



■ Made
■ in
■ Germany



FRANKEN
Multi-Cut

Fräswerkzeuge für das Hochleistungsschruppen
End Mills for High-Performance Roughing Operations



Rund 100 Jahre Präzision und Innovation

FRANKEN als Teil der EMUGE-FRANKEN Unternehmensgruppe beschäftigt sich seit seiner Gründung mit der Entwicklung und Produktion von Fräsworkzeugen. 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 Fräsworkzeugen führen wir ein durchgängiges Programm an Fräserspannmitteln und Zubehör für die verschiedensten Adaptierungsmöglichkeiten.

Nearly 100 years of precision and innovation

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.





Multi-Cut-Fräser wurden gezielt für das Hochleistungsschruppen entwickelt. Durch die ungleiche Teilung in Verbindung mit dem NR-Profil werden Schwingungen und Schnittkräfte minimiert.

Besonderheiten:

- Ungleiche Teilung
- Stabilisierte Schneidkante
- Hochleistungs-Beschichtung
- Optional mit innerer Kühlschmierstoff-Zufuhr mit axialem Austritt (ICA)

Hauptmerkmal:

Prozesssichere Schruppbearbeitung.

Verfügbare Werkzeuge:

- Hartmetall-Schaftfräser
- Hartmetall-Schaftfräser mit Eckenradius
- Hartmetall-Kugelfräser

Mit dieser Broschüre zeigen wir eine Auswahl der wichtigsten Hartmetall-Multi-Cut-Schaftfräser.

Zu jedem Werkzeug geben wir, in Abhängigkeit zur jeweiligen Werkstoffgruppe, sichere Startbedingungen (v_c / f_z) und Hinweise zum empfohlenen Kühlschmierstoff an.

Multi-Cut end mills were developed in particular for high-performance roughing operations. Due to variable spacing of flutes combined with the NR profile vibrations and cutting forces are minimised.

Characteristics:

- Variable spacing
- Stabilised cutting edge
- High-performance coating
- Optionally available with internal coolant supply, axial exit (ICA)

Main feature:

Process-reliable roughing.

Available tools:

- Solid carbide end mills
- Solid carbide end mills with corner radius
- Solid carbide ball nose end mills

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

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Wegweiser

Bitte beachten:

Die Eignung ist folgendermaßen gekennzeichnet:

- = sehr gut geeignet
- = gut geeignet

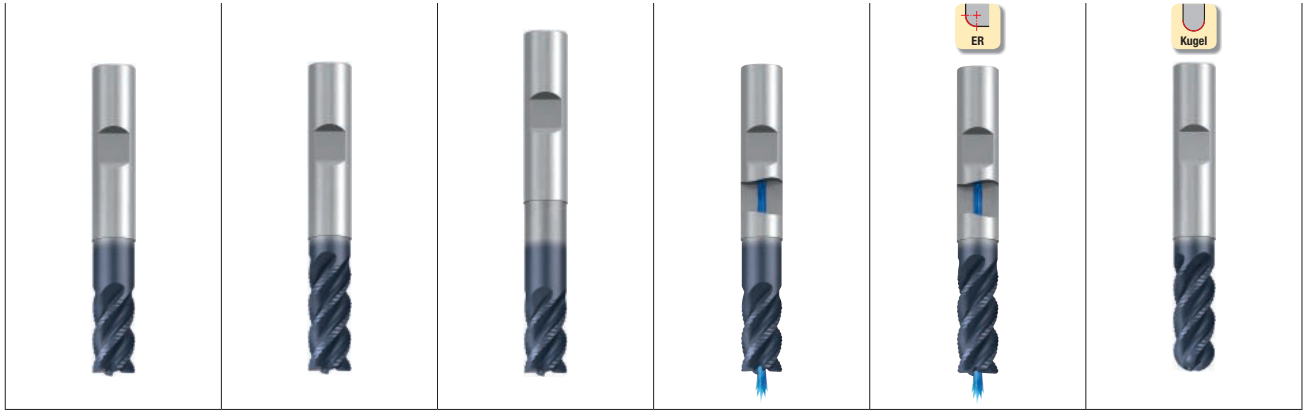
Product finder

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 E360 (St70-2) 1.0070 16MnCr5 1.7131 GS-25CrMo4 1.7218 |
| | 2.1 Baustähle, Einsatzstähle, Stahlguss, u.a. | Construction steels, Case-hardened steels, Steel castings, etc. | ≤ 800 N/mm ² | 20MoCr3 1.7320 42CrMo4 1.7225 102Cr6 1.2067 50CrMo4 1.7228 X45NiCrMo4 1.2767 31CrMo12 1.8515 |
| | 3.1 Einsatzstähle, Vergütungsstähle, Kaltarbeitsstähle, u.a. | Case-hardened steels, Heat-treatable steels, Cold work steels, etc. | ≤ 1000 N/mm ² | X38CrMoV5-3 1.2367 X100CrMoV8-1-1 1.2990 X40CrMoV5-1 1.2344 |
| | 4.1 Vergütungsstähle, Kaltarbeitsstähle, Nitrierstähle, u.a. | Heat-treatable steels, Cold work steels, Nitriding steels, etc. | ≤ 1200 N/mm ² | |
| 5.1 Hochlegierte Stähle, Kaltarbeitsstähle, Warmarbeitsstähle, u.a. | High-alloyed steels, Cold work steels, Hot work steels, etc. | ≤ 1400 N/mm ² | | |
| M | Nichtrostende Stahlwerkstoffe Stainless steel materials | | | |
| | 1.1 Ferritisch, martensitisch | Ferritic, martensitic | ≤ 950 N/mm ² | X2CrTi12 1.4512 |
| | 2.1 Austenitisch | Austenitic | ≤ 950 N/mm ² | X6CrNiMoTi17-12-2 1.4571 |
| | 3.1 Austenitisch-ferritisch (Duplex) | Austenitic-ferritic (Duplex) | ≤ 1100 N/mm ² | X2CrNiMoN22-5-3 1.4462 |
| 4.1 Austenitisch-ferritisch hitzebeständig (Super Duplex) | Austenitic-ferritic heat-resistant (Super Duplex) | ≤ 1250 N/mm ² | X2CrNiMoN25-7-4 1.4410 | |
| K | Gusswerkstoffe Cast materials | | | |
| | 1.1 Gusseisen mit Lamellengrafit (GJL) | Cast iron with lamellar graphite (GJL) | 100-250 N/mm ² | EN-GJL-200 (GG20) EN-JL-1030 |
| | 1.2 Gusseisen mit Kugelgrafit (GJS) | Cast iron with nodular graphite (GJS) | 250-450 N/mm ² | EN-GJL-300 (GG30) EN-JL-1050 |
| | 2.1 Gusseisen mit Kugelgrafit (GJS) | Cast iron with nodular graphite (GJS) | 350-500 N/mm ² | EN-GJS-400-15 (GGG40) EN-JS-1030 |
| | 2.2 Gusseisen mit Kugelgrafit (GJS) | Cast iron with nodular graphite (GJS) | 500-900 N/mm ² | EN-GJS-700-2 (GGG70) EN-JS-1070 |
| | 3.1 Gusseisen mit Vermiculargrafit (GJV) | Cast iron with vermicular graphite (GJV) | 300-400 N/mm ² | GJV 300 |
| | 3.2 Gusseisen mit Vermiculargrafit (GJV) | Cast iron with vermicular graphite (GJV) | 400-500 N/mm ² | GJV 450 |
| 4.1 Temperguss (GTMW, GTMB) | Malleable cast iron (GTMW, GTMB) | 250-500 N/mm ² | EN-GJMW-350-4 (GTW-35) EN-JM-1010 | |
| 4.2 Temperguss (GTMW, GTMB) | Malleable cast iron (GTMW, GTMB) | 500-800 N/mm ² | EN-GJMB-450-6 (GTS-45) EN-JM-1140 | |
| N | Nichteisenwerkstoffe Non-ferrous materials | | | |
| | Aluminium-Legierungen Aluminium alloys | | | |
| | 1.1 Aluminium-Knetlegierungen | Wrought aluminium alloys | ≤ 200 N/mm ² | EN AW-AlMn1 EN AW-3103 |
| | 1.2 Aluminium-Knetlegierungen | Wrought aluminium alloys | ≤ 350 N/mm ² | EN AW-AlMgSi EN AW-6060 |
| | 1.3 Aluminium-Knetlegierungen | Wrought aluminium alloys | ≤ 550 N/mm ² | EN AW-AlZn5Mg3Cu EN AW-7022 |
| | 1.4 Aluminium-Knetlegierungen | Wrought aluminium alloys | Si ≤ 7% | EN AC-AlMg5 EN AC-51300 |
| | 1.5 Aluminium-Gusslegierungen | Aluminium cast alloys | 7% < Si ≤ 12% | EN AC-AISi9Cu3 EN AC-46500 |
| | 1.6 Aluminium-Gusslegierungen | Aluminium cast alloys | 12% < Si ≤ 17% | GD-AISi17Cu4FeMg |
| | Kupfer-Legierungen Copper alloys | | | |
| | 2.1 Reinkupfer, niedriglegiertes Kupfer | Pure copper, low-alloyed copper | ≤ 400 N/mm ² | E-Cu 57 EN CW 004 A |
| | 2.2 Kupfer-Zink-Legierungen (Messing, langspanend) | Copper-zinc alloys (brass, long-chipping) | ≤ 550 N/mm ² | CuZn37 (Ms63) EN CW 508 L |
| | 2.3 Kupfer-Zink-Legierungen (Messing, kurzspanend) | Copper-zinc alloys (brass, short-chipping) | ≤ 550 N/mm ² | CuZn36Pb3 (Ms58) EN CW 603 N |
| | 2.4 Kupfer-Aluminium-Legierungen (Alubronze, langspanend) | Copper-aluminium alloys (alu bronze, long-chipping) | ≤ 800 N/mm ² | CuAl10Ni5Fe4 EN CW 307 G |
| | 2.5 Kupfer-Zinn-Legierungen (Zinnbronze, langspanend) | Copper-tin alloys (tin bronze, long-chipping) | ≤ 700 N/mm ² | CuSn8P EN CW 459 K |
| | 2.6 Kupfer-Zinn-Legierungen (Zinnbronze, kurzspanend) | Copper-tin alloys (tin bronze, short-chipping) | ≤ 400 N/mm ² | CuSn7 ZnPb (Rg7) 2.1090 |
| | 2.7 Kupfer-Sonderlegierungen | Special copper alloys | ≤ 600 N/mm ² | (AMPCO® 8) |
| 2.8 Kupfer-Sonderlegierungen | Special copper alloys | ≤ 1400 N/mm ² | (AMPCO® 45) | |
| Magnesium-Legierungen Magnesium alloys | | | | |
| 3.1 Magnesium-Knetlegierungen | Magnesium wrought alloys | ≤ 500 N/mm ² | MgAl6Zn 3.5612 | |
| 3.2 Magnesium-Gusslegierungen | Magnesium cast alloys | ≤ 500 N/mm ² | EN-MCMgAl9Zn1 EN-MC21120 | |
| Kunststoffe Synthetics | | | | |
| 4.1 Duroplaste (kurzspanend) | Duroplastics (short-chipping) | | Bakelit, Pertinax | |
| 4.2 Thermoplaste (langspanend) | Thermoplastics (long-chipping) | | PMMA, POM, PVC | |
| 4.3 Faserverstärkte Kunststoffe (Faserteil ≤ 30%) | Fibre-reinforced synthetics (fibre content ≤ 30%) | | GFK, CFK, AFK | |
| 4.4 Faserverstärkte Kunststoffe (Faserteil > 30%) | Fibre-reinforced synthetics (fibre content > 30%) | | GFK, CFK, AFK | |
| Besondere Werkstoffe Special materials | | | | |
| 5.1 Grafit | Graphite | | C 8000 | |
| 5.2 Wolfram-Kupfer-Legierungen | Tungsten-copper alloys | | W-Cu 80/20 | |
| 5.3 Verbundwerkstoffe | Composite materials | | Hyllite, Alucobond | |
| Spezialwerkstoffe Special materials | | | | |
| Titan-Legierungen Titanium alloys | | | | |
| 1.1 Reintitan | Pure titanium | ≤ 450 N/mm ² | Ti1 3.7025 | |
| 1.2 Titan-Legierungen | Titanium alloys | ≤ 900 N/mm ² | TiAl6V4 3.7165 | |
| 1.3 Titan-Legierungen | Titanium alloys | ≤ 1250 N/mm ² | TiAl4Mo4Sn2 3.7185 | |
| Nickel-, Kobalt- und Eisen-Legierungen Nickel alloys, cobalt alloys and iron alloys | | | | |
| 2.1 Reinnickel | Pure nickel | ≤ 600 N/mm ² | Ni 99,6 2.4060 | |
| 2.2 Nickel-Basis-Legierungen | Nickel-base alloys | ≤ 1000 N/mm ² | Monel 400 2.4360 | |
| 2.3 Nickel-Basis-Legierungen | Nickel-base alloys | ≤ 1600 N/mm ² | Inconel 718 2.4668 | |
| 2.4 Nickel-Basis-Legierungen | Nickel-base alloys | ≤ 1000 N/mm ² | Udimet 605 | |
| 2.5 Kobalt-Basis-Legierungen | Cobalt-base alloys | ≤ 1600 N/mm ² | Haynes 25 2.4964 | |
| 2.6 Eisen-Basis-Legierungen | Iron-base alloys | ≤ 1500 N/mm ² | Incoloy 800 1.4958 | |
| Harte Werkstoffe Hard materials | | | | |
| 1.1 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 44 - 50 HRC | Weldox 1100 | |
| 1.2 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 50 - 55 HRC | Hardox 550 | |
| 1.3 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 55 - 60 HRC | Armox 600T | |
| 1.4 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 60 - 63 HRC | Ferro-Titanit | |
| 1.5 Hochfeste Stähle, gehärtete Stähle, Hartguss | High strength steels, hardened steels, hard castings | 63 - 66 HRC | HSSE | |



Allround

NR  fein · fine

| 2869A | 2873A | 2875A | 2869AZ | 2673AZ | 2667A |
|-------|-------|-------|--------|--------|-------|
| 6 | 8 | 10 | 12 | 14 | 16 |
| 7 | 9 | 11 | 13 | 15 | 17 |

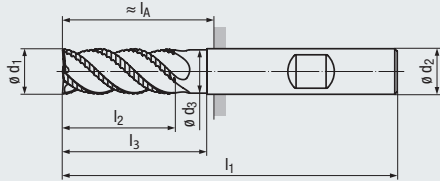
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 v_c / f_z

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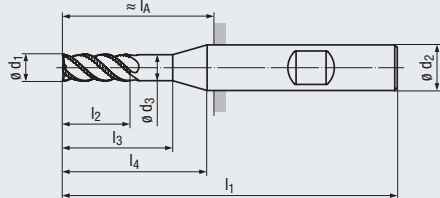
■ = sehr gut geeignet · very suitable
□ = gut geeignet · suitable

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

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



Design l_4 :



- NR** fein fine
- HM**
- DIN 6535** HA HB
- ASME B94.19**
- 45°
- 45°
- 3-5°
- v_c/f_z 7
- Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

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

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

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

Lange Ausführung · Long design

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

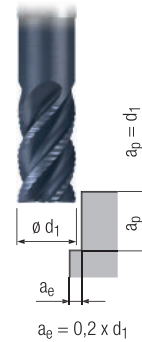
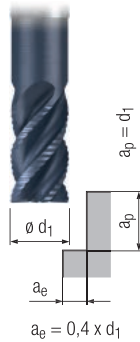
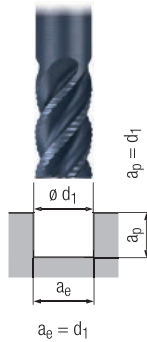
¹⁾ Glatter Schaft
Straight shank



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

NR

Gültig für · Valid for
2869A



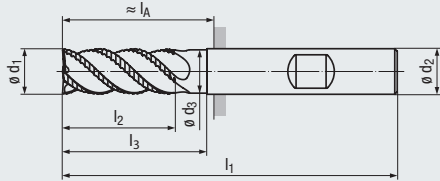
| | | v_c | f_z | v_c | f_z | v_c | f_z | | | MMS | |
|----------|-----|---------------|---------------|---------------|---------------|---------------|---------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | | | | |
| P | 1.1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | 200 | 0,009 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 150 | 0,006 x d_1 | 170 | 0,007 x d_1 | 190 | 0,008 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 140 | 0,005 x d_1 | 160 | 0,006 x d_1 | 180 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 120 | 0,004 x d_1 | 140 | 0,005 x d_1 | 150 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 100 | 0,004 x d_1 | 120 | 0,004 x d_1 | 130 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | | | | | | | | | | |
| | 2.1 | | | | | | | | | | |
| | 3.1 | | | | | | | | | | |
| | 4.1 | | | | | | | | | | |
| K | 1.1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | 200 | 0,009 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | 200 | 0,009 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 140 | 0,006 x d_1 | 160 | 0,006 x d_1 | 180 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 140 | 0,006 x d_1 | 160 | 0,006 x d_1 | 180 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 120 | 0,006 x d_1 | 140 | 0,006 x d_1 | 150 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 120 | 0,006 x d_1 | 140 | 0,006 x d_1 | 150 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 100 | 0,004 x d_1 | 120 | 0,005 x d_1 | 130 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | | | | | | | | | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 1.4 | | | | | | | | | | |
| | 1.5 | | | | | | | | | | |
| | 1.6 | | | | | | | | | | |
| | 2.1 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | 180 | 0,009 x d_1 | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | 180 | 0,009 x d_1 | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | 180 | 0,009 x d_1 | <input type="checkbox"/> | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | |
| 3.2 | | | | | | | | | | | |
| 4.1 | 320 | 0,011 x d_1 | 370 | 0,012 x d_1 | 400 | 0,014 x d_1 | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.2 | | | | | | | | | | | |
| 4.3 | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | |
| 5.2 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | |
| S | 1.1 | | | | | | | | | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 2.1 | | | | | | | | | | |
| | 2.2 | | | | | | | | | | |
| | 2.3 | | | | | | | | | | |
| | 2.4 | | | | | | | | | | |
| H | 1.1 | 80 | 0,004 x d_1 | 90 | 0,004 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 1.4 | | | | | | | | | | |
| | 1.5 | | | | | | | | | | |

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

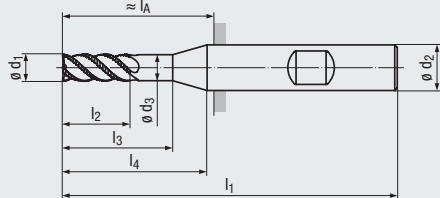
v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

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

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



Design l_4 :



- NR** fein fine
- HM**
- DIN 6535** HA HB
- ASME B94.19**
- 45°
- 45°
- 3-5°
- v_c/f_z 9
- Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

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

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

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

DIN 6527 – Lange Ausführung · Long design

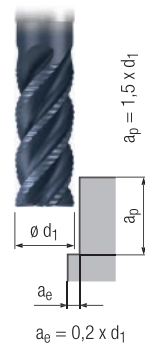
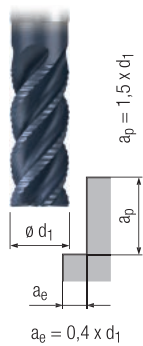
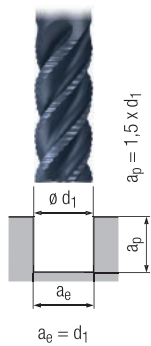
| Bestell-Code · Order code | | | | | | | | | | | 2873A | | | |
|---------------------------|--------------------------|-------|-------|-------|-------------------|-------|-------------------------|-------|---------------|------------------|-------|--|--|--|
| [mm] | $\varnothing d_1$ h11 | l_2 | l_3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



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

NR

Gültig für · Valid for
2873A



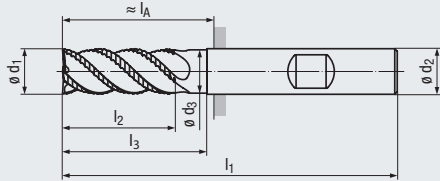
| | | v_c | f_z | v_c | f_z | v_c | f_z | | | MMS MQL | |
|----------|-----|---------------|---------------|---------------|---------------|---------------|---------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | | | | |
| P | 1.1 | 140 | 0,006 x d_1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 170 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 120 | 0,005 x d_1 | 140 | 0,005 x d_1 | 160 | 0,006 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 110 | 0,004 x d_1 | 130 | 0,004 x d_1 | 140 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 100 | 0,004 x d_1 | 120 | 0,004 x d_1 | 130 | 0,004 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | | | | | | | | | | |
| | 2.1 | | | | | | | | | | |
| | 3.1 | | | | | | | | | | |
| | 4.1 | | | | | | | | | | |
| K | 1.1 | 140 | 0,007 x d_1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 140 | 0,007 x d_1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 120 | 0,005 x d_1 | 140 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 120 | 0,005 x d_1 | 140 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 110 | 0,005 x d_1 | 130 | 0,006 x d_1 | 140 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 110 | 0,005 x d_1 | 130 | 0,006 x d_1 | 140 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 80 | 0,004 x d_1 | 90 | 0,004 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 70 | 0,004 x d_1 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | | | | | | | | | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 1.4 | | | | | | | | | | |
| | 1.5 | | | | | | | | | | |
| | 1.6 | | | | | | | | | | |
| | 2.1 | 120 | 0,007 x d_1 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 120 | 0,007 x d_1 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 120 | 0,007 x d_1 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | <input type="checkbox"/> | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 110 | 0,005 x d_1 | 130 | 0,006 x d_1 | 140 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 110 | 0,005 x d_1 | 130 | 0,006 x d_1 | 140 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 110 | 0,005 x d_1 | 130 | 0,006 x d_1 | 140 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 70 | 0,004 x d_1 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 70 | 0,004 x d_1 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | |
| 3.2 | | | | | | | | | | | |
| 4.1 | 280 | 0,010 x d_1 | 320 | 0,011 x d_1 | 360 | 0,012 x d_1 | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.2 | | | | | | | | | | | |
| 4.3 | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | |
| 5.2 | 70 | 0,004 x d_1 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | |
| S | 1.1 | | | | | | | | | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 2.1 | | | | | | | | | | |
| | 2.2 | | | | | | | | | | |
| | 2.3 | | | | | | | | | | |
| H | 1.1 | 70 | 0,004 x d_1 | 80 | 0,004 x d_1 | 90 | 0,004 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 1.4 | | | | | | | | | | |
| | 1.5 | | | | | | | | | | |

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

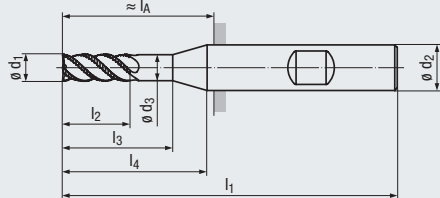
v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

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

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



Design l_4 :



- NR** fein fine
- HM**
- DIN 6535** HA HB
- ASME B94.19**
- 45°
- 45°
- 3-5°
- v_c/f_z 11
- Optional



Allround

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

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

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

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

Extra lange Ausführung · Extra long design

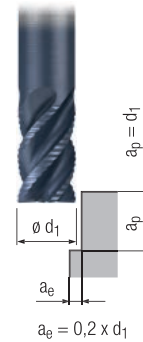
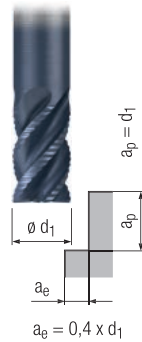
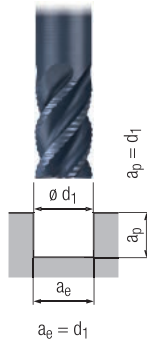
| Bestell-Code · Order code | | | | | | | | | | | | 2875A | | | | |
|---------------------------|-------|-------|-------|-------------------|-------|-------------------------|-----------|---------------|---------------|--|---|-------|--|--|--|--|
| $\varnothing d_1$ h11 | l_2 | l_3 | l_1 | $\varnothing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

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

Gültig für · Valid for
2875A



NR



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

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

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

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

NR fein fine

ICA

HM

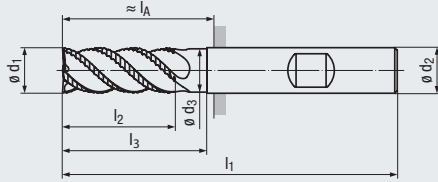
DIN 6535 HA HB

ASME B94.19

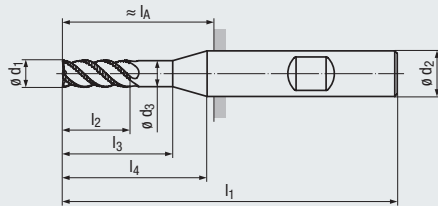
45° 45°

3-5°

V_c / f_z 13



Design I₄:



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

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

TIALN

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

Lange Ausführung · Long design

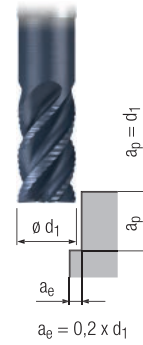
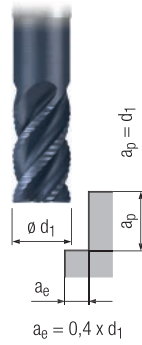
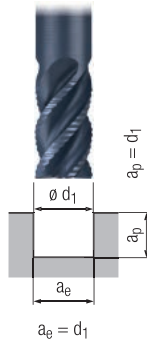
| Bestell-Code · Order code | | | | | | | | | | | 2869AZ | | | | |
|---------------------------|--------------------------|-------|-------|-------|-------------------|-------|-------------------------|---------------|---------------|------------------|--------|--|--|--|--|
| | $\varnothing d_1$ h11 |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



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

NR

Gültig für · Valid for
2869AZ



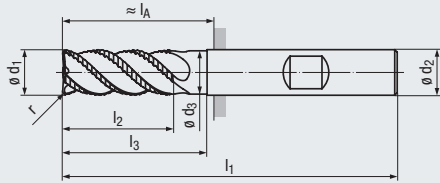
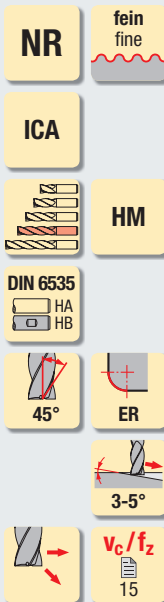
| | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | v_c [m/min] | f_z [mm] | | | MMS MQL | | |
|----------|------------------|---------------|------------------|---------------|------------------|---------------|--------------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| P | 1.1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | 200 | 0,009 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 150 | 0,006 x d_1 | 170 | 0,007 x d_1 | 190 | 0,008 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 140 | 0,005 x d_1 | 160 | 0,006 x d_1 | 180 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 120 | 0,004 x d_1 | 140 | 0,005 x d_1 | 150 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 100 | 0,004 x d_1 | 120 | 0,004 x d_1 | 130 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 2.1 | 60 | 0,004 x d_1 | 70 | 0,005 x d_1 | 80 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | |
| | 4.1 | | | | | | | | | | |
| K | 1.1 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | 200 | 0,009 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 160 | 0,007 x d_1 | 180 | 0,008 x d_1 | 200 | 0,009 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 140 | 0,006 x d_1 | 160 | 0,006 x d_1 | 180 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 140 | 0,006 x d_1 | 160 | 0,006 x d_1 | 180 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 120 | 0,006 x d_1 | 140 | 0,006 x d_1 | 150 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 120 | 0,006 x d_1 | 140 | 0,006 x d_1 | 150 | 0,007 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 100 | 0,004 x d_1 | 120 | 0,005 x d_1 | 130 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | | | | | | | | | | |
| | 1.2 | 480 | 0,009 x d_1 | 550 | 0,010 x d_1 | 600 | 0,011 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 480 | 0,009 x d_1 | 550 | 0,010 x d_1 | 600 | 0,012 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 1.4 | 320 | 0,009 x d_1 | 370 | 0,010 x d_1 | 400 | 0,011 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 1.5 | | | | | | | | | | |
| | 1.6 | | | | | | | | | | |
| | 2.1 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | 180 | 0,009 x d_1 | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | 180 | 0,009 x d_1 | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 140 | 0,007 x d_1 | 160 | 0,008 x d_1 | 180 | 0,009 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 130 | 0,006 x d_1 | 150 | 0,006 x d_1 | 160 | 0,007 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | |
| 3.2 | | | | | | | | | | | |
| 4.1 | 320 | 0,011 x d_1 | 370 | 0,012 x d_1 | 400 | 0,014 x d_1 | <input type="checkbox"/> | <input type="checkbox"/> | | <input checked="" type="checkbox"/> | |
| 4.2 | | | | | | | | | | | |
| 4.3 | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | |
| 5.2 | 80 | 0,004 x d_1 | 90 | 0,005 x d_1 | 100 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | |
| S | 1.1 | 80 | 0,005 x d_1 | 90 | 0,006 x d_1 | 100 | 0,006 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 1.2 | 60 | 0,004 x d_1 | 70 | 0,005 x d_1 | 80 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 40 | 0,004 x d_1 | 50 | 0,004 x d_1 | 50 | 0,005 x d_1 | | | | <input checked="" type="checkbox"/> |
| | 2.1 | | | | | | | | | | |
| | 2.2 | | | | | | | | | | |
| | 2.6 | | | | | | | | | | |
| H | 1.1 | 80 | 0,004 x d_1 | 90 | 0,004 x d_1 | 100 | 0,005 x d_1 | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 1.4 | | | | | | | | | | |
| | 1.5 | | | | | | | | | | |

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

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

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

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



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

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

TIALN

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

DIN 6527 – Lange Ausführung · Long design

Eckenradius · Corner radius

| Bestell-Code · Order code | | | | | | | | | | 2673AZ | |
|---------------------------|-----|-------|-------|-------|-------------------|-------------------------|-------|---------------|------------------|--------|--|
| $\varnothing d_1$ h11 | r | l_2 | l_3 | l_1 | $\varnothing d_3$ | $\varnothing d_2$ h6 | l_A | Z (Flutes) | Dimens.- Code | | |
| 6 | 0,5 | 13 | 20 | 57 | 5,8 | 6 | 21 | 4 | .006005 | ● | |
| 6 | 1 | 13 | 20 | 57 | 5,8 | 6 | 21 | 4 | .006010 | ● | |
| 6 | 1,5 | 13 | 20 | 57 | 5,8 | 6 | 21 | 4 | .006015 | ● | |
| 8 | 0,5 | 19 | 25 | 63 | 7,7 | 8 | 27 | 4 | .008005 | ● | |
| 8 | 1 | 19 | 25 | 63 | 7,7 | 8 | 27 | 4 | .008010 | ● | |
| 8 | 1,5 | 19 | 25 | 63 | 7,7 | 8 | 27 | 4 | .008015 | ● | |
| 8 | 2 | 19 | 25 | 63 | 7,7 | 8 | 27 | 4 | .008020 | ● | |
| 10 | 1 | 22 | 30 | 72 | 9,5 | 10 | 32 | 4 | .010010 | ● | |
| 10 | 1,5 | 22 | 30 | 72 | 9,5 | 10 | 32 | 4 | .010015 | ● | |
| 10 | 2 | 22 | 30 | 72 | 9,5 | 10 | 32 | 4 | .010020 | ● | |
| 12 | 1 | 26 | 35 | 83 | 11,5 | 12 | 38 | 4 | .012010 | ● | |
| 12 | 1,5 | 26 | 35 | 83 | 11,5 | 12 | 38 | 4 | .012015 | ● | |
| 12 | 2 | 26 | 35 | 83 | 11,5 | 12 | 38 | 4 | .012020 | ● | |
| 12 | 3 | 26 | 35 | 83 | 11,5 | 12 | 38 | 4 | .012030 | ● | |
| 14 | 1 | 26 | 35 | 83 | 13,5 | 14 | 38 | 4 | .014010 | ● | |
| 14 | 1,5 | 26 | 35 | 83 | 13,5 | 14 | 38 | 4 | .014015 | ● | |
| 14 | 2 | 26 | 35 | 83 | 13,5 | 14 | 38 | 4 | .014020 | ● | |
| 14 | 3 | 26 | 35 | 83 | 13,5 | 14 | 38 | 4 | .014030 | ● | |
| 16 | 1 | 32 | 40 | 92 | 15,5 | 16 | 44 | 4 | .016010 | ● | |
| 16 | 1,5 | 32 | 40 | 92 | 15,5 | 16 | 44 | 4 | .016015 | ● | |
| 16 | 2 | 32 | 40 | 92 | 15,5 | 16 | 44 | 4 | .016020 | ● | |
| 16 | 3 | 32 | 40 | 92 | 15,5 | 16 | 44 | 4 | .016030 | ● | |
| 20 | 1,5 | 38 | 50 | 104 | 19,5 | 20 | 54 | 4 | .020015 | ● | |
| 20 | 2 | 38 | 50 | 104 | 19,5 | 20 | 54 | 4 | .020020 | ● | |
| 20 | 3 | 38 | 50 | 104 | 19,5 | 20 | 54 | 4 | .020030 | ● | |

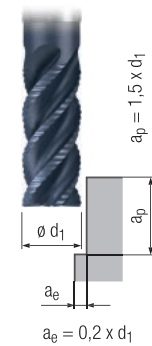
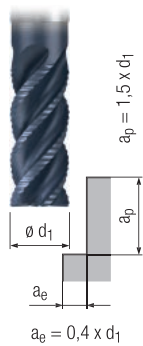
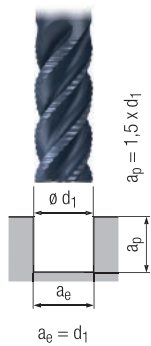
Andere Eckenradien auf Anfrage lieferbar
Other corner radii available on request



Hartmetall-Schafffräser mit Eckenradius – lange Ausführung
Solid carbide end mills with corner radius – long design

NR

Gültig für · Valid for
2673AZ



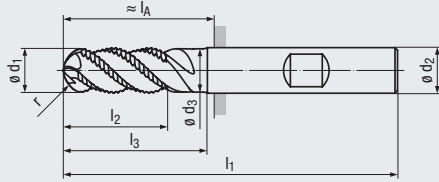
| | | v_c | f_z | v_c | f_z | v_c | f_z | | | MMS | |
|----------|-----|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| | | [m/min] | [mm] | [m/min] | [mm] | [m/min] | [mm] | | | | |
| P | 1.1 | 140 | $0,006 \times d_1$ | 160 | $0,007 \times d_1$ | 180 | $0,008 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 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"/> |
| | 3.1 | 120 | $0,005 \times d_1$ | 140 | $0,005 \times d_1$ | 160 | $0,006 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 110 | $0,004 \times d_1$ | 130 | $0,004 \times d_1$ | 140 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 100 | $0,004 \times d_1$ | 120 | $0,004 \times d_1$ | 130 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,005 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.1 | 60 | $0,004 \times d_1$ | 70 | $0,004 \times d_1$ | 80 | $0,005 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | |
| | 4.1 | | | | | | | | | | |
| K | 1.1 | 140 | $0,007 \times d_1$ | 160 | $0,007 \times d_1$ | 180 | $0,008 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 140 | $0,007 \times d_1$ | 160 | $0,007 \times d_1$ | 180 | $0,008 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,007 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 120 | $0,005 \times d_1$ | 140 | $0,006 \times d_1$ | 160 | $0,007 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 140 | $0,007 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 140 | $0,007 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 80 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | 100 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,005 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | | | | | | | | | | |
| | 1.2 | 420 | $0,008 \times d_1$ | 480 | $0,009 \times d_1$ | 550 | $0,010 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 420 | $0,008 \times d_1$ | 480 | $0,009 \times d_1$ | 550 | $0,011 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.4 | 280 | $0,008 \times d_1$ | 320 | $0,009 \times d_1$ | 360 | $0,010 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.5 | | | | | | | | | | |
| | 1.6 | | | | | | | | | | |
| | 2.1 | 120 | $0,007 \times d_1$ | 140 | $0,007 \times d_1$ | 160 | $0,008 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 120 | $0,007 \times d_1$ | 140 | $0,007 \times d_1$ | 160 | $0,008 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 120 | $0,007 \times d_1$ | 140 | $0,007 \times d_1$ | 160 | $0,008 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 140 | $0,007 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 140 | $0,007 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 110 | $0,005 \times d_1$ | 130 | $0,006 \times d_1$ | 140 | $0,007 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,005 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.8 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,005 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | | | | | |
| 3.2 | | | | | | | | | | | |
| 4.1 | 280 | $0,010 \times d_1$ | 320 | $0,011 \times d_1$ | 360 | $0,012 \times d_1$ | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.2 | | | | | | | | | | | |
| 4.3 | | | | | | | | | | | |
| 4.4 | | | | | | | | | | | |
| 5.1 | | | | | | | | | | | |
| 5.2 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,005 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | | | | | |
| S | 1.1 | 70 | $0,005 \times d_1$ | 80 | $0,005 \times d_1$ | 90 | $0,006 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.2 | 60 | $0,004 \times d_1$ | 70 | $0,004 \times d_1$ | 80 | $0,005 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 40 | $0,003 \times d_1$ | 50 | $0,004 \times d_1$ | 50 | $0,004 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.1 | | | | | | | | | | |
| | 2.2 | | | | | | | | | | |
| | 2.3 | | | | | | | | | | |
| H | 1.1 | 70 | $0,004 \times d_1$ | 80 | $0,004 \times d_1$ | 90 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | | | | | | | | | | |
| | 1.3 | | | | | | | | | | |
| | 1.4 | | | | | | | | | | |
| | 1.5 | | | | | | | | | | |

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

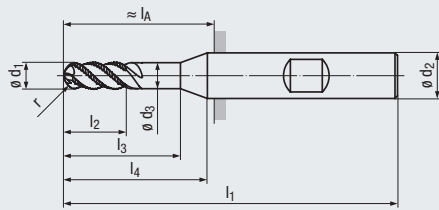
v_c = Schnittgeschwindigkeit · Cutting speed
 f_z = Vorschub pro Zahn · Feed per tooth

- Multifunktionales Hochleistungswerkzeug
- Spanteiler auch im Radiusbereich
- 2 Schneiden zur Mitte

- Multi-functional, high performance tool
- Chip-breakers also in the radius section
- 2 centre cutting edges



Design I₄:



- NR** fein fine
- HM**
- DIN 6535** HA HB
- 45°**
- Kugel**
- 3-5°**
- V_c/f_z 17**
- Optional**



Allround

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

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

Applications – material (see page 4)

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

TIALN

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

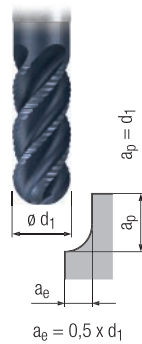
Lange Ausführung · Long design

Bestell-Code · Order code

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



Hartmetall-Kugelfräser – lange Ausführung
Solid carbide ball nose end mills – long design



Gültig für · Valid for
2667A

| | | v_c [m/min] | f_z [mm] | | | MMS MQL | |
|----------|-----|--------------------|--------------------|--------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| P | 1.1 | 140 | $0,004 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.1 | 130 | $0,003 \times d_1$ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 3.1 | 110 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 4.1 | 90 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 5.1 | 70 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| M | 1.1 | | | | | | <input checked="" type="checkbox"/> |
| | 2.1 | | | | | | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | |
| | 4.1 | | | | | | |
| K | 1.1 | 140 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | 140 | $0,004 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.1 | 130 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 2.2 | 130 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.1 | 110 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 3.2 | 110 | $0,003 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.1 | 90 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 4.2 | 70 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| N | 1.1 | | | | | | |
| | 1.2 | | | | | | <input checked="" type="checkbox"/> |
| | 1.3 | | | | | | <input checked="" type="checkbox"/> |
| | 1.4 | | | | | | <input checked="" type="checkbox"/> |
| | 1.5 | | | | | | |
| | 1.6 | | | | | | |
| | 2.1 | 130 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.2 | 130 | $0,004 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.3 | 130 | $0,004 \times d_1$ | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.4 | 120 | $0,003 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.5 | 120 | $0,003 \times d_1$ | | | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.6 | 120 | $0,003 \times d_1$ | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> |
| | 2.7 | 70 | $0,002 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.8 | 70 | $0,002 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 3.1 | | | | | | |
| 3.2 | | | | | | | |
| 4.1 | 290 | $0,006 \times d_1$ | | <input type="checkbox"/> | <input type="checkbox"/> | <input checked="" type="checkbox"/> | |
| 4.2 | | | | | | | |
| 4.3 | | | | | | | |
| 4.4 | | | | | | | |
| 5.1 | | | | | | | |
| 5.2 | 70 | $0,002 \times d_1$ | | | | <input checked="" type="checkbox"/> | |
| 5.3 | | | | | | | |
| S | 1.1 | 70 | $0,003 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.2 | 60 | $0,002 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 1.3 | 40 | $0,002 \times d_1$ | | | | <input checked="" type="checkbox"/> |
| | 2.1 | | | | | | |
| | 2.2 | | | | | | |
| | 2.3 | | | | | | |
| H | 1.1 | 70 | $0,002 \times d_1$ | <input type="checkbox"/> | <input checked="" type="checkbox"/> | | |
| | 1.2 | | | | | | |
| | 1.3 | | | | | | |
| | 1.4 | | | | | | |
| | 1.5 | | | | | | |

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

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

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

Druckerzeugnisse für Hochleistungswerkzeuge

Sales literature for high performance end mills





Baulänge

extra kurz
kurz
mittellang
lang
extra lang

Die entsprechende Baulänge ist rot hervorgehoben. Alternativ-Baulängen des gleichen Typs sind grau unterlegt. Nicht gekennzeichnete Baulängen sind im Lieferprogramm nicht enthalten.

Constructional length

extra short
short
medium length
long
extra long

The relevant length is marked in red. Alternative lengths of the same type are marked in grey. Lengths without any marking are not available as catalogue products.



Schaftausführung

Die auf der jeweiligen Seite befindlichen Schaftausführungen sind grau unterlegt.

Schaftausführung für metrische Werkzeuge

Schaftausführung für Inch-Werkzeuge

Shank design

The shank designs to be found on the respective page are marked in grey.

Shank design for metric tools

Shank design for inch tools



Drallwinkel

Angegeben ist der Drallwinkel dieser Werkzeuge. Bei unterschiedlichen Drallwinkeln sind alle Winkel aufgeführt.

Helix angle

The helix angle of these tools is shown. If there are variable helix angles, these are all shown.



Spanteiler

Diese Fräser erzeugen entsprechende Oberflächenmarkierungen.

Chip breaker

These end mills generate appropriate milling marks.



Schneidstoff

Hartmetall

Cutting material

Solid carbide



Schnittwerte

Die Schnittwerte und Einsatzparameter für diese Werkzeuge sind auf der im Symbol angegebenen Seite zu finden.

Cutting conditions

The cutting conditions and work parameters for these tools can be found on the page indicated in the symbol.



Schneideckenausführung und Stirnkontur

Schutzeckenfase



Eckenradius



Kugel (Vollradius)

Cutting edge design and face geometry

Bevelled edge

Corner radius

Ball nose



Innere Kühlschmierstoff-Zufuhr

ICA = Kühlschmierstoffaustritt axial

Internal coolant supply

ICA = Internal coolant supply, axial exit



Kühlung und Schmierung

Trockenbearbeitung

Kaltluftdüse

Coolant and lubrication

Dry machining

Cold-air nozzle



Vorschubrichtung

Die roten Pfeile beschreiben die empfohlenen Vorschubrichtungen der abgebildeten Fräser.

Feed direction

The red arrows mark the recommended feed directions of the respective cutters.

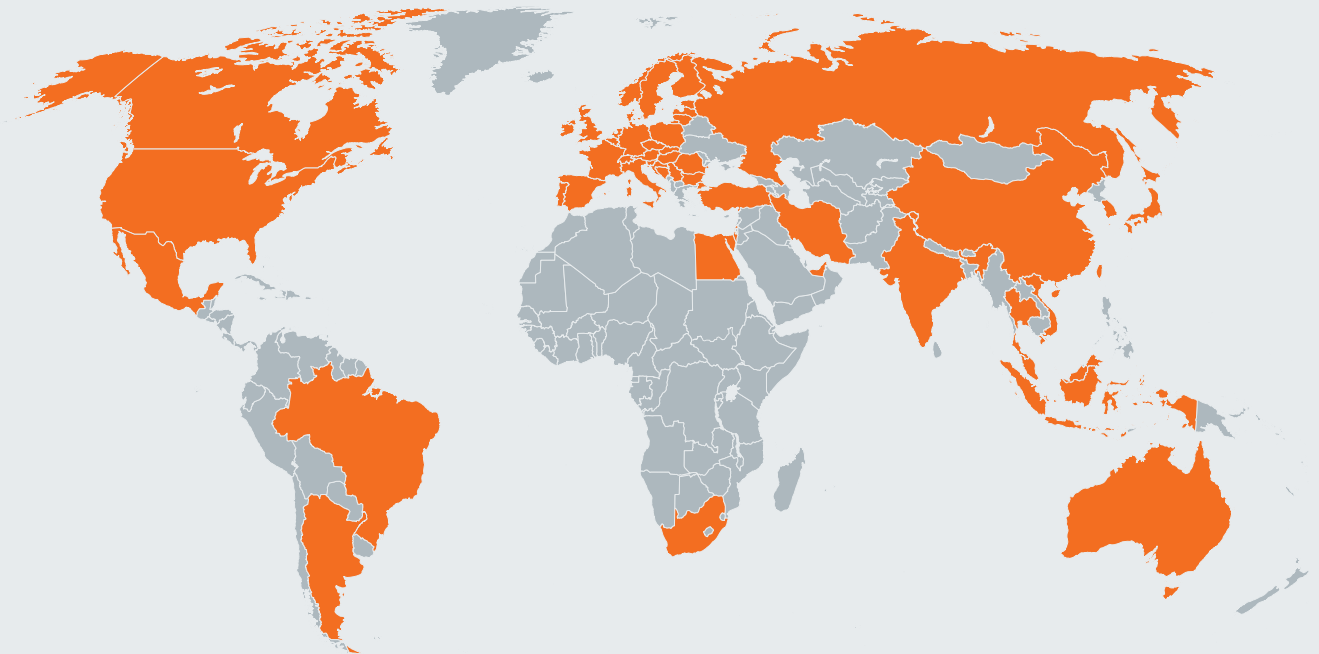


Rampenwinkel

Der Rampenwinkel ist der empfohlene Winkel beim Eintauchen in das Werkstück.

Ramping angle

The specified angle is the recommended angle for ramping applications.



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EMUGE-FRANKEN sales partners, please see www.emuge-franken.com/sales

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

🏠 Nürnberger Straße 96-100
91207 Lauf
GERMANY

☎ +49 9123 186-0
📠 +49 9123 14313

FRANKEN GmbH & Co. KG
Fabrik für Präzisionswerkzeuge

🏠 Frankenstraße 7/9a
90607 Rückersdorf
GERMANY

☎ +49 911 9575-5
📠 +49 911 9575-327

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