



■ Made
■ in
■ Germany



FRANKEN
TOP-Cut

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



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

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

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

Als Ergänzung zu den Fräswerkzeugen führen wir ein durchgängiges Programm an Fräsespannmitteln 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.



Produktionsstandort in Deutschland
Production location in Germany





TOP-Cut-Fräser sind Universalfräser aus Hartmetall, die durch ihre speziellen Geometrieigenschaften in nahezu allen Materialien und Fräsverfahren eingesetzt werden können.

Besonderheiten:

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

Hauptmerkmal:

Für alle Werkstoffgruppen einsetzbar.

Durch die Vielzahl an verschiedenen Ausführungen und Abmessungen wird ein sehr breites Anwendungsgebiet gewährleistet. Von 2-schneidigen Langlochfräsern über mehrschneidige Schlichtfräser bis zu Hochleistungsfräsern mit Einsatziefen von $6 \times d_1$ decken die TOP-Cut-Werkzeuge einen großen Einsatzbereich ab.

Schafffräser mit einer großen Anzahl an verschiedenen Eckenradien (bis zu 10 pro Durchmesser) runden das Lagerprogramm dieser Produktlinie perfekt ab.

Mit dieser Broschüre zeigen wir eine Auswahl der wichtigsten Hartmetall-TOP-Cut-Schafffräser. 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 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.

The huge number of different versions and dimensions guarantees a very wide range of applications.

TOP-Cut tools cover a huge area of usage from 2-flute slot drills via multi-flute finishing end mills to high-performance end mills with insert depths of $6 \times d_1$.

End mills with a large number of different corner radii (up to 10 per diameter) perfectly round off the stock programme of this product line.

In this brochure we present a selection of the most important solid carbide TOP-Cut end mills. We provide reliable starting conditions (v_c / f_z) and guidelines concerning the recommended coolant for every tool depending on the respective material group.

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Wegweiser

Bitte beachten:

Die Eignung ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

Product finder

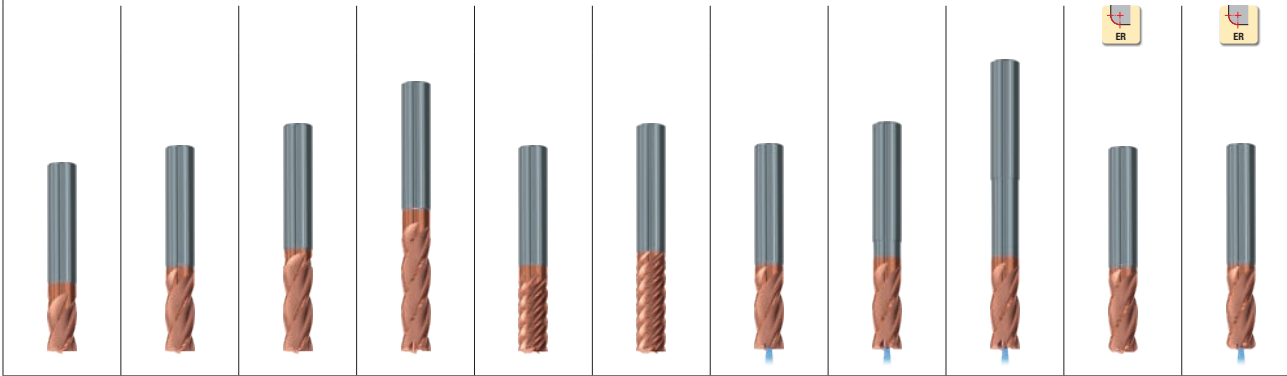
Please note:

The suitability is indicated as follows:

- = very suitable
- = suitable

| 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 50CrMo4 1.7228 |
| | 4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a. | Heat-treatable steels, Cold work steels, Nitriding steels, etc. | ≤ 1200 N/mm ² | 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 |
| 4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex) | Austenitic-ferritic heat-resistant (Super Duplex) | ≤ 1250 N/mm ² | X2CrNiMoN25-7-4 1.4410 | |
| K | Gusswerkstoffe Cast materials | | | |
| | 1.1 Gusseisen mit Lamellengrafit (GJL) | Cast iron with lamellar graphite (GJL) | 100-250 N/mm ² | EN-GJL-200 (GG20) EN-JL-1030 |
| | 2.1 Gusseisen mit Kugelgrafit (GJS) | Cast iron with nodular graphite (GJS) | 250-450 N/mm ² | EN-GJL-300 (GG30) EN-JL-1050 |
| | 2.2 Gusseisen mit Kugelgrafit (GJS) | Cast iron with nodular graphite (GJS) | 350-500 N/mm ² | EN-GJS-400-15 (GGG40) EN-JS-1030 |
| | 3.1 Gusseisen mit Vermiculargrafit (GJV) | Cast iron with vermicular graphite (GJV) | 500-900 N/mm ² | EN-GJS-700-2 (GGG70) EN-JS-1070 |
| | 3.2 Gusseisen mit Vermiculargrafit (GJV) | Cast iron with vermicular graphite (GJV) | 300-400 N/mm ² | GJV 300 |
| | 4.1 Temperguss (GTMW, GTMB) | Malleable cast iron (GTMW, GTMB) | 400-500 N/mm ² | GJV 450 |
| 4.2 Temperguss (GTMW, GTMB) | Malleable cast iron (GTMW, GTMB) | 250-500 N/mm ² | EN-GJMW-350-4 (GTW-35) EN-JM-1010 | |
| 4.2 Temperguss (GTMW, GTMB) | Malleable cast iron (GTMW, GTMB) | 500-800 N/mm ² | EN-GJMB-450-6 (GTS-45) EN-JM-1140 | |
| N | Nichteisenwerkstoffe Non-ferrous materials | | | |
| | 1.1 Aluminium-Legierungen | Aluminium alloys | | |
| | 1.2 Aluminium-Knetlegierungen | Wrought aluminium alloys | ≤ 200 N/mm ² | EN AW-AiMn1 EN AW-3103 |
| | 1.3 Aluminium-Knetlegierungen | Wrought aluminium alloys | ≤ 350 N/mm ² | EN AW-AiMgSi EN AW-6060 |
| | 1.4 Aluminium-Knetlegierungen | Wrought aluminium alloys | ≤ 550 N/mm ² | EN AW-AlZn5Mg3Cu EN AW-7022 |
| | 1.5 Aluminium-Gusslegierungen | Aluminium cast alloys | Si ≤ 7% | EN AC-AiMg5 EN AC-51300 |
| | 1.6 Aluminium-Gusslegierungen | Aluminium cast alloys | 7% < Si ≤ 12% | EN AC-AiSi9Cu3 EN AC-46500 |
| | 1.6 Aluminium-Gusslegierungen | Aluminium cast alloys | 12% < Si ≤ 17% | GD-AiSi17Cu4FeMg |
| | 2.1 Reinkupfer, niedriglegiertes Kupfer | Pure copper, low-alloyed copper | ≤ 400 N/mm ² | E-Cu 57 |
| | 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 | CuSn7ZnPb (Rg7) 2.1090 |
| | 2.7 Kupfer-Sonderlegierungen | Special copper alloys | ≤ 600 N/mm ² | (AMPCO® 8) |
| | 2.8 Kupfer-Sonderlegierungen | Special copper alloys | ≤ 1400 N/mm ² | (AMPCO® 45) |
| 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 | |
| 4.1 Duroplaste (kurzspanend) | Duroplastics (short-chipping) | | Bakelit, Pertinax | |
| 4.2 Thermoplaste (langspanend) | Thermoplastics (long-chipping) | | PMMA, POM, PVC | |
| 4.3 Faserverstärkte Kunststoffe (Faseranteil ≤ 30%) | Fibre-reinforced synthetics (fibre content ≤ 30%) | | GFK, CFK, AFK | |
| 4.4 Faserverstärkte Kunststoffe (Faseranteil > 30%) | Fibre-reinforced synthetics (fibre content > 30%) | | GFK, CFK, AFK | |
| 5.1 Grafit | Graphite | | C 8000 | |
| 5.2 Wolfram-Kupfer-Legierungen | Tungsten-copper alloys | | W-Cu 80/20 | |
| 5.3 Verbundwerkstoffe | Composite materials | | HyLite, Alucobond | |
| S | Spezialwerkstoffe Special materials | | | |
| | 1.1 Titan-Legierungen | Titanium alloys | | |
| | 1.2 Reintitan | Pure titanium | ≤ 450 N/mm ² | Ti1 3.7025 |
| | 1.3 Titan-Legierungen | Titanium alloys | ≤ 900 N/mm ² | TiAl6V4 3.7165 |
| | 1.3 Titan-Legierungen | Titanium alloys | ≤ 1250 N/mm ² | TiAl4Mo4Sn2 3.7185 |
| | 2.1 Nickel-, Kobalt- und Eisen-Legierungen | Nickel alloys, cobalt alloys and iron alloys | | |
| | 2.2 Reinnickel | Pure nickel | ≤ 600 N/mm ² | Ni 99.6 2.4060 |
| | 2.3 Nickel-Basis-Legierungen | Nickel-base alloys | ≤ 1000 N/mm ² | Monel 400 2.4360 |
| | 2.4 Nickel-Basis-Legierungen | Nickel-base alloys | ≤ 1600 N/mm ² | Inconel 718 2.4668 |
| | 2.5 Kobalt-Basis-Legierungen | Cobalt-base alloys | ≤ 1000 N/mm ² | Udimet 605 |
| 2.6 Eisen-Basis-Legierungen | Iron-base alloys | ≤ 1600 N/mm ² | Haynes 25 2.4964 | |
| 2.6 Eisen-Basis-Legierungen | Iron-base alloys | ≤ 1500 N/mm ² | Incoloy 800 1.4958 | |
| H | Harte Werkstoffe Hard materials | | | |
| | 1.1 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 44 - 50 HRC | Weldox 1100 |
| | 1.2 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 50 - 55 HRC | Hardox 550 |
| | 1.3 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 55 - 60 HRC | ArmoX 600T |
| | 1.4 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 60 - 63 HRC | Ferro-Titanit |
| | 1.5 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 63 - 66 HRC | HSSE |

Hartmetall-Schafffräser „ENORM“
Solid Carbide End Mills "ENORM"



Allround

N

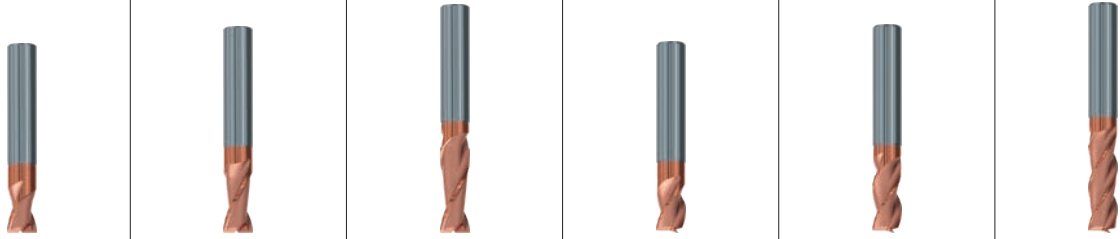
| ø3 - 20 mm | ø3 - 25 mm | ø3 - 20 mm | ø6 - 20 mm | ø5 - 20 mm | ø6 - 20 mm | ø3 - 20 mm | ø6 - 20 mm | ø3 - 20 mm | ø3 - 20 mm | ø3 - 20 mm | Z (Flutes) |
|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|------------|
| 4 | 4 - 6 | 4 - 5 | 4 - 5 | 6 - 8 | 6 - 8 | 4 | 4 | 4 | 4 | 4 | |
| 1916A | 1998A | 2526A | 2528A | 2522A | 2524A | 1998AZ | 3806AZ | 3808AZ | 2698A | 2698AZ | |
| 1917A | 1999A | 2527A | 2529A | 2523A | 2525A | 1999AZ | 3807AZ | 3809AZ | 2699A | 2699AZ | |
| 8 | 8 | 9 | 9 | 10 | 10 | 11 | 12 | 13 | 14- 15 | 14- 15 | |
| 20 | 21 | 22 | 22 | 21 | 22 | 21 | 23 | 24 | 21 | 21 | |

Seite · Page
V_c / f_z

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

Hartmetall-Schaft- und Langlochfräser
Solid Carbide End Mills and slot drills



Allround

N

| | ø0,3-20 mm | ø2-20 mm | ø3-20 mm | ø1,5-20 mm | ø1-20 mm | ø3-20 mm |
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| Z (Flutes) | 2 | 2 | 2 | 3 | 3 | 3 |
| | 2510A | 2512A | 2514A | 2516A | 2518A | 2520A |
| | 2511A | 2513A | 2515A | 2517A | 2519A | 2521A |
| Seite - Page | 16 | 17 | 17 | 18 | 18 | 19 |
| v_c / f_z | 20 | 21 | 22 | 20 | 21 | 22 |
| P | 1.1 | ■ | ■ | ■ | ■ | ■ |
| | 2.1 | ■ | ■ | ■ | ■ | ■ |
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| 2.5 | □ | □ | □ | □ | □ | |
| 2.6 | □ | □ | □ | □ | □ | |
| H | 1.1 | ■ | ■ | ■ | ■ | ■ |
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| | 1.4 | | | | | |
| | 1.5 | | | | | |



24/7

Unsere Vielfalt auf · Precision Tools on
www.emuge-franken.com



Mit dem bei den Werkzeugen abgebildeten QR-Code gelangen Sie direkt zu den jeweiligen Artikeln in unserem Webshop. Dort finden Sie umfassende Werkzeuginformationen und Schnittdaten.

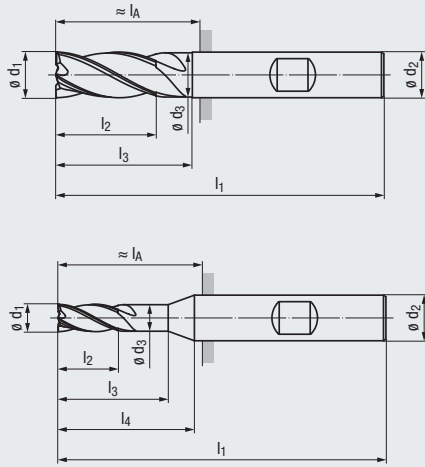
Bei Registrierung stehen Ihnen noch weitere Produktdaten und Funktionen zur Verfügung. Dazu zählen neben standardisierten Werkzeugdaten (2D / 3D / Sachmerkmale) auch eine Bestell- oder Angebotshistorie, individuelle Merklisten sowie weitere nützliche Funktionen.

The QR code shown with the tools will take you directly to the respective articles in our web store where you can find comprehensive tool information and cutting data.

Registration provides you with additional product data and functions. These include standardised tool data (2D / 3D / characteristics), an order or quotation history and individual watch lists as well as other useful functions.

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

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



N

HM

DIN 6535
HA
HB

3-5°

35-38°

KB x 45°

Vc/fz
20 - 21



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

- For almost all materials
- Suitable for roughing and finishing

TIALN

TIALN

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

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

DIN 6527 – Kurze Ausführung · Short design

| Bestell-Code · Order code | | | | | | | | | | | 1916A | 1917A | | |
|---------------------------|----|----|----|------|----|------------|----|-------|---------------|------------------|-------|-------|--|--|
| ∅ d1 f8 | l2 | l3 | l1 | ∅ d3 | l4 | ∅ d2 h5 | lA | 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 | 0,12 | 4 | .005 | ● | ● | | |
| 6 | 10 | 16 | 54 | 5,8 | – | 6 | 18 | 0,12 | 4 | .006 | ● | ● | | |
| 7 | 12 | 18 | 58 | 6,8 | 20 | 8 | 22 | 0,125 | 4 | .007 | ● new | ● new | | |
| 8 | 12 | 20 | 58 | 7,7 | – | 8 | 22 | 0,12 | 4 | .008 | ● | ● | | |
| 9 | 15 | 22 | 66 | 8,7 | 24 | 12 | 26 | 0,2 | 4 | .009 | ● new | ● new | | |
| 10 | 15 | 24 | 66 | 9,5 | – | 10 | 26 | 0,2 | 4 | .010 | ● | ● | | |
| 12 | 18 | 26 | 73 | 11,5 | – | 12 | 28 | 0,2 | 4 | .012 | ● | ● | | |
| 14 | 21 | 28 | 75 | 13,5 | – | 14 | 28 | 0,2 | 4 | .014 | ● new | ● new | | |
| 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 |
|---------------------------|----|----|-----|------|----|------------|----|------|---------------|------------------|--|--|-------|-------|
| ∅ d1 f8 | l2 | l3 | l1 | ∅ d3 | l4 | ∅ d2 h5 | lA | 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 | | | ● | ● |
| 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 | | | ● | ● |
| 8 | 19 | 25 | 63 | 7,7 | – | 8 | 27 | 0,12 | 5 | .008005 | | | ● | ● |
| 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 | | | ● | ● |
| 10 | 22 | 30 | 72 | 9,5 | – | 10 | 32 | 0,2 | 5 | .010005 | | | ● | ● |
| 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 | | | ● | ● |
| 12 | 26 | 35 | 83 | 11,5 | – | 12 | 38 | 0,2 | 5 | .012005 | | | ● | ● |
| 14 | 26 | 35 | 83 | 13,5 | – | 14 | 38 | 0,2 | 4 | .014 | | | ● | ● |
| 14 | 26 | 35 | 83 | 13,5 | – | 14 | 38 | 0,2 | 5 | .014005 | | | ● | ● |
| 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 | | | ● | ● |
| 16 | 32 | 40 | 92 | 15,5 | – | 16 | 44 | 0,2 | 5 | .016005 | | | ● | ● |
| 18 | 32 | 50 | 100 | 17,5 | – | 18 | 52 | 0,2 | 4 | .018 | | | ● | ● |
| 18 | 32 | 50 | 100 | 17,5 | – | 18 | 52 | 0,2 | 5 | .018005 | | | ● | ● |
| 20 | 38 | 50 | 104 | 19,5 | – | 20 | 54 | 0,3 | 4 | .020 | | | ● | ● |
| 20 | 38 | 50 | 104 | 19,5 | – | 20 | 54 | 0,3 | 5 | .020005 | | | ● | ● |
| 25 | 45 | 65 | 125 | 24,2 | – | 25 | 69 | 0,3 | 4 | .025004 | | | ● | ● |
| 25 | 45 | 65 | 125 | 24,2 | – | 25 | 69 | 0,3 | 6 | .025 | | | ● | ● |

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

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

N

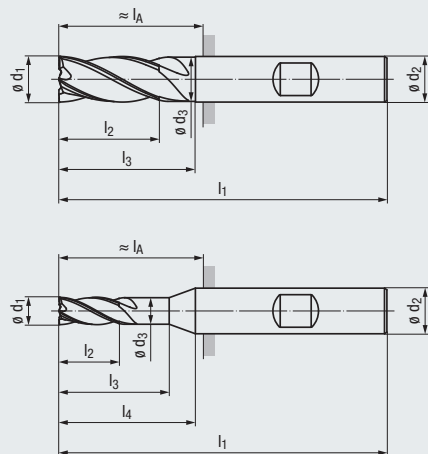
HM

DIN 6535
HA
HB

38-42°

KB x 45°

v_c / f_z
22



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- In fast allen Werkstoffen einsetzbar
- Zum Schlichten geeignet

Applications – material (see page 4)

- For almost all materials
- Suitable for finishing

TIALN

TIALN

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

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

$l_2 = 3 \times d_1$ – Extra lange Ausführung · Extra long design

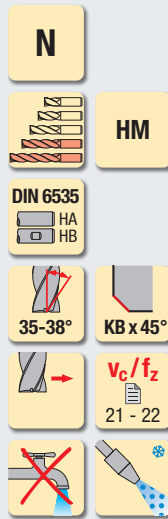
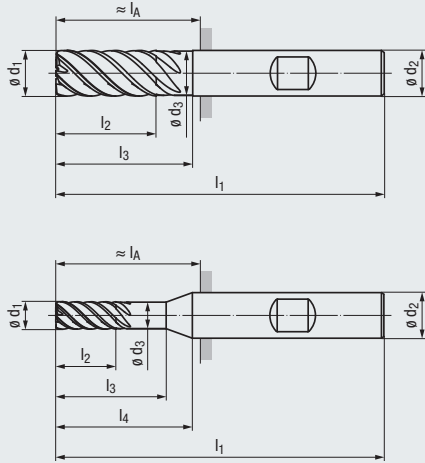
| Bestell-Code · Order code | | | | | | | | | | | 2526A | 2527A | | |
|---------------------------|-------|-------|-------|-------------------|-------|-------------------------|-----------|------|---------------|------------------|-------|-------|--|--|
| $\varnothing d_1$ h10 | l_2 | l_3 | l_1 | $\varnothing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

$l_2 = 4 \times d_1$ – Extra lange Ausführung · Extra long design

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

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Schneidlänge 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



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

- For all tough materials
- Suitable for HSC finishing

TIALN

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 | | 1.1-1.3 |

| | | |
|---|---------|---------|
| 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 | | | | | | | | | | | 2522A | 2523A | | |
|---------------------------|-------|-------|-------|-------------------|-------|-------------------------|-------------|------|---------------|------------------|-------|-------|--|--|
| $\varnothing d_1$ f8 | l_2 | l_3 | l_1 | $\varnothing d_3$ | l_4 | $\varnothing d_2$ h5 | l_A h6 | KB | Z (Flutes) | Dimens.- Code | | | | |
| 5 | 13 | 18 | 57 | 4,8 | 20 | 6 | 21 | 0,12 | 6 | .005 | ● | ● | | |
| 6 | 13 | 20 | 57 | 5,8 | – | 6 | 21 | 0,12 | 6 | .006 | ● | ● | | |
| 8 | 19 | 25 | 63 | 7,7 | – | 8 | 27 | 0,12 | 6 | .008 | ● | ● | | |
| 10 | 22 | 30 | 72 | 9,7 | – | 10 | 32 | 0,2 | 6 | .010 | ● | ● | | |
| 12 | 26 | 35 | 83 | 11,6 | – | 12 | 38 | 0,2 | 6 | .012 | ● | ● | | |
| 16 | 32 | 40 | 92 | 15,5 | – | 16 | 44 | 0,2 | 6 | .016 | ● | ● | | |
| 20 | 38 | 50 | 104 | 19,5 | – | 20 | 54 | 0,3 | 8 | .020 | ● | ● | | |

$l_2 = 3 \times d_1$ – Extra lange Ausführung · Extra long design

| Bestell-Code · Order code | | | | | | | | | | | | | 2524A | 2525A |
|---------------------------|-------|-------|-------|-------------------|-------|-------------------------|-------------|------|---------------|------------------|--|--|-------|-------|
| $\varnothing d_1$ h10 | l_2 | l_3 | l_1 | $\varnothing d_3$ | l_4 | $\varnothing d_2$ h6 | l_A h6 | KB | Z (Flutes) | Dimens.- Code | | | | |
| 6 | 18 | 25 | 62 | 5,8 | – | 6 | 26 | 0,12 | 6 | .006 | | | ● | ● |
| 8 | 24 | 30 | 68 | 7,7 | – | 8 | 32 | 0,12 | 6 | .008 | | | ● | ● |
| 10 | 30 | 35 | 80 | 9,7 | – | 10 | 40 | 0,2 | 6 | .010 | | | ● | ● |
| 12 | 36 | 45 | 93 | 11,6 | – | 12 | 48 | 0,2 | 6 | .012 | | | ● | ● |
| 16 | 48 | 55 | 108 | 15,5 | – | 16 | 60 | 0,2 | 6 | .016 | | | ● | ● |
| 20 | 60 | 70 | 126 | 19,5 | – | 20 | 76 | 0,3 | 8 | .020 | | | ● | ● |

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

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

N

ICA

HM

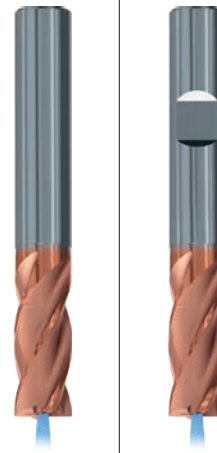
DIN 6535
HA HB

3-5°

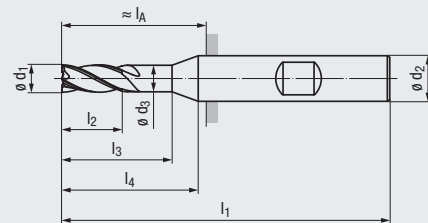
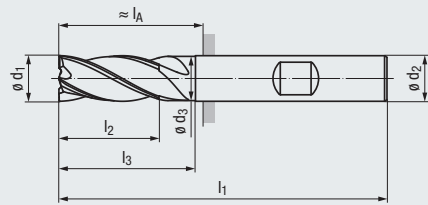
35-38°

KB x 45°

V_c/f_z
21



Allround



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

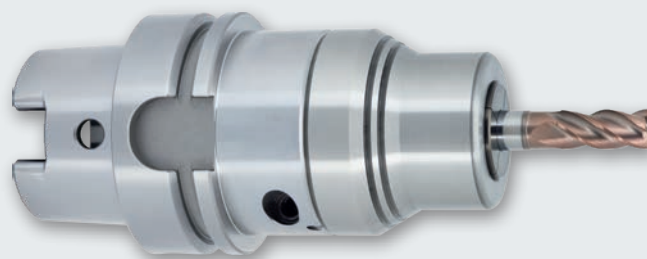
- For almost all materials, including tough materials
- Suitable for roughing and finishing

TIALN

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

DIN 6527 – Lange Ausführung · Long design

| Bestell-Code · Order code | | | | | | | | | | | 1998AZ | 1999AZ | | |
|---------------------------|----------------|----------------|----------------|------------------|----------------|------------------------|--------------------|------|---------------|------------------|--------|--------|--|--|
| ∅ d ₁ f8 | l ₂ | l ₃ | l ₁ | ∅ d ₃ | l ₄ | ∅ d ₂ h5 | l _A | KB | Z (Flutes) | Dimens.- Code | | | | |
| 3 | 8 | 14 | 57 | 2,9 | 20 | 6 | 21 | 0,07 | 4 | .003 | ● | ● | | |
| 4 | 11 | 18 | 57 | 3,8 | 20 | 6 | 21 | 0,07 | 4 | .004 | ● | ● | | |
| 5 | 13 | 19 | 57 | 4,8 | 20 | 6 | 21 | 0,12 | 4 | .005 | ● | ● | | |
| 6 | 13 | 20 | 57 | 5,8 | – | 6 | 21 | 0,12 | 4 | .006 | ● | ● | | |
| 8 | 19 | 25 | 63 | 7,7 | – | 8 | 27 | 0,12 | 4 | .008 | ● | ● | | |
| 10 | 22 | 30 | 72 | 9,5 | – | 10 | 32 | 0,2 | 4 | .010 | ● | ● | | |
| 12 | 26 | 35 | 83 | 11,5 | – | 12 | 38 | 0,2 | 4 | .012 | ● | ● | | |
| 16 | 32 | 40 | 92 | 15,5 | – | 16 | 44 | 0,2 | 4 | .016 | ● | ● | | |
| 20 | 38 | 50 | 104 | 19,5 | – | 20 | 54 | 0,3 | 4 | .020 | ● | ● | | |



Präzisions-Spannhülsen-Aufnahmen FPC

Die patentierten Präzisions-Spannhülsen-Aufnahmen FPC sind hochgenaue Werkzeug-Aufnahmen mit mechanischer Klemmung für höchste Spannkraft und Rundlaufgenauigkeit sowie mit sehr guten Dämpfungseigenschaften. Die Werkzeugspannung erfolgt mittels Spannhülsen.

Das Spannen und Lösen des Werkzeugs geschieht mit einem Sechskantschlüssel, welcher seitlich den Spannmechanismus bedient – und das innerhalb weniger Sekunden. Es können alle Zylinderschäfte nach DIN 6535 oder DIN 1835 gespannt werden.

Die Präzisions-Spannhülsen-Aufnahmen FPC eignen sich hervorragend zum Hochleistungs- und Hochgeschwindigkeitsfräsen. Darüber hinaus können diese auch zum Bohren, Reiben oder zur Gewindeherstellung eingesetzt werden.

High Precision Collet Holders FPC

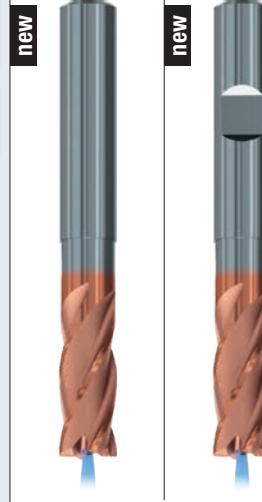
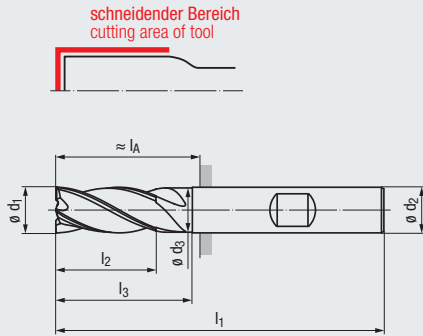
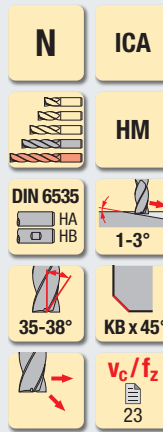
The patented precision collet holders FPC are highly precise tool holders with mechanical clamping which provide superior clamping force and concentricity as well as excellent shock-absorbing properties. The tools are clamped via collets.

Tools are clamped and unclamped with a hexagon wrench which operates the clamping mechanism at the side – and in just a few seconds. All straight shanks according to DIN 6535 or DIN 1835 can be clamped.

The high-precision collet holders FPC are well suited for high-performance and high-speed milling. In addition they can be used for drilling, reaming and threading operations.

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

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



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

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

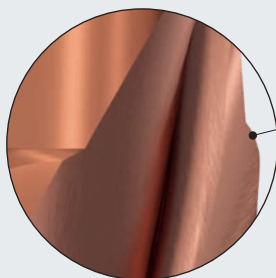
TIALN

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

Extra lange Ausführung · Extra long design

| Bestell-Code · Order code | | | | | | | | | | 3806AZ | 3807AZ | | |
|---------------------------|-------|-------|-------|-------------------|-------------------------|-------|------|---------------|------------------|--------|--------|--|--|
| $\varnothing d_1$ h10 | l_2 | l_3 | l_1 | $\varnothing d_3$ | $\varnothing d_2$ h6 | l_A | KB | Z (Flutes) | Dimens.- Code | | | | |
| 6 | 13 | 25 | 62 | 5,8 | 6 | 26 | 0,12 | 4 | .006 | ● | ● | | |
| 8 | 19 | 30 | 68 | 7,7 | 8 | 32 | 0,12 | 4 | .008 | ● | ● | | |
| 10 | 22 | 38 | 80 | 9,5 | 10 | 40 | 0,2 | 4 | .010 | ● | ● | | |
| 12 | 26 | 46 | 93 | 11,5 | 12 | 48 | 0,2 | 4 | .012 | ● | ● | | |
| 14 | 26 | 52 | 99 | 13,5 | 14 | 54 | 0,2 | 4 | .014 | ● | ● | | |
| 16 | 32 | 58 | 108 | 15,5 | 16 | 60 | 0,2 | 4 | .016 | ● | ● | | |
| 18 | 32 | 68 | 118 | 17,5 | 18 | 70 | 0,2 | 4 | .018 | ● | ● | | |
| 20 | 38 | 74 | 126 | 19,5 | 20 | 76 | 0,3 | 4 | .020 | ● | ● | | |

Übergangsradius
Transition radius

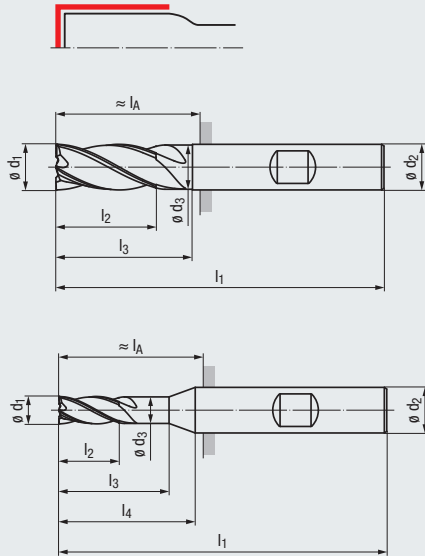


Übergangsradius von der Umfangsschneide in den Hals.
Bei axialen Zustellungen werden absatzfreie Oberflächen erzeugt.
Transition radius from the peripheral cutting edge to the neck.
Axial infeds produce stepless surfaces.

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

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

schneidender Bereich
cutting area of tool



N

ICA

HM

DIN 6535

HA HB

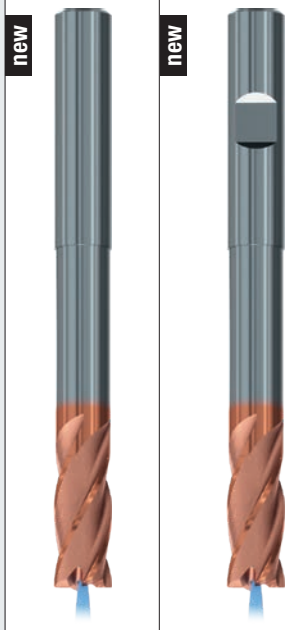
1-2°

35-38°

KB x 45°

v_c / f_z

24



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

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

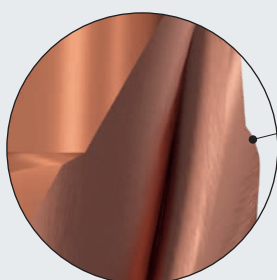
TIALN

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

$l_3 = 6 \times d_1$ – Extra lange Ausführung · Extra long design

| Bestell-Code · Order code | | | | | | | | | | | 3808AZ | 3809AZ | | |
|---------------------------|-------|-------|-------|-------------------|-------|-------------------------|-------|------|---------------|------------------|--------|--------|--|--|
| $\varnothing d_1$ h10 | l_2 | l_3 | l_1 | $\varnothing d_3$ | l_4 | $\varnothing d_2$ h6 | l_A | KB | Z (Flutes) | Dimens.- Code | | | | |
| 3 | 8 | 18 | 62 | 2,8 | 25 | 6 | 26 | 0,12 | 4 | .003 | ● | ● | | |
| 4 | 11 | 24 | 62 | 3,8 | 25 | 6 | 26 | 0,12 | 4 | .004 | ● | ● | | |
| 5 | 13 | 30 | 68 | 4,8 | 31 | 6 | 32 | 0,12 | 4 | .005 | ● | ● | | |
| 6 | 13 | 36 | 74 | 5,8 | – | 6 | 38 | 0,12 | 4 | .006 | ● | ● | | |
| 8 | 19 | 48 | 86 | 7,7 | – | 8 | 50 | 0,12 | 4 | .008 | ● | ● | | |
| 10 | 22 | 60 | 102 | 9,5 | – | 10 | 62 | 0,2 | 4 | .010 | ● | ● | | |
| 12 | 26 | 72 | 119 | 11,5 | – | 12 | 74 | 0,2 | 4 | .012 | ● | ● | | |
| 14 | 26 | 84 | 131 | 13,5 | – | 14 | 86 | 0,2 | 4 | .014 | ● | ● | | |
| 16 | 32 | 96 | 146 | 15,5 | – | 16 | 98 | 0,2 | 4 | .016 | ● | ● | | |
| 18 | 32 | 108 | 158 | 17,5 | – | 18 | 110 | 0,2 | 4 | .018 | ● | ● | | |
| 20 | 38 | 120 | 172 | 19,5 | – | 20 | 122 | 0,3 | 4 | .020 | ● | ● | | |

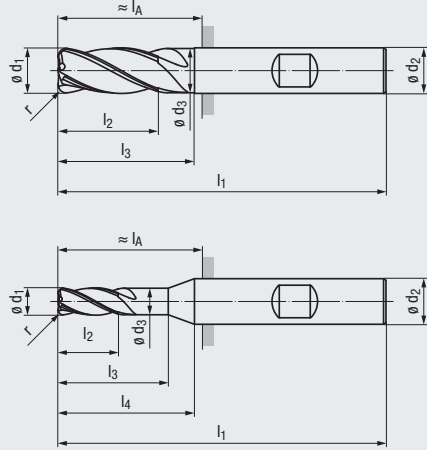
Übergangsradius
Transition radius



Übergangsradius von der Umfangsschneide in den Hals.
Bei axialen Zustellungen werden absatzfreie Oberflächen erzeugt.
Transition radius from the peripheral cutting edge to the neck.
Axial infeeds produce stepless surfaces.

- Multifunktionales Hochleistungswerkzeug
- Mit ENORM-Geometrie
- Vibrationsarme Bearbeitung
- Verschiedene Eckenradien pro Schneiddurchmesser
- 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)



N

ICA

HM

DIN 6535
HA HB

3-5°

35-38°

ER

v_c / f_z
21



Allround



Allround



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

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

TIALN

TIALN

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

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

DIN 6527 – Lange Ausführung · Long design

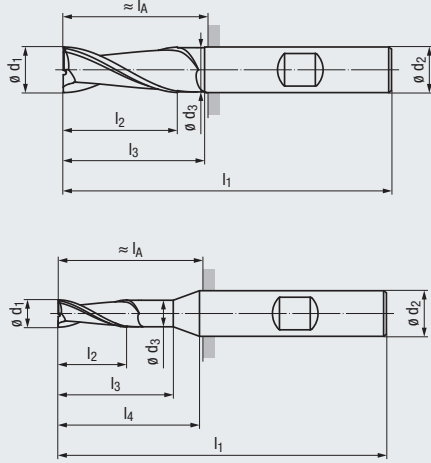
Eckenradius · Corner radius

| Bestell-Code · Order code | | | | | | | | | | | 2698A | 2699A | 2698AZ | 2699AZ |
|---------------------------|------------|-------|-------|-------|-------------------|-------|-------------------|-------|----------|--------------|-------|-------|--------|--------|
| $\varnothing d_1$ | r | l_2 | l_3 | l_1 | $\varnothing d_3$ | l_4 | $\varnothing d_2$ | l_A | Z | Dimens.-Code | | | | |
| f_8 | $\pm 0,01$ | | | | | | h_5 | | (Flutes) | | | | | |
| 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 | ● | ● | ● | ● |
| 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

- Langlochfräser mit 2 Schneiden
- Neuentwickelte Geometrie
- Vibrationsarme Bearbeitung
- Schneiden zur Mitte
- 3 Baulängen verfügbar

- Slot drill with 2 flutes
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- 3 lengths available



N

HM

DIN 6535
HA
HB

3-5°

$\varnothing 0,3 - 1,8$ mm:

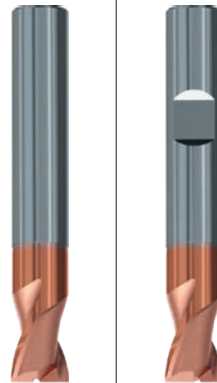
30°

$\varnothing 2 - 20$ mm:

35/38°

KB x 45°

V_c / f_z
20



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- In fast allen Werkstoffen einsetzbar
- Zum Schruppen und Schlichten geeignet
- Zur Herstellung von Passfedernuten nach DIN 6885-1
- Gut zum Bohrfräsen geeignet

Applications – material (see page 4)

- For almost all materials
- Suitable for roughing and finishing
- For producing keyways acc. DIN 6885-1
- Suitable for z-axis milling

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 1.3 |

DIN 6527 – Kurze Ausführung · Short design

| Bestell-Code · Order code | | | | | | | | | | | 2510A | 2511A | | | |
|---------------------------|----------|-------|-------|-------|-------------------|-------|-------------------------|-------------|----|---------------|------------------|-------|--|--|--|
| $\varnothing d_1$ e8 | h_{10} | l_2 | l_3 | l_1 | $\varnothing d_3$ | l_4 | $\varnothing d_2$ h6 | l_A h6 | KB | Z (Flutes) | Dimens.- Code | | | | |
| 0,3 | 1 | — | 38 | — | 8 | 3 | — | — | — | 2 | .0003 | ● | | | |
| 0,5 | 1,5 | — | 38 | — | 9 | 3 | — | — | — | 2 | .0005 | ● | | | |
| 1 | 3 | — | 38 | — | 10 | 3 | — | — | — | 2 | .001 | ● | | | |
| 1,2 | 4 | — | 38 | — | 10 | 3 | — | — | — | 2 | .0012 | ● | | | |
| 1,3 | 4 | — | 38 | — | 10 | 3 | — | — | — | 2 | .0013 | ● | | | |
| 1,4 | 4 | — | 38 | — | 10 | 3 | — | — | — | 2 | .0014 | ● | | | |
| 1,5 | 4 | — | 38 | — | 10 | 3 | — | — | — | 2 | .0015 | ● | | | |
| 1,6 | 4 | — | 38 | — | 10 | 3 | — | — | — | 2 | .0016 | ● | | | |
| 1,8 | 5 | — | 38 | — | 10 | 3 | — | — | — | 2 | .0018 | ● | | | |

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

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

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

N

HM

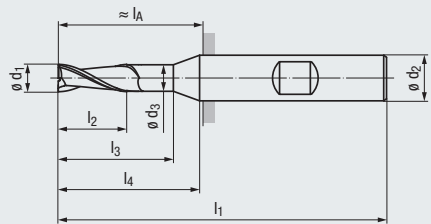
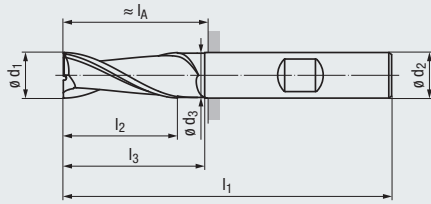
DIN 6535
HA
HB

1-2°

35/38°

KB x 45°

v_c / f_z
21 - 22



Allround



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

- For almost all materials
- Suitable for roughing and finishing

TIALN

TIALN

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

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

DIN 6527 – Lange Ausführung · Long design

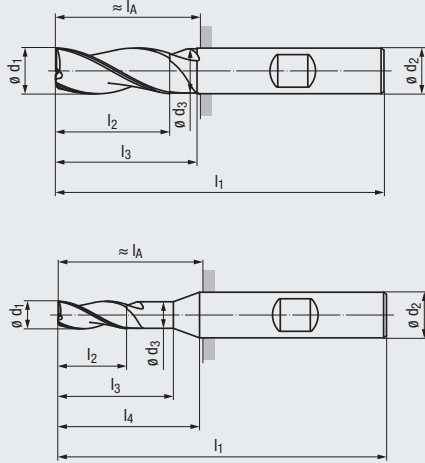
| Bestell-Code · Order code | | | | | | | | | | | 2512A | 2513A | | |
|---------------------------|-------|-------|-------|-------------------|-------|-------------------------|-----------|------|---------------|------------------|-------|-------|--|--|
| $\varnothing d_1$ h10 | l_2 | l_3 | l_1 | $\varnothing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

$l_2 = 3 \times d_1$ – Extra lange Ausführung · Extra long design

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

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

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



N

HM

DIN 6535
HA
HB

3-5°

34-38°

KB x 45°

Vc / fz
20 - 21



Allround

Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

- For almost all materials
- Suitable for roughing and finishing

TIALN

TIALN

| | |
|---|----------------------|
| P | 1.1-5.1 |
| M | 1.1-4.1 |
| K | 1.1-4.2 |
| N | 1.1-1.4 |
| N | 2.1-2.8, 5.2 3.1-4.2 |
| S | 1.1 1.2-1.3 |
| S | 2.1 2.2-2.6 |
| H | 1.1-1.2 1.3 |

| | |
|---|----------------------|
| P | 1.1-5.1 |
| M | 1.1-4.1 |
| K | 1.1-4.2 |
| N | 1.1-1.4 |
| N | 2.1-2.8, 5.2 3.1-4.2 |
| S | 1.1 1.2-1.3 |
| S | 2.1 2.2-2.6 |
| H | 1.1-1.2 1.3 |

DIN 6527 – Kurze Ausführung · Short design

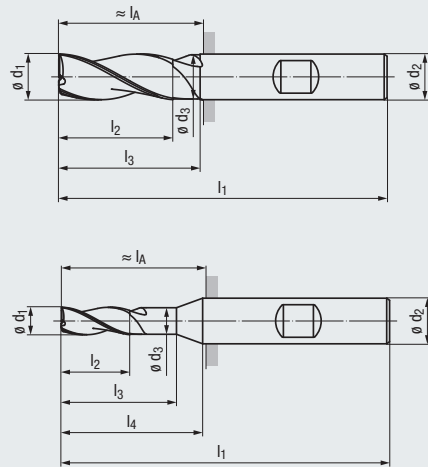
| Bestell-Code · Order code | | | | | | | | | | | 2516A | 2517A | | |
|---------------------------|----------------|----------------|----------------|------------------|----------------|------------------------|----------------|------|---------------|------------------|-------|-------|--|--|
| ∅ d ₁ h10 | l ₂ | l ₃ | l ₁ | ∅ d ₃ | l ₄ | ∅ 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 | ● | ● | | |
| 15,7 | 16 | 30 | 82 | 15,2 | 32 | 16 | 34 | 0,2 | 3 | .0157 | ● new | ● new | | |
| 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 |
|---------------------------|----------------|----------------|----------------|------------------|----------------|------------------------|----------------|------|---------------|------------------|--|--|-------|-------|
| ∅ d ₁ h10 | l ₂ | l ₃ | l ₁ | ∅ d ₃ | l ₄ | ∅ d ₂ h5 | l _A | KB | Z (Flutes) | Dimens.- Code | | | | |
| 1 | 4 | — | 57 | — | 20 | 6 | 21 | 0,04 | 3 | .00106 | | | ● new | |
| 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 x d₁
- 3 Baulängen verfügbar

- Multi-functional, high performance tool
- Newly developed geometry
- Low-vibration machining
- Centre cutting
- Flute length 3 x d₁
- 3 lengths available



N

HM

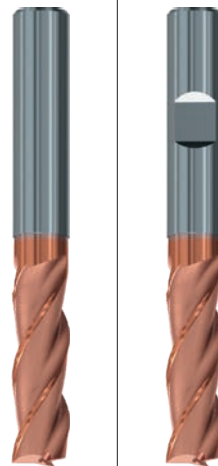
DIN 6535
HA
HB

1-2°

34-38°

KB x 45°

V_c/f_z
22



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)
- In fast allen Werkstoffen einsetzbar
- Zum Schruppen und Schlichten geeignet

Applications – material (see page 4)
- 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 | 1.1-2.8, 5.2 |
| S | 1.1 1.2-1.3 |
| S | 2.1 2.2-2.6 |

l₂ = 3 x d₁ – Extra lange Ausführung · Extra long design

| Bestell-Code · Order code | | | | | | | | | | | 2520A | 2521A | | |
|---------------------------|----------------|----------------|----------------|------------------|----------------|------------------------|----------------|------|---------------|------------------|-------|-------|--|--|
| ∅ d ₁ h10 | l ₂ | l ₃ | l ₁ | ∅ d ₃ | l ₄ | ∅ 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 | ● | ● | | |



Universalfräser für den Werkzeug- und Formenbau mit ausführlichen Informationen erhalten Sie in unserem anwendungsbezogenen FRANKEN TOP-Cut-Prospekt.

Bestell-Nr. ZP20099.DEGB

Universal end mills for the die and mould industry with detailed information can be found in our application-based FRANKEN TOP-Cut brochure.

Order No. ZP20099.DEGB

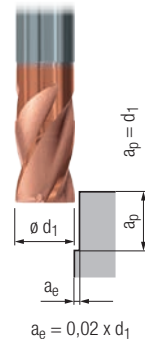
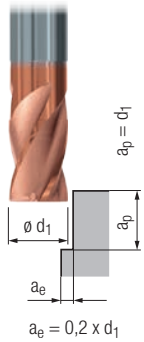
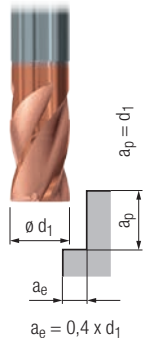
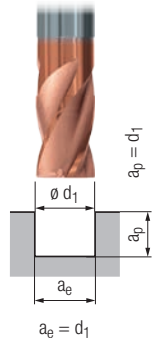


Hartmetall-Schaft- und Langlochfräser – kurze Ausführung (2 - 4 Schneiden)
Solid carbide end mills and slot drills – short design (2 - 4 flutes)

N

Gültig für · Valid for

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



| | | P | | M | | K | | N | | S | | H | | MMS MQL | Coolant |
|-----|-----|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|---------------|------------|---------------|------------|---------|---------|
| | | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | 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 | $0,003 \times d_1$ | | | | | | ■ | |
| 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 | 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 | | | | | | | | | | | | | | |

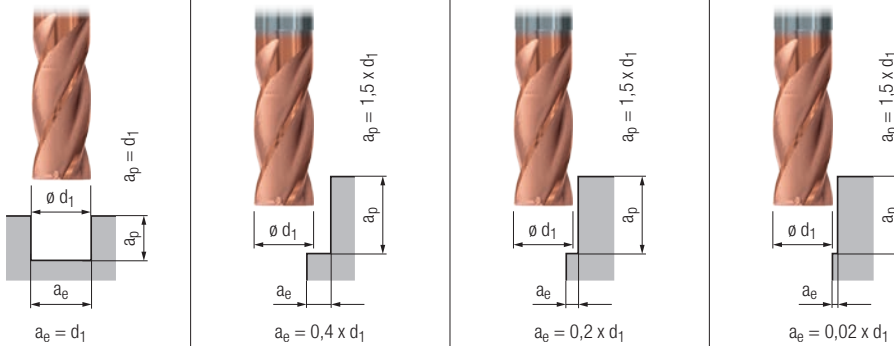


Hartmetall-Schaftfräser – lange Ausführung (2 - 8 Schneiden)
Solid carbide end mills – long design (2 - 8 flutes)

N

Gültig für · Valid for

| | | |
|--------|----------|--------|
| 1998A | 2513A | 2698A |
| 1998AZ | 2518A | 2698AZ |
| 1999A | 2519A | 2699A |
| 1999AZ | 2522A 1) | 2699AZ |
| 2512A | 2523A 1) | |



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

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

1) Für die Vollturbearbeitung nicht geeignet!
Not suitable for full slot milling!

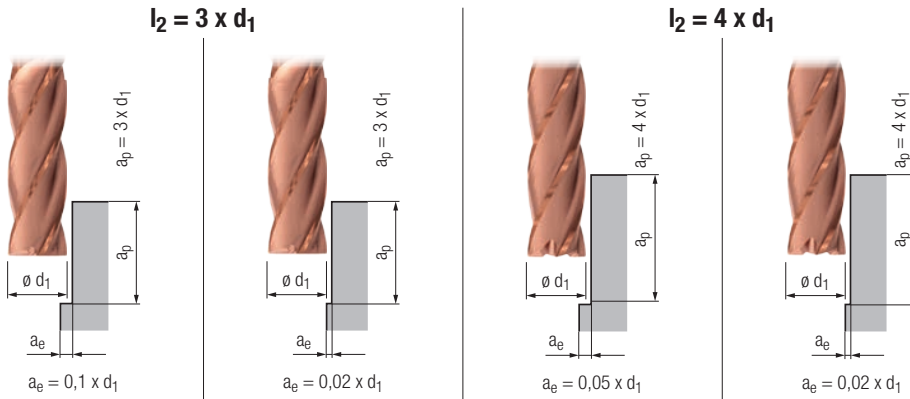


Hartmetall-Schafffräser – extra lange Ausführung (2 - 8 Schneiden)
Solid carbide end mills – extra long design (2 - 8 flutes)

N

Gültig für · Valid for

2514A 2524A 2528A
2515A 2525A 2529A
2520A 2526A
2521A 2527A



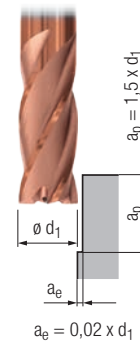
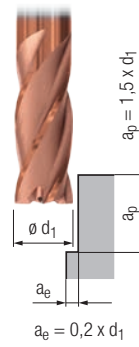
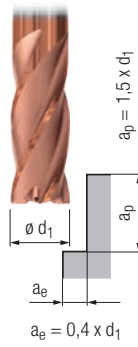
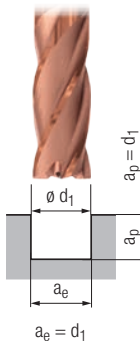
| | | $l_2 = 3 \times d_1$ | | $l_2 = 4 \times d_1$ | | | | MMS MQL | | | | | |
|----------|-----|----------------------|--------------------|----------------------|--------------------|--------------------|--------------------|--------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | | | | | v_c [m/min] | f_z [mm] | | |
| P | 1.1 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 100 | $0,005 \times d_1$ | 120 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 110 | $0,004 \times d_1$ | 130 | $0,005 \times d_1$ | 90 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 90 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 70 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 70 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 5.1 | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| M | 1.1 | 120 | $0,003 \times d_1$ | 140 | $0,004 \times d_1$ | 100 | $0,003 \times d_1$ | 120 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 100 | $0,003 \times d_1$ | 120 | $0,004 \times d_1$ | 80 | $0,003 \times d_1$ | 100 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | 50 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| K | 1.1 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 100 | $0,005 \times d_1$ | 120 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.2 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 100 | $0,005 \times d_1$ | 120 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 110 | $0,004 \times d_1$ | 130 | $0,005 \times d_1$ | 90 | $0,004 \times d_1$ | 110 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 110 | $0,004 \times d_1$ | 130 | $0,005 \times d_1$ | 90 | $0,004 \times d_1$ | 110 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 90 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 70 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.2 | 90 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 70 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 70 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.2 | 60 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| N | 1.1 | 360 | $0,009 \times d_1$ | 430 | $0,011 \times d_1$ | 300 | $0,009 \times d_1$ | 430 | $0,009 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.2 | 360 | $0,008 \times d_1$ | 430 | $0,010 \times d_1$ | 300 | $0,008 \times d_1$ | 430 | $0,009 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.3 | 360 | $0,007 \times d_1$ | 430 | $0,008 \times d_1$ | 300 | $0,007 \times d_1$ | 430 | $0,008 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.4 | 240 | $0,008 \times d_1$ | 290 | $0,010 \times d_1$ | 200 | $0,008 \times d_1$ | 290 | $0,009 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.5 | 230 | $0,007 \times d_1$ | 280 | $0,008 \times d_1$ | 180 | $0,007 \times d_1$ | 280 | $0,008 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.6 | 160 | $0,006 \times d_1$ | 190 | $0,007 \times d_1$ | 130 | $0,006 \times d_1$ | 190 | $0,007 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 90 | $0,005 \times d_1$ | 110 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 90 | $0,005 \times d_1$ | 110 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 90 | $0,005 \times d_1$ | 110 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 100 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 100 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 100 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 60 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 60 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | | | |
| | 3.2 | | | | | | | | | | | | |
| 4.1 | | | | | | | | | | | | | |
| 4.2 | | | | | | | | | | | | | |
| 4.3 | | | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | | | |
| 5.2 | 60 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | | | |
| S | 1.1 | 90 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.2 | 70 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.3 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 60 | $0,004 \times d_1$ | 70 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 30 | $0,003 \times d_1$ | 40 | $0,004 \times d_1$ | 15 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 20 | $0,002 \times d_1$ | 25 | $0,002 \times d_1$ | 25 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 30 | $0,003 \times d_1$ | 45 | $0,003 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 2.5 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 2.6 | 20 | $0,003 \times d_1$ | 20 | $0,003 \times d_1$ | 20 | $0,003 \times d_1$ | 20 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| H | 1.1 | | | | | | | | | | | | |
| | 1.2 | | | | | | | | | | | | |
| | 1.3 | | | | | | | | | | | | |
| | 1.4 | | | | | | | | | | | | |
| | 1.5 | | | | | | | | | | | | |



Hartmetall-Schafffräser – extra lange Ausführung (4 Schneiden)
Solid carbide end mills – extra long design (4 flutes)

N

Gültig für · Valid for
3806AZ
3807AZ



| | | V_c | f_z | V_c | f_z | V_c | f_z | V_c | f_z | | | | |
|----------|-----|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | | | | |
| P | 1.1 | 120 | $0,005 \times d_1$ | 140 | $0,005 \times d_1$ | 160 | $0,006 \times d_1$ | 180 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 110 | $0,004 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | 170 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 100 | $0,004 \times d_1$ | 120 | $0,004 \times d_1$ | 140 | $0,005 \times d_1$ | 160 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 80 | $0,003 \times d_1$ | 100 | $0,003 \times d_1$ | 120 | $0,004 \times d_1$ | 140 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 70 | $0,003 \times d_1$ | 90 | $0,003 \times d_1$ | 110 | $0,003 \times d_1$ | 130 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 40 | $0,002 \times d_1$ | 40 | $0,003 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 30 | $0,002 \times d_1$ | 30 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| K | 1.1 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,006 \times d_1$ | 180 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,006 \times d_1$ | 180 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 110 | $0,004 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | 170 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 110 | $0,004 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | 170 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 100 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 100 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 90 | $0,003 \times d_1$ | 100 | $0,003 \times d_1$ | 110 | $0,004 \times d_1$ | 130 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 90 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | 200 | $0,009 \times d_1$ | 220 | $0,010 \times d_1$ | 240 | $0,011 \times d_1$ | 260 | $0,013 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.2 | 200 | $0,008 \times d_1$ | 220 | $0,009 \times d_1$ | 240 | $0,010 \times d_1$ | 260 | $0,011 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.3 | 200 | $0,007 \times d_1$ | 220 | $0,008 \times d_1$ | 240 | $0,009 \times d_1$ | 260 | $0,010 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.4 | 180 | $0,008 \times d_1$ | 220 | $0,009 \times d_1$ | 240 | $0,010 \times d_1$ | 260 | $0,011 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.5 | | | | | | | | | | | | |
| | 1.6 | | | | | | | | | | | | |
| | 2.1 | 120 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 150 | $0,006 \times d_1$ | 170 | $0,007 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 120 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 150 | $0,006 \times d_1$ | 170 | $0,007 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 120 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 150 | $0,006 \times d_1$ | 170 | $0,007 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 110 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,005 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 110 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,005 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 110 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,005 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 280 | $0,009 \times d_1$ | 300 | $0,010 \times d_1$ | 320 | $0,011 \times d_1$ | 350 | $0,013 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.2 | 280 | $0,007 \times d_1$ | 300 | $0,008 \times d_1$ | 320 | $0,009 \times d_1$ | 350 | $0,010 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4.1 | 280 | $0,008 \times d_1$ | 300 | $0,009 \times d_1$ | 320 | $0,009 \times d_1$ | 350 | $0,011 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.2 | 420 | $0,008 \times d_1$ | 450 | $0,009 \times d_1$ | 480 | $0,009 \times d_1$ | 520 | $0,011 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.3 | | | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | | | |
| 5.2 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | | | |
| S | 1.1 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 80 | $0,005 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.2 | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 70 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 40 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | 50 | $0,003 \times d_1$ | 50 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.1 | 60 | $0,002 \times d_1$ | 70 | $0,002 \times d_1$ | 70 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.2 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.3 | 20 | $0,002 \times d_1$ | 25 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| 2.4 | 20 | $0,002 \times d_1$ | 25 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 2.5 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 2.6 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| H | 1.1 | 80 | $0,003 \times d_1$ | 90 | $0,003 \times d_1$ | 100 | $0,003 \times d_1$ | 110 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 90 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.3 | | | | | | | | | | | | |
| | 1.4 | | | | | | | | | | | | |
| | 1.5 | | | | | | | | | | | | |

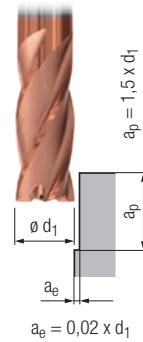
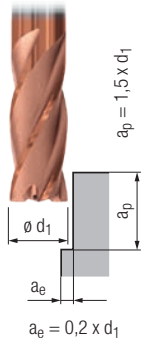
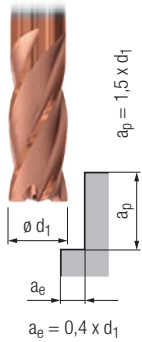
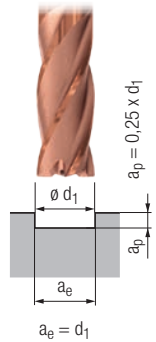
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable



Hartmetall-Schafffräser – extra lange Ausführung (4 Schneiden) Solid carbide end mills – extra long design (4 flutes)

N

$$l_3 = 6 \times d_1$$



Gültig für · Valid for

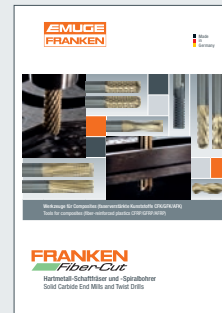
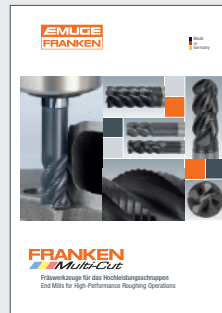
3808AZ
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| | | v_c | f_z | v_c | f_z | v_c | f_z | v_c | f_z | | | MMS | |
|-----|-----|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | | | | |
| P | 1.1 | 80 | $0,005 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 70 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 60 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 60 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 100 | $0,004 \times d_1$ | 120 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 50 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 90 | $0,003 \times d_1$ | 110 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | 70 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 60 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 40 | $0,002 \times d_1$ | 40 | $0,003 \times d_1$ | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 30 | $0,002 \times d_1$ | 30 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| K | 1.1 | 80 | $0,005 \times d_1$ | 120 | $0,006 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 80 | $0,005 \times d_1$ | 120 | $0,006 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 70 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 70 | $0,004 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | 150 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 70 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 70 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | 110 | $0,005 \times d_1$ | 130 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 60 | $0,003 \times d_1$ | 90 | $0,003 \times d_1$ | 100 | $0,004 \times d_1$ | 110 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 60 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 90 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | 160 | $0,009 \times d_1$ | 180 | $0,010 \times d_1$ | 200 | $0,011 \times d_1$ | 220 | $0,013 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.2 | 160 | $0,008 \times d_1$ | 180 | $0,009 \times d_1$ | 200 | $0,010 \times d_1$ | 220 | $0,011 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.3 | 160 | $0,007 \times d_1$ | 180 | $0,008 \times d_1$ | 200 | $0,009 \times d_1$ | 220 | $0,010 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.4 | 140 | $0,008 \times d_1$ | 180 | $0,009 \times d_1$ | 200 | $0,010 \times d_1$ | 220 | $0,011 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 1.5 | | | | | | | | | | | | |
| | 1.6 | | | | | | | | | | | | |
| | 2.1 | 100 | $0,005 \times d_1$ | 110 | $0,006 \times d_1$ | 130 | $0,006 \times d_1$ | 150 | $0,007 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 100 | $0,005 \times d_1$ | 110 | $0,006 \times d_1$ | 130 | $0,006 \times d_1$ | 150 | $0,007 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 100 | $0,005 \times d_1$ | 110 | $0,006 \times d_1$ | 130 | $0,006 \times d_1$ | 150 | $0,007 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.4 | 90 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 90 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 90 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.7 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 100 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 240 | $0,009 \times d_1$ | 260 | $0,010 \times d_1$ | 280 | $0,011 \times d_1$ | 300 | $0,013 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.2 | 240 | $0,007 \times d_1$ | 260 | $0,008 \times d_1$ | 280 | $0,009 \times d_1$ | 300 | $0,010 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| 4.1 | 240 | $0,008 \times d_1$ | 260 | $0,009 \times d_1$ | 280 | $0,009 \times d_1$ | 300 | $0,011 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | | |
| 4.2 | 380 | $0,008 \times d_1$ | 400 | $0,009 \times d_1$ | 420 | $0,009 \times d_1$ | 450 | $0,011 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.3 | | | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | | | |
| 5.2 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | | | |
| S | 1.1 | 60 | $0,004 \times d_1$ | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 80 | $0,005 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.2 | 50 | $0,003 \times d_1$ | 60 | $0,003 \times d_1$ | 70 | $0,004 \times d_1$ | 70 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 40 | $0,003 \times d_1$ | 40 | $0,003 \times d_1$ | 50 | $0,003 \times d_1$ | 50 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.1 | 50 | $0,002 \times d_1$ | 60 | $0,002 \times d_1$ | 70 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.2 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.3 | 20 | $0,002 \times d_1$ | 25 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.4 | 20 | $0,002 \times d_1$ | 25 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| 2.5 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 2.6 | 20 | $0,002 \times d_1$ | 20 | $0,002 \times d_1$ | 25 | $0,003 \times d_1$ | 30 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| H | 1.1 | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 90 | $0,003 \times d_1$ | 100 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 60 | $0,003 \times d_1$ | 70 | $0,003 \times d_1$ | 80 | $0,003 \times d_1$ | 90 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.3 | | | | | | | | | | | | |
| | 1.4 | | | | | | | | | | | | |
| | 1.5 | | | | | | | | | | | | |

| | 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



Durch die Verwendung von gekühlter Luft wird die Temperatur im Schneidenbereich herabgesetzt, wodurch höhere Schnittgeschwindigkeiten und Standzeiten erreicht werden können. Moderne Beschichtungen können durch diese Art der Kühlung erst alle Vorteile ausspielen, da eine Schädigung der Schneide durch Thermoschock vermieden wird.

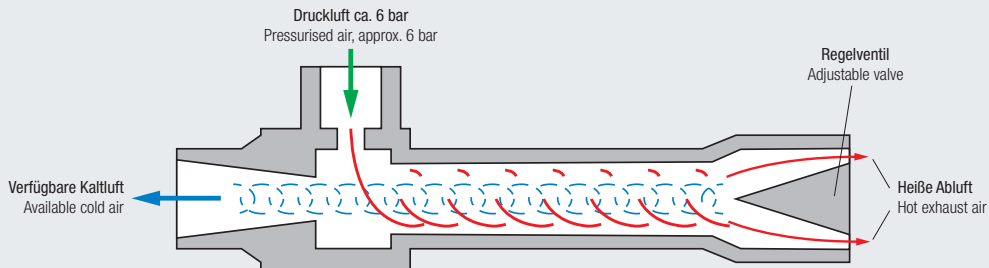
Darüber hinaus werden die beim Kopierfräsen anfallenden sehr leichten Späne auch aus tiefen Aussparungen oder Kavitäten mit Hilfe der Kaltluftdüse entfernt.

Die Wirkungsweise der Kaltluftdüse basiert auf dem Prinzip des Wirbelrohrs, in dem zwei gegenläufige, rotierende Luftströme (ohne bewegte Teile) erzeugt werden. An einem Ende tritt die innere Strömung als nutzbare Kaltluft mit bis zu -40 °C aus. Der Anschluss erfolgt über einen Druckluftanschluss.

Cooled air reduces temperatures in the cutting area, which in turn permits higher cutting speeds and longer tool life. This type of cooling enables modern coatings to achieve their full potential, as damage to the cutting edge resulting from thermal shock is avoided.

Moreover, the cold-air nozzle helps to remove the tiny chips produced in copy milling even from deep recesses or cavities.

The function of the cold-air nozzle is based on the principle of the vortex tube, in which two opposed, rotating air streams are generated (without any moving parts). The internal air stream exits from one end, in the form of useable cold air with a temperature as low as -40 °C. All that is required is a normal pressurised air connection.



Temperatur gemessen am effektiven Austritt des Wirbelrohrs (nicht Düsenende)
Temperature, measured at the effective exit of the vortex tube (not the end of the nozzle)

| Zuluft-Druck Supply air pressure [bar] | Temperatur der Nutzluft in °C bei einem Kaltluftanteil von Temperature of usable air in °C, with a cold air percentage of | | |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------|-----|-----|
| | 25% | 50% | 75% |
| 3 | -31 | -22 | - 6 |
| 4 | -35 | -35 | - 8 |
| 5 | -39 | -28 | -10 |
| 6 | -42 | -31 | -11 |
| 7 | -46 | -34 | -13 |

Luftverbrauch bei Eingangstemperatur von 21 °C
Air consumption, with supply air temperature of 21 °C

| Eingangsdruck Input pressure [bar] | Luftverbrauch Air consumption | Kapazität Capacity |
|------------------------------------------|-----------------------------------------|--------------------------|
| 6,9 | 7,08 l/s \cong 25,5 m ³ /h | 226 kcal/h \cong 263 W |

**Anwendungsbeispiel:
Standzeiterhöhung durch den Einsatz der Kaltluftdüse**

Werkstück: Formeinsatz gehärtet, Material K360 mit 63 HRC
Bearbeitung: Schichten des Formeinsatzes
Werkzeug: FRANKEN Hard-Cut
Schneidendurchmesser 10 mm, 2 Schneiden

Schnittwerte: $v_c = 240 \text{ m/min} \cdot n = 7639 \text{ min}^{-1}$
 $f_z = 0,12 \text{ mm} \cdot v_f = 1833 \text{ mm/min}$
 $a_p = 0,2 \text{ mm} \cdot a_e = 0,2 \text{ mm}$

| Standzeit ohne Kühlung | Standzeit mit Kaltluftdüse |
|------------------------|----------------------------|
| 98 Minuten | 130 Minuten |

Durch den Einsatz der Kaltluftdüse konnte die Standzeit um 33% erhöht werden.

**Application example:
Increased tool life using the cold-air nozzle**

Workpiece: Hardened mould, material K360 with 63 HRC
Operation: Finishing the mould
Tool: FRANKEN Hard-Cut
Cutting diameter 10 mm, 2 flutes

Cutting conditions: $v_c = 240 \text{ m/min} \cdot n = 7639 \text{ rpm}$
 $f_z = 0.12 \text{ mm} \cdot v_f = 1833 \text{ mm/min}$
 $a_p = 0.2 \text{ mm} \cdot a_e = 0.2 \text{ mm}$

| Tool life without coolant | Tool life with cold-air nozzle |
|---------------------------|--------------------------------|
| 98 minutes | 130 minutes |

By using the cold-air nozzle, it was possible to increase the tool life by 33%.



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



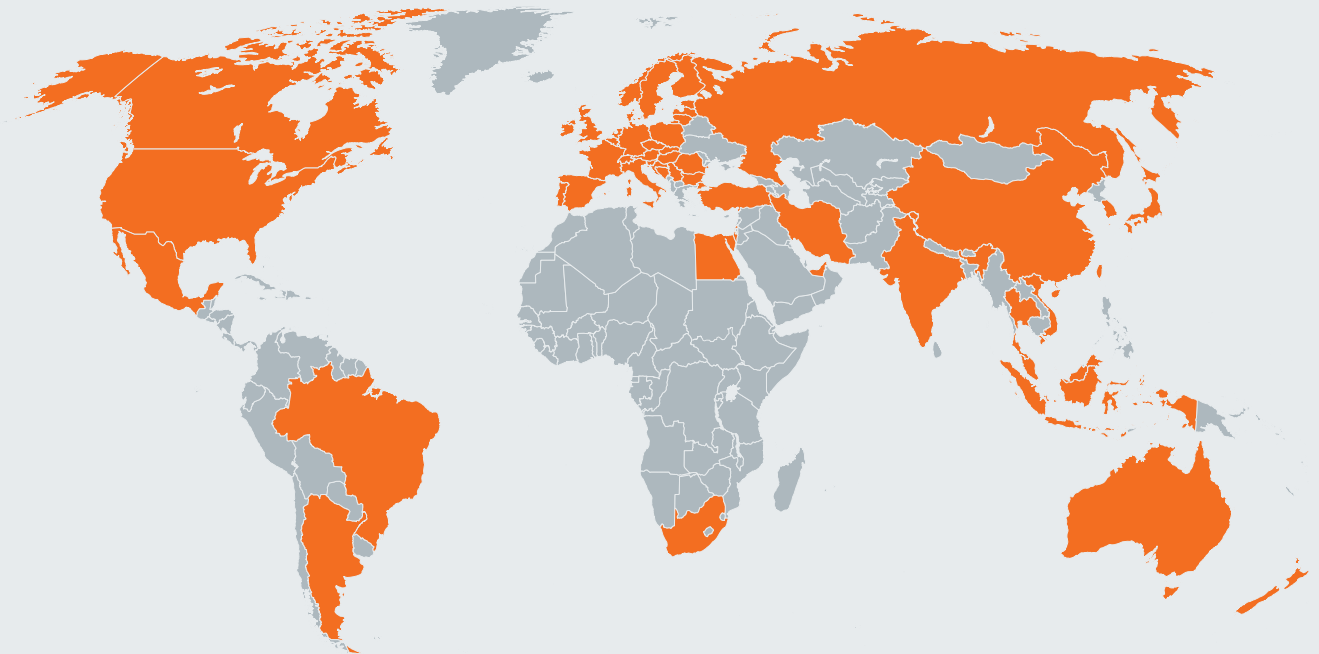
Grundhalter für Klemmarm
Basic holder for socket



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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