



■ Made
■ in
■ Germany



FRANKEN

Hard-Cut

Hochleistungsfräser für den Werkzeug- und Formenbau
High Performance End Mills for the Die and Mould Industry



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.





Mit Hard-Cut Kugel- und Torusfräsern bietet FRANKEN Hochleistungswerkzeuge für die Bearbeitung von gehärteten Werkstoffen an. Speziell für den Werkzeug- und Formenbau wurde eine Vielzahl an Baumaßen mit Halsfreilängen von bis zu $16 \times d_1$ ergänzt. Sehr enge Radiustoleranzen und eine weiterentwickelte Schneidengeometrie ermöglichen eine prozesssichere Herstellung hochgenauer 3D-Formen, Matrizen sowie Form- und Prägestempel bei höchster Leistung.

Ein sehr verschleißfestes Hartmetall, kombiniert mit einer modernen Hochleistungs-PVD-Beschichtung, machen FRANKEN Hard-Cut Fräser zu Spezialisten beim Hartfräsen.

Besonderheiten:

- Engste Radiustoleranzen für höchste Genauigkeiten am Bauteil
- Hochpräzise Zylinderschäfte mit Toleranz h4 ermöglichen eine hohe Rundlaufgenauigkeit
- Spezielle Schneidengeometrie für die Hartbearbeitung
- Optimierte Querschneidengeometrie
- Verschiedene Halsfreilängen (bis $16 \times d_1$) ab Lager verfügbar
- Hohe Zähnezahlen ermöglichen hohe Vorschubgeschwindigkeiten
- Angepasstes Hartmetallsubstrat für gehärtete Werkstoffe
- Moderne Hochleistungs-PVD-Beschichtung

Hauptmerkmal:

- Bearbeitung harter Materialien bis 66 HRC
- Zum Schruppen, Vorschlichten, Schlichten und HSC-Schlichten geeignet

FRANKEN's Hard-Cut ball nose and torus end mills are high-performance tools for the machining of hardened materials.

A wide range of dimensions with relieved neck and lengths of up to $16 \times d_1$ has been added to the product line. Very tight tolerances and a sophisticated cutting edge geometry enable the reliable production of high-precision 3D moulds, dies as well as moulding and embossing punches with highest performance.

An extremely wear-resistant carbide, combined with a modern high-performance PVD coating, make FRANKEN Hard-Cut end mills the specialists when it comes to hard milling.

Characteristics:

- Very tight radius tolerances for highest accuracies on the component
- Highly precise straight shanks with tolerance h4 enable high runout accuracy
- Special cutting edge geometry for hard machining
- Optimised chisel edge geometry
- Various relieved neck lengths (up to $16 \times d_1$) available from stock
- High number of flutes provides high feed rates
- Adapted carbide substrate for hardened materials
- Modern high-performance PVD coating

Main feature:

- Machining of hard materials up to 66 HRC
- Suitable for roughing, pre-finishing, finishing and HSC-finishing

Inhalt

	Seite
Wegweiser	4 - 6
Hartmetall-Kugelfräser	8 - 29
Hartmetall-Torusfräser	30 - 47
Kaltluftdüse mit Zubehör	48 - 50
Anwendungstechnik	51

Content

	Page
Product finder	4 - 6
Solid carbide ball nose end mills	8 - 29
Solid carbide torus end mills	30 - 47
Cold-air nozzle and accessories	48 - 50
Technical Service	51

Wegweiser

Bitte beachten:

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

- = sehr gut geeignet
- = gut geeignet

Product finder

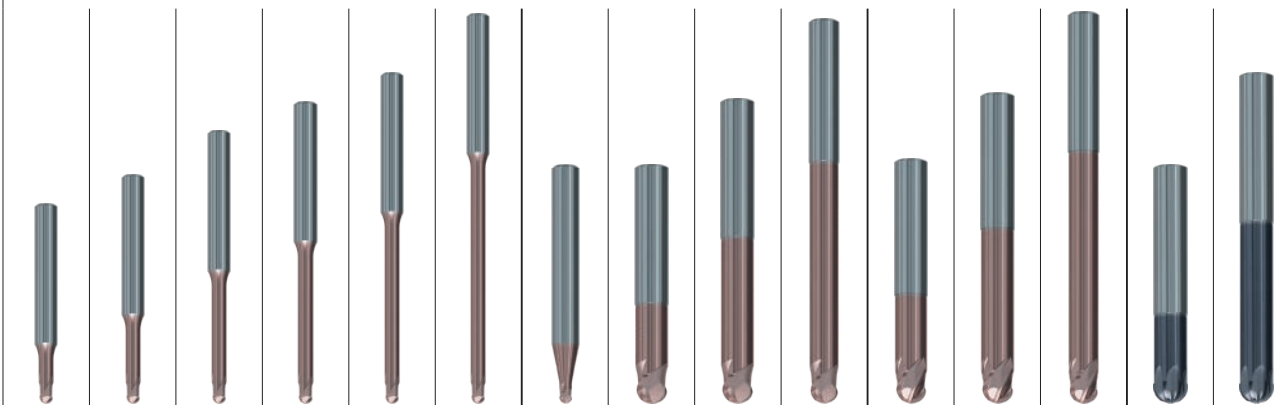
Please note:

The suitability of the solid carbide ball nose and torus end mills 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-AMn1 EN AW-3103
	1.3 Aluminium-Knetlegierungen	Wrought aluminium alloys	≤ 350 N/mm ² EN AW-AMgSi 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-AMg5 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 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)
3.1 Magnesium-Knetlegierungen	Magnesium wrought alloys	≤ 500 N/mm ² MgAl6Zn 3.5612	
3.2 Magnesium-Gusslegierungen	Magnesium cast alloys	≤ 500 N/mm ² EN-MCMgAl9Zn1 EN-MC21120	
S	Kunststoffe Synthetics		
	4.1 Duroplaste (kurzspanend)	Duroplastics (short-chipping)	Bakelit, Pertinax
	4.2 Thermoplaste (langspanend)	Thermoplastics (long-chipping)	PMMA, POM, PVC
	4.3 Faserverstärkte Kunststoffe (Faseranteil ≤ 30%)	Fibre-reinforced synthetics (fibre content ≤ 30%)	GFK, CFK, AFK
	4.4 Faserverstärkte Kunststoffe (Faseranteil > 30%)	Fibre-reinforced synthetics (fibre content > 30%)	GFK, CFK, AFK
	5.1 Besondere Werkstoffe	Special materials	
	5.2 Wolfram-Kupfer-Legierungen	Tungsten-copper alloys	C 8000
	5.3 Verbundwerkstoffe	Composite materials	W-Cu 80/20
	5.3 Verbundwerkstoffe	Composite materials	Hyllite, Alucobond
	5.3 Verbundwerkstoffe	Composite materials	
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	
	2.1 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 Kobalt-Basis-Legierungen	Cobalt-base alloys	≤ 1000 N/mm ² Udimet 605
2.5 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 Armax 600T
	1.4 Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	60 - 63 HRC Ferro-Titanit
	1.5 Hochfeste Stähle, gehärtete Stähle, Hartguss	High strength steels, hardened steels, hard castings	63 - 66 HRC HSSE

Hartmetall-Kugelfräser
Solid carbide ball nose end mills



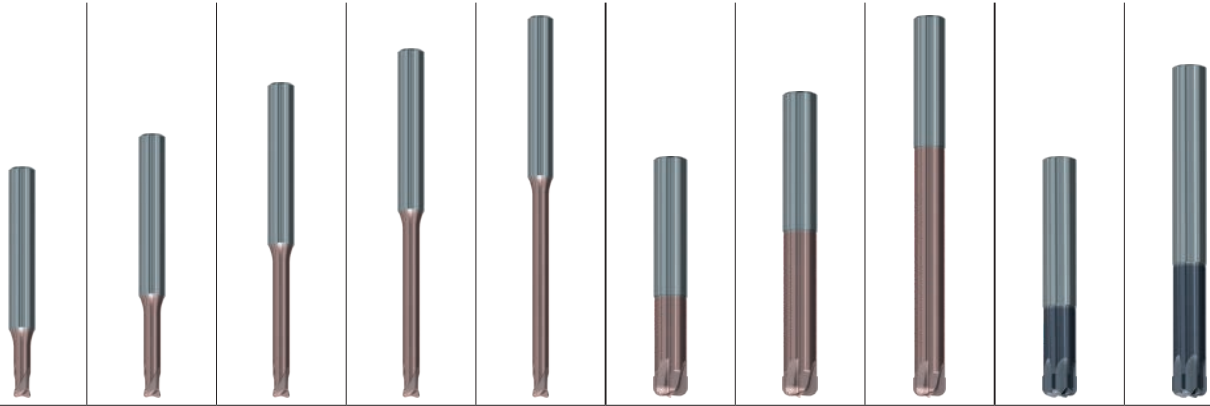
Hard materials

H

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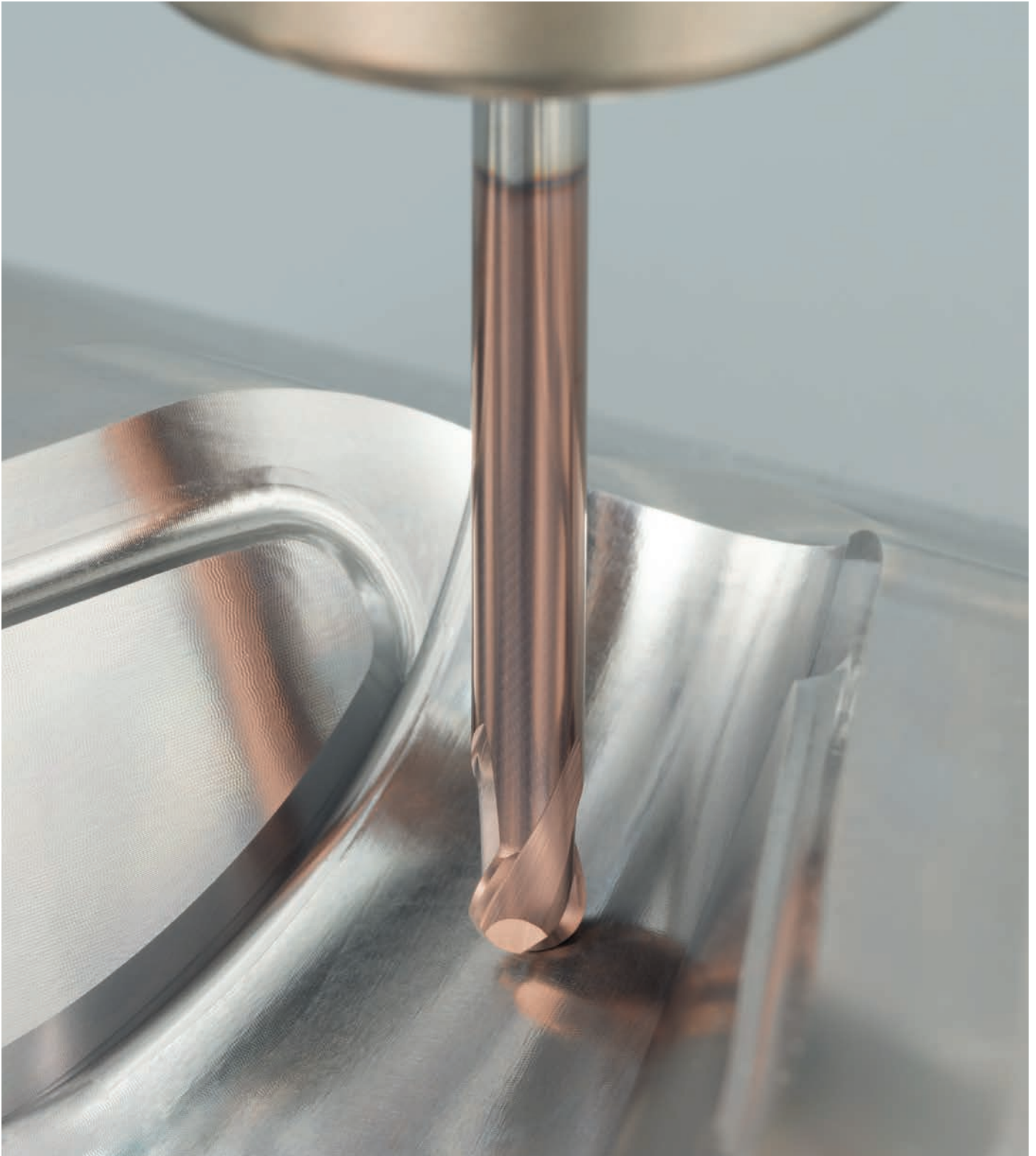
Hartmetall-Torusfräser
Solid carbide torus end mills



Hard materials

H

l_3	3 x d_1	5 x d_1	8 x d_1	10 x d_1	12 x d_1	3 x d_1	5 x d_1	8 x d_1	-	-
d_1	ø0,5-6mm	ø0,5-6mm	ø0,5-6mm	ø0,5-6mm	ø0,5-6mm	ø2-16mm	ø2-16mm	ø2-8mm	ø10-12mm	ø10-16mm
Z (Flutes)	2	2	2	2	2	4	4	4	6-8	6-8
	3867A	3868A	3869A	3870A	3871A	3874A	3875A	3876A	2876A	2877A
Seite - Page	30	32	34	36	38	40	42	44	46	46
v_c / f_z	31	33	35	37	39	41	43	45	47	47
P	1.1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	2.1	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
	3.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
M	1.1									
	2.1									
	3.1									
	4.1									
K	1.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	3.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	4.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
N	1.1									
	1.2									
	1.3									
	1.4									
	1.5									
	1.6									
	2.1									
	2.2						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2.3						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.4						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.5						<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2.6						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.7						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	2.8						<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1									
	3.2									
4.1										
4.2										
4.3										
4.4										
5.1										
5.2										
5.3										
S	1.1									
	1.2								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
2.5								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
2.6								<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
H	1.1	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.2	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.3	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.4	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
	1.5	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



24/7

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

Anmeld
 Warenk
 Unternehmen



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.

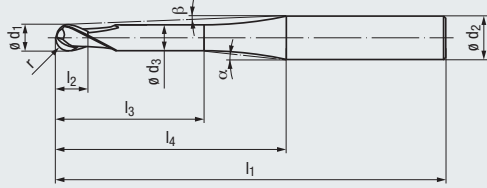
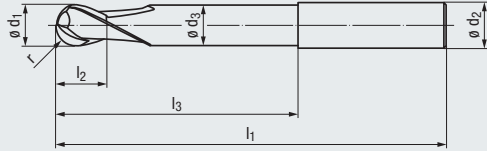
Bei Registrierung stehen Ihnen noch weitere Produktdaten und Funktionen zur Verfügung. Dazu zählen neben standardisierten Werkzeugdaten (2D / 3D / Sachmerkmale) auch eine Bestell- oder Angebotshistorie, individuelle Merklisten sowie weitere nützliche Funktionen.

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.

- Hochleistungswerkzeug
- 6 zylindrische Halslängen bis $16 \times d_1$ verfügbar
- Hochgenauer Radius
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- 6 cylindrical neck lengths up to $16 \times d_1$ available
- High-precision radius
- Highly precise straight shank with tolerance h4



H

HM

DIN 6535
HA
HB

30° Kugel

1-3°

≤ 66 HRC



new



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

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

$l_3 = 3 \times d_1$ – Kurze Ausführung · Short design

Bestell-Code · Order code

3860A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.- Code		
-0.014	-0.007						h4						
0,4	0,2	0,3	1,2	57	0,35	8	6	23°	20°	2	.0004	●	
0,5	0,25	0,4	1,5	57	0,45	8,5	6	22,5°	18,5°	2	.0005	●	
0,6	0,3	0,5	1,8	57	0,55	8,5	6	23°	18,5°	2	.0006	●	
0,8	0,4	0,5	2,4	57	0,75	9	6	22,5°	17°	2	.0008	●	
1	0,5	1	3	57	0,95	9,5	6	22°	15,5°	2	.001	●	
1,2	0,6	1	3,6	57	1,15	10	6	21,5°	14°	2	.0012	●	
1,5	0,75	1,25	4,5	57	1,4	10,5	6	21,5°	12,5°	2	.0015	●	
2	1	1,5	6	57	1,9	11,5	6	21°	10,5°	2	.002	●	
3	1,5	2	9	57	2,9	14,5	6	16,5°	6,5°	2	.003	●	
4	2	2,5	12	57	3,9	16	6	15,5°	4°	2	.004	●	
5	2,5	3	15	57	4,9	18	6	11°	2°	2	.005	●	
6	3	3,5	20	57	5,9	–	6	–	–	2	.006	●	

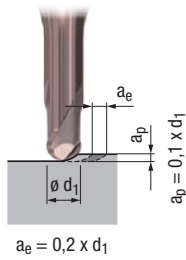


Hartmetall-Kugelfräser – kurze Ausführung (2 Schneiden)
Solid carbide ball nose end mills – short design (2 flutes)

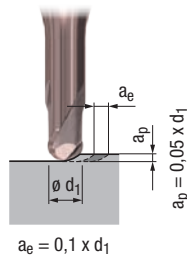
H

$l_3 = 3 \times d_1$

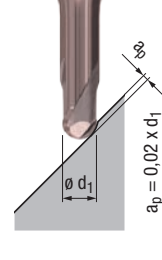
Schruppen
Roughing



Vorschlichten
Pre-finishing



Schlichten
Finishing



Gültig für · Valid for
3860A



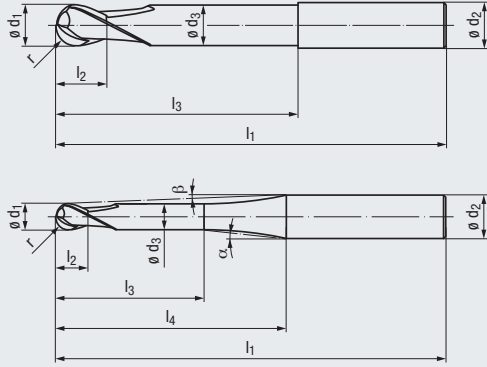
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials											
P	1.1	260	$0,013 \times d_1$	320	$0,015 \times d_1$	360	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	240	$0,012 \times d_1$	280	$0,014 \times d_1$	320	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	220	$0,011 \times d_1$	240	$0,013 \times d_1$	280	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	200	$0,010 \times d_1$	220	$0,012 \times d_1$	240	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	180	$0,009 \times d_1$	200	$0,010 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	260	$0,011 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	260	$0,011 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	240	$0,011 \times d_1$	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	240	$0,011 \times d_1$	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	220	$0,010 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	220	$0,010 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	200	$0,008 \times d_1$	220	$0,009 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	180	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	Kupfer-Legierungen · Copper alloys										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
	Magnesium-Legierungen · Magnesium alloys										
3.1											
3.2											
Kunststoffe · Synthetics											
4.1											
4.2											
4.3											
4.4											
Besondere Werkstoffe · Special materials											
5.1											
5.2											
5.3											
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
1.1											
1.2											
1.3											
Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys											
S	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
Harte Werkstoffe · Hard materials											
H	1.1	160	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	120	$0,007 \times d_1$	180	$0,008 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3			160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4			140	$0,007 \times d_1$	160	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5			120	$0,006 \times d_1$	140	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

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

- Hochleistungswerkzeug
- 6 zylindrische Halslängen bis 16 x d₁ verfügbar
- Hochgenauer Radius
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- 6 cylindrical neck lengths up to 16 x d₁ available
- High-precision radius
- Highly precise straight shank with tolerance h4



H

HM

DIN 6535
HA
HB

30°

Kugel

1-3°

≤ 66 HRC



new



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

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

l₃ = 5 x d₁ – Lange Ausführung · Long design

Bestell-Code · Order code

3861A

∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h4	α	β	Z (Flutes)	Dimens.- Code		
-0,014	-0,007												
0,4	0,2	0,3	2	57	0,35	8,5	6	24°	19°	2	.0004	●	
0,5	0,25	0,4	2,5	57	0,45	9,5	6	22,5°	17°	2	.0005	●	
0,6	0,3	0,5	3	57	0,55	9,5	6	23,5°	16,5°	2	.0006	●	
0,8	0,4	0,5	4	57	0,75	10,5	6	22,5°	14,5°	2	.0008	●	
1	0,5	1	5	57	0,95	11,5	6	22°	13°	2	.001	●	
1,2	0,6	1	6	57	1,15	12	6	22,5°	12°	2	.0012	●	
1,5	0,75	1,25	7,5	57	1,4	13,5	6	21,5°	10°	2	.0015	●	
2	1	1,5	10	57	1,9	14	6	28°	9°	2	.002	●	
3	1,5	2	15	57	2,9	20,5	6	16°	5°	2	.003	●	
4	2	2,5	20	63	3,9	24	6	15,5°	3°	2	.004	●	
5	2,5	3	25	72	4,9	35	6	4°	1,5°	2	.005	●	
6	3	3,5	30	72	5,9	–	6	–	–	2	.006	●	

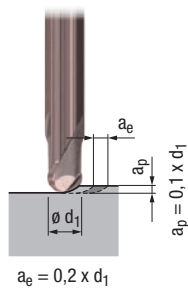


Hartmetall-Kugelfräser – lange Ausführung (2-Schneiden)
Solid carbide ball nose end mills – long design (2 flutes)

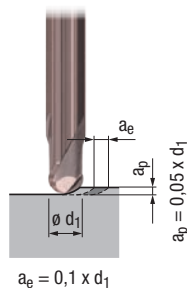
H

$l_3 = 5 \times d_1$

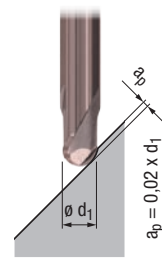
Schruppen
Roughing



Vorschlichten
Pre-finishing



Schlichten
Finishing



Gültig für · Valid for
3861A



	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials											
P	1.1	240	$0,013 \times d_1$	300	$0,015 \times d_1$	340	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	220	$0,012 \times d_1$	260	0,014	340	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	200	$0,011 \times d_1$	220	$0,013 \times d_1$	260	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	180	$0,010 \times d_1$	200	$0,012 \times d_1$	220	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	160	$0,009 \times d_1$	180	$0,010 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	240	$0,011 \times d_1$	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	240	$0,011 \times d_1$	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	220	$0,011 \times d_1$	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	220	$0,011 \times d_1$	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	200	$0,010 \times d_1$	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	200	$0,010 \times d_1$	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	180	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.2	160	$0,008 \times d_1$	180	$0,009 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	Kupfer-Legierungen · Copper alloys										
	2.1										
2.2											
2.3											
2.4											
2.5											
2.6											
2.7											
2.8											
Magnesium-Legierungen · Magnesium alloys											
3.1											
3.2											
Kunststoffe · Synthetics											
4.1											
4.2											
4.3											
4.4											
Besondere Werkstoffe · Special materials											
5.1											
5.2											
5.3											
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
1.1											
1.2											
1.3											
Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys											
S	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
Harte Werkstoffe · Hard materials											
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	110	$0,007 \times d_1$	160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3			140	$0,008 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4			130	$0,007 \times d_1$	140	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5			110	$0,006 \times d_1$	130	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

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

- Hochleistungswerkzeug
- 6 zylindrische Halslängen bis 16 x d₁ verfügbar
- Hochgenauer Radius
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- 6 cylindrical neck lengths up to 16 x d₁ available
- High-precision radius
- Highly precise straight shank with tolerance h4

H

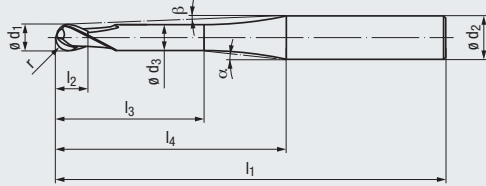
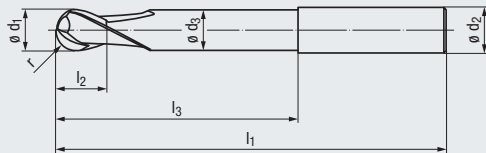
HM

DIN 6535
HA
HB

30° **Kugel**

1-3°

≤ 66
HRC



new



new



Hard materials

Hard materials

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- Spezielle TiAlN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

Applications – material (see page 4)

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

TIALN

TIALN

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

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

l₃ = 8 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code

∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h4	α	β	Z (Flutes)	Dimens.- Code
-0,014	-0,007										
0,4	0,2	0,3	3,2	57	0,35	9,5	6	25°	17°	2	.0004
0,5	0,25	0,4	4	57	0,45	11	6	22,5°	14,5°	2	.0005
0,6	0,3	0,5	4,8	57	0,55	11	6	24,5°	14,5°	2	.0006
0,8	0,4	0,5	6,4	57	0,75	13	6	22,5°	12°	2	.0008
1	0,5	1	8	57	0,95	14,5	6	22°	10,5°	2	.001
1,2	0,6	1	9,6	57	1,15	16	6	21,5°	9°	2	.0012
1,5	0,75	1,25	12	57	1,4	18	6	21,5°	8°	2	.0015
2	1	1,5	16	57	1,9	20	6	28°	6,5°	2	.002
3	1,5	2	24	68	2,9	30	6	15°	3,5°	2	.003
4	2	2,5	32	80	3,9	42	6	6,5°	2°	2	.004
5	2,5	3	40	80	4,9	43	6	11°	1,5°	2	.005
6	3	3,5	48	86	5,9	-	6	-	-	2	.006

3862A

l₃ = 10 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code

∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h4	α	β	Z (Flutes)	Dimens.- Code
-0,014	-0,007										
0,4	0,2	0,3	4	57	0,35	10,5	6	24°	15,5°	2	.0004
0,5	0,25	0,4	5	57	0,45	12	6	22,5°	13,5°	2	.0005
0,6	0,3	0,5	6	57	0,55	12,5	6	23,5°	13°	2	.0006
0,8	0,4	0,5	8	57	0,75	14,5	6	22,5°	11°	2	.0008
1	0,5	1	10	57	0,95	16,5	6	22°	9,5°	2	.001
1,2	0,6	1	12	57	1,15	18,5	6	21°	8°	2	.0012
1,5	0,75	1,25	15	57	1,4	20	6	25,5°	7°	2	.0015
2	1	1,5	20	63	1,9	24	6	28°	5,5°	2	.002
3	1,5	2	30	72	2,9	35	6	18°	3°	2	.003
4	2	2,5	40	80	3,9	44	6	15,5°	2°	2	.004
5	2,5	3	50	100	4,9	53	6	11°	1°	2	.005
6	3	3,5	60	100	5,9	-	6	-	-	2	.006

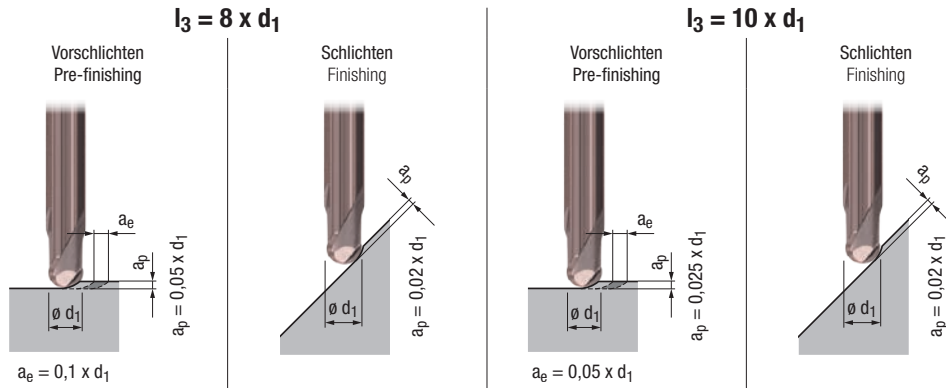
3863A



Hartmetall-Kugelfräser – extra lange Ausführung (2-Schneiden)
Solid carbide ball nose end mills – extra long design (2 flutes)

H

Gültig für · Valid for
3862A
3863A



	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]				
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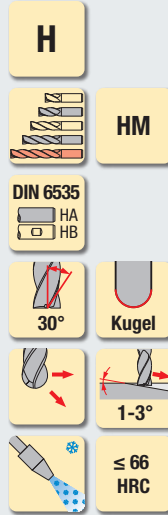
Stahlwerkstoffe · Steel materials														
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials														
M	1.1													
	2.1													
	3.1													
	4.1													
Gusswerkstoffe · Cast materials														
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Nichteisenwerkstoffe · Non-ferrous materials														
Aluminium-Legierungen · Aluminium alloys														
N	1.1													
	1.2													
	1.3													
	1.4													
	1.5													
	1.6													
	Kupfer-Legierungen · Copper alloys													
	2.1													
	2.2													
	2.3													
	2.4													
	2.5													
	2.6													
	2.7													
	2.8													
	Magnesium-Legierungen · Magnesium alloys													
3.1														
3.2														
Kunststoffe · Synthetics														
4.1														
4.2														
4.3														
4.4														
Besondere Werkstoffe · Special materials														
5.1														
5.2														
5.3														
Spezialwerkstoffe · Special materials														
Titan-Legierungen · Titanium alloys														
1.1														
1.2														
1.3														
Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys														
S	2.1													
	2.2													
	2.3													
	2.4													
	2.5													
	2.6													
Harte Werkstoffe · Hard materials														
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	140	$0,008 \times d_1$	180	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	$0,007 \times d_1$	160	$0,008 \times d_1$	120	$0,007 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	$0,008 \times d_1$	140	$0,008 \times d_1$	110	$0,008 \times d_1$	140	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	$0,007 \times d_1$	120	$0,007 \times d_1$	100	$0,007 \times d_1$	120	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	$0,006 \times d_1$	100	$0,006 \times d_1$	80	$0,006 \times d_1$	100	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- 6 zylindrische Halslängen bis 16 x d₁ verfügbar
- Hochgenauer Radius
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- 6 cylindrical neck lengths up to 16 x d₁ available
- High-precision radius
- Highly precise straight shank with tolerance h4



new

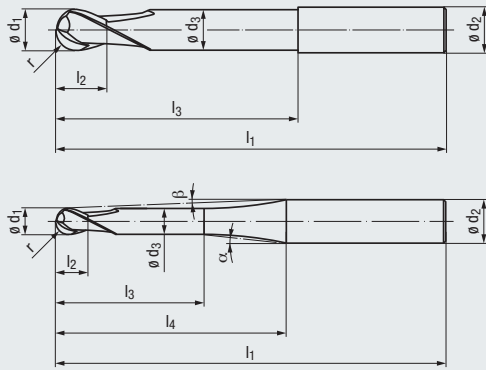


Hard materials

new



Hard materials



Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- Spezielle TiAlN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

Applications – material (see page 4)

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

TIALN

TIALN

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

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

l₃ = 12 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code

3864A

∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h4	α	β	Z (Flutes)	Dimens.- Code
-0,014	-0,007										
0,4	0,2	0,3	4,8	57	0,35	11,5	6	23,5°	14,5°	2	.0004
0,5	0,25	0,4	6	57	0,45	13	6	22,5°	12,5°	2	.0005
0,6	0,3	0,5	7,2	57	0,55	13,5	6	24°	12°	2	.0006
0,8	0,4	0,5	9,6	57	0,75	16	6	23°	10°	2	.0008
1	0,5	1	12	57	0,95	18,5	6	22°	8,5°	2	.001
1,2	0,6	1	14,4	57	1,15	21	6	21°	7°	2	.0012
1,5	0,75	1,25	18	63	1,4	24	6	21,5°	6°	2	.0015
2	1	1,5	24	66	1,9	28	6	28°	4,5°	2	.002
3	1,5	2	36	80	2,9	42,5	6	14°	2,5°	2	.003
4	2	2,5	48	100	3,9	61	6	5,5°	1,5°	2	.004
5	2,5	3	60	100	4,9	63	6	11°	1°	2	.005
6	3	3,5	72	110	5,9	-	6	-	-	2	.006

l₃ = 16 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code

3865A

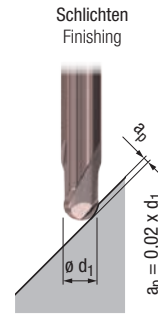
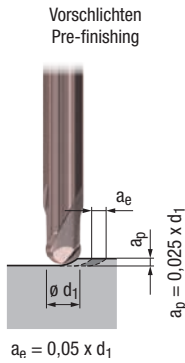
∅ d ₁	r	l ₂	l ₃	l ₁	∅ d ₃	l ₄	∅ d ₂ h4	α	β	Z (Flutes)	Dimens.- Code
-0,014	-0,007										
1	0,5	1	16	57	0,95	20,5	6	30°	7,5°	2	.001
2	1	1,5	32	80	1,9	37,5	6	21°	3,1°	2	.002



Hartmetall-Kugelfräser – extra lange Ausführung (2-Schneiden)
Solid carbide ball nose end mills – extra long design (2 flutes)

H

$l_3 = 12 \times d_1 \cdot l_3 = 16 \times d_1$



Gültig für · Valid for
3864A
3865A



	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials									
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
2.2									
2.3									
2.4									
2.5									
2.6									
2.7									
2.8									
Magnesium-Legierungen · Magnesium alloys									
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
1.1									
1.2									
1.3									
S	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	$0,007 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	$0,008 \times d_1$	140	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	$0,007 \times d_1$	120	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	$0,006 \times d_1$	100	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- Optimierte Querschneide
- Hochgenauer Radius
- 4 Baulängen verfügbar
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- Optimised chisel edge
- High-precision radius
- 4 lengths available
- Highly precise straight shank with tolerance h4

H

HM

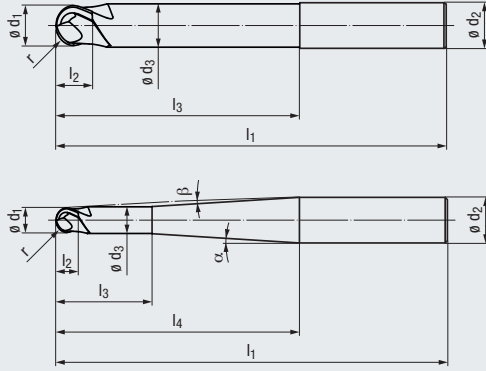
DIN 6535
HA
HB

30°

Kugel

1-3°

≤ 66
HRC



new

new



Hard materials

Hard materials

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Schruppen, Schlichten sowie zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- Suitable for roughing, finishing and HSC finishing

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

$l_3 = 1,5 \times d_1$ – Extra kurze Ausführung · Extra short design

Bestell-Code · Order code

3826A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code
-0,014	-0,007						h4			(Flutes)	
0,5	0,25	0,5	0,75	54	0,45	16,4	6	10°	10°	2	.0005
1	0,5	1	1,5	54	0,95	15,8	6	10°	9,5°	2	.001
1,5	0,75	1,5	2,25	54	1,4	15,3	6	10°	9°	2	.0015
2	1	2	3	54	1,8	14,9	6	10°	8°	2	.002
3	1,5	3	4,5	54	2,8	13,5	6	10°	7°	2	.003

$l_3 = 3 \times d_1$ – Kurze Ausführung · Short design

Bestell-Code · Order code

3827A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code
-0,014	-0,007						h4			(Flutes)	
0,5	0,25	1	2	54	0,45	17,7	6	10°	9°	2	.0005
1	0,5	2	4	57	0,95	18,3	6	10°	8,5°	2	.001
1,5	0,75	2,5	4,5	57	1,4	17,5	6	10°	8,5°	2	.0015
2	1	3	8	57	1,8	19,9	6	10°	6,5°	2	.002
3	1,5	3,5	10	57	2,8	19	6	10°	5,5°	2	.003
4	2	4	12	57	3,8	18,2	6	10°	3,5°	2	.004
5	2,5	5	15	57	4,7	18,6	6	10°	2	2	.005
6	3	6	20	57	5,6	–	6	–	–	2	.006
8	4	7	25	63	7,6	–	8	–	–	2	.008
10	5	8	30	72	9,6	–	10	–	–	2	.010
12	6	10	36	83	11,5	–	12	–	–	2	.012

Hartmetall-Kugelfräser – extra kurze und kurze Ausführung (2 Schneiden)
Solid carbide ball nose end mills – extra short and short design (2 flutes)

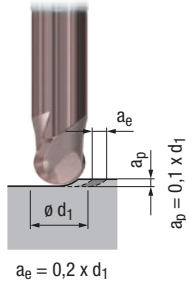
Gültig für · Valid for
3826A
3827A



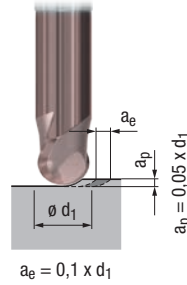
H

$l_3 = 1,5 \times d_1 \cdot l_3 = 3 \times d_1$

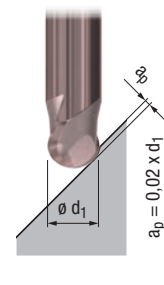
Schruppen
Roughing



Vorschlichten
Pre-finishing



Schlichten
Finishing

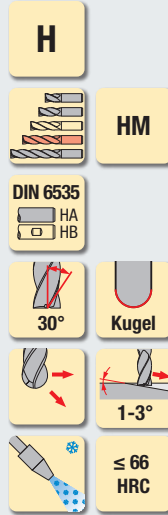


	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL		
Stahlwerkstoffe · Steel materials											
P	1.1	260	$0,013 \times d_1$	320	$0,015 \times d_1$	360	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	240	$0,012 \times d_1$	280	$0,014 \times d_1$	320	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	220	$0,011 \times d_1$	240	$0,013 \times d_1$	280	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	200	$0,010 \times d_1$	220	$0,012 \times d_1$	240	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	180	$0,009 \times d_1$	200	$0,010 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	260	$0,011 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	260	$0,011 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	240	$0,011 \times d_1$	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	240	$0,011 \times d_1$	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	220	$0,010 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	220	$0,010 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	200	$0,008 \times d_1$	220	$0,009 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	180	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	Kupfer-Legierungen · Copper alloys										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
	Magnesium-Legierungen · Magnesium alloys										
3.1											
3.2											
Kunststoffe · Synthetics											
4.1											
4.2											
4.3											
4.4											
Besondere Werkstoffe · Special materials											
5.1											
5.2											
5.3											
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
1.1											
1.2											
1.3											
Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys											
2.1											
2.2											
2.3											
2.4											
2.5											
2.6											
Harte Werkstoffe · Hard materials											
1.1	160	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.2	120	$0,007 \times d_1$	180	$0,008 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3			160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.4			140	$0,007 \times d_1$	160	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.5			120	$0,006 \times d_1$	140	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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

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

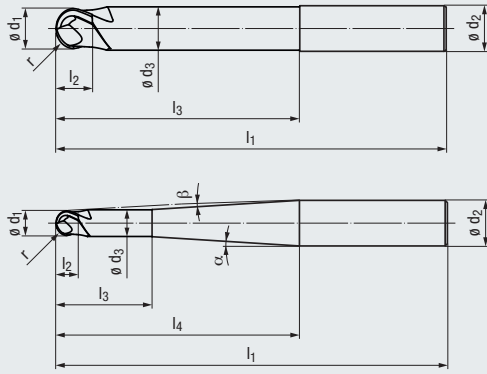
- Hochleistungswerkzeug
- Optimierte Querschnitte
- Hochgenauer Radius
- 4 Baulängen verfügbar
- Hochpräziser Zylinderschaft mit Toleranz h4
- High performance tool
- Optimised chisel edge
- High-precision radius
- 4 lengths available
- Highly precise straight shank with tolerance h4



new



Hard materials



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Schrappen, Schlichten sowie zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- Suitable for roughing, finishing and HSC finishing

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

$l_3 = 5 \times d_1$ – Lange Ausführung · Long design

Bestell-Code · Order code

3828A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h4	α	β	Z (Flutes)	Dimens.- Code		
0,5	0,25	1	2,5	57	0,45	18,2	6	10°	9°	2	.0005	●	
1	0,5	2	5	57	0,95	19,3	6	10°	8°	2	.001	●	
1,5	0,75	2,5	7,5	57	1,4	20,5	6	10°	6,5°	2	.0015	●	
2	1	3	10	63	1,8	21,9	6	10°	5,5°	2	.002	●	
3	1,5	3,5	15	63	2,8	24	6	10°	4°	2	.003	●	
4	2	4	20	63	3,8	26,2	6	10°	2,5°	2	.004	●	
5	2,5	5	25	66	4,7	28,6	6	10°	1,5°	2	.005	●	
6	3	6	30	68	5,6	–	6	–	–	2	.006	●	
8	4	7	40	78	7,6	–	8	–	–	2	.008	●	
10	5	8	50	92	9,6	–	10	–	–	2	.010	●	
12	6	10	60	106	11,5	–	12	–	–	2	.012	●	

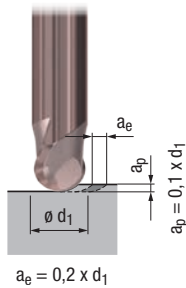


Hartmetall-Kugelfräser – lange Ausführung (2-Schneiden)
Solid carbide ball nose end mills – long design (2 flutes)

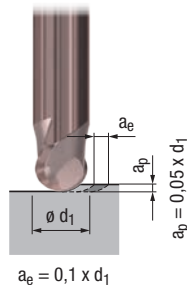
H

$l_3 = 5 \times d_1$

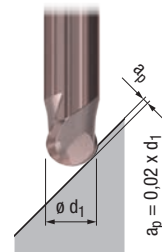
Schruppen
Roughing



Vorschlichten
Pre-finishing



Schlichten
Finishing



Gültig für · Valid for
3828A

	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]			MMS MQL		
Stahlwerkstoffe · Steel materials											
P	1.1	240	$0,013 \times d_1$	300	$0,015 \times d_1$	340	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	220	$0,012 \times d_1$	260	$0,014 \times d_1$	340	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	200	$0,011 \times d_1$	220	$0,013 \times d_1$	260	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	180	$0,010 \times d_1$	200	$0,012 \times d_1$	220	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	160	$0,009 \times d_1$	180	$0,010 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	240	$0,011 \times d_1$	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	240	$0,011 \times d_1$	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	220	$0,011 \times d_1$	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	220	$0,011 \times d_1$	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	200	$0,010 \times d_1$	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	200	$0,010 \times d_1$	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	180	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	160	$0,008 \times d_1$	180	$0,009 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	Kupfer-Legierungen · Copper alloys										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
	Magnesium-Legierungen · Magnesium alloys										
3.1											
3.2											
Kunststoffe · Synthetics											
4.1											
4.2											
4.3											
4.4											
Besondere Werkstoffe · Special materials											
5.1											
5.2											
5.3											
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
1.1											
1.2											
1.3											
Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys											
2.1											
2.2											
2.3											
2.4											
2.5											
2.6											
Harte Werkstoffe · Hard materials											
1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.2	110	$0,007 \times d_1$	160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3			140	$0,008 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.4			130	$0,007 \times d_1$	140	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.5			110	$0,006 \times d_1$	130	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- Optimierte Querschneide
- Hochgenauer Radius
- 4 Baulängen verfügbar
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- Optimised chisel edge
- High-precision radius
- 4 lengths available
- Highly precise straight shank with tolerance h4

H

HM

DIN 6535
HA
HB

30°

Kugel

1-3°

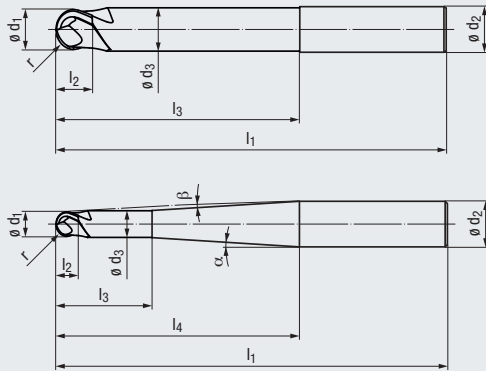
≤ 66
HRC



new



Hard materials



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Vorschlichten, Schlichten sowie zum HSC-Schlichten geeignet

- Special TIALN-coating for machining hardened materials
- Suitable for pre-finishing, finishing and HSC finishing

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

$l_3 = 8 \times d_1$ – Extra lange Ausführung · Extra long design

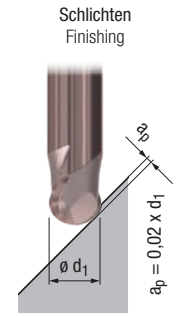
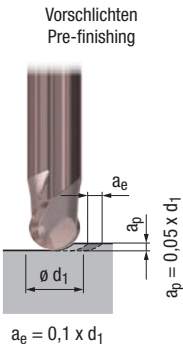
Bestell-Code · Order code												3829A	
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h4	α	β	Z (Flutes)	Dimens.- Code		
0,5	0,25	1	4	57	0,45	19,7	6	10°	8°	2	.0005	●	
1	0,5	2	8	60	0,95	22,3	6	10°	6,5°	2	.001	●	
1,5	0,75	2,5	12	63	1,4	25	6	10°	5,5°	2	.0015	●	
2	1	3	16	66	1,8	27,9	6	10°	4,5°	2	.002	●	
3	1,5	3,5	24	72	2,8	33	6	10°	3°	2	.003	●	
4	2	4	32	76	3,8	38,2	6	10°	2°	2	.004	●	
5	2,5	5	40	80	4,7	43,6	6	10°	1°	2	.005	●	
6	3	6	48	86	5,6	–	6	–	–	2	.006	●	
8	4	7	64	102	7,6	–	8	–	–	2	.008	●	



Hartmetall-Kugelfräser – extra lange Ausführung (2-Schneiden)
Solid carbide ball nose end mills – extra long design (2 flutes)

H

$l_3 = 8 \times d_1$



Gültig für · Valid for
3829A



	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Stahlwerkstoffe · Steel materials									
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	$0,007 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	$0,008 \times d_1$	140	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	$0,007 \times d_1$	120	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	$0,006 \times d_1$	100	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- Optimierte Querschneide
- Mit 4 Schneiden
- 2 Schneiden zur Mitte
- Hochgenauer Radius
- 3 Baulängen verfügbar
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- Optimised chisel edge
- With 4 flutes
- 2 centre cutting edges
- High-precision radius
- 3 lengths available
- Highly precise straight shank with tolerance h4

H

HM

DIN 6535

30°

Kugel

1-3°

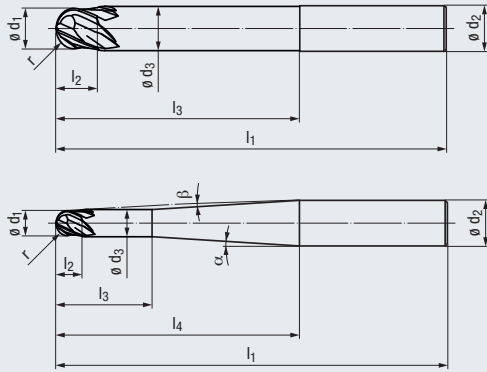
≤ 66 HRC



new



Hard materials



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Vorschlichten, Schlichten sowie zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- Suitable for pre-finishing, finishing and HSC finishing

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

$l_3 = 3 \times d_1$ – Kurze Ausführung · Short design

Bestell-Code · Order code

3831A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z	Dimens.-Code		
-0,014	-0,007						h4			(Flutes)			
2	1	3	8	57	1,8	19,9	6	10°	6,5°	4	.002	●	
3	1,5	3,5	10	57	2,8	19	6	10°	5,5°	4	.003	●	
4	2	4	12	57	3,8	18,2	6	10°	3,5°	4	.004	●	
5	2,5	5	15	57	4,7	18,6	6	10°	2°	4	.005	●	
6	3	6	20	57	5,6	–	6	–	–	4	.006	●	
8	4	7	25	63	7,6	–	8	–	–	4	.008	●	
10	5	8	30	72	9,6	–	10	–	–	4	.010	●	
12	6	10	36	83	11,5	–	12	–	–	4	.012	●	



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

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

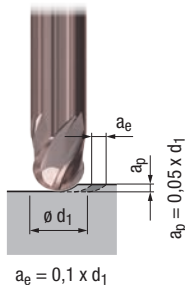


Hartmetall-Kugelfräser – kurze Ausführung (4-Schneiden)
Solid carbide ball nose end mills – short design (4 flutes)

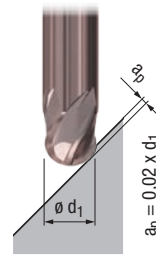
H

$l_3 = 3 \times d_1$

Vorschlichten
Pre-finishing



Schlichten
Finishing



Gültig für · Valid for
3831A



	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Stahlwerkstoffe · Steel materials									
P	1.1	320	$0,015 \times d_1$	360	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	280	$0,014 \times d_1$	320	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	240	$0,013 \times d_1$	280	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	220	$0,012 \times d_1$	240	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	200	$0,010 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	220	$0,009 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	200	$0,009 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	180	$0,008 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	140	$0,007 \times d_1$	160	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	120	$0,006 \times d_1$	140	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

= sehr gut geeignet · very suitable
 = gut geeignet · suitable

- Hochleistungswerkzeug
- Optimierte Querschnitte
- Mit 4 Schneiden
- 2 Schneiden zur Mitte
- Hochgenauer Radius
- 3 Baulängen verfügbar
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- Optimised chisel edge
- With 4 flutes
- 2 centre cutting edges
- High-precision radius
- 3 lengths available
- Highly precise straight shank with tolerance h4

H

HM

DIN 6535
HA
HB

30°

Kugel

1-3°

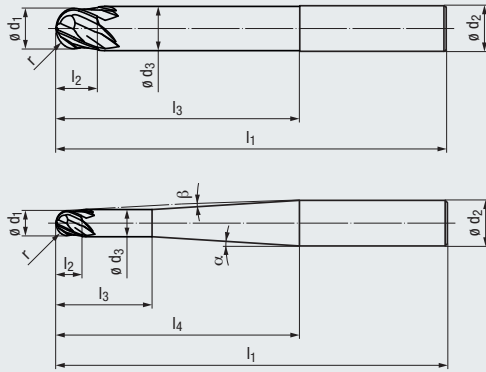
≤ 66
HRC



new



Hard materials



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Vorschlichten, Schlichten sowie zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- Suitable for pre-finishing, finishing and HSC finishing

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

$l_3 = 5 \times d_1$ – Lange Ausführung · Long design

Bestell-Code · Order code

3832A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.- Code		
-0,014	-0,007						h4						
2	1	3	10	63	1,8	21,9	6	10°	5,5°	4	.002	●	
3	1,5	3,5	15	63	2,8	24	6	10°	4°	4	.003	●	
4	2	4	20	63	3,8	26,2	6	10°	2,5°	4	.004	●	
5	2,5	5	25	66	4,7	28,6	6	10°	1,5°	4	.005	●	
6	3	6	30	68	5,6	–	6	–	–	4	.006	●	
8	4	7	40	78	7,6	–	8	–	–	4	.008	●	
10	5	8	50	92	9,6	–	10	–	–	4	.010	●	
12	6	10	60	106	11,5	–	12	–	–	4	.012	●	



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

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

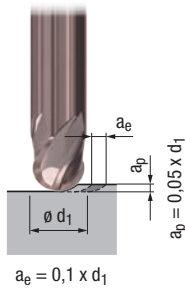


Hartmetall-Kugelfräser – lange Ausführung (4-Schneiden)
Solid carbide ball nose end mills – long design (4 flutes)

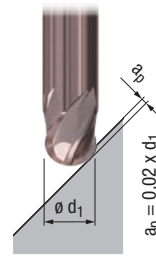
H

$l_3 = 5 \times d_1$

Vorschlichten
Pre-finishing



Schlichten
Finishing



Gültig für · Valid for
3832A



	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Stahlwerkstoffe · Steel materials									
P	1.1	300	$0,015 \times d_1$	340	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	260	$0,014 \times d_1$	340	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	220	$0,013 \times d_1$	260	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	200	$0,012 \times d_1$	220	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	180	$0,010 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	180	$0,009 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
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Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
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Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	180	$0,009 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	140	$0,008 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	130	$0,007 \times d_1$	140	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	110	$0,006 \times d_1$	130	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

v_c = Schnittgeschwindigkeit · Cutting speed
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= sehr gut geeignet · very suitable
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- Hochleistungswerkzeug
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- 3 Baulängen verfügbar
- Hochpräziser Zylinderschaft mit Toleranz h4

- High performance tool
- Optimised chisel edge
- With 4 flutes
- 2 centre cutting edges
- High-precision radius
- 3 lengths available
- Highly precise straight shank with tolerance h4

H

HM

DIN 6535
HA
HB

30° **Kugel**

1-3°

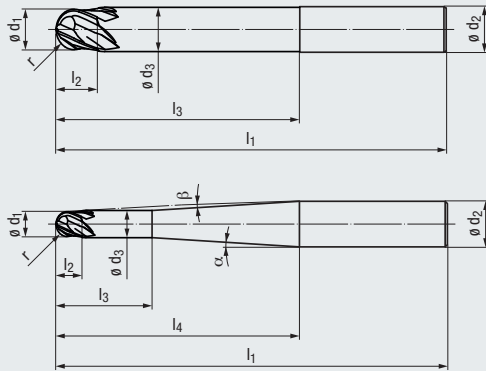
≤ 66
HRC



NEW



Hard materials



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Vorschlichten, Schlichten sowie zum HSC-Schlichten geeignet

- Special TIALN-coating for machining hardened materials
- Suitable for pre-finishing, finishing and HSC finishing

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

$l_3 = 8 \times d_1$ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code

3833A

$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h4	α	β	Z (Flutes)	Dimens.- Code	
-0,014	-0,007											
2	1	3	16	66	1,8	27,9	6	10°	4,5°	4	.002	●
3	1,5	3,5	24	72	2,8	33	6	10°	3°	4	.003	●
4	2	4	32	76	3,8	38,2	6	10°	2°	4	.004	●
5	2,5	5	40	80	4,7	43,6	6	10°	1°	4	.005	●
6	3	6	48	86	5,6	–	6	–	–	4	.006	●
8	4	7	64	102	7,6	–	8	–	–	4	.008	●



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

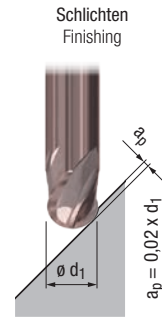
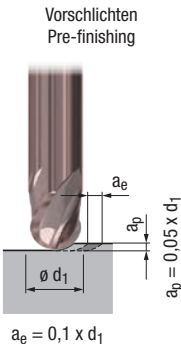
0-15° 2 Schneiden effektiv im Einsatz
2 cutting edges in operation



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

H

$l_3 = 8 \times d_1$



Gültig für · Valid for
3833A



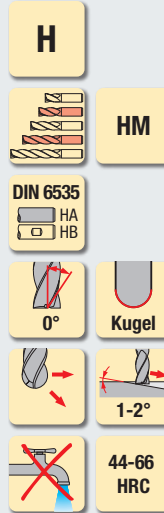
	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Stahlwerkstoffe · Steel materials									
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	$0,007 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	$0,008 \times d_1$	140	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	$0,007 \times d_1$	120	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	$0,006 \times d_1$	100	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

= sehr gut geeignet · very suitable
 = gut geeignet · suitable

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

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



Hard materials

Hard materials

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

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

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

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

Kurze Ausführung · Short design

Bestell-Code · Order code

2836A

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

Lange Ausführung · Long design

Bestell-Code · Order code

2837A

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

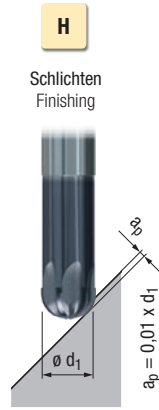


15-90° Alle Schneiden effektiv im Einsatz
All cutting edges in operation

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



Hartmetall-Kugelfräser – kurze und lange Ausführung (6-8 Schneiden)
Solid carbide ball nose end mills – short and long design (6-8 flutes)



Gültig für · Valid for
2836A
2837A

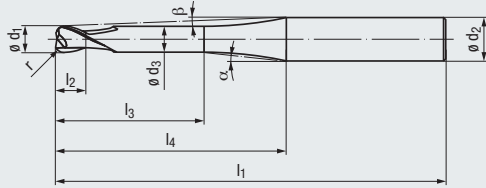
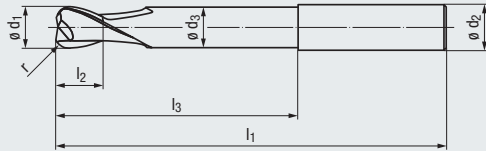
		v_c [m/min]	f_z [mm]			MMS MQL		
Stahlwerkstoffe · Steel materials								
P	1.1							
	2.1							
	3.1	270	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	4.1	220	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
	5.1	180	$0,0054 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>		
Nichtrostende Stahlwerkstoffe · Stainless steel materials								
M	1.1							
	2.1							
	3.1							
	4.1							
Gusswerkstoffe · Cast materials								
K	1.1	360	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	1.2	360	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	2.1	320	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	2.2	320	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	3.1	270	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	3.2	270	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	4.1	220	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
	4.2	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials								
Aluminium-Legierungen · Aluminium alloys								
N	1.1							
	1.2							
	1.3							
	1.4							
	1.5							
	1.6							
	Kupfer-Legierungen · Copper alloys							
	2.1							
	2.2							
	2.3	320	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4							
	2.5							
	2.6	270	$0,007 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.7							
	2.8							
	Magnesium-Legierungen · Magnesium alloys							
3.1								
3.2								
Kunststoffe · Synthetics								
4.1								
4.2								
4.3								
4.4								
Besondere Werkstoffe · Special materials								
5.1								
5.2								
5.3								
Spezialwerkstoffe · Special materials								
Titan-Legierungen · Titanium alloys								
S	1.1							
	1.2	120	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	1.3	70	$0,005 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys							
	2.1	110	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.2	50	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.3	40	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>	
2.4	40	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.5	30	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>		
2.6	40	$0,004 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>		
Harte Werkstoffe · Hard materials								
H	1.1	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.2	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.3	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.4	110	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			
	1.5	90	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>			

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

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

- Hochleistungswerkzeug
- 5 zylindrische Halslängen bis 12 x d₁ verfügbar
- Hochgenauer Eckenradius

- High performance tool
- 5 cylindrical neck lengths up to 12 x d₁ available
- High-precision corner radius



H

HM

DIN 6535

30°

Torus

1-3°

≤ 66 HRC



new



Hard materials

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- Spezielle TiAlN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

Applications – material (see page 4)

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

TIALN

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

l₃ = 3 x d₁ – Kurze Ausführung · Short design

Bestell-Code · Order code

3867A

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	α	β	Z	Dimens.-Code		
-0,015	±0,005						h5			(Flutes)			
0,5	0,05	0,5	1,5	57	0,45	8,5	6	22,5°	18,5°	2	.00050E	●	
0,5	0,1	0,5	1,5	57	0,45	8,5	6	22,5°	18,5°	2	.000501	●	
0,8	0,05	0,8	2,4	57	0,75	9	6	22,5°	17°	2	.00080E	●	
0,8	0,1	0,8	2,4	57	0,75	9	6	22,5°	17°	2	.000801	●	
1	0,05	1	3	57	0,95	9,5	6	22°	15,5°	2	.00100E	●	
1	0,1	1	3	57	0,95	9,5	6	22°	15,5°	2	.001001	●	
1	0,2	1	3	57	0,95	9,5	6	22°	15,5°	2	.001002	●	
1,2	0,1	1,2	3,6	57	1,1	10	6	21,5°	14°	2	.001201	●	
1,2	0,3	1,2	3,6	57	1,1	10	6	21,5°	14°	2	.001203	●	
1,5	0,1	1,25	4,5	57	1,4	10,5	6	21,5°	12,5°	2	.001501	●	
1,5	0,3	1,25	4,5	57	1,4	10,5	6	21,5°	12,5°	2	.001503	●	
1,8	0,1	1,5	5,4	57	1,7	11	6	21,5°	11,5°	2	.001801	●	
1,8	0,3	1,5	5,4	57	1,7	11	6	21,5°	11,5°	2	.001803	●	
2	0,1	1,5	6	57	1,9	11,5	6	21°	10,5°	2	.002001	●	
2	0,3	1,5	6	57	1,9	11,5	6	21°	10,5°	2	.002003	●	
2	0,4	1,5	6	57	1,9	11,5	6	21°	10,5°	2	.002004	●	
2	0,5	1,5	6	57	1,9	11,5	6	21°	10,5°	2	.002005	●	
3	0,1	2	9	57	2,9	14,5	6	16,5°	6,5°	2	.003001	●	
3	0,3	2	9	57	2,9	14,5	6	16,5°	6,5°	2	.003003	●	
3	0,5	2	9	57	2,9	14,5	6	16,5°	6,5°	2	.003005	●	
4	0,1	2,5	12	57	3,9	16	6	15,5°	4°	2	.004001	●	
4	0,3	2,5	12	57	3,9	16	6	15,5°	4°	2	.004003	●	
4	0,5	2,5	12	57	3,9	16	6	15,5°	4°	2	.004005	●	
4	0,6	2,5	12	57	3,9	16	6	15,5°	4°	2	.004006	●	
5	0,1	3	15	57	4,9	18	6	11°	2°	2	.005001	●	
5	0,3	3	15	57	4,9	18	6	11°	2°	2	.005003	●	
5	0,5	3	15	57	4,9	18	6	11°	2°	2	.005005	●	
5	0,8	3	15	57	4,9	18	6	11°	2°	2	.005008	●	
6	0,3	3,5	20	57	5,9	–	6	–	–	2	.006003	●	
6	0,5	3,5	20	57	5,9	–	6	–	–	2	.006005	●	
6	1	3,5	20	57	5,9	–	6	–	–	2	.006010	●	

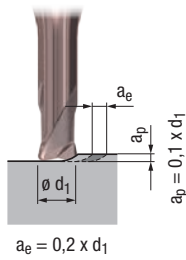


Hartmetall-Torusfräser – kurze Ausführung (2 Schneiden)
Solid carbide torus end mills – short design (2 flutes)

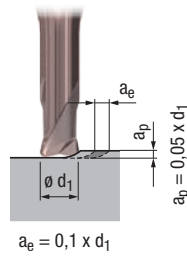
H

$l_3 = 3 \times d_1$

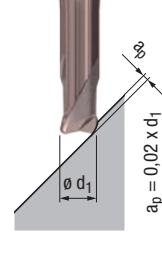
Schruppen
Roughing



Vorschlichten
Pre-finishing



Schlichten
Finishing



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3867A

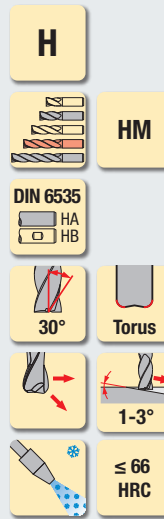
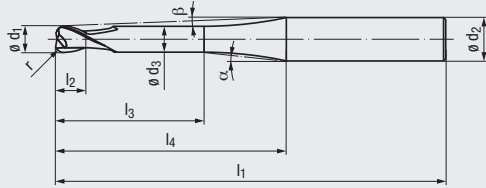
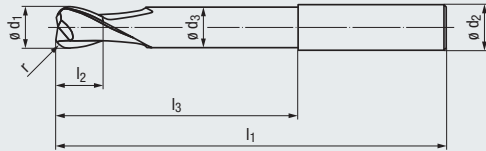
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]			MMS MQL		
Stahlwerkstoffe · Steel materials											
P	1.1	260	$0,013 \times d_1$	320	$0,015 \times d_1$	360	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	240	$0,012 \times d_1$	280	$0,014 \times d_1$	320	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	220	$0,011 \times d_1$	240	$0,013 \times d_1$	280	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	200	$0,010 \times d_1$	220	$0,012 \times d_1$	240	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	180	$0,009 \times d_1$	200	$0,010 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	260	$0,011 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	260	$0,011 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	240	$0,011 \times d_1$	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	240	$0,011 \times d_1$	280	$0,013 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	220	$0,010 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	220	$0,010 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	200	$0,008 \times d_1$	220	$0,009 \times d_1$	240	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	180	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
	Kupfer-Legierungen · Copper alloys										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
	Magnesium-Legierungen · Magnesium alloys										
3.1											
3.2											
Kunststoffe · Synthetics											
4.1											
4.2											
4.3											
4.4											
Besondere Werkstoffe · Special materials											
5.1											
5.2											
5.3											
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
1.1											
1.2											
1.3											
Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys											
2.1											
2.2											
2.3											
2.4											
2.5											
2.6											
Harte Werkstoffe · Hard materials											
1.1	160	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.2	120	$0,007 \times d_1$	180	$0,008 \times d_1$	200	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.3			160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.4			140	$0,007 \times d_1$	160	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
1.5			120	$0,006 \times d_1$	140	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- 5 zylindrische Halslängen bis 12 x d₁ verfügbar
- Hochgenauer Eckenradius

- High performance tool
- 5 cylindrical neck lengths up to 12 x d₁ available
- High-precision corner radius



new



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

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

l₃ = 5 x d₁ – Lange Ausführung · Long design

Bestell-Code · Order code

3868A

ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	α	β	Z	Dimens.-Code		
-0,015	±0,005						h5			(Flutes)			
0,5	0,05	0,5	2,5	57	0,45	9,5	6	22,5°	17°	2	.00050E	●	
0,5	0,1	0,5	2,5	57	0,45	9,5	6	22,5°	17°	2	.000501	●	
0,8	0,05	0,8	4	57	0,75	10,5	6	22,5°	14,5°	2	.00080E	●	
0,8	0,1	0,8	4	57	0,75	10,5	6	22,5°	14,5°	2	.000801	●	
1	0,05	1	5	57	0,95	11,5	6	22°	13°	2	.00100E	●	
1	0,1	1	5	57	0,95	11,5	6	22°	13°	2	.001001	●	
1	0,2	1	5	57	0,95	11,5	6	22°	13°	2	.001002	●	
1,2	0,1	1,2	6	57	1,1	12	6	22,5°	12°	2	.001201	●	
1,2	0,3	1,2	6	57	1,1	12	6	22,5°	12°	2	.001203	●	
1,5	0,1	1,25	7,5	57	1,4	13,5	6	21,5°	10°	2	.001501	●	
1,5	0,3	1,25	7,5	57	1,4	13,5	6	21,5°	10°	2	.001503	●	
1,8	0,1	1,5	9	57	1,7	14	6	24°	9°	2	.001801	●	
1,8	0,3	1,5	9	57	1,7	14	6	24°	9°	2	.001803	●	
2	0,1	1,5	10	57	1,9	14	6	28°	9°	2	.002001	●	
2	0,3	1,5	10	57	1,9	14	6	28°	9°	2	.002003	●	
2	0,4	1,5	10	57	1,9	14	6	28°	9°	2	.002004	●	
2	0,5	1,5	10	57	1,9	14	6	28°	9°	2	.002005	●	
3	0,1	2	15	57	2,9	20,5	6	16,5°	5°	2	.003001	●	
3	0,3	2	15	57	2,9	20,5	6	16,5°	5°	2	.003003	●	
3	0,5	2	15	57	2,9	20,5	6	16,5°	5°	2	.003005	●	
4	0,1	2,5	20	63	3,9	24	6	15,5°	3°	2	.004001	●	
4	0,3	2,5	20	63	3,9	24	6	15,5°	3°	2	.004003	●	
4	0,5	2,5	20	63	3,9	24	6	15,5°	3°	2	.004005	●	
4	0,6	2,5	20	63	3,9	24	6	15,5°	3°	2	.004006	●	
5	0,1	3	25	72	4,9	35	6	4°	1,5°	2	.005001	●	
5	0,3	3	25	72	4,9	35	6	4°	1,5°	2	.005003	●	
5	0,5	3	25	72	4,9	35	6	4°	1,5°	2	.005005	●	
5	0,8	3	25	72	4,9	35	6	4°	1,5°	2	.005008	●	
6	0,3	3,5	30	72	5,9	–	–	–	–	2	.006003	●	
6	0,5	3,5	30	72	5,9	–	–	–	–	2	.006005	●	
6	1	3,5	30	72	5,9	–	–	–	–	2	.006010	●	

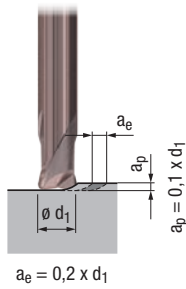


Hartmetall-Torusfräser – lange Ausführung (2 Schneiden)
Solid carbide torus end mills – long design (2 flutes)

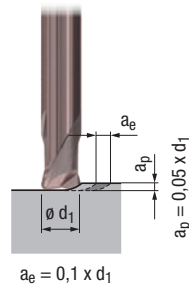
H

$l_3 = 5 \times d_1$

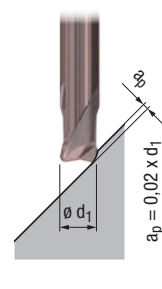
Schruppen
Roughing



Vorschlichten
Pre-finishing



Schlichten
Finishing



Gültig für · Valid for
3868A



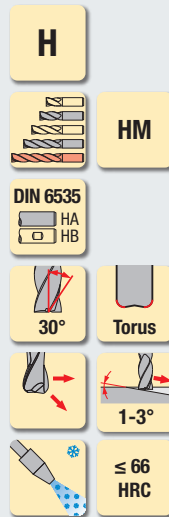
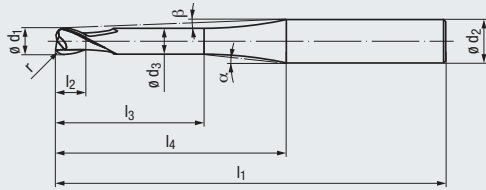
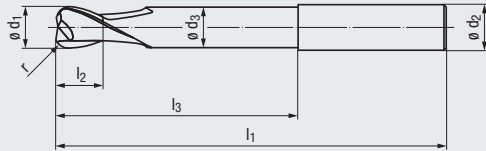
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials											
P	1.1	240	$0,013 \times d_1$	300	$0,015 \times d_1$	340	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	220	$0,012 \times d_1$	260	$0,014 \times d_1$	340	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	200	$0,011 \times d_1$	220	$0,013 \times d_1$	260	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	180	$0,010 \times d_1$	200	$0,012 \times d_1$	220	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	160	$0,009 \times d_1$	180	$0,010 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	240	$0,011 \times d_1$	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	240	$0,011 \times d_1$	300	$0,013 \times d_1$	340	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	220	$0,011 \times d_1$	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	220	$0,011 \times d_1$	260	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	200	$0,010 \times d_1$	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	200	$0,010 \times d_1$	220	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	180	$0,008 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	160	$0,008 \times d_1$	180	$0,009 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
N	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
Kupfer-Legierungen · Copper alloys											
N	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
	2.7										
	2.8										
Magnesium-Legierungen · Magnesium alloys											
N	3.1										
	3.2										
Kunststoffe · Synthetics											
N	4.1										
	4.2										
	4.3										
	4.4										
Besondere Werkstoffe · Special materials											
N	5.1										
	5.2										
	5.3										
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
S	1.1										
	1.2										
	1.3										
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys										
	2.1										
	2.2										
	2.3										
2.4											
2.5											
2.6											
Harte Werkstoffe · Hard materials											
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	200	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	110	$0,007 \times d_1$	160	$0,008 \times d_1$	180	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3			140	$0,008 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4			130	$0,007 \times d_1$	140	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5			110	$0,006 \times d_1$	130	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

v_c = Schnittgeschwindigkeit · Cutting speed
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new



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
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- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

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

l₃ = 8 x d₁ – Extra lange Ausführung · Extra long design

Bestell-Code · Order code

3869A

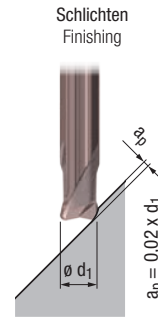
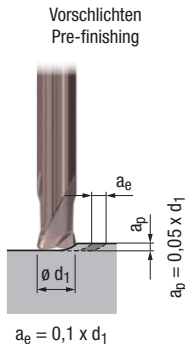
ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂	α	β	Z	Dimens.-Code		
-0,015	±0,005						h5			(Flutes)			
0,5	0,05	0,5	4	57	0,45	11	6	22,5°	14,5°	2	.00050E	●	
0,5	0,1	0,5	4	57	0,45	11	6	22,5°	14,5°	2	.000501	●	
0,8	0,05	0,8	6,4	57	0,75	13	6	22,5°	12°	2	.00080E	●	
0,8	0,1	0,8	6,4	57	0,75	13	6	22,5°	12°	2	.000801	●	
1	0,05	1	8	57	0,95	14,5	6	22°	10,5°	2	.00100E	●	
1	0,1	1	8	57	0,95	14,5	6	22°	10,5°	2	.001001	●	
1	0,2	1	8	57	0,95	14,5	6	22°	10,5°	2	.001002	●	
1,2	0,1	1,2	9,6	57	1,1	16	6	21,5°	9°	2	.001201	●	
1,2	0,3	1,2	9,6	57	1,1	16	6	21,5°	9°	2	.001203	●	
1,5	0,1	1,25	12	57	1,4	18	6	21,5°	8°	2	.001501	●	
1,5	0,3	1,25	12	57	1,4	18	6	21,5°	8°	2	.001503	●	
1,8	0,1	1,5	14,4	57	1,7	20	6	21,5°	6,5°	2	.001801	●	
1,8	0,3	1,5	14,4	57	1,7	20	6	21,5°	6,5°	2	.001803	●	
2	0,1	1,5	16	57	1,9	20	6	28°	6,5°	2	.002001	●	
2	0,3	1,5	16	57	1,9	20	6	28°	6,5°	2	.002003	●	
2	0,4	1,5	16	57	1,9	20	6	28°	6,5°	2	.002004	●	
2	0,5	1,5	16	57	1,9	20	6	28°	6,5°	2	.002005	●	
3	0,1	2	24	68	2,9	30	6	15°	3,5°	2	.003001	●	
3	0,3	2	24	68	2,9	30	6	15°	3,5°	2	.003003	●	
3	0,5	2	24	68	2,9	30	6	15°	3,5°	2	.003005	●	
4	0,1	2,5	32	80	3,9	42	6	6°	2°	2	.004001	●	
4	0,3	2,5	32	80	3,9	42	6	6°	2°	2	.004003	●	
4	0,5	2,5	32	80	3,9	42	6	6°	2°	2	.004005	●	
4	0,6	2,5	32	80	3,9	42	6	6°	2°	2	.004006	●	
5	0,1	3	40	80	4,9	43	6	11°	1,5°	2	.005001	●	
5	0,3	3	40	80	4,9	43	6	11°	1,5°	2	.005003	●	
5	0,5	3	40	80	4,9	43	6	11°	1,5°	2	.005005	●	
5	0,8	3	40	80	4,9	43	6	11°	1,5°	2	.005008	●	
6	0,3	3,5	48	86	5,9	–	6	–	–	2	.006003	●	
6	0,5	3,5	48	86	5,9	–	6	–	–	2	.006005	●	
6	1	3,5	48	86	5,9	–	6	–	–	2	.006010	●	



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

H

$l_3 = 8 \times d_1$



Gültig für · Valid for
3869A



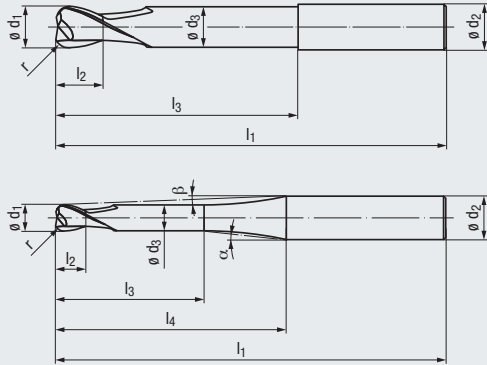
	V_c [m/min]	f_z [mm]	V_c [m/min]	f_z [mm]	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Stahlwerkstoffe · Steel materials									
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	$0,007 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	$0,008 \times d_1$	140	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	$0,007 \times d_1$	120	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	$0,006 \times d_1$	100	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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- 5 zylindrische Halslängen bis 12 x d₁ verfügbar
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- High performance tool
- 5 cylindrical neck lengths up to 12 x d₁ available
- High-precision corner radius



H

HM

DIN 6535

30°

Torus

1-3°

≤ 66 HRC



new



Hard materials

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- Spezielle TiAlN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zum Fräsen von zylindrischen Kavitäten
- Zum HSC-Schlichten geeignet

Applications – material (see page 4)

- Special TiAlN-coating for machining hardened materials
- For milling of cylindrical cavities
- Suitable for HSC finishing

TiAlN

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

l₃ = 10 x d₁ – Extra lange Ausführung · Extra long design

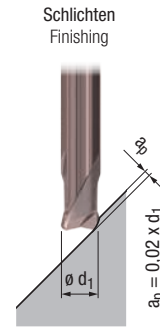
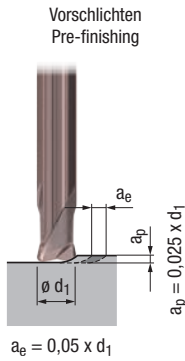
Bestell-Code · Order code											3870A		
θd_1 -0,015	r ±0,005	l ₂	l ₃	l ₁	θd_3	l ₄	θd_2 h5	α	β	Z (Flutes)	Dimens.- Code		
0,5	0,05	0,5	5	57	0,45	12	6	22,5°	13,5°	2	.00050E	●	
0,5	0,1	0,5	5	57	0,45	12	6	22,5°	13,5°	2	.000501	●	
0,8	0,05	0,8	8	57	0,75	14,5	6	22,5°	11°	2	.00080E	●	
0,8	0,1	0,8	8	57	0,75	14,5	6	22,5°	11°	2	.000801	●	
1	0,05	1	10	57	0,95	16,5	6	22°	9,5°	2	.00100E	●	
1	0,1	1	10	57	0,95	16,5	6	22°	9,5°	2	.001001	●	
1	0,2	1	10	57	0,95	16,5	6	22°	9,5°	2	.001002	●	
1,2	0,1	1,2	12	57	1,1	18,5	6	21°	8°	2	.001201	●	
1,2	0,3	1,2	12	57	1,1	18,5	6	21°	8°	2	.001203	●	
1,5	0,1	1,25	15	57	1,4	20	6	25,5°	7°	2	.001501	●	
1,5	0,3	1,25	15	57	1,4	20	6	25,5°	7°	2	.001503	●	
1,8	0,1	1,5	18	63	1,7	22	6	28,5°	6°	2	.001801	●	
1,8	0,3	1,5	18	63	1,7	22	6	28,5°	6°	2	.001803	●	
2	0,1	1,5	20	63	1,9	24	6	28°	5,5°	2	.002001	●	
2	0,3	1,5	20	63	1,9	24	6	28°	5,5°	2	.002003	●	
2	0,4	1,5	20	63	1,9	24	6	28°	5,5°	2	.002004	●	
2	0,5	1,5	20	63	1,9	24	6	28°	5,5°	2	.002005	●	
3	0,1	2	30	72	2,9	35	6	18°	3°	2	.003001	●	
3	0,3	2	30	72	2,9	35	6	18°	3°	2	.003003	●	
3	0,5	2	30	72	2,9	35	6	18°	3°	2	.003005	●	
4	0,1	2,5	40	80	3,9	44	6	15,5°	2°	2	.004001	●	
4	0,3	2,5	40	80	3,9	44	6	15,5°	2°	2	.004003	●	
4	0,5	2,5	40	80	3,9	44	6	15,5°	2°	2	.004005	●	
4	0,6	2,5	40	80	3,9	44	6	15,5°	2°	2	.004006	●	
5	0,1	3	50	100	4,9	53	6	11°	1°	2	.005001	●	
5	0,3	3	50	100	4,9	53	6	11°	1°	2	.005003	●	
5	0,5	3	50	100	4,9	53	6	11°	1°	2	.005005	●	
5	0,8	3	50	100	4,9	53	6	11°	1°	2	.005008	●	
6	0,3	3,5	60	100	5,9	–	6	–	–	2	.006003	●	
6	0,5	3,5	60	100	5,9	–	6	–	–	2	.006005	●	
6	1	3,5	60	100	5,9	–	6	–	–	2	.006010	●	



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

H

$l_3 = 10 \times d_1$



Gültig für · Valid for
3870A



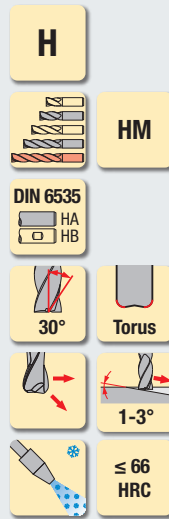
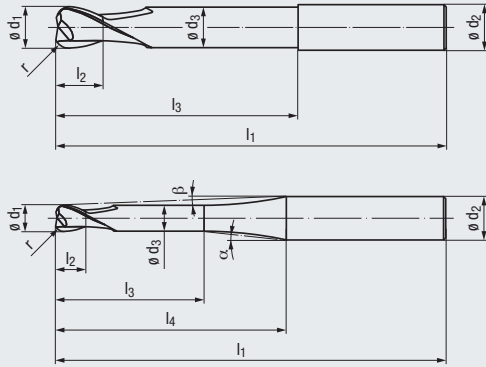
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Stahlwerkstoffe · Steel materials									
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	140	0,008	180	0,009	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	0,007	160	0,008	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	0,008	140	0,008	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	0,007	120	0,007	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	0,006	100	0,006	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

= sehr gut geeignet · very suitable
 = gut geeignet · suitable

- Hochleistungswerkzeug
- 5 zylindrische Halslängen bis 12 x d₁ verfügbar
- Hochgenauer Eckenradius

- High performance tool
- 5 cylindrical neck lengths up to 12 x d₁ available
- High-precision corner radius



new



Hard materials

Beschichtung · Coating

Einsatzgebiete – Material (siehe Seite 4)

- In gehärteten Werkstoffen einsetzbar
- Fräsen von zylindrischen Kavitäten bis 12 x d₁
- Zum HSC-Schlichten geeignet

Applications – material (see page 4)

- For hardened materials
- Milling of cylindrical cavities up to 12 x d₁
- Suitable for HSC finishing

TIALN

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

l₃ = 12 x d₁ – Extra lange Ausführung · Extra long design

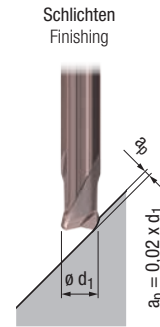
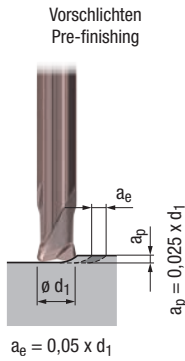
Bestell-Code · Order code											3871A		
ø d ₁	r	l ₂	l ₃	l ₁	ø d ₃	l ₄	ø d ₂ h5	α	β	Z (Flutes)	Dimens.- Code		
-0,015	±0,005												
0,5	0,05	0,5	6	57	0,45	13	6	22,5°	12,5°	2	.00050E	●	
0,5	0,1	0,5	6	57	0,45	13	6	22,5°	12,5°	2	.000501	●	
0,8	0,05	0,8	9,6	57	0,75	16	6	23°	10°	2	.00080E	●	
0,8	0,1	0,8	9,6	57	0,75	16	6	23°	10°	2	.000801	●	
1	0,05	1	12	57	0,95	18,5	6	22°	8,5°	2	.00100E	●	
1	0,1	1	12	57	0,95	18,5	6	22°	8,5°	2	.001001	●	
1	0,2	1	12	57	0,95	18,5	6	22°	8,5°	2	.001002	●	
1,2	0,1	1,2	14,4	57	1,1	21	6	21°	7°	2	.001201	●	
1,2	0,3	1,2	14,4	57	1,1	21	6	21°	7°	2	.001203	●	
1,5	0,1	1,25	18	63	1,4	24	6	21,5°	6°	2	.001501	●	
1,5	0,3	1,25	18	63	1,4	24	6	21,5°	6°	2	.001503	●	
1,8	0,1	1,5	21,6	66	1,7	26	6	28°	5,5°	2	.001801	●	
1,8	0,3	1,5	21,6	66	1,7	26	6	28°	5,5°	2	.001803	●	
2	0,1	1,5	24	66	1,9	28	6	28°	4,5°	2	.002001	●	
2	0,3	1,5	24	66	1,9	28	6	28°	4,5°	2	.002003	●	
2	0,4	1,5	24	66	1,9	28	6	28°	4,5°	2	.002004	●	
2	0,5	1,5	24	66	1,9	28	6	28°	4,5°	2	.002005	●	
3	0,1	2	36	80	2,9	42,5	6	14°	2,5°	2	.003001	●	
3	0,3	2	36	80	2,9	42,5	6	14°	2,5°	2	.003003	●	
3	0,5	2	36	80	2,9	42,5	6	14°	2,5°	2	.003005	●	
4	0,1	2,5	48	100	3,9	61	6	5,5°	1,5°	2	.004001	●	
4	0,3	2,5	48	100	3,9	61	6	5,5°	1,5°	2	.004003	●	
4	0,5	2,5	48	100	3,9	61	6	5,5°	1,5°	2	.004005	●	
4	0,6	2,5	48	100	3,9	61	6	5,5°	1,5°	2	.004006	●	
5	0,1	3	60	100	4,9	63	6	11°	1°	2	.005001	●	
5	0,3	3	60	100	4,9	63	6	11°	1°	2	.005003	●	
5	0,5	3	60	100	4,9	63	6	11°	1°	2	.005005	●	
5	0,8	3	60	100	4,9	63	6	11°	1°	2	.005008	●	
6	0,3	3,5	72	110	5,9	-	6	-	-	2	.006003	●	
6	0,5	3,5	72	110	5,9	-	6	-	-	2	.006005	●	
6	1	3,5	72	110	5,9	-	6	-	-	2	.006010	●	



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

H

$l_3 = 12 \times d_1$



Gültig für · Valid for
3871A



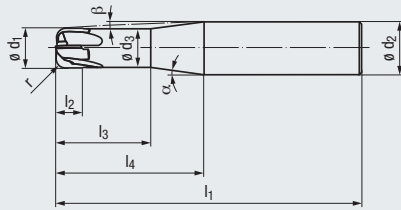
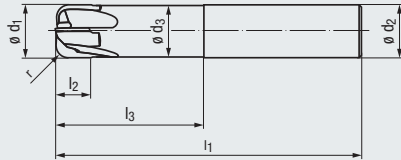
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Stahlwerkstoffe · Steel materials									
P	1.1	240	$0,013 \times d_1$	280	$0,013 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,012 \times d_1$	260	$0,012 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,011 \times d_1$	240	$0,011 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,010 \times d_1$	210	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,009 \times d_1$	190	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	240	$0,011 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	220	$0,011 \times d_1$	260	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	200	$0,010 \times d_1$	240	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	180	$0,008 \times d_1$	210	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	190	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2								
	2.3								
	2.4								
	2.5								
	2.6								
	2.7								
	2.8								
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	140	$0,008 \times d_1$	180	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	120	$0,007 \times d_1$	160	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	110	$0,008 \times d_1$	140	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	100	$0,007 \times d_1$	120	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	80	$0,006 \times d_1$	100	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- Mit 4 Schneiden
- Hochgenauer Eckenradius
- Kurze, stabile Schneidenlänge
- 3 Baulängen verfügbar

- High-performance tool
- With 4 flutes
- High-precision corner radius
- Short, stable flute length
- 3 length available



H

HM

DIN 6535
HA
HB

0°

Torus

1-3°

≤ 66 HRC



new



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- For finishing with very high surface quality
- Suitable for HSC finishing

P 1.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.8

N 2.2, 2.4-2.5

H 1.1-1.5

$l_3 = 3 \times d_1$ – Kurze Ausführung · Short design

Bestell-Code · Order code

3874A

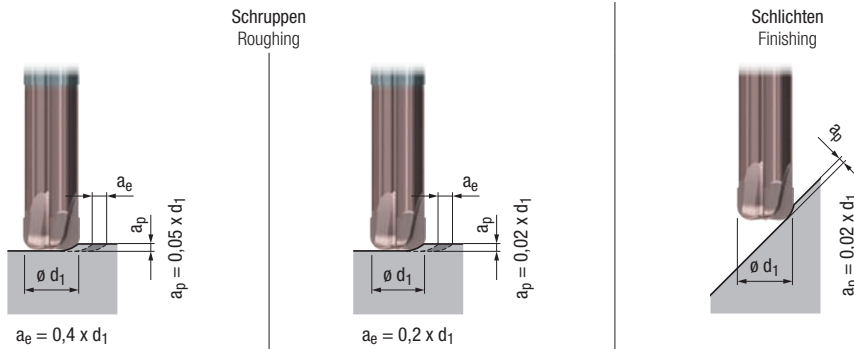
$\varnothing d_1$ -0,015	r ±0,005	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code		
2	0,1	1,5	8	57	1,8	19,9	6	10°	6,5°	4	.002001	●	
2	0,3	1,5	8	57	1,8	19,9	6	10°	6,5°	4	.002003	●	
2	0,5	1,5	8	57	1,8	19,9	6	10°	6,5°	4	.002005	●	
3	0,1	2	10	57	2,8	19	6	10°	5,5°	4	.003001	●	
3	0,3	2	10	57	2,8	19	6	10°	5,5°	4	.003003	●	
3	0,5	2	10	57	2,8	19	6	10°	5,5°	4	.003005	●	
3	0,75	2	10	57	2,8	19	6	10°	5,5°	4	.003007	●	
4	0,1	2,5	12	57	3,8	18,2	6	10°	3,5°	4	.004001	●	
4	0,3	2,5	12	57	3,8	18,2	6	10°	3,5°	4	.004003	●	
4	0,5	2,5	12	57	3,8	18,2	6	10°	3,5°	4	.004005	●	
4	1	2,5	12	57	3,8	18,2	6	10°	3,5°	4	.004010	●	
5	0,1	3	15	57	4,7	18,6	6	10°	2°	4	.005001	●	
5	0,3	3	15	57	4,7	18,6	6	10°	2°	4	.005003	●	
5	0,5	3	15	57	4,7	18,6	6	10°	2°	4	.005005	●	
5	1,25	3	15	57	4,7	18,6	6	10°	2°	4	.005012	●	
6	0,3	4	20	57	5,6	–	6	–	–	4	.006003	●	
6	0,5	4	20	57	5,6	–	6	–	–	4	.006005	●	
6	1	4	20	57	5,6	–	6	–	–	4	.006010	●	
6	1,5	4	20	57	5,6	–	6	–	–	4	.006015	●	
8	0,3	5	25	63	7,6	–	8	–	–	4	.008003	●	
8	0,5	5	25	63	7,6	–	8	–	–	4	.008005	●	
8	1	5	25	63	7,6	–	8	–	–	4	.008010	●	
8	2	5	25	63	7,6	–	8	–	–	4	.008020	●	
10	0,3	6	30	72	9,6	–	10	–	–	4	.010003	●	
10	0,5	6	30	72	9,6	–	10	–	–	4	.010005	●	
10	1	6	30	72	9,6	–	10	–	–	4	.010010	●	
10	2	6	30	72	9,6	–	10	–	–	4	.010020	●	
10	2,5	6	30	72	9,6	–	10	–	–	4	.010025	●	
12	0,5	7	36	83	11,5	–	12	–	–	4	.012005	●	
12	1	7	36	83	11,5	–	12	–	–	4	.012010	●	
12	2	7	36	83	11,5	–	12	–	–	4	.012020	●	
12	3	7	36	83	11,5	–	12	–	–	4	.012030	●	
12	4	7	36	83	11,5	–	12	–	–	4	.012040	●	
16	4	8	48	96	15,5	–	16	–	–	4	.016040	●	



Hartmetall-Torusfräser – kurze Ausführung (4 Schneiden)
Solid carbide torus end mills – short design (4 flutes)

H

$l_3 = 3 \times d_1$



Gültig für · Valid for
3874A

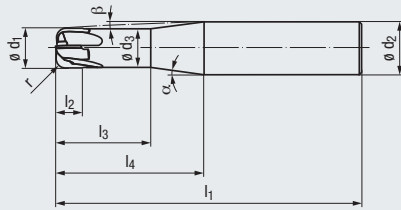
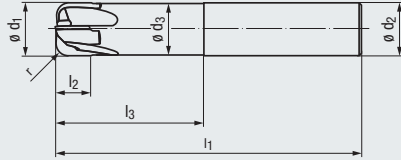
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials											
P	1.1	280	$0,013 \times d_1$	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.1	240	$0,012 \times d_1$	280	$0,012 \times d_1$	320	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	3.1	210	$0,01 \times d_1$	240	$0,01 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	170	$0,009 \times d_1$	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	5.1	140	$0,008 \times d_1$	160	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Nichtrostende Stahlwerkstoffe · Stainless steel materials											
M	1.1										
	2.1										
	3.1										
	4.1										
Gusswerkstoffe · Cast materials											
K	1.1	280	$0,014 \times d_1$	320	$0,014 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	280	$0,014 \times d_1$	320	$0,014 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.1	250	$0,011 \times d_1$	280	$0,011 \times d_1$	320	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	2.2	250	$0,011 \times d_1$	280	$0,011 \times d_1$	320	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.1	210	$0,011 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	3.2	210	$0,011 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	4.1	170	$0,008 \times d_1$	200	$0,008 \times d_1$	220	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4.2	150	$0,008 \times d_1$	160	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials											
Aluminium-Legierungen · Aluminium alloys											
	1.1										
	1.2										
	1.3										
	1.4										
	1.5										
	1.6										
Kupfer-Legierungen · Copper alloys											
N	2.1	250	$0,014 \times d_1$	280	$0,014 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.2	250	$0,014 \times d_1$	280	$0,014 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	210	$0,011 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	210	$0,011 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	210	$0,011 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	210	$0,011 \times d_1$	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	130	$0,008 \times d_1$	150	$0,008 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
2.8	130	$0,008 \times d_1$	150	$0,008 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Magnesium-Legierungen · Magnesium alloys											
	3.1										
	3.2										
Kunststoffe · Synthetics											
	4.1										
	4.2										
	4.3										
	4.4										
Besondere Werkstoffe · Special materials											
	5.1										
	5.2										
	5.3										
Spezialwerkstoffe · Special materials											
Titan-Legierungen · Titanium alloys											
	1.1										
	1.2										
	1.3										
S	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys										
	2.1										
	2.2										
	2.3										
	2.4										
	2.5										
	2.6										
Harte Werkstoffe · Hard materials											
H	1.1	130	$0,008 \times d_1$	150	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.2	120	$0,007 \times d_1$	140	$0,007 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.3			120	$0,006 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.4			90	$0,005 \times d_1$	110	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
	1.5			70	$0,004 \times d_1$	90	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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

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

- Hochleistungswerkzeug
- Mit 4 Schneiden
- Hochgenauer Eckenradius
- Kurze, stabile Schneidenlänge
- 3 Baulängen verfügbar

- High-performance tool
- With 4 flutes
- High-precision corner radius
- Short, stable flute length
- 3 length available



H

HM

DIN 6535
HA
HB

0°

Torus

1-3°

≤ 66 HRC



new



Hard materials

Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

- Special TiAlN-coating for machining hardened materials
- For finishing with very high surface quality
- Suitable for HSC finishing

P 1.1-5.1

K 1.1-4.2

N 2.3, 2.6-2.8

N 2.2, 2.4-2.5

H 1.1-1.5

$l_3 = 5 \times d_1$ – Lange Ausführung · Long design

Bestell-Code · Order code

3875A

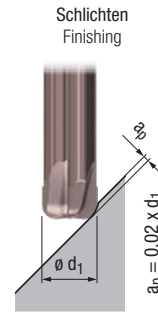
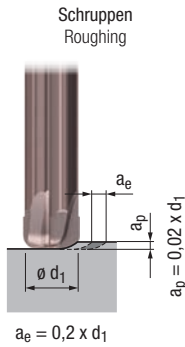
$\varnothing d_1$	r	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$	α	β	Z (Flutes)	Dimens.- Code		
-0,015	±0,005						h5						
2	0,1	1,5	10	63	1,8	21,9	6	10°	5,5°	4	.002001	●	
2	0,3	1,5	10	63	1,8	21,9	6	10°	5,5°	4	.002003	●	
2	0,5	1,5	10	63	1,8	21,9	6	10°	5,5°	4	.002005	●	
3	0,1	2	15	63	2,8	24	6	10°	4°	4	.003001	●	
3	0,3	2	15	63	2,8	24	6	10°	4°	4	.003003	●	
3	0,5	2	15	63	2,8	24	6	10°	4°	4	.003005	●	
4	0,1	2,5	20	63	3,8	26,2	6	10°	2,5°	4	.004001	●	
4	0,3	2,5	20	63	3,8	26,2	6	10°	2,5°	4	.004003	●	
4	0,5	2,5	20	63	3,8	26,2	6	10°	2,5°	4	.004005	●	
5	0,1	3	25	66	4,7	28,6	6	10°	1,5°	4	.005001	●	
5	0,3	3	25	66	4,7	28,6	6	10°	1,5°	4	.005003	●	
5	0,5	3	25	66	4,7	28,6	6	10°	1,5°	4	.005005	●	
6	0,3	4	30	66	5,6	–	6	–	–	4	.006003	●	
6	0,5	4	30	66	5,6	–	6	–	–	4	.006005	●	
6	1	4	30	66	5,6	–	6	–	–	4	.006010	●	
6	1,5	4	30	66	5,6	–	6	–	–	4	.006015	●	
8	0,3	5	40	78	7,6	–	8	–	–	4	.008003	●	
8	0,5	5	40	78	7,6	–	8	–	–	4	.008005	●	
8	1	5	40	78	7,6	–	8	–	–	4	.008010	●	
8	2	5	40	78	7,6	–	8	–	–	4	.008020	●	
10	0,3	6	50	92	9,6	–	10	–	–	4	.010003	●	
10	0,5	6	50	92	9,6	–	10	–	–	4	.010005	●	
10	1	6	50	92	9,6	–	10	–	–	4	.010010	●	
10	2	6	50	92	9,6	–	10	–	–	4	.010020	●	
10	2,5	6	50	92	9,6	–	10	–	–	4	.010025	●	
12	0,5	7	60	106	11,5	–	12	–	–	4	.012005	●	
12	1	7	60	106	11,5	–	12	–	–	4	.012010	●	
12	2	7	60	106	11,5	–	12	–	–	4	.012020	●	
12	3	7	60	106	11,5	–	12	–	–	4	.012030	●	
12	4	7	60	106	11,5	–	12	–	–	4	.012040	●	
16	4	8	80	130	15,5	–	16	–	–	4	.016040	●	



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

H

$l_3 = 5 \times d_1$



Gültig für · Valid for
3875A

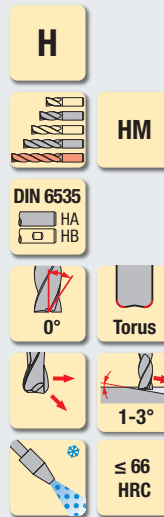
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials									
P	1.1	320	$0,013 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	280	$0,012 \times d_1$	320	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	240	$0,01 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	200	$0,009 \times d_1$	220	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	160	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	320	$0,014 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	320	$0,014 \times d_1$	360	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	280	$0,011 \times d_1$	320	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	280	$0,011 \times d_1$	320	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	200	$0,008 \times d_1$	220	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	160	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
Kupfer-Legierungen · Copper alloys									
N	2.1								
	2.2	280	$0,014 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.3	280	$0,014 \times d_1$	320	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.4	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.5	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.6	240	$0,011 \times d_1$	270	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.7	150	$0,008 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
	2.8	150	$0,008 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	
Magnesium-Legierungen · Magnesium alloys									
N	3.1								
	3.2								
Kunststoffe · Synthetics									
N	4.1								
	4.2								
	4.3								
	4.4								
Besondere Werkstoffe · Special materials									
N	5.1								
	5.2								
	5.3								
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	150	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	140	$0,007 \times d_1$	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	120	$0,006 \times d_1$	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	90	$0,005 \times d_1$	110	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	70	$0,004 \times d_1$	90	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

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

- Hochleistungswerkzeug
- Mit 4 Schneiden
- Hochgenauer Eckenradius
- Kurze, stabile Schneidenlänge
- 3 Baulängen verfügbar

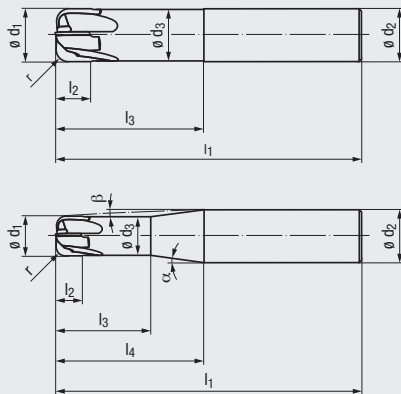
- High-performance tool
- With 4 flutes
- High-precision corner radius
- Short, stable flute length
- 3 length available



new



Hard materials



Beschichtung · Coating

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

- Spezielle TIALN-Beschichtung zur Bearbeitung gehärteter Werkstoffe
- Zur Schlichtbearbeitung mit sehr guter Oberflächenqualität
- Zum HSC-Schlichten geeignet

- Special TIALN-coating for machining hardened materials
- For finishing with very high surface quality
- Suitable for HSC finishing

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

$l_3 = 8 \times d_1$ – Extra lange Ausführung · Extra long design

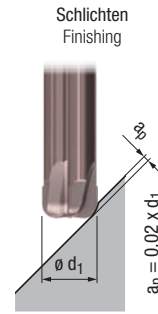
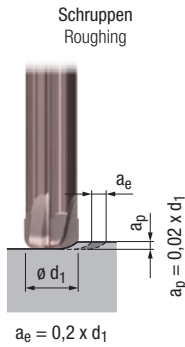
Bestell-Code · Order code												3876A	
$\varnothing d_1$ -0,015	r ±0,005	l_2	l_3	l_1	$\varnothing d_3$	l_4	$\varnothing d_2$ h5	α	β	Z (Flutes)	Dimens.- Code		
2	0,1	1,5	16	66	1,8	27,9	6	10°	4,5°	4	.002001	●	
2	0,3	1,5	16	66	1,8	27,9	6	10°	4,5°	4	.002003	●	
2	0,5	1,5	16	66	1,8	27,9	6	10°	4,5°	4	.002005	●	
3	0,1	2	24	72	2,8	33	6	10°	3°	4	.003001	●	
3	0,3	2	24	72	2,8	33	6	10°	3°	4	.003003	●	
3	0,5	2	24	72	2,8	33	6	10°	3°	4	.003005	●	
4	0,1	2,5	32	76	3,8	38,2	6	10°	2°	4	.004001	●	
4	0,3	2,5	32	76	3,8	38,2	6	10°	2°	4	.004003	●	
4	0,5	2,5	32	76	3,8	38,2	6	10°	2°	4	.004005	●	
5	0,1	3	40	80	4,7	43,6	6	10°	1°	4	.005001	●	
5	0,3	3	40	80	4,7	43,6	6	10°	1°	4	.005003	●	
5	0,5	3	40	80	4,7	43,6	6	10°	1°	4	.005005	●	
6	0,3	4	48	86	5,6	–	6	–	–	4	.006003	●	
6	0,5	4	48	86	5,6	–	6	–	–	4	.006005	●	
6	1	4	48	86	5,6	–	6	–	–	4	.006010	●	
8	0,3	5	64	102	7,6	–	8	–	–	4	.008003	●	
8	0,5	5	64	102	7,6	–	8	–	–	4	.008005	●	
8	1	5	64	102	7,6	–	8	–	–	4	.008010	●	
8	2	5	64	102	7,6	–	8	–	–	4	.008020	●	



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

H

$l_3 = 8 \times d_1$



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3876A



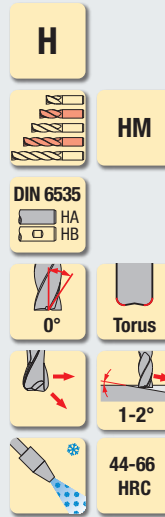
	v_c [m/min]	f_z [mm]	v_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials									
P	1.1	250	$0,013 \times d_1$	300	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	230	$0,012 \times d_1$	260	$0,009 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	200	$0,01 \times d_1$	230	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	170	$0,009 \times d_1$	200	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	150	$0,008 \times d_1$	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials									
M	1.1								
	2.1								
	3.1								
	4.1								
Gusswerkstoffe · Cast materials									
K	1.1	250	$0,014 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	250	$0,014 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	230	$0,011 \times d_1$	260	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	230	$0,011 \times d_1$	260	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	190	$0,011 \times d_1$	210	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	190	$0,011 \times d_1$	210	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	160	$0,008 \times d_1$	190	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	140	$0,008 \times d_1$	170	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials									
Aluminium-Legierungen · Aluminium alloys									
N	1.1								
	1.2								
	1.3								
	1.4								
	1.5								
	1.6								
	Kupfer-Legierungen · Copper alloys								
	2.1								
	2.2	240	$0,014 \times d_1$	280	$0,010 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.3	240	$0,014 \times d_1$	280	$0,010 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4	200	$0,011 \times d_1$	250	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.5	200	$0,011 \times d_1$	250	$0,008 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.6	200	$0,011 \times d_1$	250	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7	140	$0,008 \times d_1$	170	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.8	140	$0,008 \times d_1$	170	$0,006 \times d_1$			<input type="checkbox"/>	<input checked="" type="checkbox"/>
	Magnesium-Legierungen · Magnesium alloys								
3.1									
3.2									
Kunststoffe · Synthetics									
4.1									
4.2									
4.3									
4.4									
Besondere Werkstoffe · Special materials									
5.1									
5.2									
5.3									
Spezialwerkstoffe · Special materials									
Titan-Legierungen · Titanium alloys									
S	1.1								
	1.2								
	1.3								
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys								
	2.1								
	2.2								
	2.3								
2.4									
2.5									
2.6									
Harte Werkstoffe · Hard materials									
H	1.1	120	$0,008 \times d_1$	150	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	100	$0,007 \times d_1$	130	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.3	90	$0,006 \times d_1$	110	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.4	80	$0,005 \times d_1$	90	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.5	70	$0,004 \times d_1$	80	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	

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

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

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

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



Hard materials

Hard materials

Beschichtung · Coating

TIALN

TIALN

Einsatzgebiete – Material (siehe Seite 4)

Applications – material (see page 4)

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

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

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

Kurze Ausführung · Short design

Bestell-Code · Order code

2876A

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

Lange Ausführung · Long design

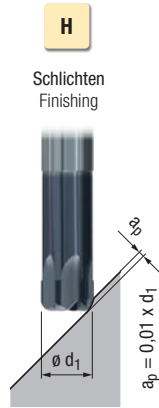
Bestell-Code · Order code

2877A

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



Hartmetall-Torusfräser – kurze und lange Ausführung (6-8 Schneiden)
Solid carbide torus end mills – short and long design (6-8 flutes)



Gültig für · Valid for
2876A
2877A



	v_c [m/min]	f_z [mm]					
Stahlwerkstoffe · Steel materials							
P	1.1						
	2.1						
	3.1	270	$0,007 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	220	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	5.1	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichtrostende Stahlwerkstoffe · Stainless steel materials							
M	1.1						
	2.1						
	3.1						
	4.1						
Gusswerkstoffe · Cast materials							
K	1.1	360	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	1.2	360	$0,008 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.1	320	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	2.2	320	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.1	270	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	3.2	270	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.1	220	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	4.2	180	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Nichteisenwerkstoffe · Non-ferrous materials							
Aluminium-Legierungen · Aluminium alloys							
N	1.1						
	1.2						
	1.3						
	1.4						
	1.5						
	1.6						
	Kupfer-Legierungen · Copper alloys						
	2.1						
	2.2						
	2.3	320	$0,008 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.4						
	2.5						
	2.6	270	$0,007 \times d_1$	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
	2.7						
	2.8						
	Magnesium-Legierungen · Magnesium alloys						
3.1							
3.2							
Kunststoffe · Synthetics							
4.1							
4.2							
4.3							
4.4							
Besondere Werkstoffe · Special materials							
5.1							
5.2							
5.3							
Spezialwerkstoffe · Special materials							
Titan-Legierungen · Titanium alloys							
S	1.1						
	1.2	120	$0,006 \times d_1$			<input type="checkbox"/>	
	1.3	70	$0,005 \times d_1$			<input type="checkbox"/>	
	Nickel-, Kobalt- und Eisen-Legierungen · Nickel alloys, cobalt alloys and iron alloys						
	2.1	110	$0,006 \times d_1$			<input type="checkbox"/>	
	2.2	50	$0,004 \times d_1$			<input type="checkbox"/>	
	2.3	40	$0,004 \times d_1$			<input type="checkbox"/>	
	2.4	40	$0,004 \times d_1$			<input type="checkbox"/>	
	2.5	30	$0,004 \times d_1$			<input type="checkbox"/>	
	2.6	40	$0,004 \times d_1$			<input type="checkbox"/>	
Harte Werkstoffe · Hard materials							
H	1.1	180	$0,006 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.2	160	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.3	140	$0,005 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.4	110	$0,004 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		
	1.5	90	$0,003 \times d_1$	<input type="checkbox"/>	<input checked="" type="checkbox"/>		

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

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

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.

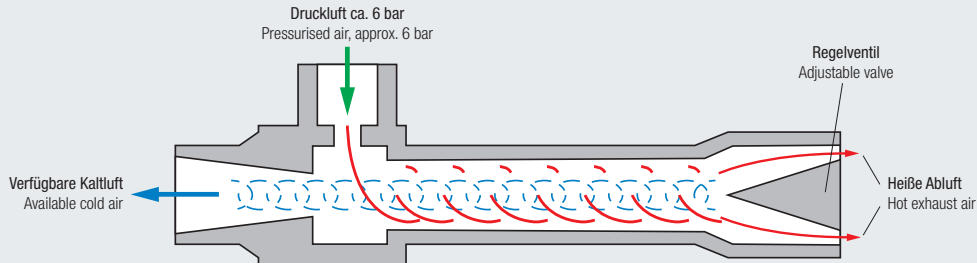
Darüber hinaus werden die beim Kopierfräsen anfallenden sehr leichten Späne auch aus tiefen Aussparungen oder Kavitäten mit Hilfe der Kaltluftdüse entfernt.

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 \approx 25,5 m ³ /h	226 kcal/h \approx 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				●	

Kaltluftdüsen-Anbauset

Cold-Air Nozzle Attachment Set



Bestell-Code · Order code	6910
Dimens.-Code	
.12	●

Lieferumfang:

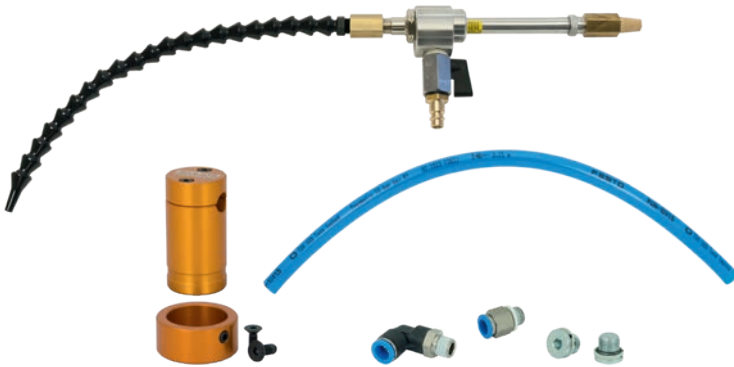
- 1 x Klemmarm mit Grundhalter (Art.-Nr.: 6910.24)
- 1 x Anschlussschlauch 300 mm
- 1 x Winkel-Verschraubung G 1/4
- 1 x Verschraubung G 1/4
- 2 x Blindstopfen G 1/4

Delivery includes:

- 1 x Socket with basic holder (art. No. 6910.24)
- 1 x Connecting hose 300 mm
- 1 x Elbow coupling G 1/4
- 1 x Screw G 1/4
- 2 x Sealing plugs G 1/4

Kaltluftdüsen-Montageset 1

Cold-Air Nozzle Assembly Set 1

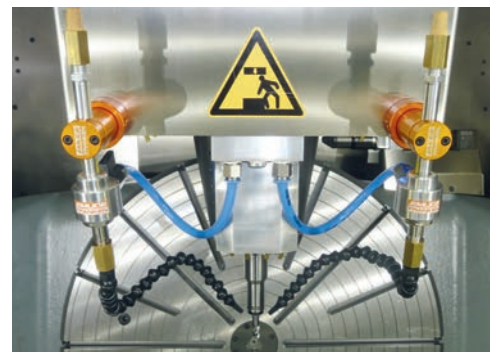
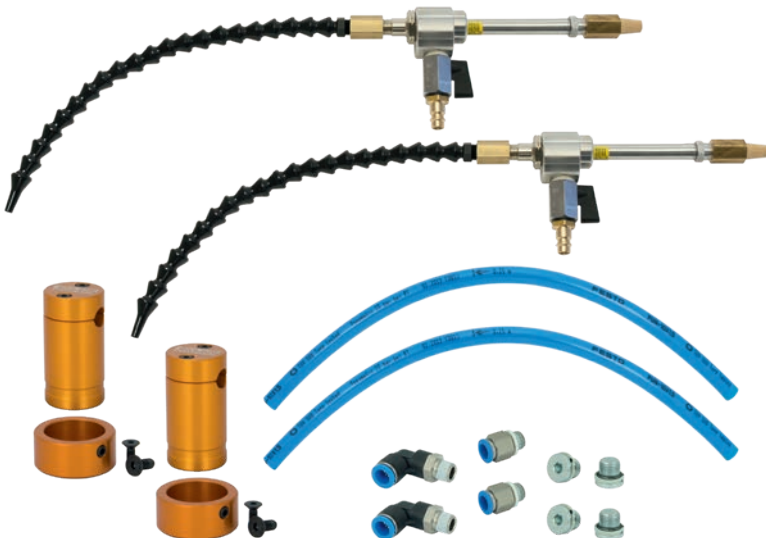


Bestehend aus 1 Kaltluftdüse (Art.-Nr.: 6910.15) und 1 Kaltluftdüsen-Anbauset (Art.-Nr.: 6910.12)
Consists of 1 cold-air nozzle (art. no. 6910.15) and 1 cold-air nozzle attachment set (art. no. 6910.12)

Bestell-Code · Order code	6910
Dimens.-Code	
.11	●

Kaltluftdüsen-Montageset 2

Cold-Air Nozzle Assembly Set 2



Bestehend aus 2 Kaltluftdüsen (Art.-Nr.: 6910.15) und 2 Kaltluftdüsen-Anbausets (Art.-Nr.: 6910.12)
Consists of 2 cold-air nozzles (art. no. 6910.15) and 2 cold-air nozzle attachment sets (art. no. 6910.12)

Bestell-Code · Order code	6910
Dimens.-Code	
.10	●

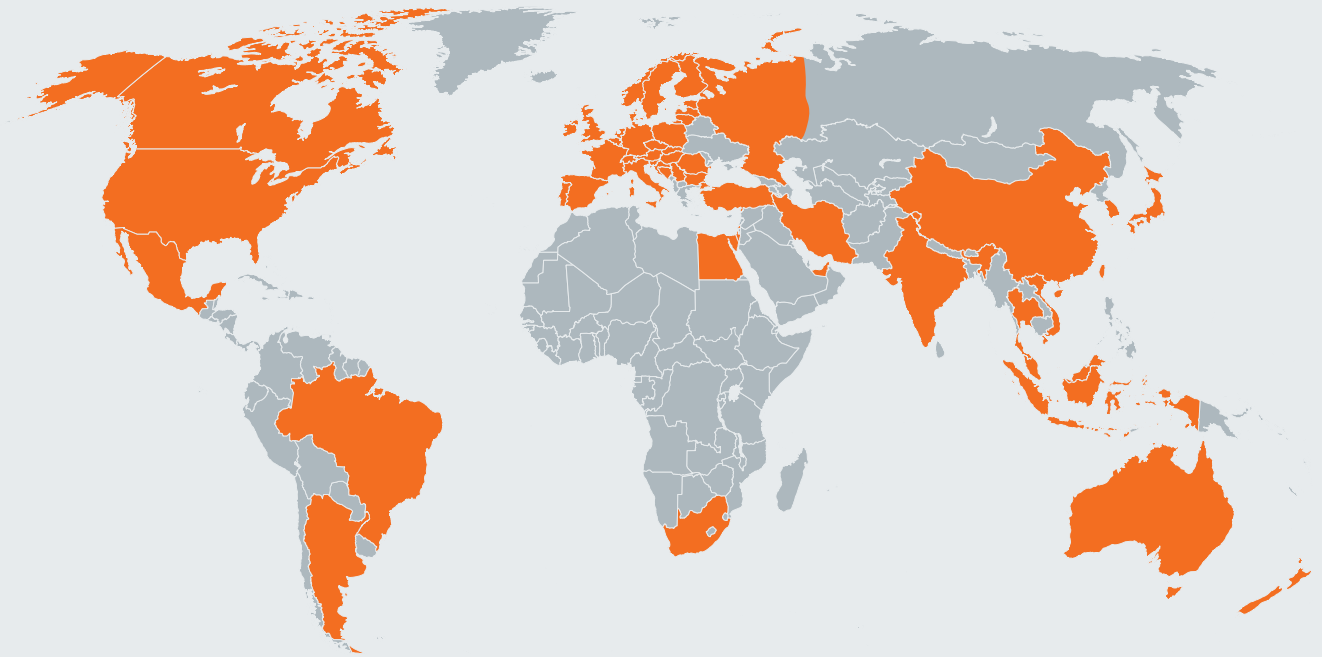
In unseren Unternehmen ist die Abteilung „Anwendungstechnik“ die Service- und Dienstleistungsabteilung für den weltweit bestehenden Kundenkreis. Für die von EMUGE-FRANKEN angebotenen Produkte stellt dieses Expertenteam folgende Leistungen zur Verfügung:

- Weltweite telefonische Beratung und Unterstützung bei der Lösung technischer Probleme
- Mitarbeit bei der Erarbeitung von Konzepten und Vorschlägen zur Optimierung des Fertigungsablaufes beim Kunden
- Durchführung von Versuchen mit spezifischen Kundenmaterialien in einer eigens dafür eingerichteten Versuchsabteilung zur optimalen Werkzeugauswahl und -empfehlung
- Entwicklung und Konstruktion kundenspezifischer Sonderwerkzeuge
- Einsatz von Servicetechnikern
- Durchführung von produktbezogenen Schulungen und Seminaren weltweit

At EMUGE-FRANKEN, the Technical Service Department is the service and consulting partner for our customers worldwide. Our team of service technicians will be happy to help you in any of the following ways:

- Worldwide telephone consulting and support in the solution of technical problems
- Active support in the development of work strategies and in the optimisation of production processes
- Cutting trials with specific customer materials in a special workshop fitted exclusively for that purpose, for the perfect tool selection
- Development and construction of special tools made to customer's specifications
- Visits to customers' workshops and active support on location
- Product-related training courses and seminars arranged at any place worldwide





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