



■ Made
■ in
■ Germany



FRANKEN
 *TOP-Cut*

Universalfräser, für alle Werkstoffgruppen einsetzbar
Universal End Mill, for all Material Groups



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 wendeplattenbestückten Fräskörpern.

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

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

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

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

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

**EMUGE-FRANKEN ist nach
ISO 9001:2015 zertifiziert**

EMUGE-FRANKEN is certified
according ISO 9001:2015



www.sgs-tuev-saar.com

Certification ID
DE/819944190





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:

- Ungleiches Drallwinkel
- Konisch ansteigender Spannutengrund
- Hochleistungs-Beschichtung
- Optional mit innerer Kühlschmierstoff-Zufuhr mit axialem Austritt (ICA)

Hauptmerkmal:

Für alle Werkstoffgruppen einsetzbar.

Mit dieser Broschüre zeigen wir eine Auswahl der wichtigsten Hartmetall-TOP-Cut-Schaftfräser. Zu jedem Werkzeug geben wir, in Abhängigkeit zur jeweiligen Werkstoffgruppe, sichere Startbedingungen (v_c / f_z) und Hinweise zum empfohlenen Kühlschmierstoff an.

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.

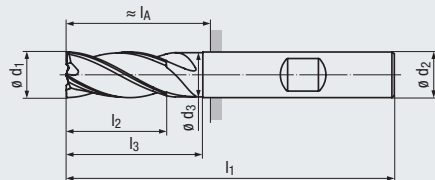
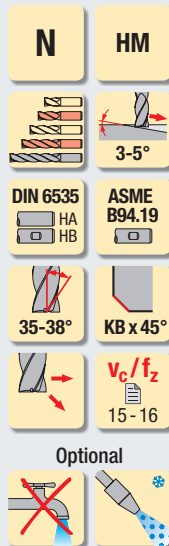
In this brochure we present a selection of the most important solid carbide TOP-Cut end mills. For every tool we give, depending on the respective material group safe starting conditions (v_c / f_z) and directions about the recommended coolant.

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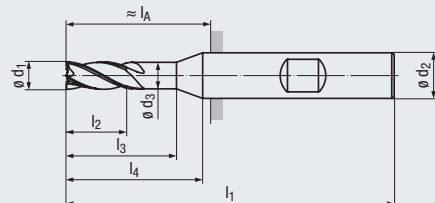
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- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar

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



Design I₄:



Allround

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



Allround

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H	1.1 1.2-1.3

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- For almost all materials
- Suitable for roughing and finishing

DIN 6527 – Kurze Ausführung · Short design

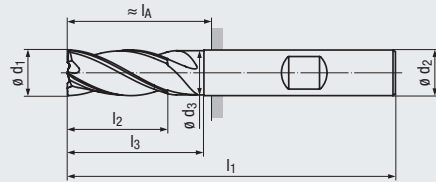
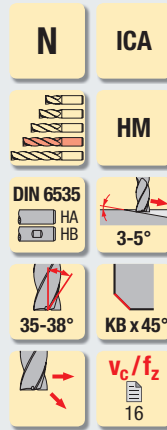
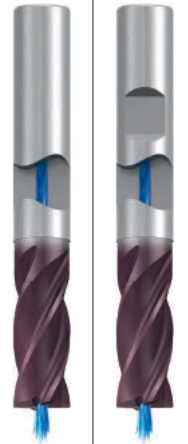
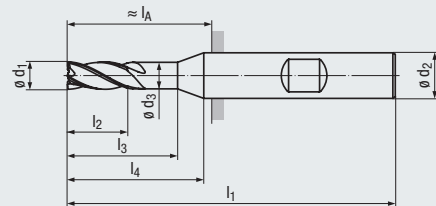
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ø d ₁ f8	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	l _A	KB	Z (Flutes)	Dimens.- Code						
3	5	9	50	2,9	14	6	14	0,07	4	.003	●	●				
4	8	12	54	3,8	18	6	18	0,07	4	.004	●	●				
5	9	16	54	4,8	18	6	18	0,07	4	.005	●	●				
6	10	16	54	5,8	—	6	18	0,12	4	.006	●	●				
8	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	●	●				

DIN 6527 – Lange Ausführung · Long design

Bestell-Code · Order code													1998A	1999A		
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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			●	●		
7	19	23	63	6,7	25	8	27	0,12	4	.007			●	●		
8	19	25	63	7,7	—	8	27	0,12	4	.008			●	●		
9	22	28	72	8,7	30	10	32	0,2	4	.009			●	●		
10	22	30	72	9,5	—	10	32	0,2	4	.010			●	●		
11	26	32	83	10,5	35	12	38	0,2	4	.011			●	●		
12	26	35	83	11,5	—	12	38	0,2	4	.012			●	●		
14	26	35	83	13,5	—	14	38	0,2	4	.014			●	●		
15	32	38	92	14,5	40	16	44	0,2	4	.015			●	●		
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			●	●		
25	45	65	125	24,2	—	25	69	0,3	6	.025			●	●		

- 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)


Design I₄:


Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 14)

Applications – material (see page 14)

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

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

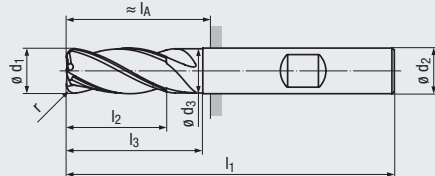
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.2-1.4
N	2.1-4.1, 5.2
S	1.1-2.6
H	1.1 1.2-1.3

DIN 6527 – Lange Ausführung · Long design

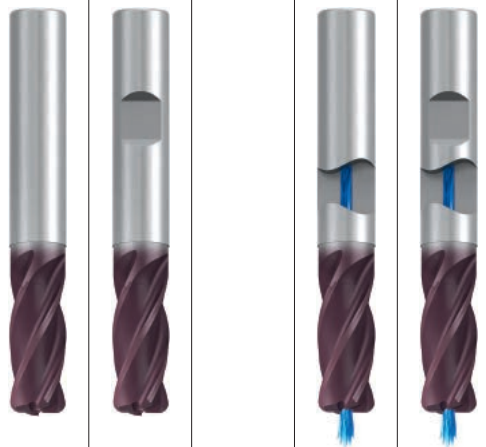
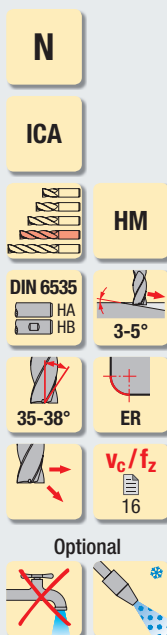
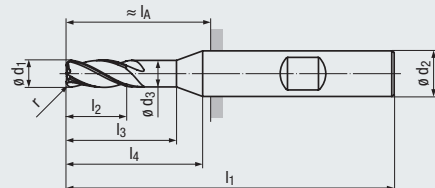
Bestell-Code · Order code											1998AZ	1999AZ				
Ø d ₁ f8	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	l _A h6	KB	Z (Flutes)	Dimens.- Code						
3	8	14	57	2,9	20	6	21	0,07	4	.003	●	●				
4	11	18	57	3,8	20	6	21	0,07	4	.004	●	●				
5	13	19	57	4,8	20	6	21	0,12	4	.005	●	●				
6	13	20	57	5,8	—	6	21	0,12	4	.006	●	●				
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	●	●				

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Verschiedene Eckenradien pro Schneidendurchmesser
- Schneiden zur Mitte oder innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Several corner radii per cutting diameter
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Design I₄:



Allround

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Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- 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

TIALN

P	1.1-5.1
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DIN 6527 – Lange Ausführung · Long design

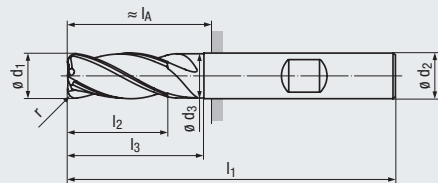
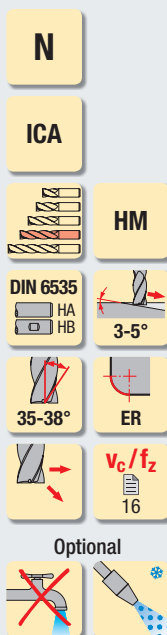
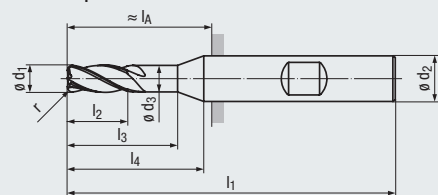
Eckenradius · Corner radius

Bestell-Code · Order code

Ø d ₁ f8	r ±0,01	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	l _A 	Z (Flutes)	Dimens.- Code					
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6	0,1	13	20	57	5,8	—	6	21	4	.006001	●	●			
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	0,15	19	25	63	7,7	—	8	27	4	.008001	●	●			
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	●	●		●	●
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10	0,5	22	30	72	9,5	—	10	32	4	.010005	●	●			
10	1	22	30	72	9,5	—	10	32	4	.010010	●	●		●	●
10	1,5	22	30	72	9,5	—	10	32	4	.010015	●	●		●	●
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10	2,5	22	30	72	9,5	—	10	32	4	.010025	●	●		●	●
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12	1,5	26	35	83	11,5	—	12	38	4	.012015	●	●		●	●
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16	0,3	32	40	92	15,5	—	16	44	4	.016003	●	●			
16	0,5	32	40	92	15,5	—	16	44	4	.016005	●	●			
16	1	32	40	92	15,5	—	16	44	4	.016010	●	●		●	●
16	1,5	32	40	92	15,5	—	16	44	4	.016015	●	●		●	●

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Verschiedene Eckenradien pro Schneidendurchmesser
- Schneiden zur Mitte oder innere Kühlschmierstoff-Zufuhr, Austritt axial (ICA)

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

Design I₄:

Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

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

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TIALN

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DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

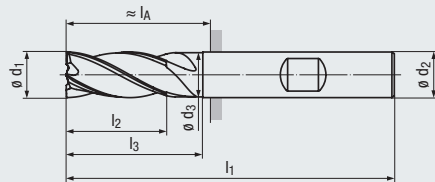
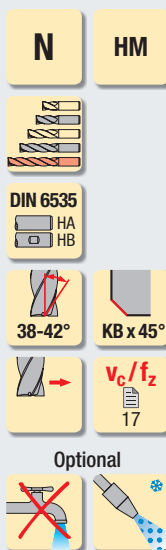
Bestell-Code · Order code											Eckenradius · Corner radius				
Ø d ₁	r	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂	l _A	Z	Dimens.-Code	2698A	2699A	2698AZ	2699AZ	
f8	±0,01						h5		(Flutes)						
16	2	32	40	92	15,5	—	16	44	4	.016020	●	●	●	●	
16	2,5	32	40	92	15,5	—	16	44	4	.016025	●	●	●	●	
16	3	32	40	92	15,5	—	16	44	4	.016030	●	●	●	●	
16	4	32	40	92	15,5	—	16	44	4	.016040	●	●	●	●	
20	0,3	38	50	104	19,5	—	20	54	4	.020003	●	●	●	●	
20	0,5	38	50	104	19,5	—	20	54	4	.020005	●	●	●	●	
20	1	38	50	104	19,5	—	20	54	4	.020010	●	●	●	●	
20	1,5	38	50	104	19,5	—	20	54	4	.020015	●	●	●	●	
20	2	38	50	104	19,5	—	20	54	4	.020020	●	●	●	●	
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	●	●	●	●	

Andere Eckenradien auf Anfrage lieferbar

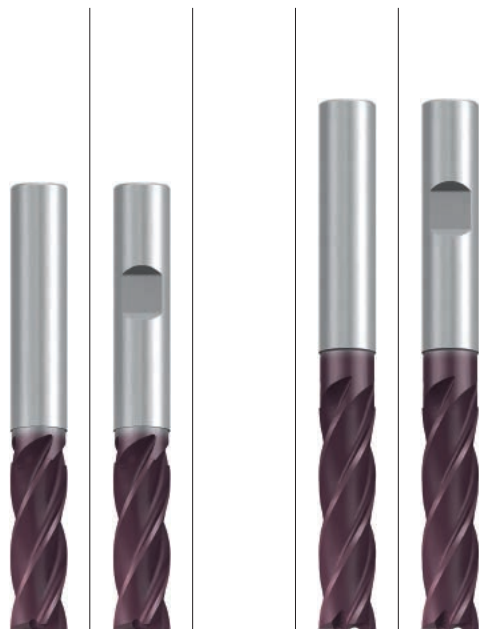
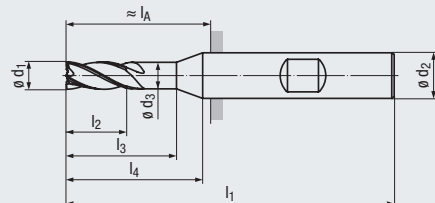
Other corner radii available on request

- 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
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Design I₄:



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- 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	1.1-1.4 1.5-1.6
N	2.1-2.8, 5.2
S	1.1-1.3 2.1-2.6

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

3 x d₁ – Extra lange Ausführung · Extra long design

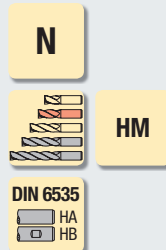
Bestell-Code · Order code											2526A	2527A				
ø d ₁ h10	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h6	l _A	KB	Z (Flutes)	Dimens.- Code						
3	9	12	62	2,9	23	6	26	0,07	4	.003	●	●				
4	12	16	62	3,8	25	6	26	0,07	4	.004	●	●				
5	15	20	62	4,8	25	6	26	0,12	4	.005	●	●				
6	18	25	62	5,8	—	6	26	0,12	4	.006	●	●				
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		
ø d ₁ h10	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø 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
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar

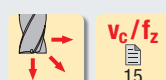
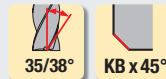
- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available



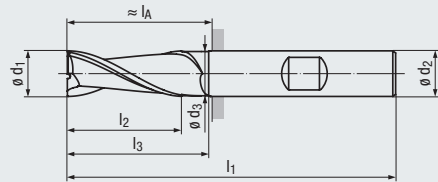
Ø 0,3 - 1,8 mm:



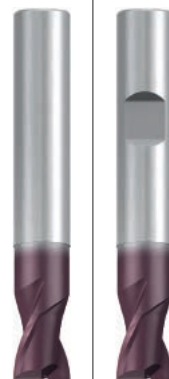
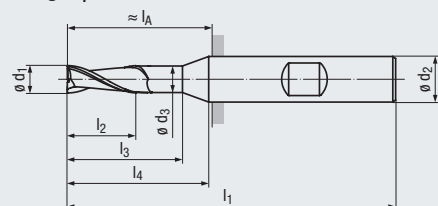
Ø 2 - 20 mm:



Optional



Design I₄:



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- For almost all materials
- Suitable for roughing and finishing

TIALN

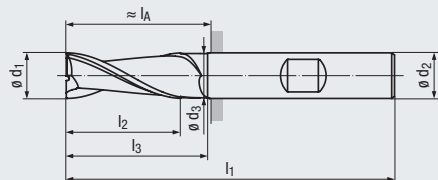
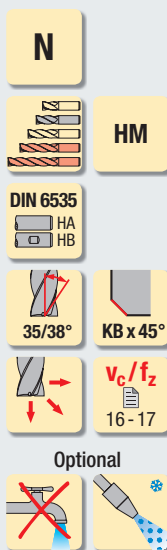
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-1.3 1.4
N	2.1-4.2, 5.2
S	1.1-2.1 2.2-2.6
H	1.1-1.2

DIN 6527 – Kurze Ausführung · Short design

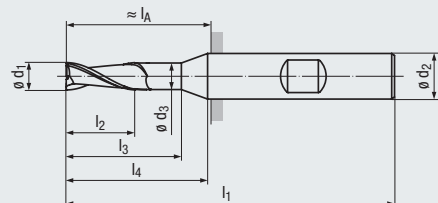
Bestell-Code · Order code											2510A	2511A				
Ø d ₁ e8	h10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h6	l _A h6	KB	Z (Flutes)	Dimens.- Code					
0,3	1	—	38	—	8	3	—	—	2	2	.0003	●				
0,5	1,5	—	38	—	9	3	—	—	2	2	.0005	●				
1	3	—	38	—	10	3	—	—	2	2	.001	●				
1,2	4	—	38	—	10	3	—	—	2	2	.0012	●				
1,3	4	—	38	—	10	3	—	—	2	2	.0013	●				
1,4	4	—	38	—	10	3	—	—	2	2	.0014	●				
1,5	4	—	38	—	10	3	—	—	2	2	.0015	●				
1,6	4	—	38	—	10	3	—	—	2	2	.0016	●				
1,8	5	—	38	—	10	3	—	—	2	2	.0018	●				
Ø d ₁ e8	h10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	l _A h5	KB	Z (Flutes)	Dimens.- Code					
2	3	5	50	1,9	14	6	14	0,04	2	2	.002	●	●			
2,5	3	5	50	2,4	14	6	14	0,07	2	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	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	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	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	2	.006	●	●			
7	8	18	58	6,7	20	8	22	0,12	2	2	.007	●	●			
8	9	20	58	7,7	—	8	22	0,12	2	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	2	.010	●	●			
12	12	26	73	11,5	—	12	28	0,2	2	2	.012	●	●			
14	14	28	75	13,5	—	14	30	0,2	2	2	.014	●	●			
16	16	32	82	15,5	—	16	34	0,2	2	2	.016	●	●			
18	18	34	84	17,5	—	18	36	0,2	2	2	.018	●	●			
20	20	40	92	19,5	—	20	42	0,3	2	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



Design I₄:



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- 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

TIALN

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

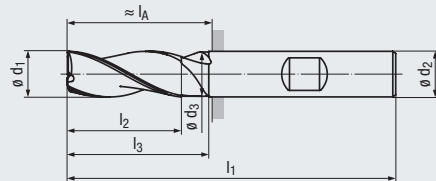
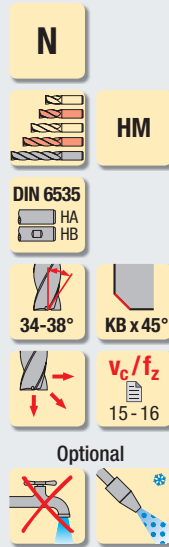
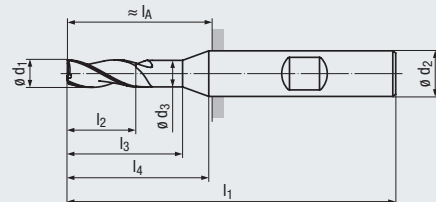
Bestell-Code · Order code											2512A	2513A				
Ø d ₁ h10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	l _A	KB	Z (Flutes)	Dimens.- Code						
2	6	8	57	1,9	20	6	21	0,04	2	.002	●	●				
3	7	10	57	2,9	20	6	21	0,07	2	.003	●	●				
4	8	12	57	3,8	20	6	21	0,07	2	.004	●	●				
5	10	15	57	4,8	20	6	21	0,12	2	.005	●	●				
6	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		
Ø d ₁ h10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø 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

Design I₄:

Allround

TIALN



Allround

TIALN

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- For almost all materials
- Suitable for roughing and finishing

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

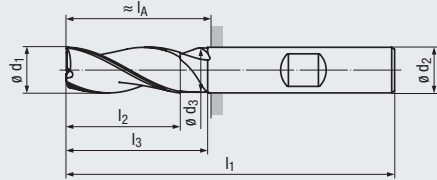
Bestell-Code · Order code											2516A	2517A				
Ø d ₁ h10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	l _A	KB	Z (Flutes)	Dimens.- Code						
1,5	3	—	50	—	14	6	14	0,04	3	.0015	●	●				
2	3	5	50	1,9	14	6	14	0,04	3	.002	●	●				
2,5	3	5	50	2,4	14	6	14	0,07	3	.0025	●	●				
2,8	4	7	50	2,7	14	6	14	0,07	3	.0028	●	●				
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

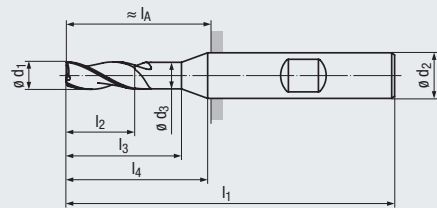
Bestell-Code · Order code														2518A	2519A	
Ø d ₁ h10	l ₂	l ₃	l ₁	Ø d ₃	l ₄	Ø d ₂ h5	l _A	KB	Z (Flutes)	Dimens.- Code						
2	6	8	57	1,9	20	6	21	0,04	3	.002				●	●	
3	7	10	57	2,9	20	6	21	0,07	3	.003				●	●	
4	8	12	57	3,8	20	6	21	0,07	3	.004				●	●	
5	10	15	57	4,8	20	6	21	0,12	3	.005				●	●	
6	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				●	●	

- Multifunktionales Hochleistungswerkzeug
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- Schneidenlänge $3 \times d_1$
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- Flute length $3 \times d_1$
- 3 lengths available



Design l_4 :



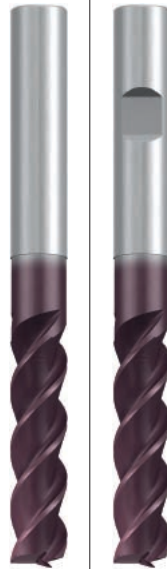
N



HM



Optional



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

- In fast allen Werkstoffen einsetzbar
- Zum Schlichten geeignet

Applications – material (see page 14)

- For almost all materials
- Suitable for finishing

TIALN

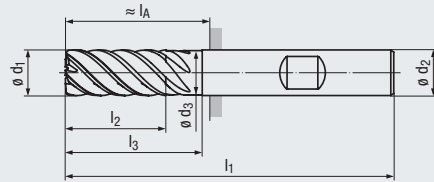
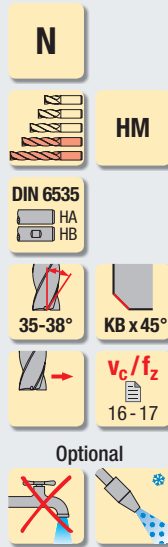
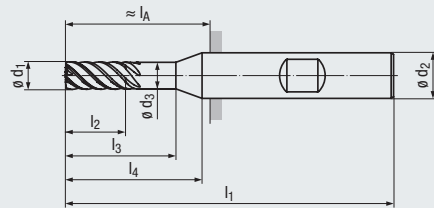
P	1.1-5.1
M	1.1-4.1
K	1.1-4.2
N	1.1-2.8, 5.2
S	1.1 1.2-1.3
S	2.1 2.2, 2.4

Extra lange Ausführung · Extra long design

Bestell-Code · Order code											2520A	2521A				
$\emptyset d_1$ h10	l_2	l_3	l_1	$\emptyset d_3$	l_4	$\emptyset d_2$ 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
- Schneidenlänge bis $3 \times d_1$
- 2 Baulängen verfügbar

- Multi-functional, high performance tool
- With ENORM geometry
- Low-vibration machining
- Flute length up to $3 \times d_1$
- 2 lengths available

Design I₄:

Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 14)

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

Applications – material (see page 14)

- 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	1.1-1.4	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

$\varnothing d_1$ f8	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	l_A 	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

2522A

2523A

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Extra lange Ausführung · Extra long design

Bestell-Code · Order code

$\varnothing d_1$ h10	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h6	l_A 	KB	Z (Flutes)	Dimens.- Code
6	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

2524A

2525A

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Internationaler Werkstoffvergleich siehe Seite 416 - 429 im FRANKEN Katalog 250

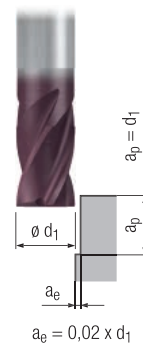
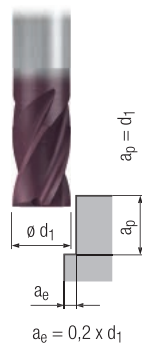
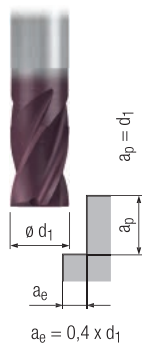
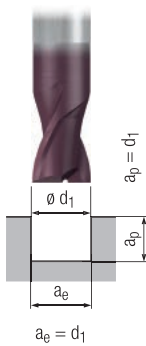
International comparison of materials, see page 416 - 429 in FRANKEN Catalogue 250

Einsatzgebiete – Material Applications – material				Material-Beispiele Material examples	Material-Nummern Material numbers
P	Stahlwerkstoffe		Steel materials		
	1.1	Kaltfließpressstähle, Baustähle, Automatenstähle, u.a.	Cold-extrusion steels, Construction steels, Free-cutting steels, etc.	≤ 600 N/mm ²	Cq15 1.1132 S235JR (St37-2) 1.0037 10SPb20 1.0722
	2.1	Baustähle, Einsatzstähle, Stahlguss, u.a.	Construction steels, Case-hardened steels, Steel castings, etc.	≤ 800 N/mm ²	E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218
	3.1	Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a.	Case-hardened steels, Heat-treatable steels, Cold work steels, etc.	≤ 1000 N/mm ²	20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067
	4.1	Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a.	Heat-treatable steels, Cold work steels, Nitriding steels, etc.	≤ 1200 N/mm ²	50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515
	5.1	Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a.	High-alloyed steels, Cold work steels, Hot work steels, etc.	≤ 1400 N/mm ²	X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344
M	Nichtrostende Stahlwerkstoffe		Stainless steel materials		
	1.1	Ferritisch, martensitisch	Ferritic, martensitic	≤ 950 N/mm ²	X2CrTi12 1.4512
	2.1	Austenitisch	Austenitic	≤ 950 N/mm ²	X6CrNiMoTi17-12-2 1.4571
	3.1	Austenitisch-ferritisch (Duplex)	Austenitic-ferritic (Duplex)	≤ 1100 N/mm ²	X2CrNiMoN22-5-3 1.4462
K	4.1	Austenitisch-ferritisch hitzebeständig (Super Duplex)	Austenitic-ferritic heat-resistant (Super Duplex)	≤ 1250 N/mm ²	X2CrNiMoN25-7-4 1.4410
	Gusswerkstoffe		Cast materials		
	1.1	Gusseisen mit Lamellengrafit (GJL)	Cast iron with lamellar graphite (GJL)	100-250 N/mm ²	EN-GJL-200 (GG20) EN-JL-1030
	1.2	Gusseisen mit Kugelgrafit (GJS)	Cast iron with nodular graphite (GJS)	250-450 N/mm ²	EN-GJL-300 (GG30) EN-JL-1050
N	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
N	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
N	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
N	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
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)
N	2.8	Kupfer-Sonderlegierungen	Special copper alloys	≤ 1400 N/mm ²	(AMPCO® 45)
	Magnesium-Legierungen		Magnesium alloys		
	3.1	Magnesium-Knetlegierungen	Magnesium wrought alloys	≤ 500 N/mm ²	MgAl6Zn 3.5612
	3.2	Magnesium-Gusslegierungen	Magnesium cast alloys	≤ 500 N/mm ²	EN-MCMgAl9Zn1 EN-MC21120
N	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
N	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
S	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
S	2.3	Nickel-Basis-Legierungen	Nickel-base alloys	≤ 1600 N/mm ²	Inconel 718 2.4668
	2.4	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1000 N/mm ²	Udimet 605
	2.5	Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1600 N/mm ²	Haynes 25 2.4964
	2.6	Eisen-Basis-Legierungen	Iron-base alloys	≤ 1500 N/mm ²	Incoloy 800 1.4958
H	Harte Werkstoffe		Hard materials		
	1.1	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	44 - 50 HRC	Weldox 1100
	1.2	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	50 - 55 HRC	Hardox 550
	1.3	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	55 - 60 HRC	Armax 600T
	1.4	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	60 - 63 HRC	Ferro-Titanit
H	1.5	Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	63 - 66 HRC	HSSE


Hartmetall-Schaft- und Langlochfräser – kurze Ausführung
Solid carbide end mills and slot drills – short design

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Gültig für · Valid for

1916A 2510A 2516A
1917A 2511A 2517A


		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	$0,005 \times d_1$	190	$0,006 \times d_1$	200	$0,007 \times d_1$	240	$0,008 \times d_1$	□	■	□	■
	2.1	150	$0,004 \times d_1$	170	$0,005 \times d_1$	180	$0,006 \times d_1$	210	$0,007 \times d_1$	□	■	□	■
	3.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■	□	■
	4.1	120	$0,003 \times d_1$	130	$0,004 \times d_1$	140	$0,004 \times d_1$	170	$0,005 \times d_1$	□	■		
	5.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	□	■		
M	1.1	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$			□	■
	2.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$			□	■
	3.1	50	$0,002 \times d_1$	60	$0,003 \times d_1$	60	$0,003 \times d_1$	70	$0,004 \times d_1$			□	■
	4.1	30	$0,002 \times d_1$	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,004 \times d_1$			□	■
K	1.1	170	$0,005 \times d_1$	190	$0,006 \times d_1$	200	$0,007 \times d_1$	240	$0,008 \times d_1$	□	■		
	1.2	170	$0,005 \times d_1$	190	$0,006 \times d_1$	200	$0,007 \times d_1$	240	$0,008 \times d_1$	□	■		
	2.1	150	$0,004 \times d_1$	170	$0,005 \times d_1$	180	$0,006 \times d_1$	210	$0,006 \times d_1$	□	■		
	2.2	150	$0,004 \times d_1$	170	$0,005 \times d_1$	180	$0,006 \times d_1$	210	$0,006 \times d_1$	□	■		
	3.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$	□	■		
	3.2	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$	□	■		
	4.1	100	$0,003 \times d_1$	110	$0,004 \times d_1$	120	$0,004 \times d_1$	140	$0,005 \times d_1$	□	■		
	4.2	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■		
N	1.1	220	$0,009 \times d_1$	250	$0,010 \times d_1$	280	$0,011 \times d_1$	300	$0,013 \times d_1$			□	■
	1.2	220	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.3	220	$0,007 \times d_1$	250	$0,008 \times d_1$	280	$0,009 \times d_1$	300	$0,010 \times d_1$			□	■
	1.4	200	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.5												
	1.6												
	2.1	150	$0,005 \times d_1$	170	$0,006 \times d_1$	180	$0,007 \times d_1$	210	$0,008 \times d_1$			□	■
	2.2	150	$0,005 \times d_1$	170	$0,006 \times d_1$	180	$0,007 \times d_1$	210	$0,008 \times d_1$			□	■
	2.3	150	$0,005 \times d_1$	170	$0,006 \times d_1$	180	$0,007 \times d_1$	210	$0,008 \times d_1$			□	■
	2.4	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$			□	■
	2.5	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$			□	■
	2.6	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,006 \times d_1$	180	$0,006 \times d_1$			□	■
	2.7	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$			□	■
	2.8	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$			□	■
	3.1	340	$0,009 \times d_1$	370	$0,011 \times d_1$	410	$0,013 \times d_1$	480	$0,014 \times d_1$			□	■
	3.2	340	$0,007 \times d_1$	370	$0,008 \times d_1$	410	$0,010 \times d_1$	480	$0,011 \times d_1$			□	■
	4.1	340	$0,008 \times d_1$	370	$0,009 \times d_1$	410	$0,011 \times d_1$	480	$0,012 \times d_1$			□	■
	4.2	500	$0,008 \times d_1$	550	$0,009 \times d_1$	600	$0,011 \times d_1$	700	$0,012 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	80	$0,003 \times d_1$	90	$0,004 \times d_1$	100	$0,004 \times d_1$	110	$0,005 \times d_1$				■
	5.3												
S	1.1	80	$0,004 \times d_1$	90	$0,004 \times d_1$	100	$0,005 \times d_1$	110	$0,006 \times d_1$				■
	1.2	70	$0,003 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$				■
	1.3	40	$0,003 \times d_1$	40	$0,003 \times d_1$	50	$0,004 \times d_1$	60	$0,004 \times d_1$				■
	2.1	70	$0,002 \times d_1$	80	$0,002 \times d_1$	80	$0,003 \times d_1$	100	$0,003 \times d_1$				■
	2.2	30	$0,002 \times d_1$	30	$0,002 \times d_1$	35	$0,003 \times d_1$	40	$0,003 \times d_1$				■
	2.3	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.4	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.5	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$				■
H	1.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	□	■		
	1.2	80	$0,003 \times d_1$	90	$0,003 \times d_1$	100	$0,004 \times d_1$	110	$0,004 \times d_1$	□	■		
	1.3			90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,004 \times d_1$	□	■		
	1.4												
	1.5												

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

■ = sehr gut geeignet · very suitable

□ = gut geeignet · suitable

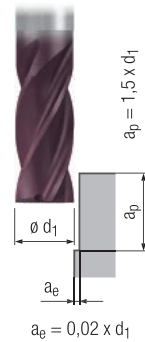
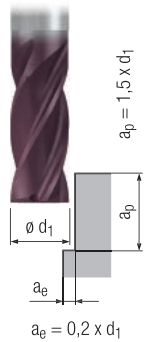
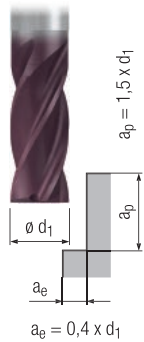
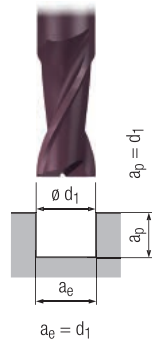


Hartmetall-Schaftfräser – lange Ausführung Solid carbide end mills – long design

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Gültig für · Valid for

1998A	2513A	2698A
1998AZ	2518A	2698AZ
1999A	2519A	2699A
1999AZ	2522A	2699AZ
2512A	2523A	



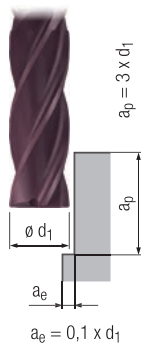
		v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL	
P	1.1	140	$0,005 \times d_1$	150	$0,005 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	□	■	□	■
	2.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■	□	■
	3.1	110	$0,004 \times d_1$	120	$0,004 \times d_1$	130	$0,005 \times d_1$	150	$0,005 \times d_1$	□	■	□	■
	4.1	100	$0,003 \times d_1$	110	$0,003 \times d_1$	120	$0,004 \times d_1$	140	$0,004 \times d_1$	□	■		
	5.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,003 \times d_1$	130	$0,004 \times d_1$	□	■		
M	1.1	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$			□	■
	3.1	40	$0,002 \times d_1$	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$			□	■
	4.1	30	$0,002 \times d_1$	30	$0,003 \times d_1$	40	$0,003 \times d_1$	40	$0,003 \times d_1$			□	■
K	1.1	140	$0,005 \times d_1$	150	$0,006 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	□	■		
	1.2	140	$0,005 \times d_1$	150	$0,006 \times d_1$	170	$0,006 \times d_1$	200	$0,007 \times d_1$	□	■		
	2.1	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■		
	2.2	130	$0,004 \times d_1$	140	$0,005 \times d_1$	160	$0,005 \times d_1$	180	$0,006 \times d_1$	□	■		
	3.1	110	$0,004 \times d_1$	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	□	■		
	3.2	110	$0,004 \times d_1$	120	$0,005 \times d_1$	130	$0,005 \times d_1$	150	$0,006 \times d_1$	□	■		
	4.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,004 \times d_1$	130	$0,004 \times d_1$	□	■		
	4.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$	□	■		
N	1.1	220	$0,009 \times d_1$	250	$0,010 \times d_1$	280	$0,011 \times d_1$	300	$0,013 \times d_1$			□	■
	1.2	220	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.3	220	$0,007 \times d_1$	250	$0,008 \times d_1$	280	$0,009 \times d_1$	300	$0,010 \times d_1$			□	■
	1.4	200	$0,008 \times d_1$	250	$0,009 \times d_1$	280	$0,010 \times d_1$	300	$0,011 \times d_1$			□	■
	1.5												
	1.6												
	2.1	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$			□	■
	2.2	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$			□	■
	2.3	130	$0,005 \times d_1$	140	$0,006 \times d_1$	160	$0,006 \times d_1$	180	$0,007 \times d_1$		□	□	■
	2.4	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$			□	■
	2.5	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$			□	■
	2.6	120	$0,004 \times d_1$	130	$0,005 \times d_1$	140	$0,005 \times d_1$	170	$0,006 \times d_1$		□	□	■
	2.7	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.8	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	3.1	290	$0,009 \times d_1$	320	$0,010 \times d_1$	350	$0,011 \times d_1$	410	$0,013 \times d_1$			□	■
	3.2	290	$0,007 \times d_1$	320	$0,008 \times d_1$	350	$0,009 \times d_1$	410	$0,010 \times d_1$			□	■
	4.1	290	$0,008 \times d_1$	320	$0,009 \times d_1$	350	$0,009 \times d_1$	410	$0,011 \times d_1$		□	□	■
	4.2	430	$0,008 \times d_1$	470	$0,009 \times d_1$	520	$0,009 \times d_1$	600	$0,011 \times d_1$			□	■
	4.3												
	4.4												
	5.1												
	5.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$				■
	5.3												
S	1.1	70	$0,004 \times d_1$	80	$0,004 \times d_1$	80	$0,004 \times d_1$	100	$0,005 \times d_1$				■
	1.2	60	$0,003 \times d_1$	70	$0,003 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
	1.3	40	$0,003 \times d_1$	40	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,004 \times d_1$				■
	2.1	60	$0,002 \times d_1$	70	$0,002 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$				■
	2.2	20	$0,002 \times d_1$	20	$0,002 \times d_1$	15	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.3	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.4	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.5	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.6	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,003 \times d_1$	30	$0,003 \times d_1$				■
H	1.1	90	$0,003 \times d_1$	100	$0,003 \times d_1$	110	$0,003 \times d_1$	130	$0,004 \times d_1$	□	■		
	1.2	70	$0,003 \times d_1$	80	$0,003 \times d_1$	80	$0,003 \times d_1$	100	$0,004 \times d_1$	□	■		
	1.3			70	$0,003 \times d_1$	70	$0,003 \times d_1$	80	$0,003 \times d_1$	□	■		
	1.4												
	1.5												


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

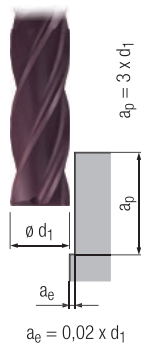
N

Gültig für · Valid for

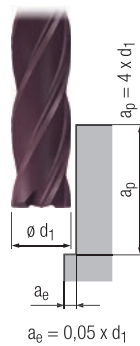
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2515A	2525A	2529A
2520A	2526A	
2521A	2527A	

3 x d₁

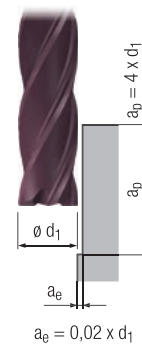
$$a_e = 0,1 \times d_1$$

3 x d₁

$$a_e = 0,02 \times d_1$$

4 x d₁

$$a_e = 0,05 \times d_1$$



$$a_e = 0,02 \times d_1$$

		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	120	$0,005 \times d_1$	140	$0,006 \times d_1$	100	$0,005 \times d_1$	120	$0,005 \times d_1$	□	■	□	■
	2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	90	$0,004 \times d_1$	110	$0,005 \times d_1$	□	■	□	■
	3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	70	$0,004 \times d_1$	90	$0,004 \times d_1$	□	■	□	■
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	□	■		
	5.1	60	$0,003 \times d_1$	70	$0,003 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$	□	■		
M	1.1	120	$0,003 \times d_1$	140	$0,004 \times d_1$	100	$0,003 \times d_1$	120	$0,003 \times d_1$			□	■
	2.1	100	$0,003 \times d_1$	120	$0,004 \times d_1$	80	$0,003 \times d_1$	100	$0,003 \times d_1$			□	■
	3.1	70	$0,003 \times d_1$	80	$0,003 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$			□	■
	4.1	50	$0,003 \times d_1$	60	$0,003 \times d_1$	40	$0,003 \times d_1$	50	$0,003 \times d_1$			□	■
K	1.1	120	$0,005 \times d_1$	140	$0,006 \times d_1$	100	$0,005 \times d_1$	120	$0,006 \times d_1$	□	■		
	1.2	120	$0,005 \times d_1$	140	$0,006 \times d_1$	100	$0,005 \times d_1$	120	$0,006 \times d_1$	□	■		
	2.1	110	$0,004 \times d_1$	130	$0,005 \times d_1$	90	$0,004 \times d_1$	110	$0,004 \times d_1$	□	■		
	2.2	110	$0,004 \times d_1$	130	$0,005 \times d_1$	90	$0,004 \times d_1$	110	$0,004 \times d_1$	□	■		
	3.1	90	$0,004 \times d_1$	110	$0,005 \times d_1$	70	$0,004 \times d_1$	90	$0,004 \times d_1$	□	■		
	3.2	90	$0,004 \times d_1$	110	$0,005 \times d_1$	70	$0,004 \times d_1$	90	$0,004 \times d_1$	□	■		
	4.1	70	$0,003 \times d_1$	80	$0,004 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$	□	■		
	4.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$	□	■		
N	1.1	360	$0,009 \times d_1$	430	$0,011 \times d_1$	300	$0,009 \times d_1$	430	$0,009 \times d_1$			□	■
	1.2	360	$0,008 \times d_1$	430	$0,010 \times d_1$	300	$0,008 \times d_1$	430	$0,009 \times d_1$			□	■
	1.3	360	$0,007 \times d_1$	430	$0,008 \times d_1$	300	$0,007 \times d_1$	430	$0,008 \times d_1$			□	■
	1.4	240	$0,008 \times d_1$	290	$0,010 \times d_1$	200	$0,008 \times d_1$	290	$0,009 \times d_1$			□	■
	1.5	230	$0,007 \times d_1$	280	$0,008 \times d_1$	180	$0,007 \times d_1$	280	$0,008 \times d_1$			□	■
	1.6	160	$0,006 \times d_1$	190	$0,007 \times d_1$	130	$0,006 \times d_1$	190	$0,007 \times d_1$			□	■
	2.1	110	$0,005 \times d_1$	130	$0,006 \times d_1$	90	$0,005 \times d_1$	110	$0,006 \times d_1$			□	■
	2.2	110	$0,005 \times d_1$	130	$0,006 \times d_1$	90	$0,005 \times d_1$	110	$0,006 \times d_1$			□	■
	2.3	110	$0,005 \times d_1$	130	$0,006 \times d_1$	90	$0,005 \times d_1$	110	$0,006 \times d_1$	□		□	■
	2.4	100	$0,004 \times d_1$	120	$0,005 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.5	100	$0,004 \times d_1$	120	$0,005 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.6	100	$0,004 \times d_1$	120	$0,005 \times d_1$	80	$0,004 \times d_1$	100	$0,004 \times d_1$			□	■
	2.7	60	$0,003 \times d_1$	70	$0,004 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$			□	■
	2.8	60	$0,003 \times d_1$	70	$0,004 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$			□	■
	3.1												
	3.2												
	4.1												
	4.2												
	4.3												
	4.4												
	5.1												
	5.2	60	$0,003 \times d_1$	70	$0,004 \times d_1$	50	$0,003 \times d_1$	60	$0,003 \times d_1$				■
	5.3												
S	1.1	90	$0,004 \times d_1$	100	$0,005 \times d_1$	70	$0,004 \times d_1$	80	$0,004 \times d_1$				■
	1.2	70	$0,003 \times d_1$	80	$0,004 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$				■
	1.3	70	$0,003 \times d_1$	80	$0,003 \times d_1$	60	$0,003 \times d_1$	70	$0,003 \times d_1$				■
	2.1	70	$0,004 \times d_1$	80	$0,004 \times d_1$	60	$0,004 \times d_1$	70	$0,004 \times d_1$				■
	2.2	30	$0,003 \times d_1$	40	$0,004 \times d_1$	15	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.3	20	$0,002 \times d_1$	25	$0,002 \times d_1$	25	$0,002 \times d_1$	20	$0,002 \times d_1$				■
	2.4	30	$0,003 \times d_1$	45	$0,003 \times d_1$	25	$0,003 \times d_1$	30	$0,003 \times d_1$				■
	2.5	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,002 \times d_1$	20	$0,002 \times d_1$				■
	2.6	20	$0,003 \times d_1$	20	$0,003 \times d_1$	20	$0,003 \times d_1$	20	$0,003 \times d_1$				■
H	1.1												
	1.2												
	1.3												
	1.4												
	1.5												

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

	P	M	K	N	S	H
Werkzeugtyp Tool type	Hochleistungsfräser-Programm High performance end mill programme					
NR	Multi-Cut	Multi-Cut	Multi-Cut			
NF	Jet-Cut	TiNox-Cut	Jet-Cut		TiNox-Cut	
N	Jet-Cut	TiNox-Cut	Jet-Cut		TiNox-Cut	
W				Alu-Cut		
W				Fiber-Cut		
WR				Alu-Cut		
H						Hard-Cut
Werkzeugtyp Tool type	Hochleistungs-Universalfräser-Programm High performance universal end mill programme					
N	TOP-Cut	TOP-Cut	TOP-Cut	TOP-Cut	TOP-Cut	TOP-Cut

Druckerzeugnisse für Hochleistungswerkzeuge

Sales literature for high performance end mills



Druckerzeugnisse für Fräswerkzeuge mit besonderen Eigenschaften

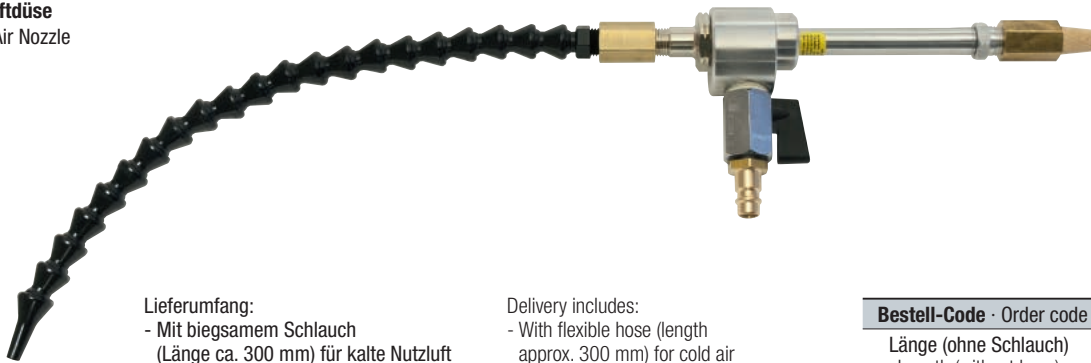
Sales literature for milling tools with special characteristics



Hauptkatalog

Main catalogue



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

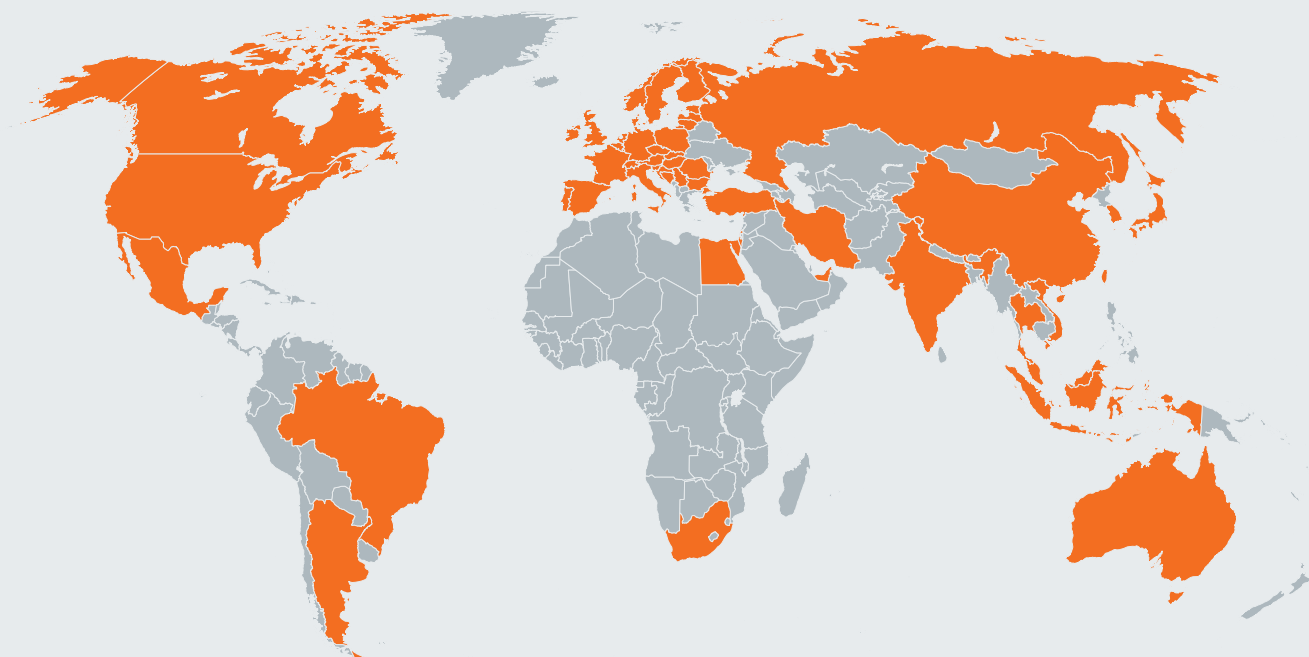
 Klemmarm mit Magnethalter
 Socket with magnetic shoe

 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				●	



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