



M.A. FORD MAX
RANGE

Where **high performance** is the **standard**®

TuffCut® Endmills

CYCLONE Drills

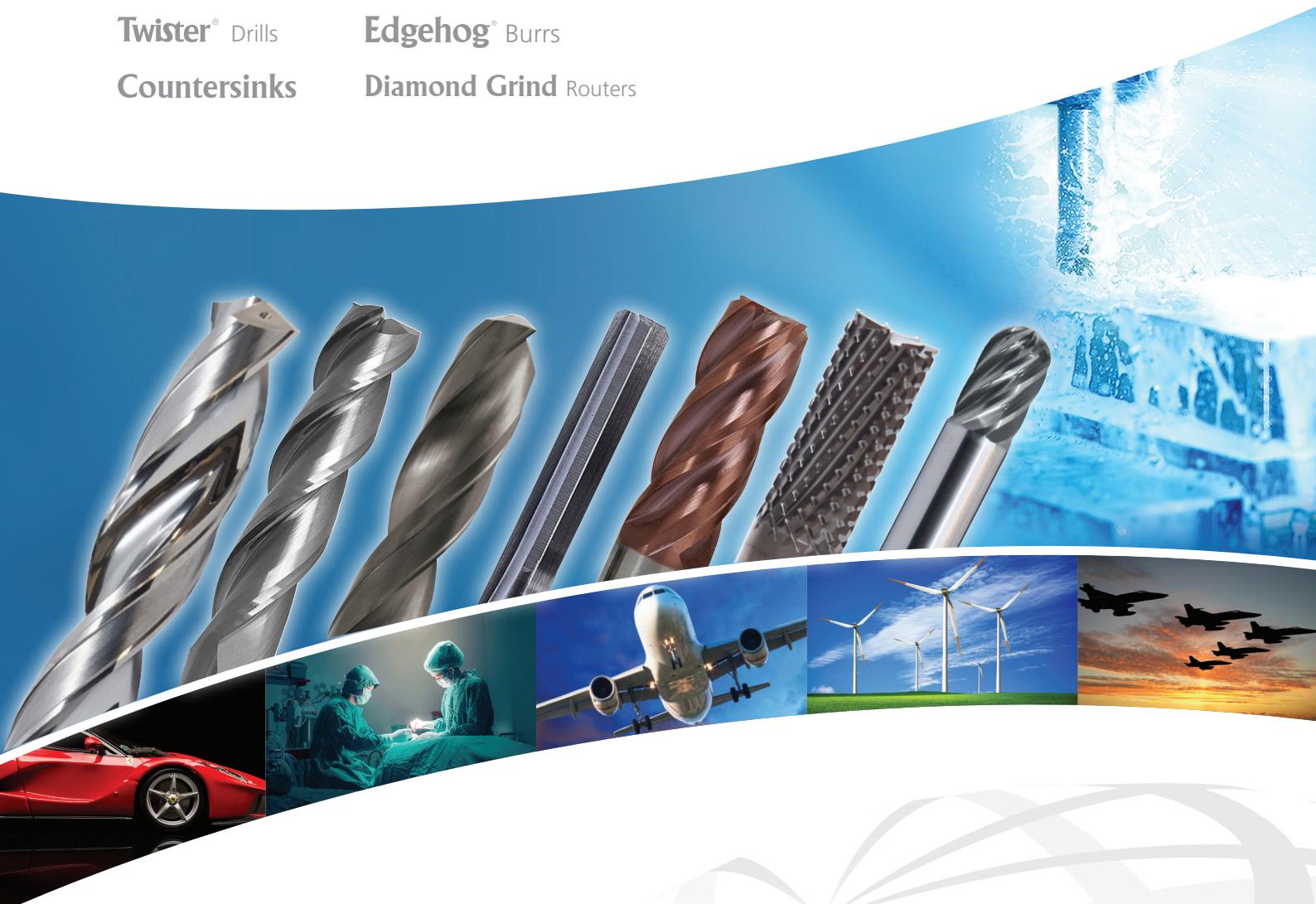
Twister® Drills

Countersinks

TrueSize® Reamers

Edgehog® Burrs

Diamond Grind Routers



Product Catalogue

Issue 3

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Where **high performance** is the **standard**®



Innovation is what drives us. Actively searching for fresh solutions to new technical and manufacturing challenges that enable our customers to improve productivity, accuracy and performance by relying on M.A.Ford® to deliver.

Our extensive range of tooling and 'Integrated Manufacturing Solutions' has developed and evolved to become a virtual byword for precision and performance. The principles of high precision and high quality extend beyond our tooling and are present in every aspect of M.A.Ford® Europe to ensure customer demands are consistently met at all levels.



"L'innovation est ce qui nous motive. Nous sommes constamment à la recherche de solutions techniques et d'usinage innovantes qui permettront à nos clients de surmonter les nouveaux défis dans le but d'améliorer la productivité, la précision et la performance tout en comptant sur M.A.Ford® pour répondre à leurs attentes.

Notre large gamme d'outils et de "Solutions d'Usinage Intégrées" a évolué au fil des années pour devenir à présent unsynonyme de précision et de performance. Les valeurs de haute précision et de qualité haut de gamme vont au-delà de nos outils et sont présents dans chacun des aspects de M.A.Ford® Europe, nous donnant ainsi l'assurance que les exigences des consommateurs soient respectées à tous les niveaux."



Innovation ist unsere Antriebskraft. Wir suchen aktiv nach bahnbrechenden Lösungen zu neuen Herausforderungen in den Bereichen Technik und Fertigung. Auf diese Weise ermöglichen wir unseren Kunden, ihre Produktivität, Präzision und Leistungsfähigkeit zu verbessern und sich dabei voll und ganz auf M.A.Ford® zu verlassen.

Unser umfangreiches Sortiment an Werkzeugausstattungen und "integrierten Herstellungslösungen" hat sich quasi zu einem Inbegriff für Präzision und Leistungsfähigkeit entwickelt. Die Grundsätze der hohen Präzision und hochwertigen Qualität gehen weit über unsere Werkzeugausstattung hinaus und durchziehen jeden Aspekt von M.A.Ford® Europe. So stellen wir sicher, dass wir den Anforderungen unserer Kunden stets auf allen Ebenen gerecht werden.



L'innovazione è il nostro motore. La continua ricerca di soluzioni innovative per le nuove sfide tecniche e produttive, che permettono ai nostri clienti di migliorare la produttività, la precisione e la performance sapendo di poter contare su M.A.Ford®.

La nostra vasta gamma di utensili e soluzioni integrate per la produzione si è sviluppata ed evoluta fino a diventare sinonimo di precisione e prestazioni. Alta qualità e precisione sono i principi su cui si basa ogni aspetto della filosofia di M.A.Ford® Europe, che si estende al di là dei nostri utensili, per assicurare che le richieste dei nostri clienti siano costantemente soddisfatte a tutti i livelli.



Innowacyjność to jest to, co nas napędza. Aktywnie poszukujemy rozwiązań dla nowych wymagań technicznych i produkcyjnych, które umożliwiają naszym klientom poprawę produktywności, dokładności i wydajności, dzięki wdrażaniu produktów firmy M.A.Ford®.

Zintegrowane rozwiązania produkcyjne w połączeniu z naszą szeroką ofertą narzędzi stały się synonimem dla precyzji i wydajności Precyzja i wysoka jakość łączy się w naszych narzędziach i są obecne w każdym detalu firmy M.A.Ford® Europe, aby spełniać wymagania wszystkich naszych klientów.



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M.A. Ford®

Achieving the outstanding cutting speeds, tool life, finish quality and overall manufacturing performance that our tooling delivers is a result of more than 100 years of experience, dedication and expertise, which has enabled us to build an enviable global reputation for performance and precision.

Every product in our range is designed to perform beyond expectations, whilst our constant process of innovative design and technological development ensures that we constantly push the boundaries of tool performance for the ultimate benefit of our customers.

(FR)
M.A. Ford®

“Atteindre une vitesse de coupe exceptionnelle, une longue durée de vie, une qualité de finition et une performance d’usinage générale, délivrée par nos outils, est le résultat de 100 ans d’expérience, de passion et d’expertise, qui nous ont permis de construire une enviable réputation mondiale basée sur la performance et la précision.

Chaque produit de notre gamme est conçu pour atteindre des résultats allant au-delà des attentes et notre processus permanent de conception innovante et de développement technologique nous permet de repousser constamment les limites de performance des outils dans le but de donner toujours plus d'avantages à nos clients.”

(DE)
M.A. Ford®

Die ausgezeichnete Schnittgeschwindigkeit, Werkzeugstandzeit, Oberflächenqualität und Gesamt fertigungsleistung unserer Werkzeuge sind das Ergebnis von über 100 Jahren Erfahrung, Engagement und Fachkompetenz, wodurch wir in der Lage waren, uns weltweit einen hervorragenden Ruf in Bezug auf Leistungsfähigkeit und Präzision zu verschaffen.

Jedes Produkt in unserem Sortiment wird mit dem Ziel konzipiert, die Erwartungen hinsichtlich der Leistungsfähigkeit zu übertreffen. Gleichzeitig ermöglicht uns der fortlaufende Prozess des innovativen Designs und der technologischen Entwicklung, stets die Möglichkeiten der Werkzeugleistung zum höchsten Nutzen unserer Kunden zu überschreiten.

(IT)
M.A. Ford®

Il raggiungimento di eccezionali velocità di taglio, la durata degli utensili, la qualità della finitura e le prestazioni che i nostri utensili offrono sono frutto di oltre 100 anni di esperienza, dedizione e competenza che ci hanno permesso di costruire una reputazione invidiabile a livello globale per prestazioni e precisione.

Ciascun prodotto della nostra gamma è progettato per offrire prestazioni al di là delle aspettative, il nostro processo di progettazione e sviluppo tecnologico è in continua innovazione e fa sì che i limiti delle prestazioni degli utensili vengano spinti sempre più avanti, per offrire il massimo beneficio ai nostri clienti.

(PL)
M.A. Ford®

Osiągnięcie doskonałych prędkości skrawania, trwałości narzędzi, jakości wykończenia i ogólnej wydajności produkcji, jaką zapewniają nasze narzędzia, jest wynikiem ponad 100-letniego doświadczenia, poświęcenia i wiedzy specjalistycznej, która pozwoliła nam zbudować godną pozzadroszczenia reputację w zakresie wydajności i precyzji.

Każdy produkt w naszej ofercie zaprojektowany jest powyżej oczekiwania naszych klientów. Proces innowacyjnego projektowania i rozwoju technologicznego zapewnia, że stale podnosimy granice wydajności narzędzi, co zapewnia naszym klientom najwyższa jakość.

New Products

new

Carbide End Mills

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New Products

Nouveaux produits | Neue Produkte | Nuovi Prodotti | Nowe Produkty

**NEW
Products**

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Nuovi
Prodotti
Nowe
Produkty

TuffCut® X-AL

Series 137V N3 AL

Designed to deliver exceptional metal removal rates and chip evacuation on aluminium, aluminium alloys and non-ferrous materials

- New end cut geometry allows plunge machining into solid material (max 1xD)
- Unique variable helix for vibration free machining at high feeds and depths of cut
- Roughing and finishing applications
- Fordlube coating increases tool-life and reduces chip adhesion



new

TuffCut® XT

Series MFB

Designed for high-efficient Semi-Finishing and Finishing of Steels, Stainless Steel, Hardened Steel, Titanium and HRSA'S.

- Multi-Flute technology
- 6, 8 or 10 Flute depending on diameter
- Parallel, Tapered or Reinforced shank versions
- ALtima® Nano or ALtima® Xtreme coatings for broad range of materials
- Diameter range 4 – 20mm



new

TuffCut® XR7

Series 180CBR

- Seven flute design allows high feed rates in profiling operations
- New Chip Breaker design creates shorter chips that evacuate more efficiently
- ALtima® Blaze coating has higher oxidisation temperature than TiAlN coatings
- Shank HA & HB



new

TuffCut® XT

Series 278CBR N3

- Five flute design works perfectly in roughing and finishing applications
- New Chip Breaker design creates shorter chips that evacuate more efficiently
- ALtima® Blaze coating has higher oxidisation temperature than TiAlN coatings
- Shank HA & HB



new

CYCLONE CXD

High Performance Drill

Series CXDCEM 15xD

Designed for 15X deep hole drilling in Steels, Stainless Steels, Hardened Steel, Cast Iron and High Temp Alloys

new



- New lower thrust point geometry
- Enhanced double margin design
- ALtima® Plus AlTiN multi-layer coating
- Enhanced surface finish technology pre and post coating
- Refined edge protection for improved performance in titanium and stainless steel
- Back margin location allows for quicker engagement in hole
- Corner Chamfer Drill Point for added strength, improved hole finish and to reduce breakout burrs
- Size Range 3.0mm - 12.0mm



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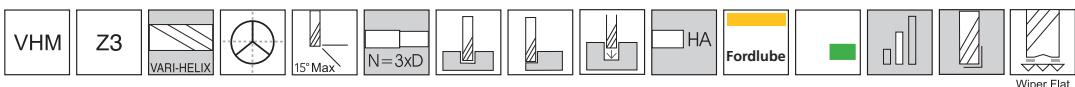


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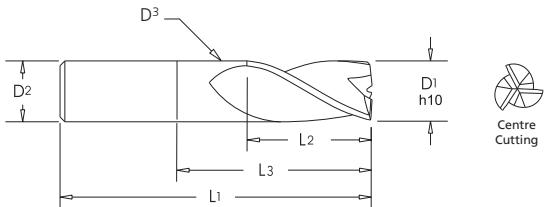


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TuffCut® X-AL Series 137V N3 AL



new



Tool Number	D1	D2	D3	L1	L2	L3
137V 03N3AL	3.0	3.0	2.8	51.0	8.0	11.0
137V 04N3AL	4.0	4.0	3.8	51.0	11.0	14.0
137V 05N3AL	5.0	5.0	4.8	57.0	13.0	17.0
137V 06N3AL	6.0	6.0	5.8	64.0	13.0	20.0
137V 08N3AL	8.0	8.0	7.8	64.0	19.0	26.0
137V 10N3AL	10.0	10.0	9.8	73.0	22.0	32.0
137V 12N3AL	12.0	12.0	11.8	84.0	26.0	38.0
137V 16N3AL	16.0	16.0	15.8	93.0	32.0	50.0
137V 20N3AL	20.0	20.0	19.8	105.0	38.0	62.0

TuffCut® X-AL Series 137V N3 AL

Recommended cutting data · Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio Raccomandati · Zalecane Parametry

Series	Type of cut		Vc	Diameter - mm					
				ø 3.0	ø 4.0	ø 5.0	ø 6.0	ø 8.0	
	Ae	Ap		fz	fz	fz	fz	fz	
137V N3 AL		1 x D	0.25 x D	400-600	0.03	0.04	0.05	0.06	0.08
		1 x D	0.5 x D	400-600	0.03	0.04	0.05	0.06	0.08
		1 x D	1 x D	400-600	0.02	0.03	0.04	0.05	0.07
		0.75 x D	0.5 x D	500-700	0.045	0.06	0.075	0.09	0.12
		0.5 x D	1 x D	500-700	0.03	0.04	0.05	0.06	0.08
		0.5 x D	1.5 x D	500-700	0.03	0.04	0.05	0.06	0.08
		≤ 0.1 x D	≤ 0.9 x L²	800-1000	0.036	0.054	0.072	0.09	0.126

Series	Type of cut		Vc	Diameter - mm				
				ø 10.0	ø 12.0	ø 16.0	ø 20.0	
	Ae	Ap		fz	fz	fz	fz	
137V N3 AL		1 x D	0.25 x D	400-600	0.10	0.12	0.16	0.20
		1 x D	0.5 x D	400-600	0.10	0.12	0.16	0.20
		1 x D	1 x D	400-600	0.09	0.11	0.15	0.19
		0.75 x D	0.5 x D	500-700	0.15	0.18	0.24	0.30
		0.5 x D	1 x D	500-700	0.10	0.12	0.16	0.20
		0.5 x D	1.5 x D	500-700	0.10	0.12	0.16	0.20
		≤ 0.1 x D	≤ 0.9 x L²	800-1000	0.162	0.2	0.27	0.342

Notes:

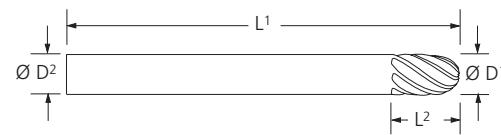
1. Plunging to 1 x D = 20% of Slotting Feed Rate.
2. Ramping (15° max) to 2 x D = 33% of Slotting Feed Rate

Fordlube Coating Properties			
Microhardness (HV)	4000	Designation	AL
Max. Service Temp.	700° C / 1292° F	Colour	Light Gold
Friction Coefficient	0.3		

New Products

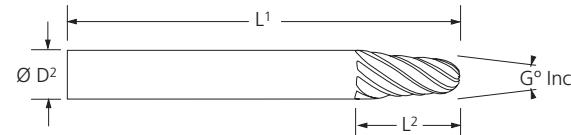
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TuffCut® XT Series MFB



MFPB Series - Multi Flute Parallel Ballnose

Tool No.		Ball Radius	Ø D1	Ø D2	L1	L2	L3	G°	No. of Flutes
ALtima® Xtreme Coating	ALtima® Nano Coating								
MFPB 0601AX	MFPB 0601AN	R3	6.0	6.0	100.0	9.0	-	-	6
MFPB 0801AX	MFPB 0801AN	R4	8.0	8.0	100.0	12.0	-	-	8
MFPB 1001AX	MFPB 1001AN	R5	10.0	10.0	108.0	15.0	-	-	8
MFPB 1201AX	MFPB 1201AN	R6	12.0	12.0	108.0	18.0	-	-	8
MFPB 1601AX	MFPB 1601AN	R8	16.0	16.0	108.0	24.0	-	-	8
MFPB 2001AX	MFPB 2001AN	R10	20.0	20.0	150.0	30.0	-	-	10



MFTB Series - Multi Flute Tapered Ballnose

Tool No.		Ball Radius	Ø D1	Ø D2	L1	L2	L3	G°	No. of Flutes
ALtima® Xtreme Coating	ALtima® Nano Coating								
MFTB 0402AX	MFTB 0402AN	R2	-	6.0	100.0	24.0	-	5°	6
MFTB 0502AX	MFTB 0502AN	R2.5	-	6.0	100.0	13.0	-	5°	6
MFTB 0602AX	MFTB 0602AN	R3	-	8.0	100.0	25.0	-	5°	6
MFTB 0802AX	MFTB 0802AN	R4	-	10.0	100.0	26.0	-	5°	8
MFTB 1002AX	MFTB 1002AN	R5	-	12.0	108.0	27.0	-	5°	8
MFTB 1202AX	MFTB 1202AN	R6	-	16.0	108.0	51.0	-	5°	8
MFTB 1602AX	MFTB 1602AN	R8	-	20.0	108.0	53.0	-	5°	8



MFNB Series - Multi Flute Necked Ballnose

Tool No.		Ball Radius	Ø D1	Ø D2	L1	L2	L3	G°	No. of Flutes
ALtima® Xtreme Coating	ALtima® Nano Coating								
MFNB 0403AX	MFNB 0403AN	R2	4.0	6.0	100.0	6.0	8.0	-	6
MFNB 0503AX	MFNB 0503AN	R2.5	5.0	6.0	100.0	7.5	10.0	-	6
MFNB 0603AX	MFNB 0603AN	R3	6.0	8.0	100.0	9.0	12.0	-	6
MFNB 0803AX	MFNB 0803AN	R4	8.0	10.0	100.0	12.0	16.0	-	8
MFNB 1003AX	MFNB 1003AN	R5	10.0	12.0	108.0	15.0	23.0	-	8
MFNB 1203AX	MFNB 1203AN	R6	12.0	16.0	108.0	18.0	24.0	-	8
MFNB 1603AX	MFNB 1603AN	R8	16.0	20.0	108.0	24.0	32.0	-	8



TuffCut® XT Series MFB

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

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Recommended Speeds by Material Group					Finishing	Semi-Finishing
Workpiece Material Group	Material Type	Ap			0.01-0.03 x D	0.05-0.1 x D
		Ae			0.02-0.03 x D	0.05-0.1 x D
		Coolant			Vc-M/Min	
Steels	P	Max	Air	MMS		
		Low Carbon	●	●	●	450
		Medium Carbon	●	●	●	345
		Alloy Steels	●	●	●	315
Stainless Steels	M	Die/Tool Steels	●	●	●	275
		Free Machining	●	X	○	205
		Austenitic	●	X	○	160
		Difficult Stainless	●	X	○	125
		PH Stainless	●	X	○	160
		Cobalt Chrome Alloys	●	X	○	125
		Duplex (22%)	●	X	○	75
Special Alloys	S	Super Duplex (25%)	●	X	○	75
		High Temp Alloys	●	X	X	55
Cast Irons	K	Titanium Alloys	●	X	X	115
		Gray Cast Iron	●	○	○	495
		Ductile Cast Iron	●	○	○	320
		Malleable Iron	●	○	○	205
Hardened Steels	H	Hardened Steels 45 - 50 Rc	●	○	○	150
		Hardened Steels 50 - 55 Rc	●	○	○	100

● Preferred ○ Possible X Not Possible



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TuffCut® XT Series MFB

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group		Material Type	Tool Diameter & Radius															
			4		5		6		8		10		12		16		20	
			Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish
Fz - mm/tooth																		
Steels	P	Low Carbon	0.12	0.06	0.15	0.075	0.18	0.09	0.24	0.12	0.3	0.15	0.36	0.18	0.48	0.24	0.6	0.3
		Medium Carbon	0.12	0.06	0.15	0.075	0.18	0.09	0.24	0.12	0.3	0.15	0.36	0.18	0.48	0.24	0.6	0.3
		Alloy Steels	0.12	0.06	0.15	0.075	0.18	0.09	0.24	0.12	0.3	0.15	0.36	0.18	0.48	0.24	0.6	0.3
		Die/Tool Steels	0.08	0.06	0.1	0.075	0.12	0.09	0.16	0.12	0.2	0.15	0.24	0.18	0.32	0.24	0.4	0.3
Stainless Steels	M	Free Machining	0.08	0.06	0.1	0.075	0.12	0.09	0.16	0.12	0.2	0.15	0.24	0.18	0.32	0.24	0.4	0.3
		Austenitic	0.08	0.06	0.1	0.075	0.12	0.09	0.16	0.12	0.2	0.15	0.24	0.18	0.32	0.24	0.4	0.3
		Difficult Stainless	0.08	0.06	0.1	0.075	0.12	0.09	0.16	0.12	0.2	0.15	0.24	0.18	0.32	0.24	0.4	0.3
		PH Stainless	0.08	0.06	0.1	0.075	0.12	0.09	0.16	0.12	0.2	0.15	0.24	0.18	0.32	0.24	0.4	0.3
		Cobalt Chrome Alloys	0.072	0.048	0.09	0.06	0.108	0.072	0.144	0.096	0.18	0.12	0.216	0.144	0.288	0.192	0.36	0.24
		Duplex (22%)	0.072	0.048	0.09	0.06	0.108	0.072	0.144	0.096	0.18	0.12	0.216	0.144	0.288	0.192	0.36	0.24
Special Alloys	S	Super Duplex (25%)	0.068	0.044	0.085	0.055	0.102	0.066	0.136	0.088	0.17	0.11	0.204	0.132	0.272	0.176	0.34	0.22
		High Temp Alloys	0.06	0.04	0.075	0.05	0.09	0.06	0.12	0.08	0.15	0.1	0.18	0.12	0.24	0.16	0.3	0.2
		Titanium Alloys	0.06	0.04	0.075	0.05	0.09	0.06	0.12	0.08	0.15	0.1	0.18	0.12	0.24	0.16	0.3	0.2
Cast Irons	K	Gray Cast Iron	0.12	0.08	0.15	0.1	0.18	0.12	0.24	0.16	0.3	0.2	0.36	0.24	0.48	0.32	0.6	0.4
		Ductile Cast Iron	0.1	0.08	0.125	0.1	0.15	0.12	0.2	0.16	0.25	0.2	0.3	0.24	0.4	0.32	0.5	0.4
		Malleable Iron	0.08	0.06	0.1	0.075	0.12	0.09	0.16	0.12	0.2	0.15	0.24	0.18	0.32	0.24	0.4	0.3
Hardened Steels	H	Hardened Steels HRC45-50	0.06	0.056	0.075	0.07	0.09	0.084	0.12	0.112	0.15	0.14	0.18	0.168	0.24	0.224	0.3	0.28
		Hardened Steels HRC50-55	0.05	0.056	0.063	0.07	0.075	0.084	0.1	0.112	0.125	0.14	0.15	0.168	0.2	0.224	0.25	0.28

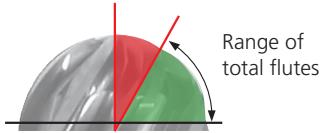
TuffCut® XT Series MFB

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

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Tool Ø	Effective Diameter at 30°						
	Axial Depth of Cut (mm) AP						
	0.2	0.4	0.6	0.8	1	1.5	2
4	3.31	3.68	3.87	3.97	-	-	-
5	4.00	4.45	4.71	4.87	4.96	-	-
6	4.66	5.16	5.52	5.73	5.87	-	-
8	5.96	6.62	7.05	7.36	7.60	7.91	-
10	7.22	8.00	8.51	8.90	9.20	9.68	9.93
12	8.46	9.33	9.94	10.38	10.74	11.37	11.75
16	10.88	11.92	12.66	13.24	13.71	14.58	15.16
20	13.25	14.44	15.30	15.98	16.55	17.62	18.40



R	Tilt Angle	No. of Flutes
2	+31°	6
2.5	+33°	6
3	+33°	6
4	+25°	8
5	+22°	8
6	+24°	8
8	+25°	8
10	+25°	10

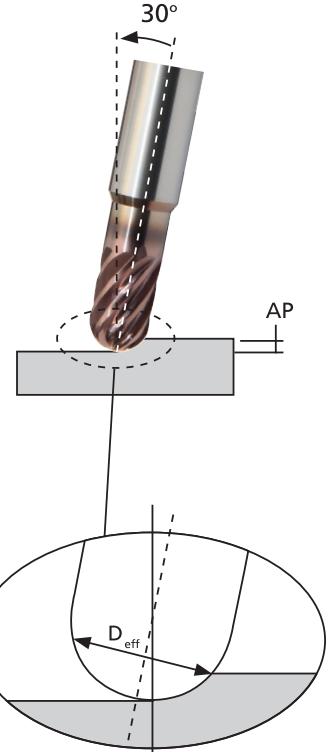
Tool Ø	Effective Teeth		
	Tilt Angle		
	20°	25°	33°
4	2	4	6
5	2	4	6
6	2	4	6
8	2	8	8
10	2	8	8
12	6	8	8
16	6	8	8
20	6	10	10

Red Area:

Does not have complete effective number of flutes to centre of tool.

Green Area:

Programming at the listed tilt angle will utilise the full effective number of flutes.



ALtima® Xtreme Coating Properties	
Microhardness (HV)	3800
Max. Service Temp.	1100° C / 2012° F
Friction Coefficient	0.3 - 0.5
Designation	AX
Colour	Copper

ALtima® Nano Coating Properties	
Microhardness (HV)	3875
Max. Service Temp.	1100° C / 2012° F
Friction Coefficient	0.3
Designation	AN
Colour	Grey



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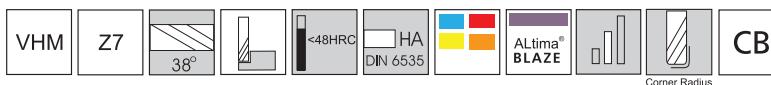


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TuffCut® XR7 Series 180CBR



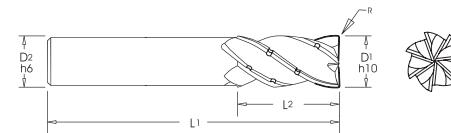
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Close up of
chipbreaker grind

new



Cylindrical Shank (HA) · Queue cylindrique (HA) · Zylinderschaft (HA) · Gambo cilindrico (HA) · Chwyt cylindryczny (HA)

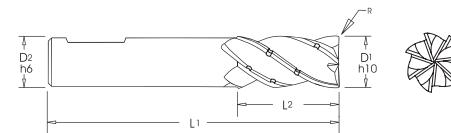
Tool Number	D1	D2	L1	L2	R
180CB 1000-1.0RB	10.0	10.0	72.0	22.0	1.0
180CB 1200-1.0RB	12.0	12.0	84.0	32.0	1.0
180CB 1600-1.0RB	16.0	16.0	92.0	42.0	1.0

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Close up of
chipbreaker grind

new

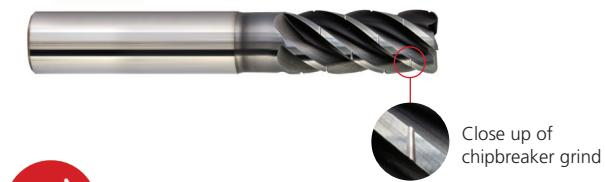
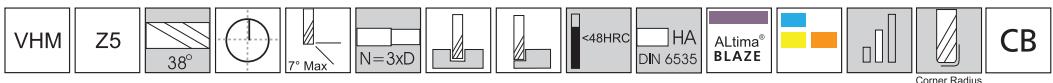


Weldon Shank (HB) · Queue weldon (HB) · Weldon-Schaft (HB) · Gambo Weldon (HB) · Chwyt Weldon (HB)

Tool Number	D1	D2	L1	L2	R
180CB 1000-1.0RBW	10.0	10.0	72.0	22.0	1.0
180CB 1200-1.0RBW	12.0	12.0	84.0	32.0	1.0
180CB 1600-1.0RBW	16.0	16.0	92.0	42.0	1.0

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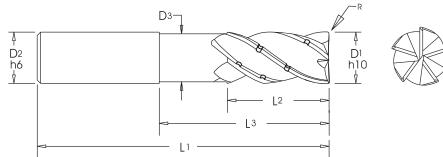
TuffCut® XT Series 278CBR N3



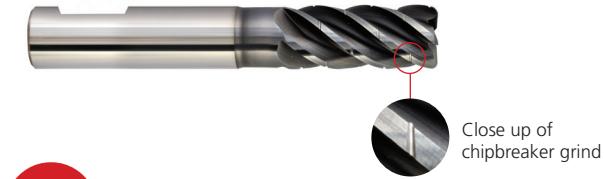
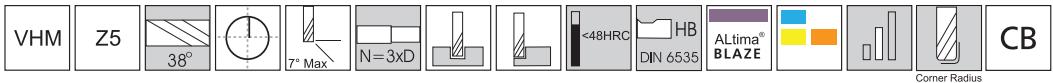
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Cylindrical Shank (HA) Queue cylindrique (HA) Zylinderschaft (HA) Gambo cilindrico (HA) Chwyt cylindryczny (HA)

Tool No.	D1	D2	D3	L1	L2	L3	R
278CB 10N3-1.0RB	10.0	10.0	9.8	72.0	22.0	31.0	1.0
278CB 12N3-1.0RB	12.0	12.0	11.4	84.0	26.0	38.0	1.0
278CB 16N3-1.0RB	16.0	16.0	15.2	100.0	35.0	50.0	1.0



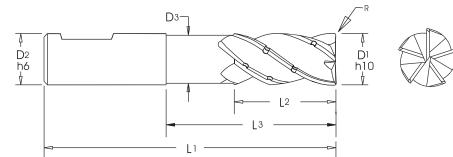
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new

Weldon Shank (HB) Queue weldon (HB) Weldon-Schaft (HB) Gambo Weldon (HB) Chwyt Weldon (HB)

Tool No.	D1	D2	D3	L1	L2	L3	R
278CB 10N3-1.0RBW	10.0	10.0	9.8	72.0	22.0	31.0	1.0
278CB 12N3-1.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	1.0
278CB 16N3-1.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	1.0



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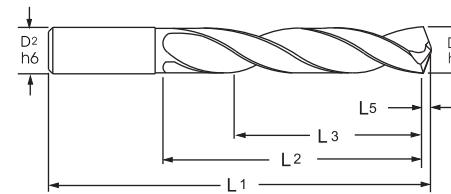
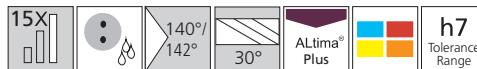
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CYCLONE CXD High Performance Drill - Series CXDCEM 15xD



new

Tool Number	D1 (m7)	D2 (h6)	L1	L2 (Max.)	L3	L5
CXDCEM0300AP	3.0	3	105	56	45	0.46
CXDCEM0350AP	3.5	4	120	66	53	0.54
CXDCEM0400AP	4.0	4	120	75	60	0.62
CXDCEM0420AP	4.2	5	143	79	63	0.65
CXDCEM0430AP	4.3	5	143	81	65	0.67
CXDCEM0440AP	4.4	5	143	83	66	0.68
CXDCEM0450AP	4.5	5	143	84	68	0.7
CXDCEM0480AP	4.8	5	143	90	72	0.74
CXDCEM0490AP	4.9	5	143	92	74	0.76
CXDCEM0500AP	5.0	5	143	94	75	0.77
CXDCEM0520AP	5.2	6	162	98	78	0.81
CXDCEM0540AP	5.4	6	162	101	81	0.84
CXDCEM0550AP	5.5	6	162	103	83	0.85
CXDCEM0560AP	5.6	6	162	105	84	0.86
CXDCEM0580AP	5.8	6	162	109	87	0.9
CXDCEM0600AP	6.0	6	162	113	90	0.93
CXDCEM0610AP	6.1	8	200	114	92	0.95
CXDCEM0620AP	6.2	8	200	116	93	0.96
CXDCEM0630AP	6.3	8	200	118	95	0.98
CXDCEM0650AP	6.5	8	200	122	98	1.01
CXDCEM0680AP	6.8	8	200	128	102	1.05
CXDCEM0700AP	7.0	8	200	131	105	1.08
CXDCEM0740AP	7.4	8	200	139	111	1.15
CXDCEM0750AP	7.5	8	200	141	113	1.16
CXDCEM0760AP	7.6	8	200	143	114	1.18
CXDCEM0780AP	7.8	8	200	146	117	1.21
CXDCEM0800AP	8.0	8	200	150	120	1.24
CXDCEM0820AP	8.2	10	240	154	123	1.27
CXDCEM0830AP	8.3	10	240	156	125	1.29
CXDCEM0840AP	8.4	10	240	158	126	1.3
CXDCEM0850AP	8.5	10	240	159	128	1.32
CXDCEM0870AP	8.7	10	240	163	131	1.35
CXDCEM0900AP	9.0	10	240	169	135	1.39
CXDCEM0940AP	9.4	10	240	176	141	1.46
CXDCEM0980AP	9.8	10	240	184	147	1.52
CXDCEM1000AP	10.0	10	240	188	150	1.55
CXDCEM1020AP	10.2	12	283	191	153	1.58
CXDCEM1030AP	10.3	12	283	193	155	1.6
CXDCEM1050AP	10.5	12	283	197	158	1.63
CXDCEM1080AP	10.8	12	283	203	162	1.67
CXDCEM1100AP	11.0	12	283	206	165	1.7
CXDCEM1150AP	11.5	12	283	216	173	1.78
CXDCEM1180AP	11.8	12	283	221	177	1.83
CXDCEM1200AP	12.0	12	283	225	180	1.86



CYCLONE CXD High Performance Drill - Series CXDCEM 15xD

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

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Workpiece Material Group	I S O	Hardness	T Y P E	D E P T H	vc- m/min.	Drill Diameter (mm)									
						3	4	5	6	7	8	9	10	12	
f - mm/Rev															
Free Machining & Low Carbon Steels 1006, 1008, 1015, 1018, 1020, 1022, 1025, 1117, 1140, 1141, 11L08, 11L14, 1213, 12L13, 12L14, 1215, 1330	P	up to 28 Rc			15X	105	.053	.070	.088	.106	.127	.193	.215	.238	.254
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels 1030, 1035, 1040, 1045, 1050, 1052, 1055, 1060, 1085, 1095, 1541, 1551, 9255, 2515, 3135, 3415, 4130, 4137, 4140, 4150, 4320, 4340, 4520, 5015, 5115, 5120, 5132, 5140, 5155, 6150, 8620, 9262, 9840, 52100, O1, O2, O6, S2, W1 to W310	P	28 to 35 Rc	• Δ	15X	80	.053	.070	.088	.106	.127	.193	.215	.238	.254	
Tool Steels & Die Steels O7, M1, M2, M3, M4, M7, T1, T2, T4, T5, T8, T15, A2, A3, A6, A7, H10, H11, H12, H13, H19, H21, L3, L6, L7, P2, P20, S1, S5, S7, 52100, A128, D2, D3, D4, D5, D7	P	28 to 35 Rc			15X	80	.053	.070	.088	.106	.127	.193	.215	.238	.254
Hardened Steels	H	35-45 Rc	• Δ	15X	35	.012	.016	.020	.022	.027	.046	.053	.060	.066	
Hardened Steels		45-55 Rc	• Δ	15X	25										
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc			15X	90	.053	.070	.090	.105	.127	.193	.215	.238	.254
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	• Δ	15X	55	.053	.070	.090	.105	.127	.193	.215	.238	.254	
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronic	M	over 28 Rc			15X	40	.053	.070	.090	.105	.127	.193	.215	.238	.254
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	• Δ	15X	20-25	.015	.020	.030	.035	.048	.051	.071	.078	.085	
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	• Δ	15X	45	.025	.033	.050	.060	.071	.098	.127	.140	.152	
Cast Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	• Δ	15X	120	.053	.070	.100	.120	.140	.200	.215	.240	.254	
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	• Δ	15X	80	.053	.070	.100	.120	.140	.200	.215	.240	.254	

Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded.

Please use corresponding diameter CXD drill for creating 1.5 to 3 x diameter pilot hole, prior to deep hole drilling with the CXDCEM drill.



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TuffCut® XR - XT Carbide End Mills

Fraises carbure en bout | Hartmetall-Schaftfräser | Frese in Metallo Duro Integrale | Frezy palcowe pełnowęglikowe

Series	Tool Illustration	Z	Length	Ø Range (mm)	Corner Prep	Application Area	Material Group	Page
3MVS		3		0.50 - 3.00	Sharp Corner			14
3MVR		3		0.50 - 3.00	Sharp Corner			15
177		4		1.50 - 3.00	Sharp Corner			16
177R		4		3.00 - 25.00	0.25 - 6.0mm Radius			17
177S		4		3.00 - 20.00	0.2 - 1.0mm Radius			18
177LR N5		4		6.0 - 20.00	0.3 - 3.0mm Radius			19
277N		4		3.0 - 20.00	Sharp Corner			20
277N-W		4		8.00 - 16.00	Sharp Corner			20
277NR		4		3.00 - 20.00	0.25 - 6.0mm Radius			21
277NR-W		4		8.00 - 20.00	0.5 - 6.0mm Radius			22
178		5		3.00 - 25.00	Sharp Corner			23
178R		5		6.00 - 25.00	0.5 - 1.0mm Radius			24
178-1		5		3.00 - 20.00	Sharp Corner			24
278R N3		5		3.00 - 25.00	0.5 - 4.0mm Radius			25
278R N4		5		12.00 - 25.00	0.5 - 3.0mm Radius			26
278R N5		5		16.00 - 25.00	1.0 - 3.0mm Radius			26
278R N5CT		5		12.00	0.5 - 4.0mm Radius			27
113A		6		3.00 - 20.00	Sharp Corner			27
179		4		1.50 - 16.00	N/A			28
179L N5		4		3.00 - 16.00	N/A			28
279		4		3.00 - 16.00	N/A			29
180		7		6.00 - 10.00	Sharp Corner			29
180R		7		6.00 - 20.00	0.5 - 4.0mm Radius			30
180R N5		7		12.00 - 20.00	1.0 - 4.0mm Radius			30
380		9		8.00 - 20.00	0.50 - 1.00mm Radius			31
V5LCB		5		6.00 - 16.00	0.5mm Radius			32
158		4		2.00 - 16.00	0.1 - 3.00mm Radius			34

TuffCut® X-AL Carbide End Mills

Fraises carbure en bout | Hartmetall-Schaftfräser | Frese in Metallo Duro Integrale | Frezy palcwe pełnowęglikowe



Series	Tool Illustration	Z	Length	Ø Range (mm)	Corner Prep	Application Area	Material Group	Page
135		2		3.00 - 25.00	0.2 - 0.75mm Radius			38
135 N		2		3.00 - 25.00	0.2 - 0.75mm Radius			39
135 N3		2		3.00 - 25.00	0 - 5.0mm Radius			40
135 N5		2		3.00 - 25.00	0 - 5.0mm Radius			42
135B N3		2		3.00 - 16.00	N/A			44
135B N5		2		2.00 - 16.00	N/A			44
137V N3		3		3.00 - 20.00	0 - 4.0mm Radius			45
137V N4		3		3.00 - 20.00	0 - 4.0mm Radius			47
137V N5		3		3.00 - 20.00	0 - 4.0mm Radius			49
138B		3		3.00 - 16.00	N/A			51
138B N5		3		2.00 - 16.00	N/A			51
137VR N3		3		12.00 - 20.00	1.0mm Radius			52
137VR N5		3		12.00 - 20.00	1.0mm Radius			52
137VF		3		3.00 - 20.00	0 - 2.0mm Radius			53

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Carbide End Mills

Fraises carbure en bout | Hartmetall-Schaftfräser | Frese in Metallo Duro Integrale | Frezy palcwe pełnowęglikowe



Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
164		2		0.20 - 20.00			72
164A		2		1.00 - 20.00			72
169		3		1.00 - 20.00			72
169A		3		1.00 - 20.00			72
163		4		1.00 - 20.00			72
163A		4		1.00 - 20.00			72

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Carbide End Mills

Fraises carbure en bout | Hartmetall-Schafträser | Frese in Metallo Duro Integrale | Frezy palcowe pełnowęglikowe

Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
166		2		1.00 - 20.00			73
166A		2		1.00 - 20.00			73
165		4		1.00 - 20.00			73
165A		4		1.00 - 20.00			73
192		3-4		8.00 - 20.00			74
121		2		0.20 - 25.00			74
121A		2		1.00 - 25.00			74
116		3		1.00 - 25.00			74
116A		3		1.00 - 25.00			74
111		4		0.20 - 25.00			74
111A		4		1.00 - 25.00			74
150		2		0.40 - 25.00			76
150A		2		1.00 - 25.00			76
140		4		1.00 - 25.00			76
140A		4		1.00 - 25.00			76
VCM60		4, 6		4.00 - 16.00	Chamfer		77
VCM60		4, 6		4.00 - 16.00	Chamfer		77
VCM90		4, 6		4.00 - 16.00	Chamfer		77
VCM90		4, 6		4.00 - 16.00	Chamfer		77
ACR		4		3.00 - 16.00 R0.25 - R6.0	Corner Rounding		77
MV4		4		6.00 - 20.00 R0.25 - R6.0			78

Carbide End Mills Anti-Vibration

Fraises carbure en bout anti-vibrations | Hartmetall-Schaftfräser für vibrationsfreies Fräsen | Frese in Metallo Duro Integrale profilo antivibrante | Antywibracyjne frezy palcowe pełnowęglikowe

M.A. FORD MAX
RANGE

Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
ASV4ACM		4		3.00 - 20.00			81
ASV4ACM-R		4		3.00 - 20.00			82
VMH		4		3.00 - 20.00			83
VMH-W		4		3.00 - 20.00			84
V4L		4		6.00 - 20.00			84
V4L		4		6.00 - 20.00			84
ASV4ACB		4		1.00 - 20.00			85
V4LB		4		6.00 - 20.00			85
V4LB		4		6.00 - 20.00			85

Carbide End Mills For Aluminium

Fraises carbure en bout pour l'aluminium | Hartmetall-Schaftfräser für Aluminium | Frese in Metallo Duro Integrale per alluminio | Frezy pełnowęglikowe palcowe do aluminium

M.A. FORD MAX
RANGE

Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
GT2		2		2.00 - 20.00			86
GT3		3		3.00 - 20.00			86
ASVSM		3		3.00 - 20.00			86
GT2R		2		2.00 - 20.00			87
GT3R		3		3.00 - 20.00			87
GT2B		2		3.00 - 20.00			88
GT3B		3		3.00 - 20.00			88
134		3		6.00 - 25.00			88

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Diamond Grind Routers

Fraises diamant pour composites | Diamant-Oberfräsen | Router con taglio a diamante | Pilnik obrotowy z pokryciem diamentowym



Series	Tool Illustration	Length	Ø Range (mm)	Coating	Material Group	Page
239		38 - 100	3 -12	Uncoated		98
239		38 - 100	3 -12	GemX		98
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Frässtifte
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Diamond Grind Routers

Fraises diamant pour composites | Diamant-Oberfräsen | Router con taglio a diamante | Pilnik obrotowy z pokryciem diamentowym



Series	Tool Illustration	Length	Ø Range (mm)	Coating	Material Group	Page
230		38 - 64	0.8 - 8	-		101
231		38 - 64	0.8 - 8	-		101
231B		38 - 64	0.8 - 8	-		101
231D		38 - 64	0.8 - 8	-		101
231F		38 - 64	0.8 - 8	-		101
230CE		38 - 64	0.8 - 8	CERAedge®		101
231CE		38 - 64	0.8 - 8	CERAedge®		101
231BCE		38 - 64	0.8 - 8	CERAedge®		101
231DCE		38 - 64	0.8 - 8	CERAedge®		101
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102						

High Performance Drills

Foret Haute Performance | Hochleistungsbohrer | Punte ad alte prestazioni | Wiertła wysoko wydajne



Series	Tool Illustration	Drilling Depth	Ø Range (mm)	Internal Coolant	Coating	Material Group	Page
305		Various	0.10 - 3.00	-	-		104
305AM		Various	0.10 - 3.00	-	ALtima® Micro		106
MPDCS		2 x D	1.00 - 2.95		ALtima®		107
MXDSR		5 x D	0.5 - 2.95	-	ALtima®		108
MXDCR		5 x D	1.00 - 2.95		ALtima®		109
200S		Spot Drill	3.00 - 16.00	-	ALtima®		110
CXDSS		3 x D	3.00 - 20.00	-	ALtima® Plus		110
CXDCS		3 x D	3.00 - 16.00		ALtima® Plus		110
XDSSM		3 x D	2.50 - 20.00	-	ALtima®		114
XDCSM		3 x D	3.00 - 16.00		ALtima®		114
CXDSR		5 x D	3.00 - 16.00	-	ALtima® Plus		117
CXDCR		5 x D	3.00 - 20.00		ALtima® Plus		117
XDSRM		5 x D	0.50 - 16.00	-	ALtima®		120
XDCRM		5 x D	3.00 - 20.00		ALtima®		120
XDCLM		7+ x D	3.00 - 12.00		ALtima®		123
CXDCLM		8 x D	3.00 - 16.00		ALtima® Plus		125
MDCLM		10 x D	2.00 - 2.95		ALtima®		129
MXDCL		12 x D	1.00 - 2.95		ALtima®		130
XDCEM		12+ x D	4.00 - 12.70		ALtima®		131
CDACRM		5 x D	3.00 - 12.50		-		132

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General Purpose Drills

Forets pour utilisation générale | Universalbohrer | Punte per uso generale | Wiertla ogólnego przeznaczenia



Series	Tool Illustration	Drilling Depth	Ø Range (mm)	Internal Coolant	Coating	Material Group	Page
302		Various	0.10 - 3.15	-	-		146
200		3 x D	0.80 - 20.00	-	-		147
207		5 x D	2.40 - 12.00	-	-		149
205		5 x D	0.30 - 20.00	-	-		150
300		5 x D	0.50 - 3.15	-	-		152
HPDSR		5 x D	3.00 - 16.00	-	HP ALTIN		153
HPDCR		5 x D	3.00 - 16.00		HP ALTIN		153
229		4-5 x D	2.00 - 16.00	-	-		156
224		5 x D	0.30 - 20.00	-	-		157
402		Centre Drill	0.50 - 5.00	-	-		159
404		Spot Drill 90°	5.00 - 12.00	-	-		159
403		Spot Drill 120°	5.00 - 12.00	-	-		160
PRM-KSN		8+xD	0.3 - 0.9	-	-		160
PRXS-KST		Various	1.0 - 13.00	-	TiN		161
PRXS-KMT		7+xD	1.0 - 13.00	-	TiN		162
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Ramers

Alésoirs | Reibahlen | Alesatori | Rozwiertaki



Series	Tool Illustration	Shank Form	Tool Material	Ø Range (mm)	Coating	Tolerance	Material Group	Page
272		M.A.FORD Standard	VHM	0.33 - 16.00	-	H7		171
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Countersinks

Fraises | Senker | Svasatori | Pogłębiacze

Series	Tool Illustration	Tool Material	Z	Included Angles	Ø Range (mm)	Type	Surface Treatment	Material Groups	Page
60		VHM	1	60°, 82°, 90°, 100°	3.20 - 25.40	UniFlute®	X		182
61		HSS	1	60°, 82°, 90°, 100°, 120°	3.20 - 76.20	UniFlute®	Steam Treated		182
61B		HSS	1	60°, 82°, 90°, 100°, 120°	3.20 - 25.40	UniFlute®	ALtima® Blaze		183
61T		HSS	1	60°, 82°, 90°, 100°, 120°	3.20 - 25.40	UniFlute®	TiN		183
92		HSS	3	60°, 82°, 90°, 100°, 120°	6.40 - 50.80	Aircraft 3 Flute	Bright Finish		188
893T		HSS	3	90°	4.30 - 31.00	3 Flute	TiN		189
78		VHM	6	60°, 82°, 90°, 100°, 120°	3.20 - 38.10	Vibration Free 6 Flute	X		185
79		HSS	6	60°, 82°, 90°, 100°, 120°	3.20 - 76.20	Vibration Free 6 Flute	Steam Treated		185
79B		HSS	6	60°, 82°, 90°, 100°, 120°	3.20 - 25.40	Vibration Free 6 Flute	ALtima® Blaze		186
79T		HSS	6	60°, 82°, 90°, 100°, 120°	3.20 - 25.40	Vibration Free 6 Flute	TiN		187
61 Set	UniFlute® HSS Countersink Sets - Series 61, 61T						Steam Treated		184
61T Set							TiN		184
79 Set	Vibration Free HSS Countersink Sets - Series 79, 79T						Steam Treated		187
79T Set							TiN		187
92 Set	3 Flute Aircraft HSS Countersink Sets - Series 92						Bright Finish		188
893T Set	3 Flute HSS 90° Countersink Sets - Series 893T						TiN		189

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Carbide Burrs

Fraise Lime Rotative Carbure | Hartmetall-Frässtifte | Lime rotative in MD | Zadziory

FORDMAX
RANGE

Series	Tool Illustration	Lengths	Ø Range (mm)	Available Shank Ø	Page
SA			Ø1.6 - Ø25.0	3.0	194
				6.0	
				8.0*	
SB			Ø3.0 - Ø25.0	3.0	195
				6.0	
				8.0*	
SC			Ø2.4 - Ø25.0	3.0	196
				6.0	
				8.0*	
SD			Ø2.4 - Ø25.0	3.0	197
				6.0	
				8.0*	
SE			Ø3.0 - Ø19.0	3.0	198
				6.0	
				8.0*	
SF			Ø3.0 - Ø19.0	3.0	199
				6.0	
				8.0*	
SG			Ø3.0 - Ø19.0	3.0	200
				6.0	
				8.0*	
SH			Ø3.0 - Ø19.0	3.0	201
				6.0	
				8.0*	
SJ			Ø3.0 - Ø25.0	3.0	202
				6.0	
				8.0*	
SK			Ø3.0 - Ø25.0	3.0	203
				6.0	
				8.0*	
SL			Ø3.0 - Ø19.0	3.0	204
				6.0	
				8.0*	
SM			Ø3.0 - Ø16.0	3.0	205
				6.0	
				8.0*	
SN			Ø2.4 - Ø19.0	3.0	206
				6.0	
				8.0*	

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* Burrs 12.0mm and above are available with an 8.0mm shank on request as a non-stock standard.

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Tool Material

Matière de l'outil
Werkzeugmaterial
Materiale Tagliente
Material Narzędzia



Number of Flutes

Nombre de Goujures
Anzahl der Schneiden
Numero di Taglienti
Ilość Ostrzy



Helix Angle

Angle d'hélice
Drallwinkel
Angolo dell'elica
Kąt linii śrubowej



Centre Cutting

Coupe au Centre
Zentrumsschnitt
Taglio al Centro
Cięcie Centralne



Lengths

Longueurs
Längen
Lunghezze
Długość



Cutting Direction

Sens de Coupe
Schnittrichtung
Direzione di Taglio
Kierunek Cięcia



Profiling

Profilage
Profilerstellung
Contornatura
Profilowanie



Slotting

Rainurage
Nutzfräsen
Scanalatura
Dłutowanie



3D Scanning

Numérisation 3D
3-D-Scannen
Copiatura di Profilo
Skanowanie 3D



Shank

Tiges
Schaft
Gambo
Chwyt



Neck Relief

Encolure
Abgesetzter Schaft
Collo Scaricato
Zwolnienie szyjki



Material Hardness

Dureté du matériau
Materialhärte
Durezza del materiale
Twardość materiału



Coating

Revêtement
Beschichtung
Rivestimento
Powloka



Uncoated or Coated

Sans revêtement
ou avec revêtement
Unbeschichtet
oder beschichtet
Non rivestito
o rivestito
Niepowlekane
lub powlekane



Corner Radius

Rayon d'angle
Eckenradius
Spigolo Raggiato
Promień naroża



Solid

Solide
Fest
Solido
Lity



Coolant Feed

Liquide de refroidissement
Kühlmittelzufuhr
Con fori di lubrificazione
Chłodzivo



Drill Point Angle

Forêt à angle de pointe
Spitzenwinkel der Bohrerspitze
Angolo al vertice della punta
Kąt wiercenia



DIN Specs

Normes DIN
DIN-Normen
Norme DIN
Specyfikacje DIN



Lead Chamfer

Chanfrein de bec
Einführschrägen
Smusso d'imbozzo
Główna faza



Right Hand Cutting

Coupe à droite
Rechts schneidend
Taglio destro
Prawostronne cięcie



Included Angles

Angle inclus
Eingeschlossener Winkel
Angoli inclusi
Kąt zawyty



Thread Angle

Angle filetage
Spitzenwinkel
Angolo del profilo
Kąt gwintów



Lead

Conduire
Werkzeugmaterial
Imbocco
Nakrój



Hole Depth Type

Type de profondeur de trou
Lochtiefe
Profondità del foro
Głębokość otworu



Tel: +44 (0) 1332 267960



Email: sales@mafordeurope.com

Continued >>>


Hole Depth Type

Type de profondeur de trou
Lochtiefe
Profondità del foro
Głębokość otworu


Wear Safety Glasses

Portez des lunettes de protection
Schutzbrille tragen
Indossare occhiali di sicurezza
Załóż okulary ochronne


Wear Ear Defenders

Portez des protège-oreilles
Gehörschutz tragen
Usare le protezioni auricolari
Załóż ochraniacze słuchu


Wear Protective Mask

Portez des protège-oreilles
Schutzmaske tragen
Indossare la maschera di protezione
Załóż maskę ochronną


Wear Protective Gloves

Portez des gants de protection
Schutzhandschuhe tragen
Indossare i guanti di protezione
Załóż ochronne rękawice


Wiper Flat

Essuie-glace Plat
Wischer Flach
Wiper Flat
Wycieraczka Płaska


Read Instructions

Lisez les instructions
Die Anleitung beachten
Leggere le istruzioni
Przeczytaj instrukcje


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Workpiece Material Group

Groupe de matériaux des pièces | Materialgruppen der Werkstücke
Gruppo del materiale da lavorare | Grupa materiałów obrabianego przedmiotu


Steel

Acier
Stahl
Acciaio
Stal


Cast Iron

Fontes
Gusseisen
Ghisa
Żeliwo


Hardened Steels (35-65Rc)

Aciers trempés (35-65Rc)
Gehärteter Stahl (35-65Rc)
Acciai temprati (35-65Rc)
Stal Hartowana (35-65Rc)


Special Alloys

Alliages spéciaux
Speziallegierungen
Leghe speciali
Stopy specjalne


Stainless Steels

Aciers inoxydables
Rostfreier Stahl
Acciai inossidabili
Stale nierdzewne


Non-Ferrous

Métaux non-ferreux
Nicht eisenhaltig
Non ferroso
Materiał nieżelazny

TuffCut® XR-XT

Carbide End Mills

Fraises carbure en bout | Hartmetall-Schaftfräser
 Frese in Metallo Duro Integrale
 Frezy palcowe pełnowęglikowe

TuffCut® XR and XT end mills form a key part of our high performance APG range and deliver outstanding results to maximise productivity, minimise process downtime and optimise cost efficiency on materials such as stainless steels, high temperature alloys and hardened steel.

(FR)

"Les fraises TuffCut® XR et XT font partie de notre gamme à haute performance APG et offrent des résultats exceptionnels afin de maximiser la productivité, de minimiser les temps d'arrêt et d'optimiser la rentabilité dans les matériaux comme les aciers inoxydables, les alliages haute température et l'acier trempé."

(DE)

TuffCut® XR- und XT-Schaftfräser sind ein wichtiger Bestandteil unseres APG-Hochleistungssortiments. Sie liefern ausgezeichnete Ergebnisse und erhöhen so die Produktivität, verringern die Ausfallzeiten im Prozess und optimieren die Kosteneffizienz bei Material wie rostfreiem Stahl, hochtemperaturfesten Legierungen sowie gehärtetem Stahl.

(IT)

Le frese TuffCut® XR e XT sono il fulcro del nostro programma di utensili ad alte prestazioni APG e permettono di ottenere risultati eccezionali per massimizzare la produttività, ridurre al minimo il tempo di inattività dei processi e ottimizzare i costi su materiali quali acciai inossidabili, leghe ad alta temperatura ed acciaio temprato.

(PL)

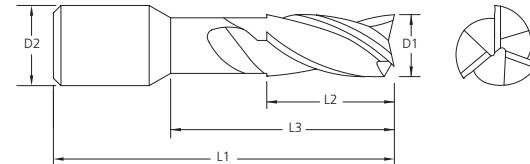
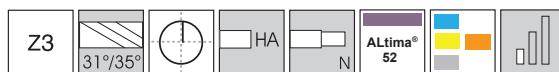
Frezy TuffCut® XR i XT stanowią kluczową część naszego wysokowydajnego assortymentu APG i zapewniają znakomite rezultaty. Gwarantujemy zwiększenie wydajności, obniżenie czasu obróbki i optymalizacji kosztów w takich materiałach jak stal nierdzewna, stopy wysokotemperaturowe i stal hartowana

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APG
ADVANCED PRODUCT GROUP
End Mills
Fraise en bout
Schaftfräser
Frese a Candela
Frez

TuffCut® Series 3MVS

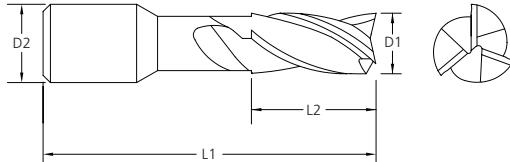
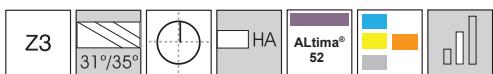


Tool Number	EDP	D1	D2	L1	L2	L3
3MVSM0050AH	39004	0.5	4.0	50	0.75	-
3MVSM0100AH	39014	1.0	4.0	50	1.50	-
3MVSM0100N5AH	39016	1.0	4.0	50	1.50	5
3MVSM0100N8AH	39017	1.0	4.0	50	1.50	8
3MVSM0150AH	39023	1.5	4.0	50	2.25	-
3MVSM0200AH	39038	2.0	4.0	50	3.00	-
3MVSM0200N5AH	39040	2.0	4.0	50	3.00	10
3MVSM0200N8AH	39041	2.0	4.0	50	3.00	16
3MVSM0250AH	39050	2.5	4.0	50	3.75	-
3MVSM0300AH	39056	3.0	4.0	50	4.50	-
3MVSM0300N5AH	39058	3.0	4.0	50	4.50	15
3MVSM0300N8AH	39059	3.0	4.0	50	4.50	24



Metric (mm)		Metric (mm)	
D1	Tolerance	D2	Tolerance (h6)
0.5 - 3.0	+0/-0.020	4.0	+0/-0.008

TuffCut® Series 3MVR



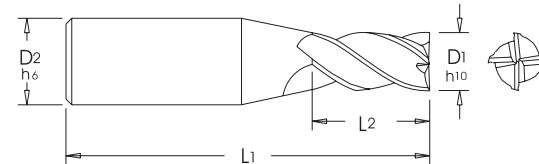
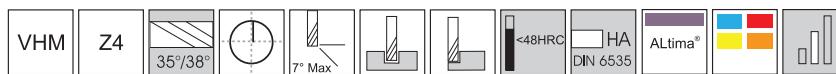
Tool Number	EDP	D1	D2	L1	L2
3MVRM0050AH	39005	0.5	4.0	50	1.50
3MVRM0100AH	39015	1.0	4.0	50	3.00
3MVRM0150AH	39024	1.5	4.0	50	4.50
3MVRM0200AH	39039	2.0	4.0	50	6.00
3MVRM0250AH	39051	2.5	4.0	50	7.50
3MVRM0300AH	39057	3.0	4.0	50	9.00



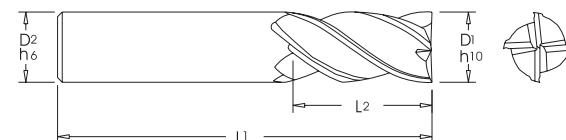
Metric (mm)		Metric (mm)	
D1	Tolerance	D2	Tolerance (h6)
0.5 - 3.0	+0/-0.020	4.0	+0/-0.008



TuffCut® XR Series 177



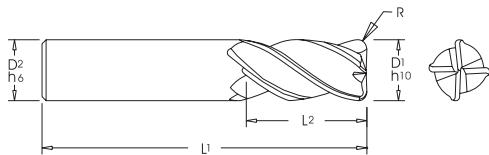
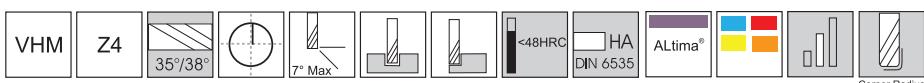
Tool SNo.	EDP	D1	D2	L1	L2
177 0150A	17680	1.5	3.0	38.0	3.0
177 0200A	17682	2.0	3.0	38.0	4.0
177 0250A	17684	2.5	3.0	38.0	5.0
177 0303A	17686	3.0	3.0	38.0	6.0



Tool No.	EDP	D1	D2	L1	L2
177 0300A	17928	3.0	6.0	57.0	8.0
177 0350A	17688	3.5	6.0	57.0	7.0
177 0400A	17930	4.0	6.0	57.0	11.0
177 0450A	17690	4.5	6.0	57.0	9.0
177 0500A	17932	5.0	6.0	57.0	13.0
177 0600A	17934	6.0	6.0	57.0	13.0
177 0800A	17937	8.0	8.0	63.0	19.0
177 1000A	17940	10.0	10.0	72.0	22.0
177 1200A	17943	12.0	12.0	83.0	26.0
177 1400A	17946	14.0	14.0	83.0	26.0
177 1600A	17950	16.0	16.0	92.0	32.0
177 1800A	17952	18.0	18.0	92.0	32.0
177 2000A	17955	20.0	20.0	104.0	38.0
177 2500A	17957	25.0	25.0	104.0	38.0



TuffCut® XR Series 177R



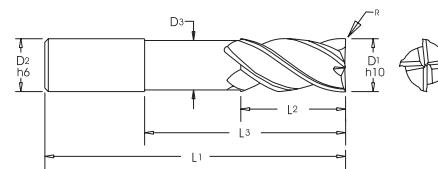
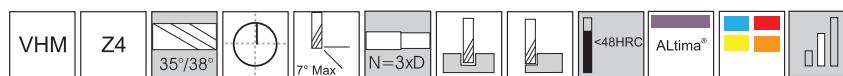
Tool No.	EDP	D1	D2	L1	L2	R
177 0300-0.25RA	17929	3.0	6.0	57.0	8.0	0.25
177 0300-0.50RA	17783	3.0	6.0	57.0	8.0	0.5
177 0400-0.25RA	17931	4.0	6.0	57.0	11.0	0.25
177 0400-0.50RA	17784	4.0	6.0	57.0	11.0	0.5
177 0500-0.25RA	17933	5.0	6.0	57.0	13.0	0.25
177 0500-0.50RA	17785	5.0	6.0	57.0	13.0	0.5
177 0600-0.25RA	17786	6.0	6.0	57.0	13.0	0.25
177 0600-0.50RA	17935	6.0	6.0	57.0	13.0	0.5
177 0600-1.0RA	17787	6.0	6.0	57.0	13.0	1.0
177 0600-1.5RA	17788	6.0	6.0	57.0	13.0	1.5
177 0600-2.0RA	18070	6.0	6.0	57.0	13.0	2.0
177 0800-0.50RA	17938	8.0	8.0	63.0	19.0	0.5
177 0800-1.0RA	17789	8.0	8.0	63.0	19.0	1.0
177 0800-1.5RA	17790	8.0	8.0	63.0	19.0	1.5
177 0800-2.0RA	17791	8.0	8.0	63.0	19.0	2.0
177 0800-3.0RA	18072	8.0	8.0	63.0	19.0	3.0
177 1000-0.50RA	17941	10.0	10.0	72.0	22.0	0.5
177 1000-1.0RA	17792	10.0	10.0	72.0	22.0	1.0
177 1000-1.5RA	17793	10.0	10.0	72.0	22.0	1.5
177 1000-2.0RA	17794	10.0	10.0	72.0	22.0	2.0
177 1000-3.0RA	96603	10.0	10.0	72.0	22.0	3.0
177 1200-0.50RA	17795	12.0	12.0	83.0	26.0	0.5
177 1200-0.75RA	17944	12.0	12.0	83.0	26.0	0.75
177 1200-1.0RA	17796	12.0	12.0	83.0	26.0	1.0
177 1200-1.5RA	17797	12.0	12.0	83.0	26.0	1.5
177 1200-2.0RA	17798	12.0	12.0	83.0	26.0	2.0
177 1200-2.5RA	18074	12.0	12.0	83.0	26.0	2.5
177 1200-3.0RA	96506	12.0	12.0	83.0	26.0	3.0
177 1200-4.0RA	18076	12.0	12.0	83.0	26.0	4.0
177 1400-0.75RA	17947	14.0	14.0	83.0	26.0	0.75
177 1600-0.50RA	18078	16.0	16.0	92.0	32.0	0.5
177 1600-1.0RA	17951	16.0	16.0	92.0	32.0	1.0
177 1600-1.5RA	17799	16.0	16.0	92.0	32.0	1.5
177 1600-2.0RA	17673	16.0	16.0	92.0	32.0	2.0
177 1600-2.5RA	18080	16.0	16.0	92.0	32.0	2.5
177 1600-3.0RA	17674	16.0	16.0	92.0	32.0	3.0
177 1600-4.0RA	18082	16.0	16.0	92.0	32.0	4.0
177 1800-1.0RA	17953	18.0	18.0	92.0	32.0	1.0
177 2000-1.0RA	17956	20.0	20.0	104.0	38.0	1.0
177 2000-1.5RA	18091	20.0	20.0	104.0	38.0	1.5
177 2000-2.0RA	18084	20.0	20.0	104.0	38.0	2.0
177 2000-3.0RA	18086	20.0	20.0	104.0	38.0	3.0
177 2000-4.0RA	18088	20.0	20.0	104.0	38.0	4.0
177 2000-5.0RA	18090	20.0	20.0	104.0	38.0	5.0
177 2000-6.0RA	18092	20.0	20.0	104.0	38.0	6.0
177 2500-1.0RA	17958	25.0	25.0	104.0	38.0	1.0





End Mills
Fraise en bout
Schaftfräser
Frese a Candela
Frez

TuffCut® XR Series 177S



Tool No.	EDP	D1	D2	D3	L1	L2	L3	Shank
177S 0300A	18218	3.0	6.0	2.9	50.0	5.0	11.0	DIN 6535 HA
177S 0400A	18220	4.0	6.0	3.9	50.0	6.0	14.0	DIN 6535 HA
177S 0500A	18222	5.0	6.0	4.9	57.0	8.0	17.0	DIN 6535 HA
177S 0600A	18224	6.0	6.0	5.8	57.0	9.0	20.0	DIN 6535 HA
177S 0800A	18226	8.0	8.0	7.6	63.0	12.0	26.0	DIN 6535 HA
177S 1000A	18228	10.0	10.0	9.6	72.0	15.0	32.0	DIN 6535 HA
177S 1200A	18230	12.0	12.0	11.4	83.0	18.0	38.0	DIN 6535 HA
177S 1600A	18232	16.0	16.0	15.2	98.0	24.0	50.0	DIN 6535 HA
177S 2000A	18234	20.0	20.0	19.2	112.0	30.0	62.0	DIN 6535 HA



Tool No.	EDP	D1	D2	D3	L1	L2	L3	Shank
177S 0300AW	18254	3.0	6.0	2.9	50.0	5.0	11.0	DIN 6535 HB
177S 0400AW	18256	4.0	6.0	3.9	50.0	6.0	14.0	DIN 6535 HB
177S 0500AW	18258	5.0	6.0	4.9	57.0	8.0	17.0	DIN 6535 HB
177S 0600AW	18260	6.0	6.0	5.8	57.0	9.0	20.0	DIN 6535 HB
177S 0800AW	18262	8.0	8.0	7.6	63.0	12.0	26.0	DIN 6535 HB
177S 1000AW	18264	10.0	10.0	9.6	72.0	15.0	32.0	DIN 6535 HB
177S 1200AW	18266	12.0	12.0	11.4	83.0	18.0	38.0	DIN 6535 HB
177S 1600AW	18268	16.0	16.0	15.2	98.0	24.0	50.0	DIN 6535 HB
177S 2000AW	18270	20.0	20.0	19.2	112.0	30.0	62.0	DIN 6535 HB



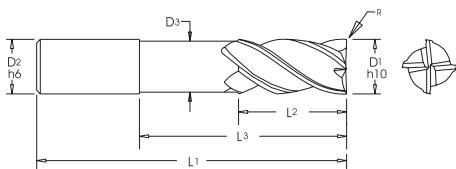
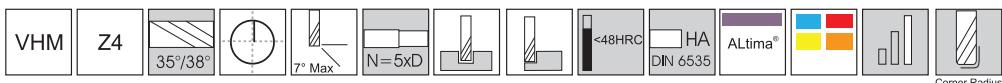
Tool No.	EDP	D1	D2	D3	L1	L2	L3	R	Shank
177S 03-0.2RA	18200	3.0	6.0	2.9	50.0	5.0	11.0	0.2	DIN 6535 HA
177S 04-0.2RA	18202	4.0	6.0	3.9	50.0	6.0	14.0	0.2	DIN 6535 HA
177S 05-0.2RA	18204	5.0	6.0	4.9	57.0	8.0	17.0	0.2	DIN 6535 HA
177S 06-0.3RA	18206	6.0	6.0	5.8	57.0	9.0	20.0	0.3	DIN 6535 HA
177S 08-0.5RA	18208	8.0	8.0	7.6	63.0	12.0	26.0	0.5	DIN 6535 HA
177S 10-0.5RA	18210	10.0	10.0	9.6	72.0	15.0	32.0	0.5	DIN 6535 HA
177S 12-0.5RA	18212	12.0	12.0	11.4	83.0	18.0	38.0	0.5	DIN 6535 HA
177S 16-1.0RA	18214	16.0	16.0	15.2	98.0	24.0	50.0	1.0	DIN 6535 HA
177S 20-1.0RA	18216	20.0	20.0	19.2	112.0	30.0	62.0	1.0	DIN 6535 HA



Tool No.	EDP	D1	D2	D3	L1	L2	L3	R	Shank
177S 03-0.2RAW	18236	3.0	6.0	2.9	50.0	5.0	11.0	0.2	DIN 6535 HB
177S 04-0.2RAW	18238	4.0	6.0	3.9	50.0	6.0	14.0	0.2	DIN 6535 HB
177S 05-0.2RAW	18240	5.0	6.0	4.9	57.0	8.0	17.0	0.2	DIN 6535 HB
177S 06-0.3RAW	18242	6.0	6.0	5.8	57.0	9.0	20.0	0.3	DIN 6535 HB
177S 08-0.5RAW	18244	8.0	8.0	7.6	63.0	12.0	26.0	0.5	DIN 6535 HB
177S 10-0.5RAW	18246	10.0	10.0	9.6	72.0	15.0	32.0	0.5	DIN 6535 HB
177S 12-0.5RAW	18248	12.0	12.0	11.4	83.0	18.0	38.0	0.5	DIN 6535 HB
177S 16-1.0RAW	18250	16.0	16.0	15.2	98.0	24.0	50.0	1.0	DIN 6535 HB
177S 20-1.0RAW	18252	20.0	20.0	19.2	112.0	30.0	62.0	1.0	DIN 6535 HB



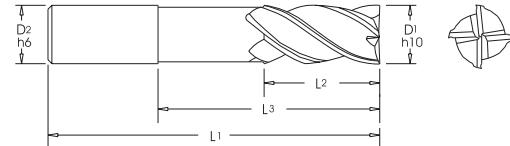
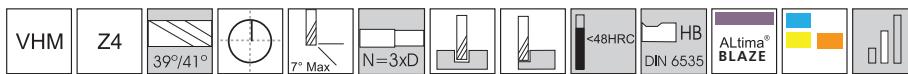
TuffCut® XR Series 177LR N5



Tool No.	EDP	D1	D2	D3	L1	L2	L3	R
177L 06N5-0.25RA	18186	6.0	6.0	5.8	101.0	12.0	30.0	0.25
177L 06N5-0.5RA	18183	6.0	6.0	5.8	101.0	12.0	30.0	0.5
177L 06N5-1.0RA	18184	6.0	6.0	5.8	101.0	12.0	30.0	1.0
177L 08N5-0.5RA	18187	8.0	8.0	7.6	101.0	16.0	40.0	0.5
177L 08N5-1.0RA	18194	8.0	8.0	7.6	101.0	16.0	40.0	1.0
177L 08N5-2.0RA	18195	8.0	8.0	7.6	101.0	16.0	40.0	2.0
177L 08N5-3.0RA	18196	8.0	8.0	7.6	101.0	16.0	40.0	3.0
177L 10N5-0.5RA	18188	10.0	10.0	9.6	127.0	20.0	50.0	0.5
177L 10N5-1.0RA	18197	10.0	10.0	9.6	127.0	20.0	50.0	1.0
177L 10N5-2.0RA	18198	10.0	10.0	9.6	127.0	20.0	50.0	2.0
177L 10N5-3.0RA	18199	10.0	10.0	9.6	127.0	20.0	50.0	3.0
177L 12N5-0.5RA	18189	12.0	12.0	11.4	152.0	24.0	60.0	0.5
177L 12N5-1.0RA	18176	12.0	12.0	11.4	152.0	24.0	60.0	1.0
177L 12N5-2.0RA	18177	12.0	12.0	11.4	152.0	24.0	60.0	2.0
177L 12N5-3.0RA	18190	12.0	12.0	11.4	152.0	24.0	60.0	3.0
177L 12N5-4.0RA	18178	12.0	12.0	11.4	152.0	24.0	60.0	4.0
177L 16N5-0.5RA	18181	16.0	16.0	15.2	152.0	32.0	80.0	0.5
177L 16N5-1.0RA	18191	16.0	16.0	15.2	152.0	32.0	80.0	1.0
177L 16N5-2.0RA	18179	16.0	16.0	15.2	152.0	32.0	80.0	2.0
177L 16N5-3.0RA	18180	16.0	16.0	15.2	152.0	32.0	80.0	3.0
177L 20N5-0.5RA	18182	20.0	20.0	19.2	152.0	40.0	100.0	0.5
177L 20N5-1.0RA	18192	20.0	20.0	19.2	152.0	40.0	100.0	1.0
177L 20N5-3.0RA	18193	20.0	20.0	19.2	152.0	40.0	100.0	3.0



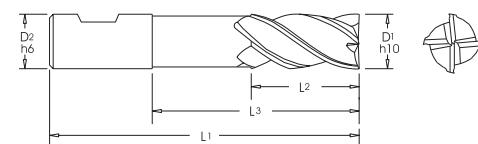
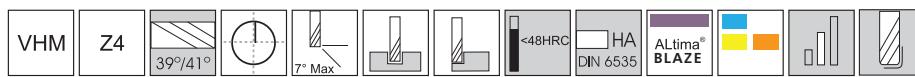
TuffCut® XT Series 277N



Tool No.	D1	D2	L1	L2	L3
277 03N3B	3	6	64	8	11
277 04N3B	4	6	64	11	14
277 05N3B	5	6	64	13	17
277 06N3B	6	6	64	13	20
277 08N3B	8	8	64	19	26
277 10N3B	10	10	73	22	32
277 12N3B	12	12	84	26	38
277 16N3B	16	16	100	32	50
277 20N3B	20	20	112	40	62



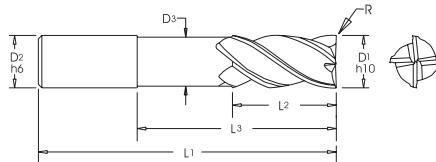
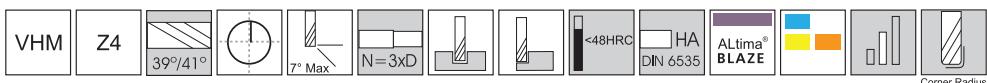
TuffCut® XT Series 277N - W



Tool No.	D1	D2	L1	L2	L3
277 08N3BW	8	8	64	19	26
277 10N3BW	10	10	73	22	32
277 12N3BW	12	12	84	26	38
277 16N3BW	16	16	100	32	50



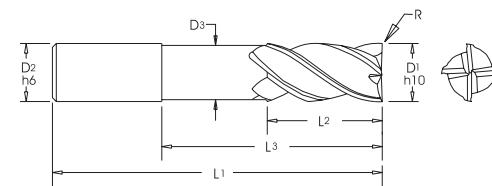
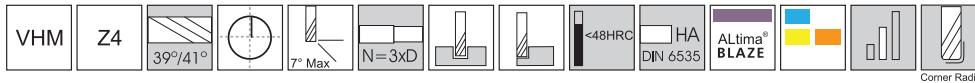
TuffCut® XT Series 277NR



Tool No.	D1	D2	D3	L1	L2	L3	R
277 03N3-0.25RB	3.0	6.0	2.9	64.0	8.0	11.0	0.25
277 03N3-0.3RB	3.0	6.0	2.9	64.0	8.0	11.0	0.3
277 03N3-0.5RB	3.0	6.0	2.9	64.0	8.0	11.0	0.5
277 04N3-0.25RB	4.0	6.0	3.9	64.0	11.0	14.0	0.25
277 04N3-0.3RB	4.0	6.0	3.9	64.0	11.0	14.0	0.3
277 04N3-0.5RB	4.0	6.0	3.9	64.0	11.0	14.0	0.5
277 05N3-0.25RB	5.0	6.0	4.9	64.0	13.0	17.0	0.25
277 05N3-0.3RB	5.0	6.0	4.9	64.0	13.0	17.0	0.3
277 05N3-0.5RB	5.0	6.0	4.9	64.0	13.0	17.0	0.5
277 06N3-0.25RB	6.0	6.0	5.9	64.0	13.0	20.0	0.25
277 06N3-0.3RB	6.0	6.0	5.9	64.0	13.0	20.0	0.3
277 06N3-0.5RB	6.0	6.0	5.9	64.0	13.0	20.0	0.5
277 06N3-1.0RB	6.0	6.0	5.9	64.0	13.0	20.0	1.0
277 06N3-1.5RB	6.0	6.0	5.9	64.0	13.0	20.0	1.5
277 06N3-2.0RB	6.0	6.0	5.9	64.0	13.0	20.0	2.0
277 08N3-0.5RB	8.0	8.0	7.8	64.0	19.0	26.0	0.5
277 08N3-0.8R8	8.0	8.0	7.8	64.0	19.0	26.0	0.8
277 08N3-1.0RB	8.0	8.0	7.8	64.0	19.0	26.0	1.0
277 08N3-1.5RB	8.0	8.0	7.8	64.0	19.0	26.0	1.5
277 08N3-2.0RB	8.0	8.0	7.8	64.0	19.0	26.0	2.0
277 08N3-3.0RB	8.0	8.0	7.8	64.0	19.0	26.0	3.0
277 10N3-0.5RB	10.0	10.0	9.8	73.0	22.0	32.0	0.5
277 10N3-0.8RB	10.0	10.0	9.8	73.0	22.0	32.0	0.8
277 10N3-1.0RB	10.0	10.0	9.8	73.0	22.0	32.0	1.0
277 10N3-1.5RB	10.0	10.0	9.8	73.0	22.0	32.0	1.5
277 10N3-2.0RB	10.0	10.0	9.8	73.0	22.0	32.0	2.0
277 10N3-3.0RB	10.0	10.0	9.8	73.0	22.0	32.0	3.0
277 12N3-0.5RB	12.0	12.0	11.4	84.0	26.0	38.0	0.5
277 12N3-0.8RB	12.0	12.0	11.4	84.0	26.0	38.0	0.8
277 12N3-1.0RB	12.0	12.0	11.4	84.0	26.0	38.0	1.0
277 12N3-1.5RB	12.0	12.0	11.4	84.0	26.0	38.0	1.5
277 12N3-2.0RB	12.0	12.0	11.4	84.0	26.0	38.0	2.0
277 12N3-2.5RB	12.0	12.0	11.4	84.0	26.0	38.0	2.5
277 12N3-3.0RB	12.0	12.0	11.4	84.0	26.0	38.0	3.0
277 12N3-4.0RB	12.0	12.0	11.4	84.0	26.0	38.0	4.0
277 16N3-0.5RB	16.0	16.0	15.2	100.0	32.0	50.0	0.5
277 16N3-0.8RB	16.0	16.0	15.2	100.0	32.0	50.0	0.8
277 16N3-1.0RB	16.0	16.0	15.2	100.0	32.0	50.0	1.0
277 16N3-1.5RB	16.0	16.0	15.2	100.0	32.0	50.0	1.5
277 16N3-2.0RB	16.0	16.0	15.2	100.0	32.0	50.0	2.0
277 16N3-3.0RB	16.0	16.0	15.2	100.0	32.0	50.0	3.0



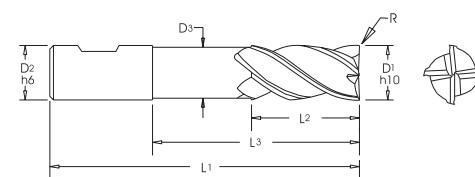
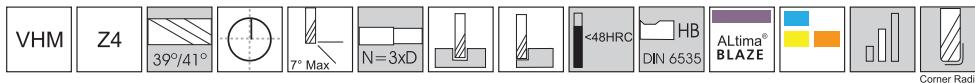
TuffCut® XT Series 277NR



Tool No.	D1	D2	D3	L1	L2	L3	R
277 16N3-4.0RB	16.0	16.0	15.2	100.0	32.0	50.0	4.0
277 20N3-0.8RB	20.0	20.0	19.2	112.0	40.0	62.0	0.8
277 20N3-1.0RB	20.0	20.0	19.2	112.0	40.0	62.0	1.0
277 20N3-1.5RB	20.0	20.0	19.2	112.0	40.0	62.0	1.5
277 20N3-2.0RB	20.0	20.0	19.2	112.0	40.0	62.0	2.0
277 20N3-3.0RB	20.0	20.0	19.2	112.0	40.0	62.0	3.0
277 20N3-4.0RB	20.0	20.0	19.2	112.0	40.0	62.0	4.0
277 20N3-5.0RB	20.0	20.0	19.2	112.0	40.0	62.0	5.0
277 20N3-6.0RB	20.0	20.0	19.2	112.0	40.0	62.0	6.0

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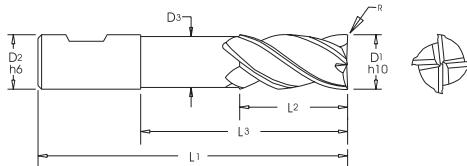
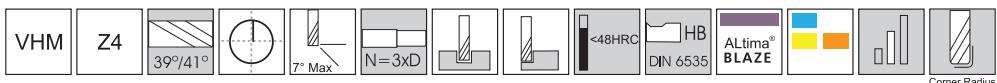
TuffCut® XT Series 277NR-W



Tool No.	D1	D2	D3	L1	L2	L3	R
277 08N3-0.5RBW	8.0	8.0	7.8	64.0	19.0	26.0	0.5
277 08N3-1.0RBW	8.0	8.0	7.8	64.0	19.0	26.0	1.0
277 08N3-1.5RBW	8.0	8.0	7.8	64.0	19.0	26.0	1.5
277 08N3-2.0RBW	8.0	8.0	7.8	64.0	19.0	26.0	2.0
277 08N3-3.0RBW	8.0	8.0	7.8	64.0	19.0	26.0	3.0
277 10N3-0.5RBW	10.0	10.0	9.8	73.0	22.0	32.0	0.5
277 10N3-1.0RBW	10.0	10.0	9.8	73.0	22.0	32.0	1.0
277 10N3-1.5RBW	10.0	10.0	9.8	73.0	22.0	32.0	1.5
277 10N3-2.0RBW	10.0	10.0	9.8	73.0	22.0	32.0	2.0
277 10N3-3.0RBW	10.0	10.0	9.8	73.0	22.0	32.0	3.0
277 12N3-0.5RBW	12.0	12.0	11.4	84.0	26.0	38.0	0.5
277 12N3-1.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	1.0
277 12N3-1.5RBW	12.0	12.0	11.4	84.0	26.0	38.0	1.5
277 12N3-2.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	2.0
277 12N3-2.5RBW	12.0	12.0	11.4	84.0	26.0	38.0	2.5
277 12N3-3.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	3.0

P61

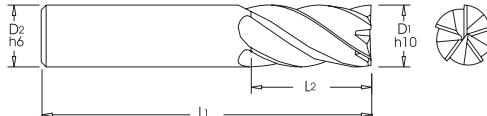
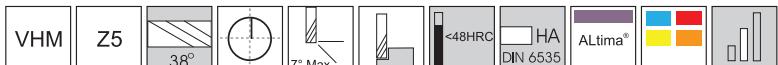
TuffCut® XT Series 277NR-W



Tool No.	D1	D2	D3	L1	L2	L3	R
277 12N3-4.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	4.0
277 16N3-0.5RBW	16.0	16.0	15.2	100.0	32.0	50.0	0.5
277 16N3-1.0RBW	16.0	16.0	15.2	100.0	32.0	50.0	1.0
277 16N3-1.5RBW	16.0	16.0	15.2	100.0	32.0	50.0	1.5
277 16N3-2.0RBW	16.0	16.0	15.2	100.0	32.0	50.0	2.0
277 16N3-3.0RBW	16.0	16.0	15.2	100.0	32.0	50.0	3.0
277 16N3-4.0RBW	16.0	16.0	15.2	100.0	32.0	50.0	4.0
277 20N3-1.0RBW	20.0	20.0	19.2	112.0	40.0	62.0	1.0
277 20N3-1.5RBW	20.0	20.0	19.2	112.0	40.0	62.0	1.5
277 20N3-2.0RBW	20.0	20.0	19.2	112.0	40.0	62.0	2.0
277 20N3-3.0RBW	20.0	20.0	19.2	112.0	40.0	62.0	3.0
277 20N3-4.0RBW	20.0	20.0	19.2	112.0	40.0	62.0	4.0
277 20N3-5.0RBW	20.0	20.0	19.2	112.0	40.0	62.0	5.0
277 20N3-6.0RBW	20.0	20.0	19.2	112.0	40.0	62.0	6.0



TuffCut® XR Series 178



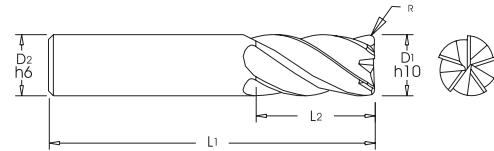
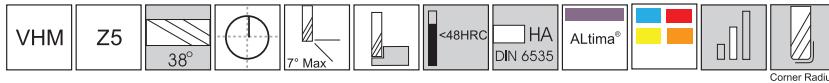
Tool No.	EDP	D1	D2	L1	L2
178 0300A	17959	3.0	6.0	57.0	8.0
178 0400A	17961	4.0	6.0	57.0	11.0
178 0500A	17963	5.0	6.0	57.0	13.0
178 0600A	17965	6.0	6.0	57.0	13.0
178 0800A	17968	8.0	8.0	63.0	19.0
178 1000A	17971	10.0	10.0	72.0	22.0
178 1200A	17974	12.0	12.0	83.0	26.0
178 1400A	17977	14.0	14.0	83.0	26.0
178 1600A	17981	16.0	16.0	92.0	32.0
178 1800A	17983	18.0	18.0	92.0	32.0
178 2000A	17986	20.0	20.0	104.0	38.0
178 2500A	17988	25.0	25.0	104.0	38.0





ADVANCED PRODUCT GROUP
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Schaftfräser
Frese a Candela
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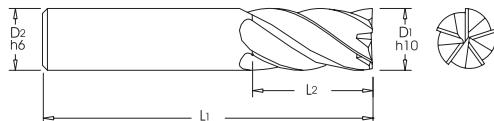
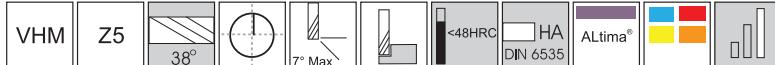
TuffCut® XR Series 178R



Tool No.	EDP	D1	D2	L1	L2	R
178 0600-0.50RA	17966	6.0	6.0	57.0	13.0	0.5
178 0800-0.50RA	17969	8.0	8.0	63.0	19.0	0.5
178 1000-0.50RA	17972	10.0	10.0	72.0	22.0	0.5
178 1200-0.75RA	17975	12.0	12.0	83.0	26.0	0.75
178 1400-0.75RA	17978	14.0	14.0	83.0	26.0	0.75
178 1600-1.0RA	17982	16.0	16.0	92.0	32.0	1.0
178 1800-1.0RA	17984	18.0	18.0	92.0	32.0	1.0
178 2000-1.0RA	17987	20.0	20.0	104.0	38.0	1.0
178 2500-1.0RA	17989	25.0	25.0	104.0	38.0	1.0

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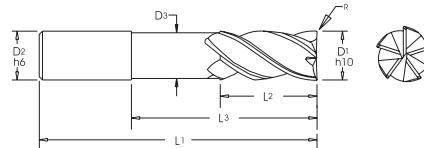
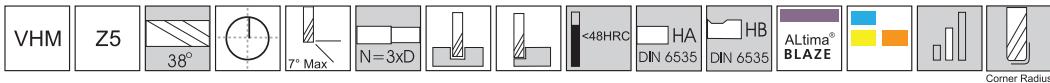
TuffCut® XR Series 178-1



Tool No.	EDP	D1	D2	L1	L2
178 0300-1A	17998	3.0	3.0	75.0	25.0
178 0400-1A	17999	4.0	4.0	75.0	25.0
178 0500-1A	18026	5.0	5.0	75.0	25.0
178 0600-1A	18027	6.0	6.0	75.0	25.0
178 0800-1A	18028	8.0	8.0	75.0	30.0
178 1000-1A	18029	10.0	10.0	100.0	45.0
178 1200-1A	18030	12.0	12.0	150.0	75.0
178 1600-1A	18031	16.0	16.0	150.0	75.0
178 2000-1A	18032	20.0	20.0	150.0	75.0

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TuffCut® XT Series 278R N3

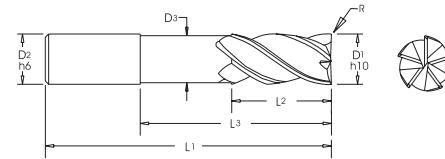
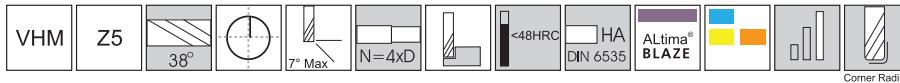


Tool No.	D1	D2	D3	L1	L2	L3	R
278 0300N3-0.25RB	3.0	6.0	2.9	57.0	8.0	10.0	0.25
278 0300N3-0.5RB	3.0	6.0	2.9	57.0	8.0	10.0	0.5
278 0400N3-0.25RB	4.0	6.0	3.9	57.0	11.0	13.0	0.25
278 0400N3-0.5RB	4.0	6.0	3.9	57.0	11.0	13.0	0.5
278 0500N3-0.25RB	5.0	6.0	4.9	57.0	13.0	16.0	0.25
278 0500N3-0.5RB	5.0	6.0	4.9	57.0	13.0	16.0	0.5
278 0600N3-0.25RB	6.0	6.0	5.9	57.0	13.0	19.0	0.25
278 0600N3-0.5RB	6.0	6.0	5.9	57.0	13.0	19.0	0.5
278 0600N3-1.0RB	6.0	6.0	5.9	57.0	13.0	19.0	1.0
278 0800N3-0.25RB	8.0	8.0	7.8	63.0	19.0	25.0	0.25
278 0800N3-0.5RB	8.0	8.0	7.8	63.0	19.0	25.0	0.5
278 0800N3-1.0RB	8.0	8.0	7.8	63.0	19.0	25.0	1.0
278 0800N3-1.5RB	8.0	8.0	7.8	63.0	19.0	25.0	1.5
278 0800N3-2.0RB	8.0	8.0	7.8	63.0	19.0	25.0	2.0
278 1000N3-0.5RB	10.0	10.0	9.8	72.0	22.0	31.0	0.5
278 1000N3-1.0RB	10.0	10.0	9.8	72.0	22.0	31.0	1.0
278 1000N3-2.0RB	10.0	10.0	9.8	72.0	22.0	31.0	2.0
278 1200N3-0.5RB	12.0	12.0	11.4	84.0	26.0	38.0	0.5
*278 1200N3-0.5RBW	12.0	12.0	11.4	84.0	26.0	38.0	0.5
278 1200N3-1.0RB	12.0	12.0	11.4	84.0	26.0	38.0	1.0
*278 1200N3-1.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	1.0
278 1200N3-1.5RB	12.0	12.0	11.4	84.0	26.0	38.0	1.5
278 1200N3-2.0RB	12.0	12.0	11.4	84.0	26.0	38.0	2.0
278 1200N3-2.5RB	12.0	12.0	11.4	84.0	26.0	38.0	2.5
278 1200N3-3.0RB	12.0	12.0	11.4	84.0	26.0	38.0	3.0
278 1200N3-4.0RB	12.0	12.0	11.4	84.0	26.0	38.0	4.0
278 1600N3-0.5RB	16.0	16.0	15.2	100.0	35.0	50.0	0.5
*278 1600N3-0.5RBW	16.0	16.0	15.2	100.0	35.0	50.0	0.5
278 1600N3-1.0RB	16.0	16.0	15.2	100.0	35.0	50.0	1.0
*278 1600N3-1.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	1.0
278 1600N3-1.5RB	16.0	16.0	15.2	100.0	35.0	50.0	1.5
*278 1600N3-1.5RBW	16.0	16.0	15.2	100.0	35.0	50.0	1.5
278 1600N3-2.5RB	16.0	16.0	15.2	100.0	35.0	50.0	2.5
278 1600N3-3.0RB	16.0	16.0	15.2	100.0	35.0	50.0	3.0
*278 1600N3-3.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	3.0
278 1600N3-4.0RB	16.0	16.0	15.2	100.0	35.0	50.0	4.0
*278 1600N3-4.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	4.0
278 2000N3-1.0RB	20.0	20.0	19.2	112.0	40.0	62.0	1.0
278 2000N3-2.0RB	20.0	20.0	19.2	112.0	40.0	62.0	2.0
278 2000N3-3.0RB	20.0	20.0	19.2	112.0	40.0	62.0	3.0
278 2000N3-4.0RB	20.0	20.0	19.2	112.0	40.0	62.0	4.0
278 2500N3-1.0RB	25.0	25.0	24.6	127.0	40.0	77.0	1.0
278 2500N3-3.0RB	25.0	25.0	24.6	127.0	40.0	77.0	3.0
278 2500N3-4.0RB	25.0	25.0	24.6	127.0	40.0	77.0	4.0

* - Weldon Shank.



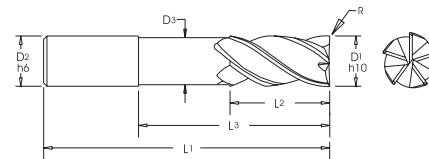
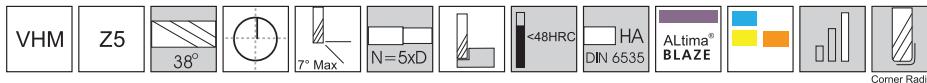
TuffCut® XT Series 278R N4



Tool No.	D1	D2	D3	L1	L2	L3	R
278 1200N4-0.5RB	12.0	12.0	11.4	100.0	18.0	50.0	0.5
278 1200N4-1.0RB	12.0	12.0	11.4	100.0	18.0	50.0	1.0
278 1200N4-1.5RB	12.0	12.0	11.4	100.0	18.0	50.0	1.5
278 1200N4-2.0RB	12.0	12.0	11.4	100.0	18.0	50.0	2.0
278 1200N4-3.0RB	12.0	12.0	11.4	100.0	18.0	50.0	3.0
278 1200N4-4.0RB	12.0	12.0	11.4	100.0	18.0	50.0	4.0
278 1600N4-1.0RB	16.0	16.0	15.2	120.0	35.0	65.0	1.0
278 1600N4-3.0RB	16.0	16.0	15.2	120.0	35.0	65.0	3.0
278 2000N4-1.0RB	20.0	20.0	19.2	133.0	40.0	82.0	1.0
278 2000N4-3.0RB	20.0	20.0	19.2	133.0	40.0	82.0	3.0
278 2500N4-1.0RB	25.0	25.0	24.6	152.0	40.0	102.0	1.0
278 2500N4-3.0RB	25.0	25.0	24.6	152.0	40.0	102.0	3.0



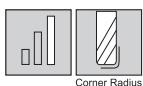
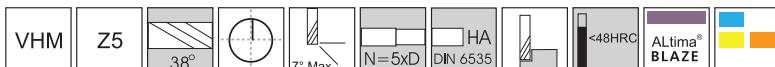
TuffCut® XT Series 278R N5



Tool No.	D1	D2	D3	L1	L2	L3	R
278 1600N5-1.0RB	16.0	16.0	15.2	133	35.0	82.0	1.0
278 1600N5-3.0RB	16.0	16.0	15.2	133	35.0	82.0	3.0
278 2000N5-1.0RB	20.0	20.0	19.2	152	40.0	102.0	1.0
278 2000N5-3.0RB	20.0	20.0	19.2	152	40.0	102.0	3.0
278 2500N5-1.0RB	25.0	25.0	24.6	180	40.0	125.0	1.0
278 2500N5-3.0RB	25.0	25.0	24.6	180	40.0	125.0	3.0



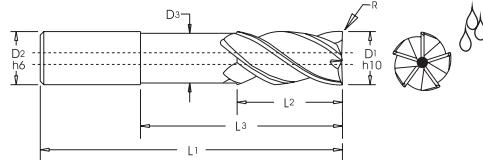
TuffCut® XT Series 278R N5CT With Central Coolant



Corner Radius



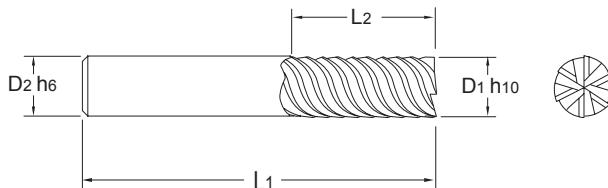
Avec Arrosage au centre | Mit zentralem Kühlmittelkanal
Con lubrificación central | Z centralnym chłodzeniem



Tool No.	D1	D2	D3	L1	L2	L3	R
278 1200N5-0.5RBCT	12.0	12.0	11.4	110.0	18.0	62.0	0.5
278 1200N5-1.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	1.0
278 1200N5-1.5RBCT	12.0	12.0	11.4	110.0	18.0	62.0	1.5
278 1200N5-2.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	2.0
278 1200N5-3.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	3.0
278 1200N5-4.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	4.0



TuffCut® XR Series 113A

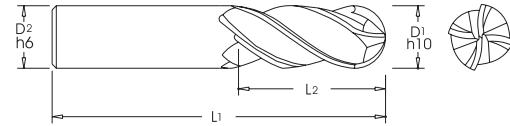
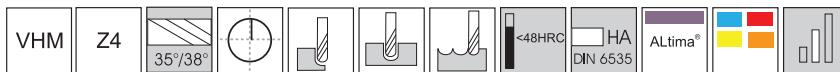


Tool No.	EDP	D1	D2	L1	L2
113 0300A	11384	3.0	3.0	38.0	12.0
113 0400A	11385	4.0	4.0	51.0	14.0
113 0500A	11386	5.0	5.0	51.0	20.0
113 0600A	11387	6.0	6.0	64.0	20.0
113 0800A	11388	8.0	8.0	64.0	20.0
113 1000A	11389	10.0	10.0	70.0	25.0
113 1200A	11390	12.0	12.0	76.0	25.0
113 1600A	11391	16.0	16.0	89.0	30.0
113 2000A	11392	20.0	20.0	102.0	38.0





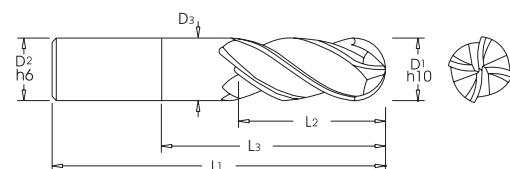
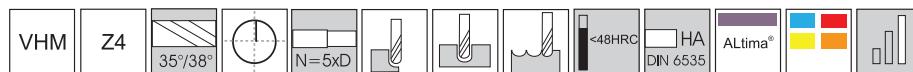
TuffCut® XR Series 179



Tool No.	EDP	D1	D2	L1	L2
179 0150A	18272	1.5	3.0	38.0	3.0
179 0200A	18274	2.0	3.0	38.0	4.0
179 0250A	18276	2.5	3.0	38.0	5.0
179 0300A	18018	3.0	6.0	57.0	8.0
179 0303A	18278	3.0	3.0	38.0	6.0
179 0350A	18280	3.5	6.0	57.0	7.0
179 0400A	18019	4.0	6.0	57.0	11.0
179 0450A	18282	4.5	6.0	57.0	9.0
179 0500A	18020	5.0	6.0	57.0	13.0
179 0600A	18021	6.0	6.0	57.0	13.0
179 0800A	18022	8.0	8.0	63.0	19.0
179 1000A	18023	10.0	10.0	72.0	22.0
179 1200A	18024	12.0	12.0	83.0	26.0
179 1600A	18059	16.0	16.0	92.0	32.0



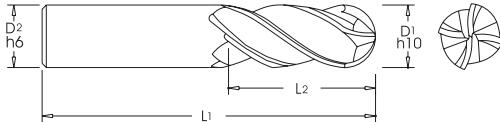
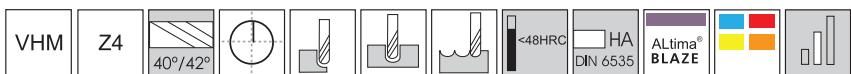
TuffCut® XR Series 179L N5



Tool No.	EDP	D1	D2	D3	L1	L2	L3
179L 03N5A	18290	3.0	6.0	2.9	75.0	4.5	17.0
179L 04N5A	18292	4.0	6.0	3.9	75.0	6.0	22.0
179L 05N5A	18294	5.0	6.0	4.9	75.0	7.5	27.0
179L 06N5A	18296	6.0	6.0	5.8	101.0	9.0	32.0
179L 08N5A	18298	8.0	8.0	7.6	101.0	12.0	42.0
179L 10N5A	18302	10.0	10.0	9.6	127.0	15.0	52.0
179L 12N5A	18304	12.0	12.0	11.4	152.0	18.0	62.0
179L 16N5A	18306	16.0	16.0	15.2	152.0	24.0	82.0



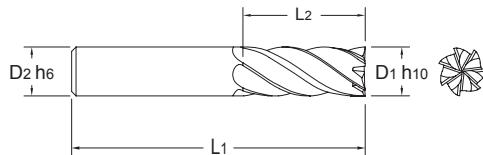
TuffCut® XT Series 279



Tool Number	D1	D2	L1	L2
279 0300B	3.0	6.0	57.0	8.0
279 0400B	4.0	6.0	57.0	11.0
279 0500B	5.0	6.0	57.0	13.0
279 0600B	6.0	6.0	57.0	13.0
279 0800B	8.0	8.0	63.0	19.0
279 1000B	10.0	10.0	72.0	22.0
279 1200B	12.0	12.0	83.0	26.0
279 1600B	16.0	16.0	92.0	32.0



TuffCut® XR7 Series 180

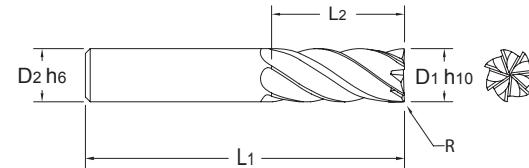
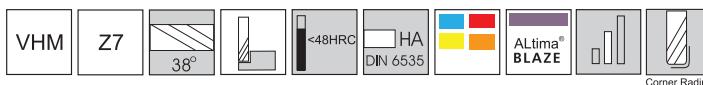


Tool Number	EDP	D1	D2	L1	L2
180 0600B	18936	6.0	6.0	57.0	13.0
180 0800B	18944	8.0	8.0	63.0	19.0
180 1000B	18940	10.0	10.0	72.0	22.0



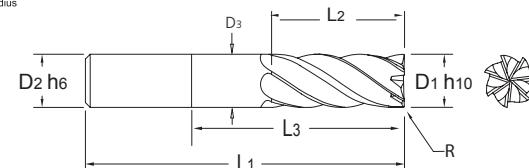
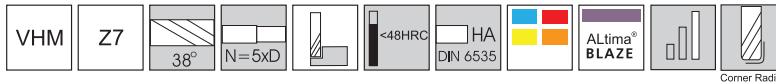


TuffCut® XR7 Series 180R



Tool Number	EDP	D1	D2	L1	L2	R
180 0600-0.5RB	18938	6.0	6.0	57.0	13.0	0.5
180 0800-0.5RB	18946	8.0	8.0	63.0	19.0	0.5
180 1000-0.5RB	18942	10.0	10.0	72.0	22.0	0.5
180 1200-0.5RB	18501	12.0	12.0	84.0	32.0	0.5
180 1200-1.0RB	18503	12.0	12.0	84.0	32.0	1.0
180 1200-2.0RB	18505	12.0	12.0	84.0	32.0	2.0
180 1200-3.0RB	18507	12.0	12.0	84.0	32.0	3.0
180 1200-4.0RB	18508	12.0	12.0	84.0	32.0	4.0
180 1600-0.5RB	18509	16.0	16.0	92.0	42.0	0.5
180 1600-1.0RB	18510	16.0	16.0	92.0	42.0	1.0
180 1600-2.0RB	18511	16.0	16.0	92.0	42.0	2.0
180 1600-3.0RB	18513	16.0	16.0	92.0	42.0	3.0
180 1600-4.0RB	18527	16.0	16.0	92.0	42.0	4.0
180 2000-0.5RB	18528	20.0	20.0	102.0	52.0	0.5
180 2000-1.0RB	18529	20.0	20.0	102.0	52.0	1.0
180 2000-2.0RB	18530	20.0	20.0	102.0	52.0	2.0
180 2000-3.0RB	18531	20.0	20.0	102.0	52.0	3.0
180 2000-4.0RB	18533	20.0	20.0	102.0	52.0	4.0

TuffCut® XR7 Series 180R N5

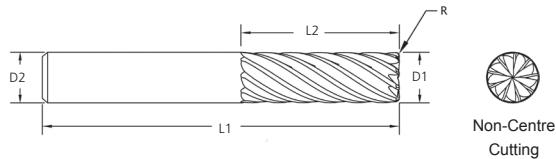
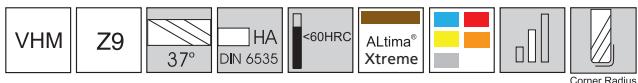


Tool No.	EDP	D1	D2	D3	L1	L2	L3	R
180 1200N5-1.0RB	18500	12.0	12.0	11.4	120.0	30.0	60.0	1.0
180 1200N5-2.0RB	18502	12.0	12.0	11.4	120.0	30.0	60.0	2.0
180 1200N5-3.0RB	18504	12.0	12.0	11.4	120.0	30.0	60.0	3.0
180 1200N5-4.0RB	18506	12.0	12.0	11.4	120.0	30.0	60.0	4.0
180 1600N5-1.0RB	18548	16.0	16.0	15.2	150.0	40.0	80.0	1.0
180 1600N5-2.0RB	18550	16.0	16.0	15.2	150.0	40.0	80.0	2.0
180 1600N5-3.0RB	18552	16.0	16.0	15.2	150.0	40.0	80.0	3.0
180 1600N5-4.0RB	18554	16.0	16.0	15.2	150.0	40.0	80.0	4.0
180 2000N5-1.0RB	18590	20.0	20.0	19.2	150.0	50.0	100.0	1.0
180 2000N5-2.0RB	18592	20.0	20.0	19.2	150.0	50.0	100.0	2.0
180 2000N5-3.0RB	18594	20.0	20.0	19.2	150.0	50.0	100.0	3.0
180 2000N5-4.0RB	18596	20.0	20.0	19.2	150.0	50.0	100.0	4.0



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TuffCut® XT9 Series 380



new items

Tool Number	D1	D2 (h6)	L1	L2	R
380M 0800-0.5RAX	8.0	8.0	63.0	22.0	0.5
380M 0800-0.8RAX	8.0	8.0	63.0	22.0	0.8
380M 0800-1.0RAX	8.0	8.0	63.0	22.0	1.0
380M 0800-2.0RAX	8.0	8.0	63.0	22.0	2.0
380M 1000-0.5RAX	10.0	10.0	72.0	27.0	0.5
380M 1000-1.0RAX	10.0	10.0	72.0	27.0	1.0
380M 1000-2.0RAX	10.0	10.0	72.0	27.0	2.0
380M 1200-0.5RAX	12.0	12.0	81.0	32.0	0.5
380M 1200-1.0RAX	12.0	12.0	81.0	32.0	1.0
380M 1200-2.0RAX	12.0	12.0	81.0	32.0	2.0
380M 1200-3.0RAX	12.0	12.0	81.0	32.0	3.0
380M 1600-0.5RAX	16.0	16.0	92.0	42.0	0.5
380M 1600-1.0RAX	16.0	16.0	92.0	42.0	1.0
380M 1600-2.0RAX	16.0	16.0	92.0	42.0	2.0
380M 1600-3.0RAX	16.0	16.0	92.0	42.0	3.0
380M 1600-4.0RAX	16.0	16.0	92.0	42.0	4.0
380M 2000-0.5RAX	20.0	20.0	104.0	52.0	0.5
380M 2000-1.0RAX	20.0	20.0	104.0	52.0	1.0

ALtima® Xtreme Coating Properties	
Microhardness (HV)	3800
Max. Service Temp.	1100° C / 2012° F
Friction Coefficient	0.3 - 0.5
Designation	AX
Colour	Copper

P60



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Tel: +44 (0) 1332 267960

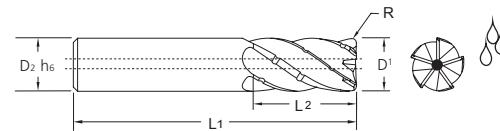
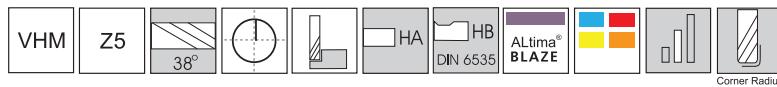


Email: sales@mafordeurope.com



TuffCut® XT Series V5LCB - CT With Central Coolant

Avec Arrosage au centre | Mit zentralem Kühlmittelkanal
Con lubrificazione centrale | Z centralnym chłodzeniem

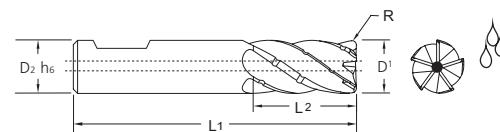


3 x D Cutting Length

Cylindrical Shank (HA)

Queue cylindrique (HA) | Zylinderschaft (HA) | Gambo cilindrico (HA) | Chwyt cylindryczny (HA)

Tool Number	D1	D2	L1	L2	R
V5LCB 0603-0.5RB-CT	6.0	6.0	64.0	18.0	0.5
V5LCB 0803-0.5RB-CT	8.0	8.0	70.0	24.0	0.5
V5LCB 1003-0.5RB-CT	10.0	10.0	80.0	30.0	0.5
V5LCB 1203-0.5RB-CT	12.0	12.0	84.0	36.0	0.5
V5LCB 1603-0.5RB-CT	16.0	16.0	110.0	48.0	0.5



3 x D Cutting Length

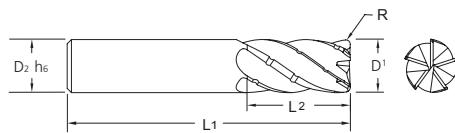
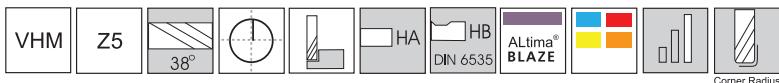
Weldon Shank (HB)

Queue weldon (HB) | Weldon-Schaft (HB) | Gambo Weldon (HB) | Chwyt Weldon (HB)

Tool Number	D1	D2	L1	L2	R
V5LCB 0803-0.5RBW-CT	8.0	8.0	70.0	24.0	0.5
V5LCB 1003-0.5RBW-CT	10.0	10.0	80.0	30.0	0.5
V5LCB 1203-0.5RBW-CT	12.0	12.0	84.0	36.0	0.5
V5LCB 1603-0.5RBW-CT	16.0	16.0	110.0	48.0	0.5



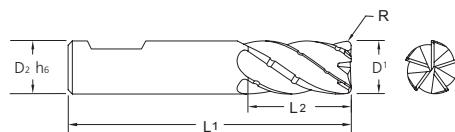
TuffCut® XT Series V5LCB



4 x D Cutting Length

Cylindrical Shank (HA) | Queue cylindrique (HA) | Zylinderschaft (HA) | Gambo cilindrico (HA) | Chwyt cylindryczny (HA)

Tool Number	D1	D2	L1	L2	R
V5LCB 0604-0.5RB	6.0	6.0	75.0	24.0	0.5
V5LCB 0804-0.5RB	8.0	8.0	75.0	32.0	0.5
V5LCB 1004-0.5RB	10.0	10.0	90.0	40.0	0.5
V5LCB 1204-0.5RB	12.0	12.0	100.0	48.0	0.5
V5LCB 1604-0.5RB	16.0	16.0	120.0	64.0	0.5



4 x D Cutting Length

Weldon Shank (HB) | Queue weldon (HB) | Weldon-Schaft (HB) | Gambo Weldon (HB) | Chwyt Weldon (HB)

Tool Number	D1	D2	L1	L2	R
V5LCB 0804-0.5RBW	8.0	8.0	75.0	32.0	0.5
V5LCB 1004-0.5RBW	10.0	10.0	90.0	40.0	0.5
V5LCB 1204-0.5RBW	12.0	12.0	100.0	48.0	0.5
V5LCB 1604-0.5RBW	16.0	16.0	120.0	64.0	0.5



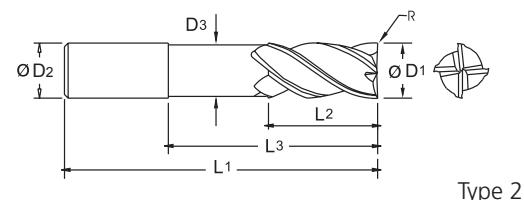
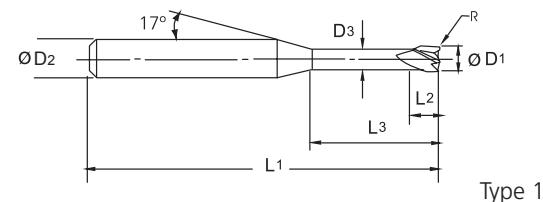


APG
ADVANCED PRODUCT GROUP
End Mills
Fraise en bout
Schaftfräser
Frese a Candela
Frez

TuffCut® Series 158 Corner Radius - High Feed Roughing



Diameter	Diameter Tolerance	CR Tolerance	Shank Ø Tolerance
Ø2.0 - Ø16	+0 / -0.02	-0.02 / +0.02	h6



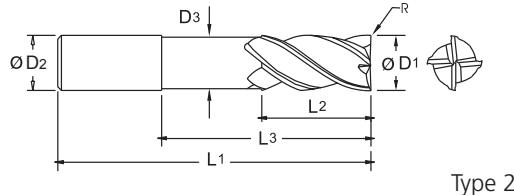
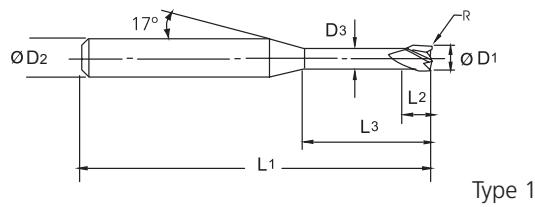
Tool No.	D1	D2	D3	L1	L2	L3	R	Type
158 02N08-0.5RA	2.0	6.0	1.9	63.0	3.0	8.0	R0.5	1
158 03N10-0.8RA	3.0	6.0	2.9	63.0	5.0	10.0	R0.8	1
158 04N12-1.0RA	4.0	6.0	3.9	63.0	6.0	12.0	R1.0	1
158 06N20-1.5RA	6.0	6.0	5.8	75.0	9.0	20.0	R1.5	2
158 06N30-1.5RA	6.0	6.0	5.8	100.0	9.0	30.0	R1.5	2
158 08N30-2.0RA	8.0	8.0	7.6	75.0	12.0	30.0	R2.0	2
158 08N40-2.0RA	8.0	8.0	7.6	100.0	12.0	40.0	R2.0	2
158 08N50-2.0RA	8.0	8.0	7.6	120.0	12.0	50.0	R2.0	2
158 10N30-2.0RA	10.0	10.0	9.6	75.0	15.0	30.0	R2.0	2
158 10N50-2.0RA	10.0	10.0	9.6	100.0	15.0	50.0	R2.0	2
158 10N60-2.0RA	10.0	10.0	9.6	130.0	15.0	60.0	R2.0	2
158 12N40-2.0RA	12.0	12.0	11.4	100.0	18.0	40.0	R2.0	2
158 12N60-2.0RA	12.0	12.0	11.4	140.0	18.0	60.0	R2.0	2
158 16N50-3.0RA	16.0	16.0	15.2	100.0	24.0	50.0	R3.0	2
158 16N70-3.0RA	16.0	16.0	15.2	150.0	24.0	70.0	R3.0	2



TuffCut® Series 158 Corner Radius



Diameter	Diameter Tolerance	CR Tolerance	Shank Ø Tolerance
Ø2.0 - Ø16	+0 / -0.02	-0.02 / +0.02	h6



Tool No.	D1	D2	D3	L1	L2	L3	R	Type
158 02N06-0.1RA	2.0	6.0	1.9	63.0	3.0	6.0	R0.1	1
158 02N08-0.1RA	2.0	6.0	1.9	63.0	3.0	8.0	R0.1	1
158 02N12-0.1RA	2.0	6.0	1.9	63.0	3.0	12.0	R0.1	1
158 02N16-0.1RA	2.0	6.0	1.9	63.0	3.0	16.0	R0.1	1
158 02N20-0.1RA	2.0	6.0	1.9	75.0	3.0	20.0	R0.1	1
158 02N06-0.2RA	2.0	6.0	1.9	63.0	3.0	6.0	R0.2	1
158 02N08-0.2RA	2.0	6.0	1.9	63.0	3.0	8.0	R0.2	1
158 02N12-0.2RA	2.0	6.0	1.9	63.0	3.0	12.0	R0.2	1
158 02N16-0.2RA	2.0	6.0	1.9	63.0	3.0	16.0	R0.2	1
158 02N20-0.2RA	2.0	6.0	1.9	75.0	3.0	20.0	R0.2	1
158 03N10-0.2RA	3.0	6.0	2.9	63.0	5.0	10.0	R0.2	1
158 03N12-0.2RA	3.0	6.0	2.9	63.0	5.0	12.0	R0.2	1
158 03N16-0.2RA	3.0	6.0	2.9	63.0	5.0	16.0	R0.2	1
158 03N20-0.2RA	3.0	6.0	2.9	75.0	5.0	20.0	R0.2	1
158 03N25-0.2RA	3.0	6.0	2.9	75.0	5.0	25.0	R0.2	1
158 03N30-0.2RA	3.0	6.0	2.9	75.0	5.0	30.0	R0.2	1
158 03N10-0.5RA	3.0	6.0	2.9	63.0	5.0	10.0	R0.5	1
158 03N12-0.5RA	3.0	6.0	2.9	63.0	5.0	12.0	R0.5	1
158 03N16-0.5RA	3.0	6.0	2.9	63.0	5.0	16.0	R0.5	1
158 03N20-0.5RA	3.0	6.0	2.9	75.0	5.0	20.0	R0.5	1
158 03N25-0.5RA	3.0	6.0	2.9	75.0	5.0	25.0	R0.5	1
158 03N30-0.5RA	3.0	6.0	2.9	75.0	5.0	30.0	R0.5	1





TuffCut® Series 158 Corner Radius

Tool No.	D1	D2	D3	L1	L2	L3	R	Type
158 04N10-0.2RA	4.0	6.0	3.9	63.0	6.0	10.0	R0.2	1
158 04N12-0.2RA	4.0	6.0	3.9	63.0	6.0	12.0	R0.2	1
158 04N16-0.2RA	4.0	6.0	3.9	63.0	6.0	16.0	R0.2	1
158 04N20-0.2RA	4.0	6.0	3.9	75.0	6.0	20.0	R0.2	1
158 04N25-0.2RA	4.0	6.0	3.9	75.0	6.0	25.0	R0.2	1
158 04N30-0.2RA	4.0	6.0	3.9	75.0	6.0	30.0	R0.2	1
158 04N10-0.5RA	4.0	6.0	3.9	63.0	6.0	10.0	R0.5	1
158 04N12-0.5RA	4.0	6.0	3.9	63.0	6.0	12.0	R0.5	1
158 04N16-0.5RA	4.0	6.0	3.9	63.0	6.0	16.0	R0.5	1
158 04N20-0.5RA	4.0	6.0	3.9	75.0	6.0	20.0	R0.5	1
158 04N25-0.5RA	4.0	6.0	3.9	75.0	6.0	25.0	R0.5	1
158 04N30-0.5RA	4.0	6.0	3.9	75.0	6.0	30.0	R0.5	1
158 06N20-0.3RA	6.0	6.0	5.8	75.0	9.0	20.0	R0.3	2
158 06N20-0.5RA	6.0	6.0	5.8	75.0	9.0	20.0	R0.5	2
158 06N20-1.0RA	6.0	6.0	5.8	75.0	9.0	20.0	R1.0	2
158 06N30-0.3RA	6.0	6.0	5.8	100.0	9.0	30.0	R0.3	2
158 06N30-0.5RA	6.0	6.0	5.8	100.0	9.0	30.0	R0.5	2
158 06N30-1.0RA	6.0	6.0	5.8	100.0	9.0	30.0	R1.0	2
158 08N30-0.3RA	8.0	8.0	7.6	75.0	12.0	30.0	R0.3	2
158 08N30-0.5RA	8.0	8.0	7.6	75.0	12.0	30.0	R0.5	2
158 08N30-1.0RA	8.0	8.0	7.6	75.0	12.0	30.0	R1.0	2
158 08N40-0.3RA	8.0	8.0	7.6	100.0	12.0	40.0	R0.3	2
158 08N40-0.5RA	8.0	8.0	7.6	100.0	12.0	40.0	R0.5	2
158 08N40-1.0RA	8.0	8.0	7.6	100.0	12.0	40.0	R1.0	2
158 08N50-0.3RA	8.0	8.0	7.6	120.0	12.0	50.0	R0.3	2
158 08N50-0.5RA	8.0	8.0	7.6	120.0	12.0	50.0	R0.5	2
158 08N50-1.0RA	8.0	8.0	7.6	120.0	12.0	50.0	R1.0	2
158 10N30-0.3RA	10.0	10.0	9.6	75.0	15.0	30.0	R0.3	2
158 10N30-0.5RA	10.0	10.0	9.6	75.0	15.0	30.0	R0.5	2
158 10N30-1.0RA	10.0	10.0	9.6	75.0	15.0	30.0	R1.0	2
158 10N50-0.3RA	10.0	10.0	9.6	100.0	15.0	50.0	R0.3	2
158 10N50-0.5RA	10.0	10.0	9.6	100.0	15.0	50.0	R0.5	2
158 10N50-1.0RA	10.0	10.0	9.6	100.0	15.0	50.0	R1.0	2
158 10N60-0.3RA	10.0	10.0	9.6	130.0	15.0	60.0	R0.3	2
158 10N60-0.5RA	10.0	10.0	9.6	130.0	15.0	60.0	R0.5	2
158 10N60-1.0RA	10.0	10.0	9.6	130.0	15.0	60.0	R1.0	2
158 12N40-0.3RA	12.0	12.0	11.4	100.0	18.0	40.0	R0.3	2
158 12N40-1.0RA	12.0	12.0	11.4	100.0	18.0	40.0	R1.0	2
158 12N60-0.3RA	12.0	12.0	11.4	140.0	18.0	60.0	R0.3	2
158 12N60-1.0RA	12.0	12.0	11.4	140.0	18.0	60.0	R1.0	2
158 16N50-0.3RA	16.0	16.0	15.2	100.0	24.0	50.0	R0.3	2
158 16N50-1.0RA	16.0	16.0	15.2	100.0	24.0	50.0	R1.0	2
158 16N70-0.3RA	16.0	16.0	15.2	150.0	24.0	70.0	R0.3	2
158 16N70-1.0RA	16.0	16.0	15.2	150.0	24.0	70.0	R1.0	2



TuffCut® X-AL

Carbide End Mills

Fraises carbure en bout | Hartmetall-Schaftfräser
 Frese in Metallo Duro Integrale
 Frezy palcove pełnowęglikowe



Designed to deliver exceptional metal removal rates and chip evacuation on aluminium, aluminium alloys and non-ferrous materials, the TuffCut® X-AL range has become the preferred tool choice for many precision manufacturers in a diverse range of industry sectors.

(FR)

“Conçue pour atteindre des niveaux exceptionnels de débit et d'évacuation copeaux dans l'aluminium, les alliages en aluminium et les métaux non-ferreux, la gamme TuffCut® X-AL est devenue l'outil de référence pour beaucoup de mécanique de précision dans divers secteurs de l'industrie.”

(DE)

Auf außergewöhnliche Metallabtragsleistung und Spanabfuhr bei Aluminium, Aluminiumlegierungen und eisenfreiem Material ausgelegt, das TuffCut® X-AL-Sortiment ist für viele Hersteller technischer Präzisionsteile in verschiedensten Branchen zur ersten Wahl unter den Werkzeugen geworden.

(IT)

La famiglia TuffCut® X-AL, progettata per offrire eccezionale capacità di asportazione ed evacuazione truciolo su alluminio, leghe di alluminio e materiali non ferrosi, è diventata la scelta ideale per molti produttori di pezzi di precisione in diversi settori industriali.

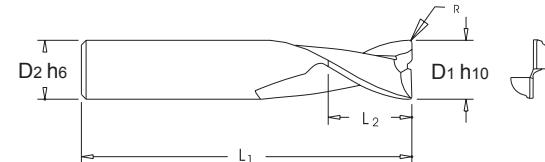
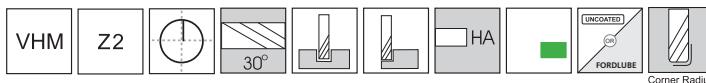
(PL)

Zaprojektowany tak, aby zapewnić wyjątkową szybkość usuwania materiału i odprowadzania wiórów w aluminium, stopach aluminium i materiałach nieżelaznych. Typoszereg TuffCut® X-AL stał się preferowanym wyborem narzędzi dla wielu precyzyjnych producentów w różnych gałęziach przemysłu.

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TuffCut® X-AL Series 135



Tool Number	EDP	D1	D2	L1	L2	R
135 0300	13523	3.0	3.0	38.0	3.5	0.2
135 0400	13533	4.0	4.0	51.0	4.8	0.2
135 0500	13502	5.0	5.0	51.0	6.0	0.25
135 0600	13504	6.0	6.0	64.0	7.0	0.3
135 0800	13508	8.0	8.0	64.0	9.5	0.35
135 1000	13515	10.0	10.0	70.0	12.0	0.5
135 1200	13525	12.0	12.0	76.0	14.0	0.5
135 1400	13552	14.0	14.0	89.0	16.0	0.5
135 1600	13535	16.0	16.0	89.0	18.0	0.75
135 1800	13563	18.0	18.0	102.0	20.0	0.75
135 2000	13545	20.0	20.0	102.0	22.0	0.75
135 2500	13555	25.0	25.0	102.0	25.0	0.75



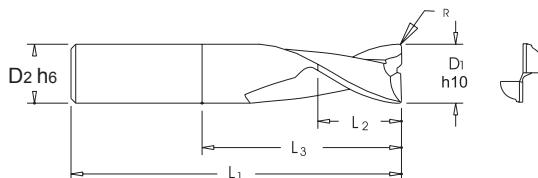
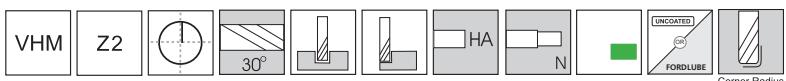
Tool Number	EDP	D1	D2	L1	L2	R
135 1001	13516	10.0	10.0	76.0	12.0	0.5
135 1201	13526	12.0	12.0	102.0	14.0	0.5
135 1401	13554	14.0	14.0	102.0	16.0	0.5
135 1601	13536	16.0	16.0	117.0	18.0	0.75
135 1801	13568	18.0	18.0	127.0	20.0	0.75
135 2001	13546	20.0	20.0	127.0	22.0	0.75
135 2501	13556	25.0	25.0	127.0	25.0	0.75



Tool Number	EDP	D1	D2	L1	L2	R
135 1002	13517	10.0	10.0	89.0	12.0	0.5
135 1202	13527	12.0	12.0	127.0	14.0	0.5
135 1402	13573	14.0	14.0	127.0	16.0	0.5
135 1602	13537	16.0	16.0	133.0	18.0	0.75
135 1802	13574	18.0	18.0	152.0	20.0	0.75
135 2002	13547	20.0	20.0	152.0	22.0	0.75
135 2502	13557	25.0	25.0	152.0	25.0	0.75



TuffCut® X-AL Series 135N



Tool Number	EDP	D1	D2	L1	L2	L3	R
135 0300N	13524	3.0	3.0	38.0	3.5	11.0	0.2
135 0400N	13534	4.0	4.0	51.0	4.8	22.0	0.2
135 0500N	13503	5.0	5.0	51.0	6.0	22.0	0.25
135 0600N	13505	6.0	6.0	64.0	7.0	26.0	0.3
135 0800N	13509	8.0	8.0	64.0	9.5	26.0	0.35
135 1000N	13565	10.0	10.0	70.0	12.0	28.0	0.5
135 1200N	13575	12.0	12.0	76.0	14.0	28.0	0.5
135 1400N	13553	14.0	14.0	89.0	16.0	42.0	0.5
135 1600N	13585	16.0	16.0	89.0	18.0	39.0	0.75
135 1800N	13564	18.0	18.0	102.0	20.0	52.0	0.75
135 2000N	13594	20.0	20.0	102.0	22.0	50.0	0.75
135 2500N	13597	25.0	25.0	102.0	25.0	36.0	0.75



Tool Number	EDP	D1	D2	L1	L2	L3	R
135 1001N	13566	10.0	10.0	76.0	12.0	34.0	0.5
135 1201N	13576	12.0	12.0	102.0	14.0	54.0	0.5
135 1401N	13558	14.0	14.0	102.0	16.0	55.0	0.5
135 1601N	13586	16.0	16.0	117.0	18.0	83.0	0.75
135 1801N	13569	18.0	18.0	127.0	20.0	77.0	0.75
135 2001N	13595	20.0	20.0	127.0	22.0	75.0	0.75
135 2501N	13598	25.0	25.0	127.0	25.0	61.0	0.75

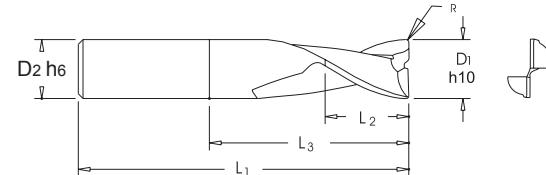
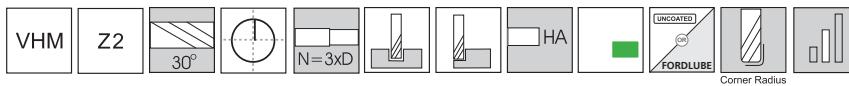


Tool Number	EDP	D1	D2	L1	L2	L3	R
135 1002N	13567	10.0	10.0	89.0	12.0	47.0	0.5
135 1202N	13577	12.0	12.0	127.0	14.0	79.0	0.5
135 1402N	13559	14.0	14.0	127.0	16.0	80.0	0.5
135 1602N	13587	16.0	16.0	133.0	18.0	99.0	0.75
135 1802N	13578	18.0	18.0	152.0	20.0	102.0	0.75
135 2002N	13596	20.0	20.0	152.0	22.0	100.0	0.75
135 2502N	13599	25.0	25.0	152.0	25.0	86.0	0.75





TuffCut® X-AL Series 135 N3



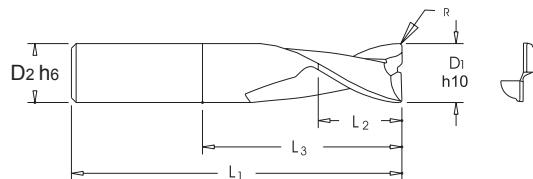
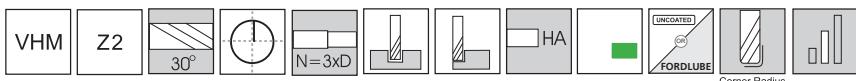
Tool Number	EDP	D1	D2	L1	L2	L3	R
135 03N3	96620	3.0	3.0	38.0	3.5	11.0	-
135 03N3-0.5R	96621	3.0	3.0	38.0	3.5	11.0	0.5
135 03N3-1.0R	96622	3.0	3.0	38.0	3.5	11.0	1.0
135 04N3	96626	4.0	4.0	51.0	4.8	14.0	-
135 04N3-0.5R	96627	4.0	4.0	51.0	4.8	14.0	0.5
135 04N3-1.0R	96628	4.0	4.0	51.0	4.8	14.0	1.0
135 05N3	96632	5.0	6.0	64.0	6.0	17.0	-
135 05N3-0.5R	96633	5.0	6.0	64.0	6.0	17.0	0.5
135 05N3-1.0R	96634	5.0	6.0	64.0	6.0	17.0	1.0
135 06N3	96638	6.0	6.0	64.0	7.0	20.0	-
135 06N3-0.5R	96639	6.0	6.0	64.0	7.0	20.0	0.5
135 06N3-1.0R	96640	6.0	6.0	64.0	7.0	20.0	1.0
135 06N3-1.5R	96641	6.0	6.0	64.0	7.0	20.0	1.5
135 06N3-2.0R	96642	6.0	6.0	64.0	7.0	20.0	2.0
135 08N3	96648	8.0	8.0	64.0	9.5	26.0	-
135 08N3-0.5R	96649	8.0	8.0	64.0	9.5	26.0	0.5
135 08N3-1.0R	96650	8.0	8.0	64.0	9.5	26.0	1.0
135 08N3-1.5R	96651	8.0	8.0	64.0	9.5	26.0	1.5
135 08N3-2.0R	96652	8.0	8.0	64.0	9.5	26.0	2.0
135 08N3-3.0R	96653	8.0	8.0	64.0	9.5	26.0	3.0
135 10N3	96660	10.0	10.0	76.0	12.0	34.0	-
135 1001N	13566	10.0	10.0	76.0	12.0	34.0	0.5
135 10N3-1.0R	96662	10.0	10.0	76.0	12.0	34.0	1.0
135 10N3-1.5R	96663	10.0	10.0	76.0	12.0	34.0	1.5
135 10N3-2.0R	96664	10.0	10.0	76.0	12.0	34.0	2.0
135 10N3-3.0R	96665	10.0	10.0	76.0	12.0	34.0	3.0
135 12N3	96671	12.0	12.0	76.0	14.0	38.0	-

Available with Fordlube upon request.

- Disponible avec revêtement FordLube sur demande
- Auf Anforderung mit Fordlube-Schmiermittel erhältlich
- Disponibile con Fordlube su richiesta
- Dostępne na zamówienie z pokryciem Fordlube



TuffCut® X-AL Series 135 N3



Tool Number	EDP	D1	D2	L1	L2	L3	R
135 12N3-0.5R	96672	12.0	12.0	76.0	14.0	38.0	0.5
135 12N3-1.0R	96673	12.0	12.0	76.0	14.0	38.0	1.0
135 12N3-1.5R	96674	12.0	12.0	76.0	14.0	38.0	1.5
135 12N3-2.0R	96675	12.0	12.0	76.0	14.0	38.0	2.0
135 12N3-3.0R	96676	12.0	12.0	76.0	14.0	38.0	3.0
135 12N3-4.0R	96677	12.0	12.0	76.0	14.0	38.0	4.0
135 16N3	96684	16.0	16.0	117.0	18.0	53.0	-
135 16N3-0.5R	96685	16.0	16.0	117.0	18.0	53.0	0.5
135 16N3-1.0R	96686	16.0	16.0	117.0	18.0	53.0	1.0
135 16N3-1.5R	96687	16.0	16.0	117.0	18.0	53.0	1.5
135 16N3-2.0R	96688	16.0	16.0	117.0	18.0	53.0	2.0
135 16N3-3.0R	96689	16.0	16.0	117.0	18.0	53.0	3.0
135 16N3-4.0R	96690	16.0	16.0	117.0	18.0	53.0	4.0
135 20N3-0.5R	96697	20.0	20.0	127.0	22.0	65.0	0.5
135 20N3-1.0R	96698	20.0	20.0	127.0	22.0	65.0	1.0
135 20N3-1.5R	96699	20.0	20.0	127.0	22.0	65.0	1.5
135 20N3-2.0R	96700	20.0	20.0	127.0	22.0	65.0	2.0
135 20N3-3.0R	96701	20.0	20.0	127.0	22.0	65.0	3.0
135 20N3-4.0R	96702	20.0	20.0	127.0	22.0	65.0	4.0
135 25N3-0.5R	96709	25.0	25.0	127.0	25.0	80.0	0.5
135 25N3-1.0R	96710	25.0	25.0	127.0	25.0	80.0	1.0
135 25N3-1.5R	96711	25.0	25.0	127.0	25.0	80.0	1.5
135 25N3-2.0R	96712	25.0	25.0	127.0	25.0	80.0	2.0
135 25N3-3.0R	96713	25.0	25.0	127.0	25.0	80.0	3.0
135 25N3-4.0R	96714	25.0	25.0	127.0	25.0	80.0	4.0

Available with Fordlube upon request.

Disponible avec revêtement FordLube sur demande

Auf Anforderung mit Fordlube-Schmiermittel erhältlich

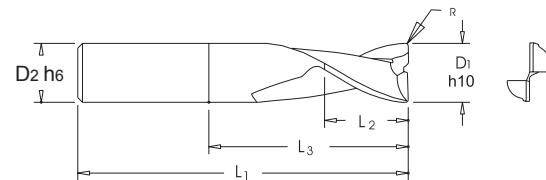
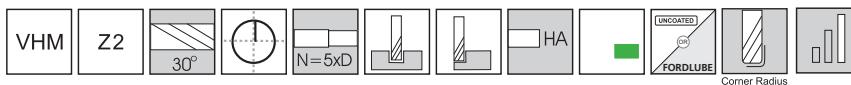
Disponibile con Fordlube su richiesta

Dostępne na zamówienie z pokryciem Fordlube





TuffCut® X-AL Series 135 N5



Tool Number	EDP	D1	D2	L1	L2	L3	R
135 03N5	96623	3.0	3.0	38.0	3.5	16.0	-
135 03N5-0.5R	96624	3.0	3.0	38.0	3.5	16.0	0.5
135 03N5-1.0R	96625	3.0	3.0	38.0	3.5	16.0	1.0
135 04N5	96629	4.0	4.0	51.0	4.8	22.0	-
135 04N5-0.5R	96630	4.0	4.0	51.0	4.8	22.0	0.5
135 04N5-1.0R	96631	4.0	4.0	51.0	4.8	22.0	1.0
135 05N5	96635	5.0	6.0	64.0	6.0	27.0	-
135 05N5-0.5R	96636	5.0	6.0	64.0	6.0	27.0	0.5
135 05N5-1.0R	96637	5.0	6.0	64.0	6.0	27.0	1.0
135 06N5	96643	6.0	6.0	64.0	7.0	32.0	-
135 06N5-0.5R	96644	6.0	6.0	64.0	7.0	32.0	0.5
135 06N5-1.0R	96645	6.0	6.0	64.0	7.0	32.0	1.0
135 06N5-1.5R	96646	6.0	6.0	64.0	7.0	32.0	1.5
135 06N5-2.0R	96647	6.0	6.0	64.0	7.0	32.0	2.0
135 08N5	96654	8.0	8.0	75.0	9.5	42.0	-
135 08N5-0.5R	96655	8.0	8.0	75.0	9.5	42.0	0.5
135 08N5-1.0R	96656	8.0	8.0	75.0	9.5	42.0	1.0
135 08N5-1.5R	96657	8.0	8.0	75.0	9.5	42.0	1.5
135 08N5-2.0R	96658	8.0	8.0	75.0	9.5	42.0	2.0
135 08N5-3.0R	96659	8.0	8.0	75.0	9.5	42.0	3.0
135 10N5-0.5R	96666	10.0	10.0	89.0	12.0	52.0	0.5
135 10N5-1.0R	96667	10.0	10.0	89.0	12.0	52.0	1.0
135 10N5-1.5R	96668	10.0	10.0	89.0	12.0	52.0	1.5
135 10N5-2.0R	96669	10.0	10.0	89.0	12.0	52.0	2.0
135 10N5-3.0R	96670	10.0	10.0	89.0	12.0	52.0	3.0
135 12N5-0.5R	96678	12.0	12.0	110.0	14.0	62.0	0.5

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Disponible avec revêtement FordLube sur demande

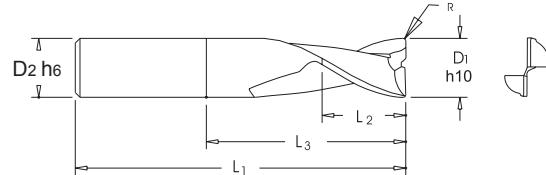
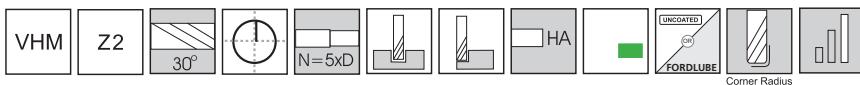
Auf Anforderung mit Fordlube-Schmiermittel erhältlich

Disponibile con Fordlube su richiesta

Dostępne na zamówienie z pokryciem Fordlube



TuffCut® X-AL Series 135 N5



Tool Number	EDP	D1	D2	L1	L2	L3	R
135 12N5-1.0R	96679	12.0	12.0	110.0	14.0	62.0	1.0
135 12N5-1.5R	96680	12.0	12.0	110.0	14.0	62.0	1.5
135 12N5-2.0R	96681	12.0	12.0	110.0	14.0	62.0	2.0
135 12N5-3.0R	96682	12.0	12.0	110.0	14.0	62.0	3.0
135 12N5-4.0R	96683	12.0	12.0	110.0	14.0	62.0	4.0
135 12N5-5.0R	96723	12.0	12.0	110.0	14.0	62.0	5.0
135 16N5-0.5R	96691	16.0	16.0	127.0	18.0	85.0	0.5
135 16N5-1.0R	96692	16.0	16.0	127.0	18.0	85.0	1.0
135 16N5-1.5R	96693	16.0	16.0	127.0	18.0	85.0	1.5
135 16N5-2.0R	96694	16.0	16.0	127.0	18.0	85.0	2.0
135 16N5-3.0R	96695	16.0	16.0	127.0	18.0	85.0	3.0
135 16N5-4.0R	96696	16.0	16.0	127.0	18.0	85.0	4.0
135 20N5-0.5R	96703	20.0	20.0	152.0	22.0	105.0	0.5
135 20N5-1.0R	96704	20.0	20.0	152.0	22.0	105.0	1.0
135 20N5-1.5R	96705	20.0	20.0	152.0	22.0	105.0	1.5
135 20N5-2.0R	96706	20.0	20.0	152.0	22.0	105.0	2.0
135 20N5-3.0R	96707	20.0	20.0	152.0	22.0	105.0	3.0
135 20N5-4.0R	96708	20.0	20.0	152.0	22.0	105.0	4.0
135 20N5-5.0R	96724	20.0	20.0	152.0	22.0	105.0	5.0
135 25N5-0.5R	96715	25.0	25.0	180.0	25.0	130.0	0.5
135 25N5-1.0R	96716	25.0	25.0	180.0	25.0	130.0	1.0
135 25N5-1.5R	96717	25.0	25.0	180.0	25.0	130.0	1.5
135 25N5-2.0R	96718	25.0	25.0	180.0	25.0	130.0	2.0
135 25N5-3.0R	96719	25.0	25.0	180.0	25.0	130.0	3.0
135 25N5-4.0R	96720	25.0	25.0	180.0	25.0	130.0	4.0

Available with Fordlube upon request.

Disponible avec revêtement FordLube sur demande

Auf Anforderung mit Fordlube-Schmiermittel erhältlich

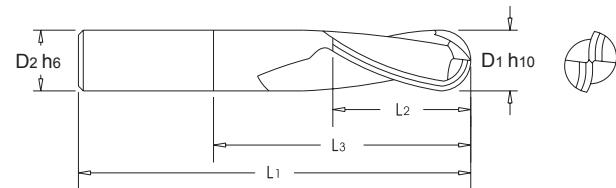
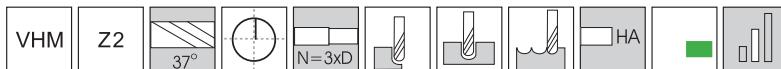
Disponibile con Fordlube su richiesta

Dostępne na zamówienie z pokryciem Fordlube





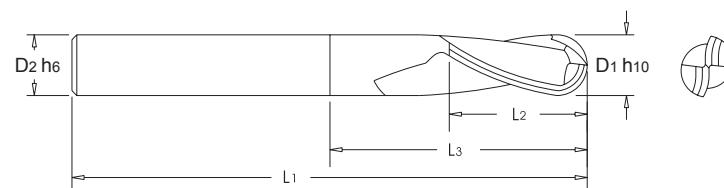
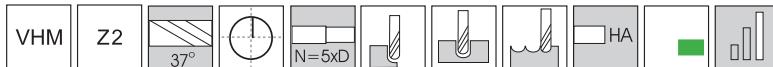
TuffCut® X-AL Series 135B N3



Tool Number	EDP	D1	D2	L1	L2	L3
135B 0300N3	13236	3.0	3.0	38.0	5.0	11.0
135B 0400N3	13238	4.0	4.0	51.0	6.0	14.0
135B 0500N3	13240	5.0	5.0	64.0	7.0	17.0
135B 0600N3	13242	6.0	6.0	64.0	8.0	20.0
135B 0800N3	13244	8.0	8.0	64.0	10.0	26.0
135B 1000N3	13246	10.0	10.0	70.0	12.0	32.0
135B 1200N3	13248	12.0	12.0	76.0	16.0	38.0
135B 1600N3	13250	16.0	16.0	89.0	20.0	50.0

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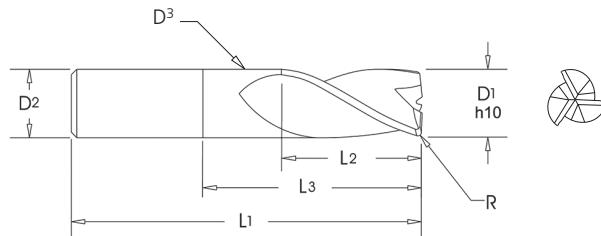
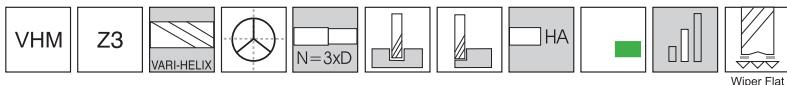
TuffCut® X-AL Series 135B N5



Tool Number	EDP	D1	D2	L1	L2	L3
135B 0200N5	13252	2.0	6.0	75.0	4.0	12.0
135B 0300N5	13254	3.0	6.0	75.0	5.0	17.0
135B 0400N5	13256	4.0	6.0	75.0	6.0	22.0
135B 0500N5	13258	5.0	6.0	75.0	7.0	27.0
135B 0600N5	13260	6.0	6.0	110.0	8.0	32.0
135B 0800N5	13262	8.0	8.0	110.0	10.0	42.0
135B 1000N5	13264	10.0	10.0	110.0	12.0	52.0
135B 1200N5	13266	12.0	12.0	120.0	16.0	62.0
135B 1600N5	13268	16.0	16.0	130.0	20.0	82.0

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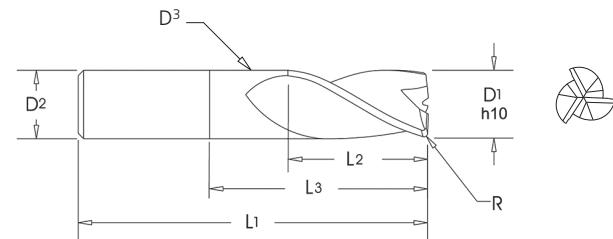
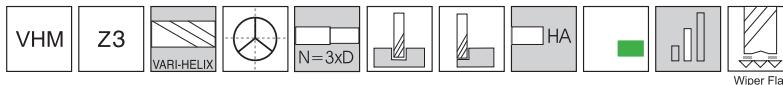
TuffCut® X-AL Series 137V N3



Tool Number	D1	D2	D3	L1	L2	L3	R
137V 03N3	3.0	3.0	2.8	51.0	8.0	11.0	-
137V 03N3-0.2R	3.0	3.0	2.8	51.0	8.0	11.0	0.2
137V 03N3-0.5R	3.0	3.0	2.8	51.0	8.0	11.0	0.5
137V 03N3-1.0R	3.0	3.0	2.8	51.0	8.0	11.0	1.0
137V 04N3	4.0	4.0	3.8	51.0	11.0	14.0	-
137V 04N3-0.2R	4.0	4.0	3.8	51.0	11.0	14.0	0.2
137V 04N3-0.5R	4.0	4.0	3.8	51.0	11.0	14.0	0.5
137V 04N3-1.0R	4.0	4.0	3.8	51.0	11.0	14.0	1.0
137V 05N3	5.0	5.0	4.8	57.0	13.0	17.0	-
137V 05N3-0.2R	5.0	5.0	4.8	57.0	13.0	17.0	0.2
137V 05N3-0.5R	5.0	5.0	4.8	57.0	13.0	17.0	0.5
137V 05N3-1.0R	5.0	5.0	4.8	57.0	13.0	17.0	1.0
137V 06N3	6.0	6.0	5.8	64.0	13.0	20.0	-
137V 06N3-0.2R	6.0	6.0	5.8	64.0	13.0	20.0	0.2
137V 06N3-0.5R	6.0	6.0	5.8	64.0	13.0	20.0	0.5
137V 06N3-1.0R	6.0	6.0	5.8	64.0	13.0	20.0	1.0
137V 06N3-1.5R	6.0	6.0	5.8	64.0	13.0	20.0	1.5
137V 06N3-2.0R	6.0	6.0	5.8	64.0	13.0	20.0	2.0
137V 08N3	8.0	8.0	7.8	64.0	19.0	26.0	-
137V 08N3-0.2R	8.0	8.0	7.8	64.0	19.0	26.0	0.2
137V 08N3-0.5R	8.0	8.0	7.8	64.0	19.0	26.0	0.5
137V 08N3-1.0R	8.0	8.0	7.8	64.0	19.0	26.0	1.0
137V 08N3-1.5R	8.0	8.0	7.8	64.0	19.0	26.0	1.5
137V 08N3-2.0R	8.0	8.0	7.8	64.0	19.0	26.0	2.0
137V 08N3-3.0R	8.0	8.0	7.8	64.0	19.0	26.0	3.0
137V 10N3	10.0	10.0	9.8	73.0	22.0	32.0	-
137V 10N3-0.2R	10.0	10.0	9.8	73.0	22.0	32.0	0.2
137V 10N3-0.3R	10.0	10.0	9.8	73.0	22.0	32.0	0.3
137V 10N3-0.5R	10.0	10.0	9.8	73.0	22.0	32.0	0.5
137V 10N3-1.0R	10.0	10.0	9.8	73.0	22.0	32.0	1.0
137V 10N3-1.5R	10.0	10.0	9.8	73.0	22.0	32.0	1.5
137V 10N3-2.0R	10.0	10.0	9.8	73.0	22.0	32.0	2.0
137V 10N3-3.0R	10.0	10.0	9.8	73.0	22.0	32.0	3.0
137V 10N3-4.0R	10.0	10.0	9.8	73.0	22.0	32.0	4.0
137V 12N3	12.0	12.0	11.8	84.0	26.0	38.0	-
137V 12N3-0.2R	12.0	12.0	11.8	84.0	26.0	38.0	0.2



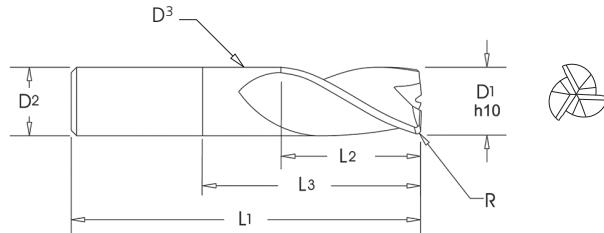
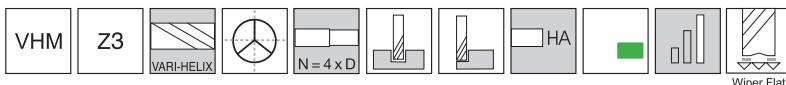
TuffCut® X-AL Series 137V N3



Tool Number	D1	D2	D3	L1	L2	L3	R
137V 12N3-0.5R	12.0	12.0	11.8	84.0	26.0	38.0	0.5
137V 12N3-1.0R	12.0	12.0	11.8	84.0	26.0	38.0	1.0
137V 12N3-1.5R	12.0	12.0	11.8	84.0	26.0	38.0	1.5
137V 12N3-2.0R	12.0	12.0	11.8	84.0	26.0	38.0	2.0
137V 12N3-2.50R	12.0	12.0	11.8	84.0	26.0	38.0	2.5
137V 12N3-3.0R	12.0	12.0	11.8	84.0	26.0	38.0	3.0
137V 12N3-4.0R	12.0	12.0	11.8	84.0	26.0	38.0	4.0
137V 16N3	16.0	16.0	15.8	93.0	32.0	50.0	-
137V 16N3-0.2R	16.0	16.0	15.8	93.0	32.0	50.0	0.2
137V 16N3-0.5R	16.0	16.0	15.8	93.0	32.0	50.0	0.5
137V 16N3-1.0R	16.0	16.0	15.8	93.0	32.0	50.0	1.0
137V 16N3-1.5R	16.0	16.0	15.8	93.0	32.0	50.0	1.5
137V 16N3-2.0R	16.0	16.0	15.8	93.0	32.0	50.0	2.0
137V 16N3-3.0R	16.0	16.0	15.8	93.0	32.0	50.0	3.0
137V 16N3-4.0R	16.0	16.0	15.8	93.0	32.0	50.0	4.0
137V 20N3	20.0	20.0	19.8	105.0	38.0	62.0	-
137V 20N3-0.2R	20.0	20.0	19.8	105.0	38.0	62.0	0.2
137V 20N3-0.5R	20.0	20.0	19.8	105.0	38.0	62.0	0.5
137V 20N3-1.0R	20.0	20.0	19.8	105.0	38.0	62.0	1.0
137V 20N3-1.5R	20.0	20.0	19.8	105.0	38.0	62.0	1.5
137V 20N3-2.0R	20.0	20.0	19.8	105.0	38.0	62.0	2.0
137V 20N3-3.0R	20.0	20.0	19.8	105.0	38.0	62.0	3.0
137V 20N3-4.0R	20.0	20.0	19.8	105.0	38.0	62.0	4.0
137V 20N3-5.0R	20.0	20.0	19.8	105.0	38.0	62.0	5.0
137V 20N3-6.0R	20.0	20.0	19.8	105.0	38.0	62.0	6.0



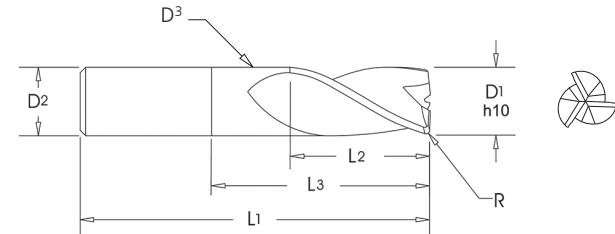
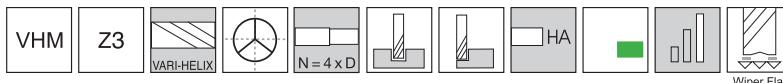
TuffCut® X-AL Series 137V N4



Tool Number	D1	D2	D3	L1	L2	L3	R
137V 03N4	3.0	3.0	2.8	51.0	4.5	14.0	-
137V 03N4-0.2R	3.0	3.0	2.8	51.0	4.5	14.0	0.2
137V 03N4-0.5R	3.0	3.0	2.8	51.0	4.5	14.0	0.5
137V 03N4-1.0R	3.0	3.0	2.8	51.0	4.5	14.0	1.0
137V 04N4	4.0	4.0	3.8	51.0	6.0	18.0	-
137V 04N4-0.2R	4.0	4.0	3.8	51.0	6.0	18.0	0.2
137V 04N4-0.5R	4.0	4.0	3.8	51.0	6.0	18.0	0.5
137V 04N4-1.0R	4.0	4.0	3.8	51.0	6.0	18.0	1.0
137V 05N4	5.0	5.0	4.8	57.0	7.5	22.0	-
137V 05N4-0.2R	5.0	5.0	4.8	57.0	7.5	22.0	0.2
137V 05N4-0.5R	5.0	5.0	4.8	57.0	7.5	22.0	0.5
137V 05N4-1.0R	5.0	5.0	4.8	57.0	7.5	22.0	1.0
137V 06N4	6.0	6.0	5.8	64.0	9.0	26.0	-
137V 06N4-0.2R	6.0	6.0	5.8	64.0	9.0	26.0	0.2
137V 06N4-0.5R	6.0	6.0	5.8	64.0	9.0	26.0	0.5
137V 06N4-1.0R	6.0	6.0	5.8	64.0	9.0	26.0	1.0
137V 06N4-1.5R	6.0	6.0	5.8	64.0	9.0	26.0	1.5
137V 06N4-2.0R	6.0	6.0	5.8	64.0	9.0	26.0	2.0
137V 08N4	8.0	8.0	7.8	70.0	12.0	34.0	-
137V 08N4-0.2R	8.0	8.0	7.8	70.0	12.0	34.0	0.2
137V 08N4-0.5R	8.0	8.0	7.8	70.0	12.0	34.0	0.5
137V 08N4-1.0R	8.0	8.0	7.8	70.0	12.0	34.0	1.0
137V 08N4-1.5R	8.0	8.0	7.8	70.0	12.0	34.0	1.5
137V 08N4-2.0R	8.0	8.0	7.8	70.0	12.0	34.0	2.0
137V 08N4-3.0R	8.0	8.0	7.8	70.0	12.0	34.0	3.0
137V 10N4	10.0	10.0	9.8	90.0	15.0	42.0	-
137V 10N4-0.2R	10.0	10.0	9.8	90.0	15.0	42.0	0.2
137V 10N4-0.5R	10.0	10.0	9.8	90.0	15.0	42.0	0.5
137V 10N4-1.0R	10.0	10.0	9.8	90.0	15.0	42.0	1.0
137V 10N4-1.5R	10.0	10.0	9.8	90.0	15.0	42.0	1.5
137V 10N4-2.0R	10.0	10.0	9.8	90.0	15.0	42.0	2.0
137V 10N4-3.0R	10.0	10.0	9.8	90.0	15.0	42.0	3.0
137V 10N4-4.0R	10.0	10.0	9.8	90.0	15.0	42.0	4.0
137V 12N4	12.0	12.0	11.8	100.0	18.0	50.0	-
137V 12N4-0.2R	12.0	12.0	11.8	100.0	18.0.	50.0	0.2

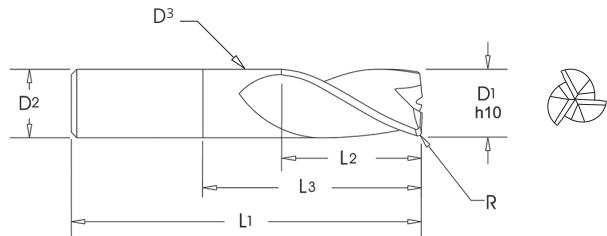
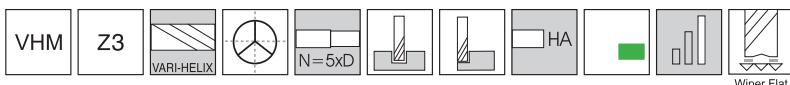


TuffCut® X-AL Series 137V N4



Tool Number	D1	D2	D3	L1	L2	L3	R
137V 12N4-0.5R	12.0	12.0	11.8	100.0	18.0	50.0	0.5
137V 12N4-1.0R	12.0	12.0	11.8	100.0	18.0	50.0	1.0
137V 12N4-1.5R	12.0	12.0	11.8	100.0	18.0	50.0	1.5
137V 12N4-2.0R	12.0	12.0	11.8	100.0	18.0	50.0	2.0
137V 12N4-3.0R	12.0	12.0	11.8	100.0	18.0	50.0	3.0
137V 12N4-4.0R	12.0	12.0	11.8	100.0	18.0	50.0	4.0
137V 16N4	16.0	16.0	15.8	120.0	24.0	66.0	-
137V 16N4-0.2R	16.0	16.0	15.8	120.0	24.0	66.0	0.2
137V 16N4-0.5R	16.0	16.0	15.8	120.0	24.0	66.0	0.5
137V 16N4-1.0R	16.0	16.0	15.8	120.0	24.0	66.0	1.0
137V 16N4-1.5R	16.0	16.0	15.8	120.0	24.0	66.0	1.5
137V 16N4-2.0R	16.0	16.0	15.8	120.0	24.0	66.0	2.0
137V 16N4-3.0R	16.0	16.0	15.8	120.0	24.0	66.0	3.0
137V 16N4-4.0R	16.0	16.0	15.8	120.0	24.0	66.0	4.0
137V 20N4	20.0	20.0	19.8	135.0	30.0	82.0	-
137V 20N4-0.2R	20.0	20.0	19.8	135.0	30.0	82.0	0.2
137V 20N4-0.5R	20.0	20.0	19.8	135.0	30.0	82.0	0.5
137V 20N4-1.0R	20.0	20.0	19.8	135.0	30.0	82.0	1.0
137V 20N4-1.5R	20.0	20.0	19.8	135.0	30.0	82.0	1.5
137V 20N4-2.0R	20.0	20.0	19.8	135.0	30.0	82.0	2.0
137V 20N4-3.0R	20.0	20.0	19.8	135.0	30.0	82.0	3.0
137V 20N4-4.0R	20.0	20.0	19.8	135.0	30.0	82.0	4.0

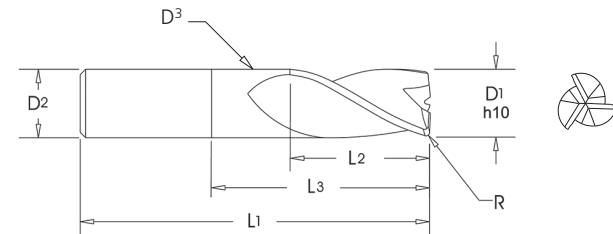
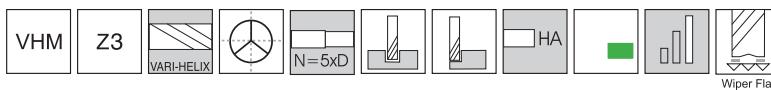
TuffCut® X-AL Series 137V N5



Tool Number	D1	D2	D3	L1	L2	L3	R
137V 03N5	3.0	3.0	2.8	51.0	4.5	17.0	-
137V 03N5-0.2R	3.0	3.0	2.8	51.0	4.5	17.0	0.2
137V 03N5-0.5R	3.0	3.0	2.8	51.0	4.5	17.0	0.5
137V 03N5-1.0R	3.0	3.0	2.8	51.0	4.5	17.0	1.0
137V 04N5	4.0	4.0	3.8	51.0	6.0	22.0	-
137V 04N5-0.2R	4.0	4.0	3.8	51.0	6.0	22.0	0.2
137V 04N5-0.5R	4.0	4.0	3.8	51.0	6.0	22.0	0.5
137V 04N5-1.0R	4.0	4.0	3.8	51.0	6.0	22.0	1.0
137V 05N5	5.0	5.0	4.8	57.0	7.5	27.0	-
137V 05N5-0.2R	5.0	5.0	4.8	57.0	7.5	27.0	0.2
137V 05N5-0.5R	5.0	5.0	4.8	57.0	7.5	27.0	0.5
137V 05N5-1.0R	5.0	5.0	4.8	57.0	7.5	27.0	1.0
137V 06N5	6.0	6.0	5.8	64.0	9.0	32.0	-
137V 06N5-0.2R	6.0	6.0	5.8	64.0	9.0	32.0	0.2
137V 06N5-0.5R	6.0	6.0	5.8	64.0	9.0	32.0	0.5
137V 06N5-1.0R	6.0	6.0	5.8	64.0	9.0	32.0	1.0
137V 06N5-1.5R	6.0	6.0	5.8	64.0	9.0	32.0	1.5
137V 06N5-2.0R	6.0	6.0	5.8	64.0	9.0	32.0	2.0
137V 08N5	8.0	8.0	7.8	75.0	12.0	42.0	-
137V 08N5-0.2R	8.0	8.0	7.8	75.0	12.0	42.0	0.2
137V 08N5-0.5R	8.0	8.0	7.8	75.0	12.0	42.0	0.5
137V 08N5-1.0R	8.0	8.0	7.8	75.0	12.0	42.0	1.0
137V 08N5-1.5R	8.0	8.0	7.8	75.0	12.0	42.0	1.5
137V 08N5-2.0R	8.0	8.0	7.8	75.0	12.0	42.0	2.0
137V 08N5-3.0R	8.0	8.0	7.8	75.0	12.0	42.0	3.0
137V 10N5	10.0	10.0	9.8	90.0	15.0	52.0	-
137V 10N5-0.2R	10.0	10.0	9.8	90.0	15.0	52.0	0.2
137V 10N5-0.5R	10.0	10.0	9.8	90.0	15.0	52.0	0.5
137V 10N5-1.0R	10.0	10.0	9.8	90.0	15.0	52.0	1.0
137V 10N5-1.5R	10.0	10.0	9.8	90.0	15.0	52.0	1.5
137V 10N5-2.0R	10.0	10.0	9.8	90.0	15.0	52.0	2.0
137V 10N5-3.0R	10.0	10.0	9.8	90.0	15.0	52.0	3.0
137V 10N5-4.0R	10.0	10.0	9.8	90.0	15.0	52.0	4.0
137V 12N5	12.0	12.0	11.8	110.0	18.0	62.0	-
137V 12N5-0.2R	12.0	12.0	11.8	110.0	18.0	62.0	0.2



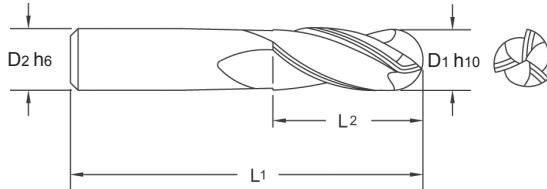
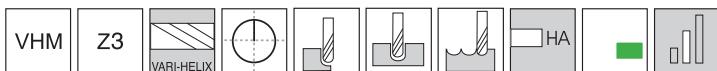
TuffCut® X-AL Series 137V N5



Tool Number	D1	D2	D3	L1	L2	L3	R
137V 12N5-0.5R	12.0	12.0	11.8	110.0	18.0	62.0	0.5
137V 12N5-1.0R	12.0	12.0	11.8	110.0	18.0	62.0	1.0
137V 12N5-1.5R	12.0	12.0	11.8	110.0	18.0	62.0	1.5
137V 12N5-2.0R	12.0	12.0	11.8	110.0	18.0	62.0	2.0
137V 12N5-3.0R	12.0	12.0	11.8	110.0	18.0	62.0	3.0
137V 12N5-4.0R	12.0	12.0	11.8	110.0	18.0	62.0	4.0
137V 16N5	16.0	16.0	15.8	130.0	24.0	82.0	-
137V 16N5-0.2R	16.0	16.0	15.8	130.0	24.0	82.0	0.2
137V 16N5-0.5R	16.0	16.0	15.8	130.0	24.0	82.0	0.5
137V 16N5-1.0R	16.0	16.0	15.8	130.0	24.0	82.0	1.0
137V 16N5-1.5R	16.0	16.0	15.8	130.0	24.0	82.0	1.5
137V 16N5-2.0R	16.0	16.0	15.8	130.0	24.0	82.0	2.0
137V 16N5-3.0R	16.0	16.0	15.8	130.0	24.0	82.0	3.0
137V 16N5-4.0R	16.0	16.0	15.8	130.0	24.0	82.0	4.0
137V 20N5	20.0	20.0	19.8	150.0	30.0	102.0	-
137V 20N5-0.2R	20.0	20.0	19.8	150.0	30.0	102.0	0.2
137V 20N5-0.5R	20.0	20.0	19.8	150.0	30.0	102.0	0.5
137V 20N5-1.0R	20.0	20.0	19.8	150.0	30.0	102.0	1.0
137V 20N5-1.5R	20.0	20.0	19.8	150.0	30.0	102.0	1.5
137V 20N5-2.0R	20.0	20.0	19.8	150.0	30.0	102.0	2.0
137V 20N5-3.0R	20.0	20.0	19.8	150.0	30.0	102.0	3.0
137V 20N5-4.0R	20.0	20.0	19.8	150.0	30.0	102.0	4.0

P68

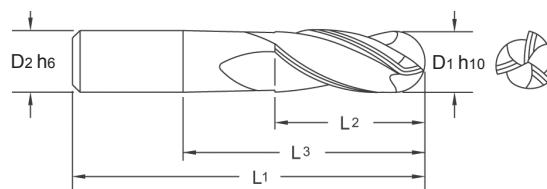
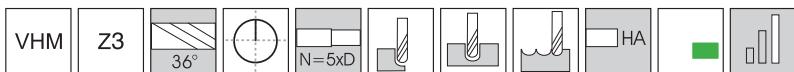
TuffCut® X-AL Series 138B



Tool Number	EDP	D1	D2	L1	L2
138B 0300	13356	3.0	3.0	38.0	12.0
138B 0400	13358	4.0	4.0	51.0	15.0
138B 0500	13360	5.0	5.0	64.0	20.0
138B 0600	13362	6.0	6.0	64.0	20.0
138B 0800	13364	8.0	8.0	64.0	20.0
138B 1000	13366	10.0	10.0	70.0	25.0
138B 1200	13368	12.0	12.0	76.0	25.0
138B 1600	13370	16.0	16.0	89.0	35.0



TuffCut® X-AL Series 138B N5 (Taper Neck)

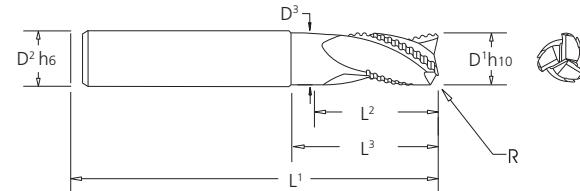
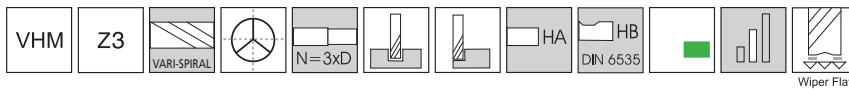


Tool Number	EDP	D1	D2	L1	L2	L3
138B 0200N5	13372	2.0	6.0	75.0	4.0	12.0
138B 0300N5	13374	3.0	6.0	75.0	5.0	17.0
138B 0400N5	13376	4.0	6.0	75.0	6.0	22.0
138B 0500N5	13378	5.0	6.0	75.0	7.0	27.0
138B 0600N5	13380	6.0	6.0	110.0	8.0	32.0
138B 0800N5	13382	8.0	8.0	110.0	10.0	42.0
138B 1000N5	13384	10.0	10.0	110.0	12.0	52.0
138B 1200N5	13386	12.0	12.0	120.0	16.0	62.0
138B 1600N5	13388	16.0	16.0	130.0	20.0	82.0





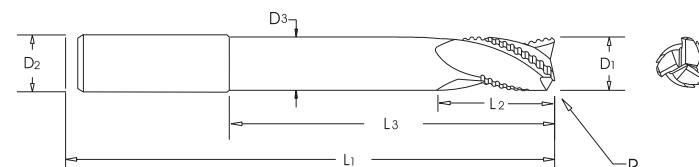
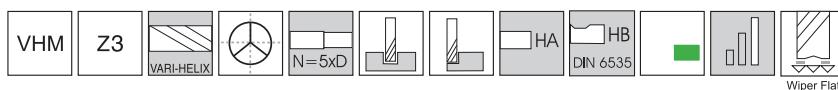
TuffCut® X-AL Series 137VR N3



Tool Number	D1	D2	D3	L1	L2	L3	R	Shank
137VR 12N3-1.0R	12.0	12.0	11.8	84.0	26.0	38.0	1.0	HA
137VR 12N3-1.0RW	12.0	12.0	11.8	84.0	26.0	38.0	1.0	HB
137VR 16N3-1.0R	16.0	16.0	15.8	93.0	32.0	50.0	1.0	HA
137VR 16N3-1.0RW	16.0	16.0	15.8	100.0	32.0	50.0	1.0	HB
137VR 20N3-1.0R	20.0	20.0	19.8	105.0	38.0	62.0	1.0	HA
137VR 20N3-1.0RW	20.0	20.0	19.8	112.0	38.0	62.0	1.0	HB



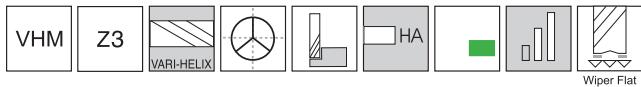
TuffCut® X-AL Series 137VR N5



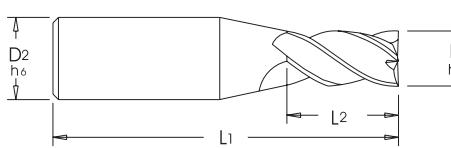
Tool Number	EDP	D1	D2	D3	L1	L2	L3	R	Shank
137VR 12N5-1.0R	12.0	12.0	11.8	11.8	110.0	18.0	62.0	1.0	HA
137VR 12N5-1.0RW	12.0	12.0	11.8	11.8	110.0	18.0	62.0	1.0	HB
137VR 16N5-1.0R	16.0	16.0	15.8	15.8	130.0	24.0	82.0	1.0	HA
137VR 16N5-1.0RW	16.0	16.0	15.8	15.8	130.0	24.0	82.0	1.0	HB
137VR 20N5-1.0R	20.0	20.0	19.8	19.8	150.0	30.0	102.0	1.0	HA
137VR 20N5-1.0RW	20.0	20.0	19.8	19.8	155.0	30.0	102.0	1.0	HB



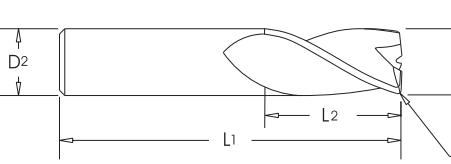
TuffCut® X-AL Series 137VF Finishing



Type 1



Type 2



3 x D1 and 5 x D1 Flute Lengths

Longueurs Taillées 3 x D1 et 5 x D1

Schneidenlängen 3 x D1 und 5 x D1

Lunghezza del tagliente 3 x D1 e 5 x D1

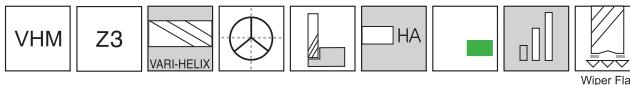
3 x D1 i 5 x D1 d'lunghezza dell'arista

Tool Number	D1	D2	L1	L2	R	Type
137VF 0303	3.0	6.0	75.0	11.0	-	1
137VF 0303-0.2R	3.0	6.0	75.0	11.0	0.2	1
137VF 0305	3.0	6.0	75.0	17.0	-	1
137VF 0305-0.2R	3.0	6.0	75.0	17.0	0.2	1
137VF 0403	4.0	6.0	75.0	14.0	-	1
137VF 0403-0.2R	4.0	6.0	75.0	14.0	0.2	1
137VF 0403-0.5R	4.0	6.0	75.0	14.0	0.5	1
137VF 0405	4.0	6.0	75.0	22.0	-	1
137VF 0405-0.2R	4.0	6.0	75.0	22.0	0.2	1
137VF 0405-0.5R	4.0	6.0	75.0	22.0	0.5	1
137VF 0503	5.0	6.0	75.0	17.0	-	1
137VF 0503-0.2R	5.0	6.0	75.0	17.0	0.2	1
137VF 0503-0.5R	5.0	6.0	75.0	17.0	0.5	1
137VF 0505	5.0	6.0	75.0	27.0	-	1
137VF 0505-0.2R	5.0	6.0	75.0	27.0	0.2	1
137VF 0505-0.5R	5.0	6.0	75.0	27.0	0.5	1
137VF 0603	6.0	6.0	75.0	20.0	-	2
137VF 0603-0.2R	6.0	6.0	75.0	20.0	0.2	2
137VF 0603-0.5R	6.0	6.0	75.0	20.0	0.5	2
137VF 0605	6.0	6.0	75.0	32.0	-	2
137VF 0605-0.2R	6.0	6.0	75.0	32.0	0.2	2
137VF 0605-0.5R	6.0	6.0	75.0	32.0	0.5	2
137VF 0605-1.0R	6.0	6.0	75.0	32.0	1.0	2
137VF 0803	8.0	8.0	75.0	26.0	-	2
137VF 0803-0.2R	8.0	8.0	75.0	26.0	0.2	2
137VF 0803-0.5R	8.0	8.0	75.0	26.0	0.5	2
137VF 0803-1.0R	8.0	8.0	75.0	26.0	1.0	2
137VF 0805	8.0	8.0	90.0	42.0	-	2
137VF 0805-0.2R	8.0	8.0	90.0	42.0	0.2	2
137VF 0805-0.5R	8.0	8.0	90.0	42.0	0.5	2
137VF 0805-1.0R	8.0	8.0	90.0	42.0	1.0	2
137VF 1003	10.0	10.0	90.0	32.0	-	2
137VF 1003-0.2R	10.0	10.0	90.0	32.0	0.2	2
137VF 1003-0.5R	10.0	10.0	90.0	32.0	0.5	2
137VF 1003-1.0R	10.0	10.0	90.0	32.0	1.0	2
137VF 1003-2.0R	10.0	10.0	90.0	32.0	2.0	2
137VF 1005	10.0	10.0	100.0	52.0	-	2
137VF 1005-0.2R	10.0	10.0	100.0	52.0	0.2	2
137VF 1005-0.5R	10.0	10.0	100.0	52.0	0.5	2



TuffCut® X-AL Series 137VF Finishing

Finition | Schlichten | Finitura | Obróbka wykańczająca



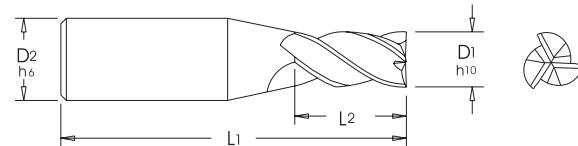
Wiper Flat



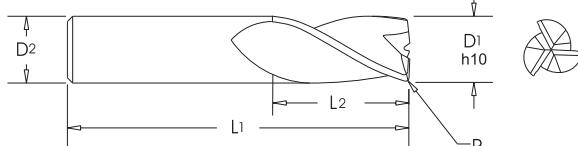
3 x D1 and 5 x D1 Flute Lengths

Longueurs Taillées 3 x D1 et 5 x D1
Schneidenlängen 3 x D1 und 5 x D1
Lunghezza del tagliente 3 x D1 e 5 x D1
3 x D1 i 5 x D1 długość ostrza

Type 1



Type 2



Tool Number	D1	D2	L1	L2	R	Type
137VF 1005-1.0R	10.0	10.0	100.0	52.0	1.0	2
137VF 1005-2.0R	10.0	10.0	100.0	52.0	2.0	2
137VF 1203	12.0	12.0	100.0	38.0	-	2
137VF 1203-0.2R	12.0	12.0	100.0	38.0	0.2	2
137VF 1203-0.5R	12.0	12.0	100.0	38.0	0.5	2
137VF 1203-1.0R	12.0	12.0	100.0	38.0	1.0	2
137VF 1203-2.0R	12.0	12.0	100.0	38.0	2.0	2
137VF 1205	12.0	12.0	120.0	62.0	-	2
137VF 1205-0.2R	12.0	12.0	120.0	62.0	0.2	2
137VF 1205-0.5R	12.0	12.0	120.0	62.0	0.5	2
137VF 1205-1.0R	12.0	12.0	120.0	62.0	1.0	2
137VF 1205-2.0R	12.0	12.0	120.0	62.0	2.0	2
137VF 1603	16.0	16.0	120.0	50.0	-	2
137VF 1603-0.2R	16.0	16.0	120.0	50.0	0.2	2
137VF 1603-0.5R	16.0	16.0	120.0	50.0	0.5	2
137VF 1603-1.0R	16.0	16.0	120.0	50.0	1.0	2
137VF 1603-2.0R	16.0	16.0	120.0	50.0	2.0	2
137VF 1605	16.0	16.0	150.0	82.0	-	2
137VF 1605-0.2R	16.0	16.0	150.0	82.0	0.2	2
137VF 1605-0.5R	16.0	16.0	150.0	82.0	0.5	2
137VF 1605-1.0R	16.0	16.0	150.0	82.0	1.0	2
137VF 1605-2.0R	16.0	16.0	150.0	82.0	2.0	2
137VF 2003	20.0	20.0	135.0	62.0	-	2
137VF 2003-0.2R	20.0	20.0	135.0	62.0	0.2	2
137VF 2003-0.5R	20.0	20.0	135.0	62.0	0.5	2
137VF 2003-1.0R	20.0	20.0	135.0	62.0	1.0	2
137VF 2003-2.0R	20.0	20.0	135.0	62.0	2.0	2
137VF 2005	20.0	20.0	164.0	102.0	-	2
137VF 2005-0.2R	20.0	20.0	164.0	102.0	0.2	2
137VF 2005-0.5R	20.0	20.0	164.0	102.0	0.5	2
137VF 2005-1.0R	20.0	20.0	164.0	102.0	1.0	2
137VF 2005-2.0R	20.0	20.0	164.0	102.0	2.0	2



TuffCut® XR Series 113A

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group		Material Type	Coolant			0.05 x D 2 x D	0.1 x D 2 x D	0.25 x D 2 x D	0.5 x D 1.5 x D
			Max	Air	MMS	Vc-M/Min			
Steels	P	Low Carbon	●	●	●	280	240	200	160
		Medium Carbon	●	●	●	200	185	160	135
		Alloy Steels	●	●	●	185	170	145	120
		Die/Tool Steels	●	●	●	160	135	105	100
Stainless Steels	M	Free Machining	●	X	○	120	100	85	80
		Austenitic	●	X	○	95	90	80	70
		Difficult Stainless	●	X	○	75	65	55	50
		PH Stainless	●	X	○	95	90	80	70
		Cobalt Chrome Alloys	●	X	○	70	65	55	50
		Duplex (22%)	●	X	○	70	65	55	50
		Super Duplex (25%)	●	X	○	45	40	35	30
Special Alloys	S	High Temp Alloys	●	X	X	35	30	25	20
		Inconel 625/718	●	X	X	35	30	25	20
		Titanium Alloys	●	X	X	95	70	60	50
Cast Irons	K	Gray Cast Iron	●	○	○	290	190	150	130
		Ductile Cast Iron	●	○	○	215	150	135	120
		Malleable Iron	●	○	○	120	110	105	95
Hardened Steels	H	Hardened Steels 45 - 50 Rc	●	○	○	110	70	40	35
		Hardened Steels 50 - 55 Rc	●	○	○	90	60	35	30

● Preferred

○ Possible

X Not Possible

Workpiece Material Group		Material Type	Tool Diameter								
			1.5mm	3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm
fz-mm/tooth											
Steels	P	Low Carbon	0.020								
		Medium Carbon		0.027	0.067	0.080	0.093	0.133	0.160	0.187	0.267
		Alloy Steels									
		Die/Tool Steels									
Stainless Steels	M	Free Machining	0.020								
		Austenitic		0.027	0.067	0.080	0.093	0.133	0.160	0.187	0.267
		Difficult Stainless									
		PH Stainless									
		Cobalt Chrome Alloys	0.014								
		Duplex (22%)		0.020	0.050	0.060	0.070	0.100	0.120	0.140	0.200
		Super Duplex (25%)									
Special Alloys	S	High Temp Alloys	0.009								
		Inconel		0.013	0.033	0.040	0.047	0.067	0.080	0.093	0.133
		Titanium Alloys									
Cast Irons	K	Gray Cast Iron	0.019								
		Ductile Cast Iron		0.027	0.067	0.080	0.093	0.133	0.160	0.187	0.267
		Malleable Iron									
Hardened Steels	H	Hardened Steels 45 - 50 Rc	0.017	0.024	0.060	0.072	0.084	0.120	0.144	0.168	0.240
		Hardened Steels 50 - 55 Rc	0.010	0.018	0.043	0.053	0.061	0.089	0.107	0.124	0.178

Please Note- Peripheral Milling only.

During profile milling less than 50% of the cutter diameter radial width, the actual chip thickness at the cutting edge is less than the programmed chipload. The accompanying table shows the increase in tooth load by given radial percentage engagement. Multiply your feed per tooth by the factor before finalising your table feed.

Radial Cut (Ae)	Chip thickness Compensation factor
30%	1.10
20%	1.20
15%	1.40
10%	1.80
5%	2.30
1%	5.00

TuffCut® Series 3MVS/3MVR

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group	I S O	Hardness	Coolant			vc-m/min	Application	End Mill Diameter (mm)					
			• Preferred	○ Possible	x Not Possible			0.5	1.0	1.5	2.0	2.5	3
			Max.	Air	MMS			fz - mm/tooth					
Alloy Steels 4140, 4145	P	28 to 44 Rc	●	●	○	85	Slotting	.002	.003	.005	.006	.008	.010
							Roughing	.006	.011	.017	.022	.028	.034
							Finishing	.011	.022	.032	.043	.054	.065
Die / Tool Steels A2, D2, H13, P20	P	28 to 44 Rc	●	●	○	70	Slotting	.002	.003	.005	.006	.008	.010
							Roughing	.006	.011	.017	.022	.028	.034
							Finishing	.011	.022	.032	.043	.054	.065
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	●	X	○	100	Slotting	.002	.003	.005	.006	.008	.010
							Roughing	.006	.011	.017	.022	.028	.034
							Finishing	.011	.022	.032	.043	.054	.065
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	X	○	70	Slotting	.002	.003	.005	.006	.008	.010
							Roughing	.006	.011	.017	.022	.028	.034
							Finishing	.011	.022	.032	.043	.054	.065
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronic	M	over 28 Rc	●	X	○	60	Slotting	.002	.003	.005	.006	.008	.010
							Roughing	.006	.011	.017	.022	.028	.034
							Finishing	.011	.022	.032	.043	.054	.065
High Temp Alloys Nimonics, Inconel, Monel, Hastelloy	S	up to 42 Rc	●	X	X	30	Slotting	.001	.002	.004	.005	.006	.007
							Roughing	.001	.003	.004	.006	.007	.009
							Finishing	.003	.006	.008	.011	.014	.017
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	●	X	X	55	Slotting	.001	.002	.004	.005	.006	.007
							Roughing	.001	.003	.004	.006	.007	.009
							Finishing	.003	.006	.008	.011	.014	.017
Hardened Steels	H	45 to 50 Rc	●	●	○	60	Slotting	.001	.002	.004	.005	.006	.007
							Roughing	.003	.006	.009	.012	.014	.017
							Finishing	.006	.011	.017	.022	.028	.033
Hardened Steels	H	50 to 55 Rc	●	●	○	55	Slotting	.0004	.001	.001	.002	.002	.002
							Roughing	.001	.003	.004	.006	.007	.009
							Finishing	.003	.006	.008	.011	.014	.017
Hardened Steels	H	> 55 Rc	●	●	○	45	Slotting	.0004	.001	.001	.002	.002	.002
							Roughing	.001	.003	.004	.006	.007	.009
							Finishing	.003	.006	.008	.011	.014	.017

Depth of Cut Per Application - 1.5x, 3x, & 5x Reach Tools		
Application	Depth of Cut	
	Radial	Axial
Slotting	1 x Dia.	0.25 x Dia.
Roughing	0.25 x Dia.	0.5 - 1 x Dia.
Finishing	0.05 x Dia.	0.5 - 1 x Dia.

Depth of Cut Per Application - 8x Reach Tools		
Application	Depth of Cut	
	Radial	Axial
Slotting	1 x Dia.	0.2 x Dia.
Roughing	0.2 x Dia.	0.5 - 1 x Dia.
Finishing	0.05 x Dia.	0.5 - 1 x Dia.

Depth of Cut Per Application - 10x Reach Tools		
Application	Depth of Cut	
	Radial	Axial
Slotting	1 x Dia.	0.15 x Dia.
Roughing	0.15 x Dia.	0.5 - 1 x Dia.
Finishing	0.05 x Dia.	0.5 - 1 x Dia.

Depth of Cut Per Application - 12x Reach Tools		
Application	Depth of Cut	
	Radial	Axial
Slotting	1 x Dia.	0.12 x Dia.
Roughing	0.1 x Dia.	0.5 - 1 x Dia.
Finishing	0.05 x Dia.	0.5 - 1 x Dia.

Depth of Cut Per Application - 15x Reach Tools		
Application	Depth of Cut	
	Radial	Axial
Slotting	1 x Dia.	0.07 x Dia.
Roughing	0.1 x Dia.	0.5 - 1 x Dia.
Finishing	0.05 x Dia.	0.5 - 1 x Dia.

Spindle Maximum - Should the calculated spindle speed be more than your actual spindle maximum, use this formula:
(Calculated Feed x Spindle Maximum)/Calculated Speed.

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.


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TuffCut® XR Series 177, 178 & 179

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group		Material Type	Coolant			1x D	1x D	0.05 x D	0.1 x D	0.2 x D	0.3 x D	0.5 x D
			Max	Air	MMS	1x D 0.5 x D	1x D 1x D	2x D	2x D	2x D	1.5 x D	1.5 x D
Steels	P	Low Carbon	●	●	●	210	200	450	350	300	250	200
		Medium Carbon	●	●	●	180	170	270	250	230	200	170
		Alloy Steels	●	●	●	160	150	250	230	210	180	150
		Die/Tool Steels	●	●	●	130	120	225	200	170	130	120
Stainless Steels	M	Free Machining	●	X	○	110	100	150	150	120	105	100
		Austenitic	●	X	○	100	90	130	120	110	100	90
		Difficult Stainless	●	X	○	70	60	100	90	80	70	60
		PH Stainless	●	X	○	100	90	130	120	110	100	90
		Cobalt Chrome Alloys	●	X	○	70	60	100	90	80	70	60
		Duplex (22%)	●	X	○	70	60	100	90	80	70	60
Special Alloys	S	Super Duplex (25%)	●	X	○	50	40	60	55	50	45	40
		High Temp Alloys	●	X	X	30	25	50	40	35	30	25
Cast Irons	K	Titanium Alloys	●	X	X	70	60	120	120	90	75	60
		Gray Cast Iron	●	○	○	180	160	360	360	240	190	160
		Ductile Cast Iron	●	○	○	170	150	270	270	190	170	150
Hardened Steels	H	Malleable Iron	●	○	○	130	120	160	150	140	130	120
		Hardened Steels 45 - 50 Rc	●	○	○	50	45	135	135	90	50	45
		Hardened Steels 50 - 55 Rc	●	○	○	45	40	115	115	75	45	40

● Preferred

○ Possible

X Not Possible

Workpiece Material Group		Material Type	Tool Diameter									
			1.5mm	3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm	25mm
Steels	P	Profiling-177-178-179	0.005	0.018	0.025	0.060	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting-177/179	0.003	0.009	0.012	0.030	0.040	0.050	0.060	0.080	0.100	0.125
Stainless Steels	M	Profiling-177-178-179	0.005	0.018	0.025	0.060	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting-177/179	0.003	0.009	0.012	0.030	0.040	0.050	0.060	0.080	0.100	0.125
Special Alloys	S	Profiling-177-178-179	0.003	0.009	0.013	0.032	0.038	0.044	0.064	0.076	0.089	0.127
		Slotting-177/179	0.0015	0.0045	0.007	0.016	0.019	0.022	0.032	0.038	0.045	0.065
Titanium	K	Profiling-177-178-179	0.005	0.018	0.025	0.060	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting-177/179	0.003	0.009	0.013	0.030	0.040	0.050	0.060	0.080	0.100	0.125
Cast Irons	K	Profiling-177-178-179	0.005	0.018	0.025	0.060	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting-177/179	0.003	0.009	0.013	0.030	0.040	0.050	0.060	0.080	0.100	0.125
Hardened Steels	H	Profiling-177-178-179<50HRC	0.005	0.016	0.023	0.057	0.069	0.080	0.114	0.137	0.160	0.229
		Slotting-177/179 <50HRC	0.003	0.008	0.013	0.028	0.035	0.040	0.065	0.070	0.080	0.115
		Profiling-177-178-179>55HRC	0.003	0.010	0.015	0.041	0.051	0.058	0.084	0.102	0.119	0.170
		Slotting-177/179 >55HRC	0.002	0.005	0.008	0.020	0.025	0.028	0.042	0.050	0.060	0.080

Please Note- 178 series-5 flute to be used for Peripheral milling only.

During profile milling less than 50% of the cutter diameter radial width, the actual chip thickness at the cutting edge is less than the programmed chipload. The accompanying table shows the increase in tooth load by given radial percentage engagement. Multiply your feed per tooth by the factor before finalising your table feed.

Radial Cut (Ae)	Chip thickness Compensation factor
30%	1.10
20%	1.20
15%	1.40
10%	1.80
5%	2.30
1%	5.00

For 177L tools please use the following conditions	
Ap 1 x D1	0.25 x D1
Ae 0.1 x D1	1.0 x D1

When using Long Series 178 - 1 Reduce speed by 20%



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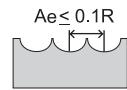
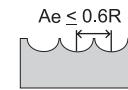
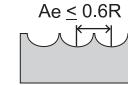
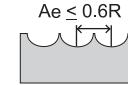


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TuffCut® XR & XT Series 179, 179L & 279

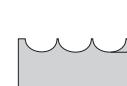
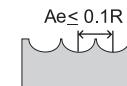
Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Semi Roughing / Roughing Steel (25-48 HRC)							Semi Finishing / Finishing Steel (25-48 HRC)				
Diameter	R	RPM	f	fz	Ae Max.	Ap Max.	f	fz	Ae Max.	Ap Max.	
mm	mm	trs	mm/min	mm/z	mm	mm	mm/min	mm/z	mm	mm	
1.5	R 0.75	35,000	1,950 - 3,300	0.0139 - 0.0235	0.075	0.450	1,950 - 3,300	0.0139 - 0.0235	0.450	0.075	
2	R 1.0	30,000	2,100 - 3,600	0.0175 - 0.0300	0.100	0.600	2,100 - 3,600	0.0175 - 0.0300	0.600	0.100	
2.5	R 1.25	28,000	2,100 - 3,600	0.0185 - 0.0320	0.125	0.750	2,100 - 3,600	0.0185 - 0.0320	0.750	0.125	
3	R 1.5	26,500	2,100 - 3,600	0.0198 - 0.0330	0.150	0.900	2,100 - 3,600	0.0198 - 0.0330	0.900	0.150	
3.5	R 1.75	24,000	2,250 - 3,900	0.0230 - 0.0400	0.175	1.000	2,250 - 3,900	0.0230 - 0.0400	1.000	0.175	
4	R 2.0	23,000	2,250 - 3,900	0.0240 - 0.0420	0.200	1.200	2,250 - 3,900	0.0240 - 0.0420	1.200	0.200	
4.5	R 2.25	22,000	2,250 - 3,900	0.0250 - 0.0440	0.220	1.350	2,250 - 3,900	0.0250 - 0.0440	1.350	0.220	
5	R 2.5	20,000	1,800 - 5,500	0.0225 - 0.0687	0.250	1.500	1,800 - 5,500	0.0225 - 0.0687	1.500	0.250	
6	R 3.0	20,000	1,800 - 5,500	0.0225 - 0.0687	0.300	1.800	1,800 - 5,500	0.0225 - 0.0687	1.800	0.300	
8	R 4.0	15,000	2,200 - 5,000	0.0366 - 0.0833	0.400	2.400	2,200 - 5,000	0.0366 - 0.0833	2.400	0.400	
10	R 5.0	12,000	2,300 - 4,600	0.0479 - 0.0958	0.500	3.000	2,300 - 4,600	0.0479 - 0.0958	3.000	0.500	
12	R 6.0	10,000	1,900 - 4,100	0.0475 - 0.1025	0.600	3.600	1,900 - 4,100	0.0475 - 0.1025	3.600	0.600	
16	R 8.0	7,500	1,600 - 3,200	0.0533 - 0.1066	0.800	4.800	1,600 - 3,200	0.0533 - 0.1066	4.800	0.800	


Ae \leq 0.1R
Cooling Requirements - High Pressure Air Blast

Ap \leq 0.6R
Cooling Requirements - High Pressure Air Blast

Ap \leq 0.1R
Cooling Requirements - High Pressure Air Blast.

Titanium				
Diameter	R	RPM	f	fz
mm	mm	trs	mm/min	mm/z
1.5	R 0.75	32,000	2,700	0.020
2.0	R 1.0	24,000	2,400	0.025
2.5	R 1.25	24,000	2,400	0.025
3.0	R 1.5	16,000	1,950	0.030
3.5	R 1.75	16,000	1,950	0.030
4.0	R 2.0	12,000	1,950	0.040
4.5	R 2.25	12,000	1,950	0.040
5.0	R 2.5	10,000	1,650	0.040
6.0	R 3.0	8,000	1,500	0.046
8.0	R 4.0	6,000	1,650	0.068
10.0	R 5.0	5,000	1,650	0.080
12.0	R 6.0	4,000	1,500	0.093
16.0	R 8.0	3,000	1,200	0.100

High Temperature Alloys						
Diameter	R	RPM	f	fz	Ae Max.	Ap Max.
mm	mm	trs	mm/min	mm/z	mm	mm
1.5	R 0.75	10,000	825	0.020	0.075	0.05
2.0	R 1.0	7,300	750	0.025	0.100	0.06
2.5	R 1.25	6,000	700	0.029	0.125	0.08
3.0	R 1.5	5,000	630	0.030	0.150	0.09
3.5	R 1.75	4,100	575	0.035	0.175	0.11
4.0	R 2.0	3,600	555	0.040	0.200	0.12
4.5	R 2.25	3,200	510	0.040	0.220	0.14
5.0	R 2.5	3,000	510	0.040	0.250	0.15
6.0	R 3.0	2,500	495	0.046	0.300	0.18
8.0	R 4.0	1,900	510	0.068	0.400	0.24
10.0	R 5.0	1,500	510	0.080	0.500	0.30
12.0	R 6.0	1,200	450	0.093	0.600	0.36
16.0	R 8.0	900	360	0.100	0.800	0.48


Ae \leq 0.1R
Ap \leq 0.06R
Cooling Requirements - Maximum coolant flow/pressure

TuffCut® XR7 Series 180

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group		Material Type	Coolant			0.05 x D 2 x D	0.1 x D 2 x D	0.2 x D 2 x D
			Max	Air	MMS	Vc-M/Min		
Steels	P	Low Carbon	●	●	●	480	385	330
		Medium Carbon	●	●	●	345	275	255
		Alloy Steels	●	●	●	315	255	230
		Die/Tool Steels	●	●	●	275	220	187
Stainless Steels	M	Free Machining	●	X	○	205	165	130
		Austenitic	●	X	○	160	130	120
		Difficult Stainless	●	X	○	125	100	90
		PH Stainless	●	X	○	160	130	120
		Cobalt Chrome Alloys	●	X	○	125	100	90
		Duplex (22%)	●	X	○	125	100	90
		Super Duplex (25%)	●	X	○	75	60	55
Special Alloys	S	High Temp Alloys	●	X	X	55	45	40
		Inconel	●	X	X	55	45	40
		Titanium Alloys	●	X	X	160	130	100
Cast Irons	K	Gray Cast Iron	●	○	○	495	395	265
		Ductile Cast Iron	●	○	○	370	300	210
		Malleable Iron	●	○	○	205	165	155
Hardened Steels	H	Hardened Steels 45 - 50 Rc	●	○	○	185	150	100
		Hardened Steels 50 - 55 Rc	I	○	○	155	125	85

● Preferred ○ Possible X Not Possible

Workpiece Material Group		Material Type	Tool Diameter			
			12mm	16mm	20mm	25mm
Steels	P	Low Carbon	0.120	0.160	0.200	0.250
		Medium Carbon				
		Alloy Steels				
		Die/Tool Steels				
Stainless Steels	M	Free Machining	0.120	0.160	0.200	0.250
		Austenitic				
		Difficult Stainless				
		PH Stainless	0.095	0.114	0.133	0.191
		Cobalt Chrome Alloys				
		Duplex (22%)				
Special Alloys	S	Super Duplex (25%)				
		High Temp Alloys	0.064	0.076	0.089	0.127
		Inconel				
Cast Irons	K	Titanium Alloys				
		Gray Cast Iron	0.120	0.160	0.200	0.250
		Ductile Cast Iron				
Hardened Steels	H	Malleable Iron				
		Hardened Steels 45 - 50 Rc	0.114	0.137	0.160	0.229
		Hardened Steels 50 - 55 Rc	0.084	0.102	0.119	0.170

Please Note - Peripheral Milling only.

During profile milling less than 50% of the cutter diameter radial width, the actual chip thickness at the cutting edge is less than the programmed chipload. The accompanying table shows the increase in tooth load by given radial percentage engagement. Multiply your feed per tooth by the factor before finalising your table feed.

Radial Cut (Ae)	Chip thickness Compensation factor
30%	1.10
20%	1.20
15%	1.40
10%	1.80
5%	2.30
1%	5.00

TuffCut® XT9 Series 380

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group	I S O	Hardness	Coolant		Profiling (ae)	End Mill Diameter (mm)						
			● Preferred	○ Possible		8	10	12	16	20		
						5%	10%	Multiply fz by this Factor based on ae. When finishing, use the standard fz per chart below. Only add chip thinning when roughing or semi-finishing.				
			Max.	Air	MMS	vc - m/min	fz - mm/tooth					
Low Carbon Steels 1018, 1020	P	up to 28 Rc	●	●	●	450	350	.080	.100	.110	.150	.254
Medium Carbon Steels 1140, 1145	P	28 to 38 Rc	●	●	●	345	275	.080	.100	.110	.150	.254
Alloy Steels 4140, 4145	P	28 to 44 Rc	●	●	●	315	255	.080	.100	.110	.150	.254
Die / Tool Steels A2, D2, H13, P20	P	28 to 44 Rc	●	●	●	275	220	.080	.100	.110	.150	.254
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	●	x	o	205	165	.030-.040	.038-.050	.050-.078	.050-.083	.060-.099
Stainless Steel - Austenitic 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	●	x	o	160	130	.030-.040	.038-.050	.050-.078	.050-.083	.060-.099
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321	M	up to 28 Rc	●	x	o	125	100	.030-.040	.038-.050	.050-.078	.050-.083	.060-.099
Stainless Steel - Difficult to Machine 17-4 PH, PH13-8Mo, Nitronics	M	over 28 Rc	●	x	o	160	130	.030-.040	.038-.050	.050-.078	.050-.083	.060-.099
Cobalt Chrome Alloys	M		●	x	o	125	100	.040	.050	.078	.083	.099
Duplex (22%)	M		●	x	o	75	60	.040	.050	.078	.083	.099
Super Duplex (25%)	M		●	x	o	75	60	.040	.050	.078	.083	.099
High Temp Alloys	S	up to 42 Rc	●	x	x	55	45	.030-.040	.038-.050	.025-.040	.025-.043	.030-.050
Inconel	S		●	x	x	55	45	.020-.030	.025-.040	.025-.040	.025-.043	.030-.050
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2.5Sn-4Zr-6Mo, 3Al-8V-6Cr4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	●	x	x	115	105	.020-.030	.025-.040	.050-.078	.050-.083	.030-.050
Cast-Iron - Gray CG, ASTM A48, CLASS 20, 25, 30, 35, SAE J431C, GRADES G1800, G3000, G3500, GG 10, 15, 20, 25, 30, 35, 40	K	up to 240 HB	●	o	o	495	395	.080	.100	.110	.150	.254
Cast Iron - Ductile & Malleable CGI 60-40-18, 65-45-12, D4018, D4512, D5506, 32510, 35108, M3210, M4504, M5503, 250, 300, 350, 400, 450	K	over 240 HB	●	o	o	205	165	.065	.080	.110	.150	.254
Hardened Steels	H	40-50 Rc	●	o	o	185	150	.050	.060	.101	.116	.152
Hardened Steels		50-55 Rc	●	o	o	155	125	.030	.040	.061	.076	.088
Hardened Steels		>55 Rc	●	o	o	100	95	.020	.025	.045	.055	.063

Safety Note

Always wear the appropriate personal protective equipment such as safety glasses and protective clothing when using solid carbide or HSS cutting tools. Machines should be fully guarded.

Spindle Maximum - Should the calculated spindle speed be more than your actual spindle maximum, use this formula:
 $(\text{Calculated Feed} \times \text{Spindle Maximum}) / \text{Calculated Speed}$

Technical data provided should be considered advisory only as variations may be necessary depending on the particular application.



TuffCut® XT Series 279, 277 / R / NR / NR-W, 278 R / N3 / N4 / N5

Recommended cutting data Conditions de coupe recommandées Empfohlene Schnittdaten Dati di taglio Raccomandati Zalecane Parametry

Workpiece Material Group		Material Type	Coolant			1x D 0.5 x D	1x D 1 x D	0.05 x D 2 x D	0.1 x D 2 x D	0.2 x D 2 x D	0.3 x D 1.5 x D	0.5 x D 1.5 x D
			Max	Air	MMS	Vc-M/Min						
Steels	P	Low Carbon	●	●	●	230	220	480	385	330	275	220
		Medium Carbon	●	●	●	200	185	345	275	255	220	185
		Alloy Steels	●	●	●	175	165	315	255	230	200	165
		Die/Tool Steels	●	●	●	145	130	275	220	187	145	130
Stainless Steels	M	Free Machining	●	X	○	120	110	205	165	130	115	110
		Austenitic	●	X	○	110	100	160	130	120	110	100
		Difficult Stainless	●	X	○	75	65	125	100	90	75	65
		PH Stainless	●	X	○	110	100	160	130	120	110	100
		Cobalt Chrome Alloys	●	X	○	75	65	125	100	90	75	65
		Duplex (22%)	●	X	○	75	65	125	100	90	75	65
Special Alloys	S	Super Duplex (25%)	●	X	○	55	45	75	60	55	50	45
		High Temp Alloys	●	X	X	35	28	55	45	40	35	28
		Titanium Alloys	●	X	X	35	28	55	45	40	35	28
Cast Irons	K	Gray Cast Iron	●	○	○	200	175	495	395	265	210	175
		Ductile Cast Iron	●	○	○	185	165	370	300	210	185	165
		Malleable Iron	●	○	○	145	132	205	165	155	145	130
Hardened Steels	H	Hardened Steels 35 - 45 Rc	●	○	○	60	50	185	150	100	55	50
		Hardened Steels 45 - 55 Rc	●	○	○	50	45	155	125	85	50	45

● Preferred ○ Possible X Not Possible

Workpiece Material Group		Material Type	Tool Diameter								
			3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm	25mm
Steels	P	Profiling	0.030	0.050	0.06	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting	0.015	0.025	0.03	0.040	0.050	0.060	0.080	0.100	0.125
Stainless Steels	M	Profiling	0.030	0.050	0.06	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting	0.015	0.025	0.03	0.040	0.050	0.060	0.080	0.100	0.125
Special Alloys	S	Profiling	0.009	0.013	0.032	0.038	0.044	0.064	0.076	0.089	0.127
		Slotting	0.005	0.007	0.016	0.019	0.022	0.032	0.038	0.045	0.065
Titanium		Profiling	0.030	0.050	0.060	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting	0.015	0.025	0.030	0.040	0.050	0.060	0.080	0.100	0.125
Cast Irons	K	Profiling	0.030	0.050	0.060	0.080	0.100	0.120	0.160	0.200	0.250
		Slotting	0.015	0.025	0.030	0.040	0.050	0.060	0.080	0.100	0.125
Hardened Steels	H	Profiling 35 - 45 Rc	0.016	0.023	0.057	0.069	0.080	0.114	0.137	0.160	0.229
		Slotting 35 - 45 Rc	0.010	0.015	0.025	0.035	0.045	0.065	0.070	0.075	0.100
		Profiling 45 - 55 Rc	0.010	0.015	0.041	0.051	0.058	0.084	0.102	0.119	0.170
		Slotting 45 - 55 Rc	0.008	0.011	0.020	0.030	0.040	0.050	0.055	0.080	0.090

During profile milling less than 50% of the cutter diameter radial width, the actual chip thickness at the cutting edge is less than the programmed chipload. The accompanying table shows the increase in tooth load by given radial percentage engagement. Multiply your feed per tooth by the factor before finalising your table feed.

Radial Cut (Ae)	Chip thickness Compensation factor
30%	1.10
20%	1.20
15%	1.40
10%	1.80
5%	2.30
1%	5.00

Note:

For N4 tools reduce above data by 10%
For N5 tools reduce above data by 30%

For N4 & N5 tools profile machining only!


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TuffCut® XT Series V5LCB

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

3 x D Cutting Length			Ø 6.0	Ø 8.0	Ø 10.0	Ø 12.0	Ø 16.0
			Maximum Axial Depth Of Cut (ap)				
Material Group	Vc		≤ 3 x ØD (18.0mm)	≤ 3 x ØD (24.0mm)	≤ 3 x ØD (30.0mm)	≤ 3 x ØD (36.0mm)	≤ 3 x ØD (48.0mm)
			Maximum Radial Depth Of Cut (ae)				
Low Carbon, Free Machining Steels	300	0.1 x ØD ₁ (0.6mm)	0.1 x ØD ₁ (0.8mm)	0.1 x ØD ₁ (1.0mm)	0.1 x ØD ₁ (1.2mm)	0.1 x ØD ₁ (1.6mm)	
		RPM	15,900	11,925	9,540	7,950	5,963
Alloy Steels, Tool Steels & Nitriding Steels	200	Feed (Vf)	5,724	5,724	5,724	5,724	5,724
		RPM	10,600	7,950	6,360	5,300	3,975
Free Machining & Austenitic Stainless Steels ≤ 32 HRC	150	Feed (Vf)	3,816	3,816	3,816	3,816	3,816
		RPM	7,950	5,963	4,770	3,975	2,981
Moderate Machining & PH Stainless Steels	130	Feed (Vf)	2,862	2,862	2,862	2,862	2,862
		RPM	6,890	5,168	4,134	3,445	2,584
Duplex & Super Duplex Stainless Steels	80	Feed (Vf)	2,480	2,480	2,480	2,480	2,480
		RPM	4,240	3,180	2,544	2,120	1,590
Titanium Alloys	80	Feed (Vf)	1,526	1,526	1,526	1,526	1,526

4 x D Cutting Length			Ø 6.0	Ø 8.0	Ø 10.0	Ø 12.0	Ø 16.0
			Maximum Axial Depth Of Cut (ap)				
Material Group	Vc		≤ 4 x ØD (24.0mm)	≤ 4 x ØD (32.0mm)	≤ 4 x ØD (40.0mm)	≤ 4 x ØD (48.0mm)	≤ 4 x ØD (64.0mm)
			Maximum Radial Depth Of Cut (ae)				
Low Carbon, Free Machining Steels	300	0.05 x ØD (0.3mm)	0.05 x ØD (0.4mm)	0.05 x ØD (0.5mm)	0.05 x ØD (0.6mm)	0.05 x ØD (0.8mm)	
		RPM	15,900	11,925	9,540	7,950	5,963
Alloy Steels, Tool Steels & Nitriding Steels	200	Feed (Vf)	5,724	5,724	5,724	5,724	5,724
		RPM	10,600	7,950	6,360	5,300	3,975
Free Machining & Austenitic Stainless Steels ≤ 32 HRC	150	Feed (Vf)	3,816	3,816	3,816	3,816	3,816
		RPM	7,950	5,963	4,770	3,975	2,981
Moderate Machining & PH Stainless Steels	130	Feed (Vf)	2,862	2,862	2,862	2,862	2,862
		RPM	6,890	5,168	4,134	3,445	2,584
Duplex & Super Duplex Stainless Steels	80	Feed (Vf)	2,480	2,480	2,480	2,480	2,480
		RPM	4,240	3,180	2,544	2,120	1,590
Titanium Alloys	80	Feed (Vf)	1,526	1,526	1,526	1,526	1,526

Please note - the cutting data shown in the table above is advisory and should be considered as the maximum.

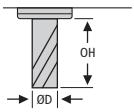
Adjustments should be made to the cutting data depending on the application, work piece rigidity, machine tool etc.

V5LCB should only be used in accurate tool holders with high gripping power. ER collet type tool holders are not recommended.

TuffCut® Series 158

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

HSC Roughing



Tool Diameter and Corner Radius

Workpiece Material Group		Material Type	Coolant		OH	Vc	2.0 x R0.5			3.0 x R0.8			4.0 x R1.0		
			Air	Emulsion			Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Steel	P	Alloy & Tool Steel Below 260HB	●	○	3D	120	0.10	0.5	0.10	0.16	0.7	0.16	0.20	1.0	0.20
					4D	110	0.09		0.10	0.14		0.16	0.18		0.20
					5D	100	0.09		0.10	0.14		0.16	0.17		0.20
					6D	95	0.07		0.10	0.11		0.16	0.14		0.20
					8D	85	0.06		0.10	0.10		0.16	0.12		0.20
					10D	70	0.05		0.10	0.08		0.16	0.10		0.20
	P	Pre-hardened Tool Steel HRC30-40	●	○	3D	95	0.08	0.5	0.09	0.13	0.7	0.14	0.16	1.0	0.18
					4D	85	0.07		0.09	0.12		0.14	0.14		0.18
					5D	80	0.07		0.09	0.11		0.14	0.14		0.18
					6D	75	0.05		0.09	0.09		0.14	0.11		0.18
					8D	65	0.05		0.09	0.08		0.14	0.10		0.18
					10D	55	0.04		0.09	0.06		0.14	0.08		0.18
Stainless Steel	M	Stainless Steel 300 & PH series	X	●	3D	70	0.08	0.5	0.09	0.13	0.7	0.14	0.16	1.0	0.18
					4D	65	0.07		0.09	0.12		0.14	0.14		0.18
					5D	60	0.07		0.09	0.11		0.14	0.14		0.18
					6D	55	0.05		0.09	0.09		0.14	0.11		0.18
					8D	50	0.05		0.09	0.08		0.14	0.10		0.18
					10D	40	0.04		0.09	0.06		0.14	0.08		0.18
Special Alloys	S	High Temp Alloys	X	●	3D	30	0.03	0.4	0.05	0.04	0.6	0.08	0.05	0.8	0.10
					4D	25	0.02		0.05	0.04		0.08	0.05		0.10
					5D	25	0.02		0.05	0.03		0.08	0.04		0.10
					6D	25	0.02		0.05	0.03		0.08	0.03		0.10
					8D	20	0.02		0.05	0.02		0.08	0.03		0.10
					10D	20	0.01		0.05	0.02		0.08	0.03		0.10
	S	Titanium Alloys	X	●	3D	70	0.06	0.4	0.08	0.09	0.6	0.12	0.11	0.8	0.15
					4D	65	0.05		0.08	0.08		0.12	0.10		0.15
					5D	60	0.05		0.08	0.07		0.12	0.09		0.15
					6D	55	0.04		0.08	0.06		0.12	0.07		0.15
					8D	50	0.03		0.08	0.05		0.12	0.07		0.15
					10D	40	0.03		0.08	0.04		0.12	0.06		0.15
Cast Iron	K	GG, GGG	●	●	3D	120	0.10	0.5	0.10	0.16	0.7	0.16	0.20	1.0	0.20
					4D	110	0.09		0.10	0.14		0.16	0.18		0.20
					5D	100	0.09		0.10	0.14		0.16	0.17		0.20
					6D	95	0.07		0.10	0.11		0.16	0.14		0.20
					8D	85	0.06		0.10	0.10		0.16	0.12		0.20
					10D	70	0.05		0.10	0.08		0.16	0.10		0.20
	H	Hardened Steels HRC45-50	●	○	3D	80	0.06	0.5	0.07	0.10	0.7	0.11	0.12	1.0	0.14
					4D	70	0.05		0.07	0.09		0.11	0.11		0.14
					5D	70	0.05		0.07	0.08		0.11	0.10		0.14
					6D	65	0.04		0.07	0.07		0.11	0.08		0.14
					8D	55	0.04		0.07	0.06		0.11	0.07		0.14
					10D	50	0.03		0.07	0.05		0.11	0.06		0.14
Hardened Steels	H	Hardened Steels HRC50-55	●	X	3D	60	0.05	0.4	0.05	0.08	0.6	0.08	0.10	0.8	0.10
					4D	55	0.05		0.05	0.07		0.08	0.09		0.10
					5D	50	0.04		0.05	0.07		0.08	0.09		0.10
					6D	50	0.03		0.05	0.05		0.08	0.07		0.10
					8D	40	0.03		0.05	0.05		0.08	0.06		0.10
					10D	35	0.03		0.05	0.04		0.08	0.05		0.10

● Preferred

○ Possible

X Not Possible



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TuffCut® Series 158

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

HSC Roughing

Tool Diameter and Corner Radius

6.0 x R1.5			8.0 x R2.0			10.0 x R2.0			12 x R2.0			16 x R3.0		
Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
0.30	1.5	0.30	0.40	2.0	0.4	0.40	3.0	0.40	0.40	4.0	0.40	0.60	5.0	0.6
0.27		0.30	0.36		0.4	0.36		0.40	0.36		0.40	0.54		0.6
0.26		0.30	0.34		0.4	0.34		0.40	0.34		0.40	0.51		0.6
0.20		0.30	0.27		0.4	0.27		0.40	0.27		0.40	0.41		0.6
0.18		0.30	0.24		0.4	0.24		0.40	0.24		0.40	0.36		0.6
0.15		0.30	0.20		0.4	0.20		0.40	0.20		0.40	0.30		0.6
0.24	1.5	0.27	0.32	2.0	0.36	0.32	3.0	0.36	0.32	4.0	0.36	0.48	5.0	0.54
0.22		0.27	0.29		0.36	0.29		0.36	0.29		0.36	0.43		0.54
0.20		0.27	0.27		0.36	0.27		0.36	0.27		0.36	0.41		0.54
0.16		0.27	0.22		0.36	0.22		0.36	0.22		0.36	0.33		0.54
0.14		0.27	0.19		0.36	0.19		0.36	0.19		0.36	0.29		0.54
0.12		0.27	0.16		0.36	0.16		0.36	0.16		0.36	0.28		0.54
0.24	1.5	0.27	0.32	2.0	0.36	0.32	3.0	0.36	0.32	4.0	0.36	0.48	5.0	0.54
0.22		0.27	0.29		0.36	0.29		0.36	0.29		0.36	0.43		0.54
0.20		0.27	0.27		0.36	0.27		0.36	0.27		0.36	0.41		0.54
0.16		0.27	0.22		0.36	0.22		0.36	0.22		0.36	0.33		0.54
0.14		0.27	0.19		0.36	0.19		0.36	0.19		0.36	0.29		0.54
0.12		0.27	0.16		0.36	0.16		0.36	0.16		0.36	0.24		0.54
0.08	1.2	0.15	0.10	1.6	0.20	0.10	2.5	0.20	0.10	3.5	0.20	0.15	4.3	0.30
0.07		0.15	0.09		0.20	0.09		0.20	0.09		0.20	0.14		0.30
0.06		0.15	0.09		0.20	0.09		0.20	0.09		0.20	0.13		0.30
0.05		0.15	0.07		0.20	0.07		0.20	0.07		0.20	0.10		0.30
0.05		0.15	0.06		0.20	0.06		0.20	0.06		0.20	0.09		0.30
0.04		0.15	0.05		0.20	0.05		0.20	0.05		0.20	0.08		0.30
0.17	1.2	0.23	0.22	1.6	0.30	0.22	2.5	0.30	0.22	3.5	0.30	0.33	4.3	0.45
0.15		0.23	0.20		0.30	0.20		0.30	0.20		0.30	0.30		0.45
0.14		0.23	0.19		0.30	0.19		0.30	0.19		0.30	0.28		0.45
0.11		0.23	0.15		0.30	0.15		0.30	0.15		0.30	0.22		0.45
0.10		0.23	0.13		0.30	0.13		0.30	0.13		0.30	0.20		0.45
0.08		0.23	0.11		0.30	0.11		0.30	0.11		0.30	0.17		0.45
0.30	1.5	0.30	0.40	2.0	0.4	0.40	3.0	0.40	0.40	4.0	0.40	0.60	5.0	0.6
0.27		0.30	0.36		0.4	0.36		0.40	0.36		0.40	0.54		0.6
0.26		0.30	0.34		0.4	0.34		0.40	0.34		0.40	0.51		0.6
0.20		0.30	0.27		0.4	0.27		0.40	0.27		0.40	0.41		0.6
0.18		0.30	0.24		0.4	0.24		0.40	0.24		0.40	0.36		0.6
0.15		0.30	0.20		0.4	0.20		0.40	0.20		0.40	0.30		0.6
0.18	1.5	0.21	0.24	2.0	0.28	0.24	3.0	0.28	0.24	4.0	0.28	0.36	5.0	0.42
0.16		0.21	0.22		0.28	0.22		0.28	0.22		0.28	0.32		0.42
0.15		0.21	0.20		0.28	0.20		0.28	0.20		0.28	0.31		0.42
0.12		0.21	0.16		0.28	0.16		0.28	0.16		0.28	0.24		0.42
0.11		0.21	0.14		0.28	0.14		0.28	0.14		0.28	0.22		0.42
0.09		0.21	0.12		0.28	0.12		0.28	0.12		0.28	0.18		0.42
0.15	1.2	0.15	0.20	1.6	0.20	0.20	2.5	0.20	0.20	3.5	0.20	0.30	4.3	0.30
0.14		0.15	0.18		0.20	0.18		0.20	0.18		0.20	0.27		0.30
0.13		0.15	0.17		0.20	0.17		0.20	0.17		0.20	0.26		0.30
0.10		0.15	0.14		0.20	0.14		0.20	0.14		0.20	0.20		0.30
0.09		0.15	0.12		0.20	0.12		0.20	0.12		0.20	0.18		0.30
0.08		0.15	0.10		0.20	0.10		0.20	0.10		0.20	0.15		0.30

TuffCut® Series 158

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry



Cutting Speed

Workpiece Material Group		Material Type	Coolant		1 x D	0.1 x D	2D/3D HSC
			Air	Emulsion	Slotting	Profiling	2D/3D HSC
			Vc-M/Min				
Steels	P	Alloy & Tool Steels Below 260HB	●	○	100	180	200
		Pre-hardened Tools Steel HRC30-40	●	●	70	120	180
Stainless Steels	M	Stainless Steels 300 & PH series	X	●	80	100	150
Special Alloys	S	High Temp Alloys	X	●	25	50	70
		Titanium Alloys	X	●	60	100	120
Cast Irons	K	GG, GGG	●	●	100	200	220
Hardened Steels	H	Hardened Steels HRC45-50	●	○	75	90	140
		Hardened Steels HRC50-55	●	○	40	70	120

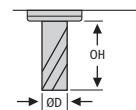
● Preferred ○ Possible X Not Possible

Feed Per Tooth

Workpiece Material Group		Material Type	Operation	Tool Diameter							
				2.0	3.0	4.0	6.0	8.0	10.0	12.0	16.0
fz-mm/tooth											
Steels	P	Alloy & Tool Steels Below 260HB	Slotting	0.010	0.015	0.020	0.030	0.040	0.050	0.060	0.080
			Profiling	0.020	0.030	0.040	0.060	0.080	0.100	0.120	0.160
			HSC 2D/3D	0.060	0.090	0.120	0.180	0.240	0.300	0.360	0.480
		Pre-hardened Tool Steels HRC30-40	Slotting	0.008	0.012	0.016	0.024	0.032	0.040	0.048	0.064
			Profiling	0.016	0.024	0.032	0.048	0.064	0.080	0.096	0.128
			HSC 2D/3D	0.050	0.075	0.100	0.150	0.200	0.250	0.300	0.400
Stainless Steels	M	Stainless Steel 300 & PH series	Slotting	0.007	0.010	0.013	0.020	0.026	0.033	0.040	0.053
			Profiling	0.013	0.020	0.026	0.040	0.053	0.066	0.079	0.106
			HSC 2D/3D	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.320
Special Alloys	S	High Temp Alloys	Slotting	0.004	0.006	0.008	0.013	0.017	0.021	0.025	0.034
			Profiling	0.008	0.013	0.017	0.025	0.034	0.042	0.050	0.067
			HSC 2D/3D	0.020	0.030	0.040	0.060	0.080	0.100	0.120	0.160
		Titanium Alloys	Slotting	0.006	0.009	0.012	0.018	0.024	0.030	0.036	0.048
			Profiling	0.012	0.018	0.024	0.036	0.048	0.060	0.072	0.096
			HSC 2D/3D	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.320
Cast Irons	K	GG, GGG	Slotting	0.010	0.015	0.020	0.030	0.040	0.050	0.060	0.080
			Profiling	0.020	0.030	0.040	0.060	0.080	0.100	0.120	0.160
			HSC 2D/3D	0.060	0.090	0.120	0.180	0.240	0.300	0.360	0.480
Hardened Steels	H	Hardened Steels HRC45-50	Slotting	0.007	0.010	0.013	0.020	0.026	0.033	0.040	0.053
			Profiling	0.013	0.020	0.026	0.040	0.053	0.066	0.079	0.106
			HSC 2D/3D	0.040	0.060	0.080	0.120	0.160	0.200	0.240	0.320
		Hardened Steels HRC50-55	Slotting	0.005	0.008	0.010	0.015	0.020	0.025	0.030	0.040
			Profiling	0.010	0.015	0.020	0.030	0.040	0.050	0.060	0.080
			HSC 2D/3D	0.030	0.045	0.060	0.090	0.120	0.150	0.180	0.240

TuffCut® Series 158

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry



Depth of Cut HSC 2D/3D Axial & Radial

Workpiece Material Group		Material Type	OH	Tool Diameter							
				2.0	3.0	4.0	6.0	8.0	10.0	12.0	16.0
Steels	P	Alloy & Tool Steels Below 260HB	3D-4D	0.06	0.09	0.12	0.18	0.24	0.30	0.36	0.48
			5D-6D	0.05	0.07	0.10	0.14	0.19	0.24	0.29	0.38
			8D-10D	0.04	0.05	0.07	0.11	0.14	0.18	0.22	0.29
	M	Pre-hardened Tool Steels HRC30-40	3D-4D	0.06	0.09	0.12	0.18	0.24	0.30	0.36	0.48
			5D-6D	0.05	0.07	0.10	0.14	0.19	0.24	0.29	0.38
			8D-10D	0.04	0.05	0.07	0.11	0.14	0.18	0.22	0.29
Stainless Steels	M	Stainless Steel 300 & PH series	3D-4D	0.06	0.09	0.12	0.18	0.24	0.30	0.36	0.48
			5D-6D	0.05	0.07	0.10	0.14	0.19	0.24	0.29	0.38
			8D-10D	0.04	0.05	0.07	0.11	0.14	0.18	0.22	0.29
Special Alloys	S	High Temp Alloys	3D-4D	0.04	0.06	0.08	0.12	0.16	0.20	0.24	0.32
			5D-6D	0.03	0.05	0.06	0.10	0.13	0.16	0.19	0.26
			8D-10D	0.02	0.04	0.05	0.07	0.10	0.12	0.14	0.19
	S	Titanium Alloys	3D-4D	0.06	0.09	0.12	0.18	0.24	0.30	0.36	0.48
			5D-6D	0.05	0.07	0.10	0.14	0.19	0.24	0.29	0.38
			8D-10D	0.04	0.05	0.07	0.11	0.14	0.18	0.22	0.29
Cast Irons	K	GG, GGG	3D-4D	0.06	0.09	0.12	0.18	0.24	0.30	0.36	0.48
			5D-6D	0.05	0.07	0.10	0.14	0.19	0.24	0.29	0.38
			8D-10D	0.04	0.05	0.07	0.11	0.14	0.18	0.22	0.29
Hardened Steels	H	Hardened Steels HRC45-50	3D-4D	0.05	0.08	0.10	0.15	0.20	0.25	0.30	0.40
			5D-6D	0.04	0.06	0.08	0.12	0.16	0.20	0.24	0.32
			8D-10D	0.03	0.05	0.06	0.09	0.12	0.15	0.18	0.24
	H	Hardened Steels HRC50-55	3D-4D	0.04	0.06	0.08	0.12	0.16	0.20	0.24	0.32
			5D-6D	0.03	0.05	0.06	0.10	0.13	0.16	0.19	0.26
			8D-10D	0.02	0.04	0.05	0.07	0.10	0.12	0.14	0.19

Notes:

For profile machining
adjust radial cut (Ae)

OH	Ae (x Ø)
3D-4D	0.1
5D-6D	0.07
8D-10D	0.05

Radial Cut (Ae)	Chip thickness Compensation factor
30%	1.10
20%	1.20
15%	1.40
10%	1.80
5%	2.30
1%	5.00

For slotting
adjust axial cut (Ap)

OH	Ap (x Ø)
3D-4D	0.1
5D-6D	0.07
8D-10D	0.05



TuffCut® X-AL Series 135

Feed capability - Necked Tools | Capacités d'avance - Outils détalonnés | Vorschubleistung - Abgesetzter Schaft | Avanzamento - Utensili con collo scaricato | Zalecane parametry - narzędzia z odciąganą szyjką

RPM	Diameter - mm									
	3 fz 0.035	4 fz 0.035	5 fz 0.084	6 fz 0.12	8 fz 0.26	10 fz 0.61	12 fz 0.77	16 fz 0.79	20 fz 0.762	25 fz 0.76
	280	280	672	960	2080	4880	6160	6304	6096	6096
4000	280	280	672	960	2080	4880	6160	6304	6096	6096
5000	350	350	840	1200	2600	6100	7700	7880	7620	7620
6000	420	420	1008	1440	3120	7320	9240	9456	9144	9144
7000	490	490	1176	1680	3640	8540	10780	11032	10668	10668
8000	560	560	1344	1920	4160	9760	12320	12608	12192	12192
9000	630	630	1512	2160	4680	10980	13860	14184	13716	13716
10000	700	700	1680	2400	5200	12200	15400	15760	15240	15240
11000	770	770	1848	2640	5720	13420	16940	17336	16764	16764
12000	840	840	2016	2880	6240	14640	18480	18912	18288	18288
13000	910	910	2184	3120	6760	15860	20020	20488	19812	19812
14000	980	980	2352	3360	7280	17080	21560	22064	21336	21336
15000	1050	1050	2520	3600	7800	18300	23100	23640	22860	22860
16000	1120	1120	2688	3840	8320	19520	24640	25216	24384	24384
17000	1190	1190	2856	4080	8840	20740	26180	26792	25908	25908
18000	1260	1260	3024	4320	9360	21960	27720	28368	27432	27432

RPM	Diameter - mm									
	3 fz 0.035	4 fz 0.035	5 fz 0.084	6 fz 0.12	8 fz 0.26	10 fz 0.61	12 fz 0.77	16 fz 0.79	20 fz 0.762	25 fz 0.76
	1330	1330	3192	4560	9880	23180	29260	29944	28956	28956
19000	1330	1330	3192	4560	9880	23180	29260	29944	28956	28956
20000	1400	1400	3360	4800	10400	24400	30800	31520	30480	30480
21000	1470	1470	3528	5040	10920	25620	32340	33096	32004	32004
22000	1540	1540	3696	5280	11440	26840	33880	34672	33528	33528
23000	1610	1610	3864	5520	11960	28060	35420	36248	35052	35052
24000	1680	1680	4032	5760	12480	29280	36960	37824	36576	36576
25000	1750	1750	4200	6000	13000	30500	38500	39400	38100	38100
30000	2100	2100	5040	7200	15600	36600	46200	47280	45720	45720

FEED Shown in mm/min | Avance affichée en mm/min

Feed rate allowance for length (Slotting)

Part no. example	length	Fz	Ae	Ap
135 12N3	Short	1	1 x D	1 X D
135 12N5	Medium	x 0.7	1 x D	0.25 X D
135 1202N	Long	x 0.6	0.1 x D	1 X D

Feed rate for un-necked tools

Please calculate feed rate based upon length from table above - then apply the following factors:

Diameter

3 - 8mm
10 - 25mm

Factor

Feed mm/min x 2.0
Feed mm/min x 1.35

TuffCut® X-AL Series 135, 135B, 138B

Recommended cutting data - Al / Al Si Alloy | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Series		Type of cut		Vc	Diameter - mm				
		Ae	Ap		2 - 3 fz	4 fz	5 fz	6 fz	8 fz
135		1 x D	0.5 x D	300-425	0.035	0.035	0.075-0.1	0.1-0.23	0.175-0.3
		1 x D	1 x D	250-365	0.03	0.03	0.025-0.05	0.1-0.15	0.1-0.15
		0.2 x D	1 x D	300-425	0.03	0.03	0.05-0.1	0.1-0.23	0.1-0.23
		0.5 x D	1 x D	300-425	0.03	0.03	0.05-0.1	0.1-0.23	0.1-0.23
135B		1 x D	0.5 x D	150	0.05	0.08	0.12	0.16	0.2
		1 x D	1 x D	250-365	0.025	0.025	0.025-0.05	0.1-0.15	0.1-0.15
138B		0.1 x D	1 x D	300	0.05	0.08	0.12	0.16	0.2



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TuffCut® X-AL Series 135, 135B, 138B

Recommended cutting data - Al / Al Si Alloy | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Series		Type of cut		Vc M/Min	Diameter - mm				
		Ae	Ap		fz	fz	fz	fz	fz
135		1 x D	0.5 x D	300-425	0.175-0.3	0.25-1.15	0.38-1.02	0.38-1.02	0.38-1.02
		1 x D	1 x D	250-365	0.1-0.15	0.25-0.75	0.38-0.75	0.38-0.75	0.38-0.75
		0.2 x D	1 x D	300-425	0.1-0.23	0.25-1.15	0.38-1.02	0.38-1.02	0.38-1.02
		0.5 x D	1 x D	300-425	0.1-0.23	0.25-0.89	0.38-0.89	0.38-0.89	0.38-0.89
		1 x D	1 x D	250-365	0.1-0.15	0.25-0.75	0.38-0.75	0.38-0.75	0.38-0.75
135B		1 x D	0.5 x D	150	0.25	0.50	0.50	-	-
138B		0.1 x D	1 x D	300	0.25	0.50	0.50	-	-

TuffCut® X-AL Series 137V, 137V N3-4-5, 137VF

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Series		Type of cut		Vc M/Min	Diameter - mm				
		Ae	Ap		fz	fz	fz	fz	fz
137V N3 / 137VR N3		1 x D	0.25 x D	400-600	0.03	0.04	0.05	0.06	0.08
		1 x D	0.5 x D	400-600	0.03	0.04	0.05	0.06	0.08
		1 x D	1 x D	400-600	0.02	0.03	0.04	0.05	0.07
		0.75 x D	0.5 x D	500-700	0.045	0.06	0.075	0.09	0.12
		0.5 x D	1 x D	500-700	0.03	0.04	0.05	0.06	0.08
		0.5 x D	1.5 x D	500-700	0.03	0.04	0.05	0.06	0.08
		≤ 0.1 x D	≤ 0.9 x L ²	800-1000	0.036	0.054	0.072	0.09	0.126

Series		Type of cut		Vc M/Min	Diameter - mm			
		Ae	Ap		fz	fz	fz	fz
137V N3 / 137VR N3		1 x D	0.25 x D	400-600	0.10	0.12	0.16	0.20
		1 x D	0.5 x D	400-600	0.10	0.12	0.16	0.20
		1 x D	1 x D	400-600	0.09	0.11	0.15	0.19
		0.75 x D	0.5 x D	500-700	0.15	0.18	0.24	0.30
		0.5 x D	1 x D	500-700	0.10	0.12	0.16	0.20
		0.5 x D	1.5 x D	500-700	0.10	0.12	0.16	0.20
		≤ 0.1 x D	≤ 0.9 x L ²	800-1000	0.162	0.2	0.27	0.342

Series		Type of cut		Vc M/Min	Diameter - mm				
		Ae	Ap		fz	fz	fz	fz	fz
137V N4		1 x D	0.25 x D	400-600	0.03	0.04	0.05	0.06	0.08
		1 x D	0.5 x D	400-600	0.03	0.04	0.05	0.06	0.08
		1 x D	1 x D	400-600	0.02	0.03	0.04	0.05	0.07
		0.75 x D	0.5 x D	500-700	0.045	0.06	0.075	0.09	0.12
		0.5 x D	1 x D	500-700	0.03	0.04	0.05	0.06	0.08
		0.5 x D	0.9 x L	500-700	0.03	0.04	0.05	0.06	0.08
		≤ 0.1 x D	≤ 0.9 x L ²	800-1000	0.036	0.054	0.072	0.09	0.126

TuffCut® X-AL Series 137V, 137V N3-4-5, 137VF

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Series		Type of cut		Vc	Diameter - mm			
		Ae	Ap		ø 10.0	ø 12.0	ø 16.0	ø 20.0
137V N4		1 x D	0.25 x D	400-600	0.10	0.12	0.16	0.20
		1 x D	0.5 x D	400-600	0.10	0.12	0.16	0.20
		1 x D	1 x D	400-600	0.09	0.11	0.15	0.19
		0.75 x D	0.5 x D	500-700	0.15	0.18	0.24	0.30
		0.5 x D	1 x D	500-700	0.10	0.12	0.16	0.20
		0.5 x D	0.9 x L	500-700	0.10	0.12	0.16	0.20
		≤ 0.1 x D	≤ 0.9 x L ²	800-1000	0.162	0.20	0.27	0.342

Series		Type of cut		Vc	Diameter - mm				
		Ae	Ap		fz	fz	fz	fz	fz
137V N5 / 137VR N5		≤ 1 x D Max	≤ 0.2 x D	300-500	0.02	0.03	0.04	0.05	0.07
		0.1 - 0.2 x D	≤ 1 x D Max	300-500	0.03	0.06	0.08	0.10	0.14

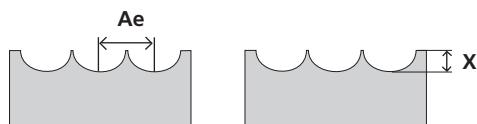
Series		Type of cut		Vc	Diameter - mm			
		Ae	Ap		fz	fz	fz	fz
137V N5 / 137VR N5		≤ 1 x D Max	≤ 0.2 x D	300-500	0.09	0.11	0.13	0.15
		0.1 - 0.2 x D	≤ 1 x D Max	300-500	0.16	0.18	0.2	0.23

Profile Height-X (µm) / Surface finish

Profondeur de passe-X (µm) / Finition | Profilhöhe-X (µm)/Oberflächenausführung

Altezza del profilo X (µm) / Finitura superficiale | Wysokość profilu-X (µm) / Wykończenie powierzchni

Ae mm	Diameter - mm							
	1	2	4	6	8	10	12	16
0.06	0.9	0.45	0.23	0.15	0.11	0.09	0.08	0.06
0.08	1.6	0.8	0.4	0.27	0.2	0.16	0.13	0.1
0.11	3	1.5	0.76	0.5	0.38	0.3	0.25	0.19
0.15	5.7	2.8	1.4	0.94	0.7	0.56	0.47	0.35
0.2	10	5	2.5	1.7	1.3	1	0.83	0.63
0.3	23	11	5.6	3.8	2.8	2.3	1.9	1.41
0.45	53	26	13	8.4	6.3	5.1	4.2	3.16



Now your end mills have done their job, why not let us re-manufacture them to our OE standard so they can do it all over again?



When you select end mills from M.A.Ford® Europe, you're not only choosing precision, performance and enhanced productivity, but also the ability to get extended use by having your pre-used end mills re-manufactured to our original OE specifications at a fraction of the cost of purchasing a new tool.



"Maintenant que vos fraises ont fait leur travail, pourquoi ne nous laissez-vous pas les re-conditionner à nos normes standard de fabrication (OE), afin qu'elles puissent de nouveau accomplir leur tâche?"

Lorsque vous choisissez des fraises M.A.Ford® Europe, vous ne choisissez pas seulement la précision, la performance ou une productivité accrue, mais également la possibilité d'étendre leur utilisation en re-conditionnant à neuf vos fraises usagées, avec leurs spécificités initiales, à un coût moindre que si vous aviez dû acheter à neuf."



Ora che le frese hanno fatto il loro lavoro, perché non ce le fai ripristinare secondo le nostre specifiche di produzione originali, perché possano ricominciare da capo?

Quando scegli le frese di M.A.Ford® Europe, non scegli solo la precisione, le prestazioni e la maggiore produttività, ma anche la possibilità di un utilizzo prolungato grazie al servizio di ripristino degli utensili usurati secondo le nostre specifiche originali, ad una frazione del costo di un utensile nuovo.



Was geschieht mit Ihren Schaftfräsern, die alle ihre Aufgaben erfüllt und das Ende ihrer betrieblichen Nutzungsdauer erreicht haben? Warum überlassen Sie uns diese Werkzeuge nicht einfach zur Wiederverwertung in der Neufertigung gemäß unseren OE-Normen, sodass sie erneut eingesetzt werden können?

Wenn Ihre Auswahl auf Schaftfräser von M.A. Ford Europe fällt, dann entscheiden Sie sich nicht nur für Präzision, Leistungsstärke und verbesserte Produktivität, sondern auch für die Möglichkeit, Ihre gebrauchten Schaftfräser gemäß unseren OE-Originalvorgaben neu fertigen zu lassen und dafür nur einen Bruchteil der Kosten zu tragen, die Sie für den Kauf eines neuen Werkzeugs aufwenden müssten.



Kiedy Twoje frezy wykonały swoją pracę, pozwól nam zregenerować narzędzie zgodnie z naszymi standardami, aby znów mogły wykonać swoją pracę. Wybierając frezy M.A.Ford® Europe stawiasz na precyzję i wydajność

Gwarantujemy również zwiększoną produktywność, możliwość długiego użytkowania dzięki zastosowaniu narzędzi wyprodukowanych ponownie, jedynie za część ceny nowego narzędzia.

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TuffCut®

Carbide End Mills

Fraises carbure en bout | Hartmetall-Schaftfräser
 Frese in Metallo Duro Integrale
 Frezy palcove pełnowęglkowe



End Mills
 Fraise en bout
 Schaftfräser
 Frese a Candela
 Frez

For the efficient general purpose milling of all steels, cast irons and most other materials, including aluminium and softer alloys, our FordMax range provides a complete family of standard carbide end mills designed for batch production on applications where absolute performance is not essential.

(FR)

"Pour l'efficacité des fraises à usage général dans les aciers, fontes et la plupart des autres matériaux, y compris l'aluminium et les alliages légers, notre gamme FordMax vous propose un éventail complet de fraises carbure standard conçues pour la production en petite série, pour des utilisations où la performance absolue n'est pas nécessaire."

(DE)

Zum effizienten Ausführen von Universalfräsanbeiten bei allen Stahlarten, Gusseisen und vielen anderen Materialien, einschließlich Aluminium und weicheren Legierungen, stellt unser FordMax-Sortiment eine vollständige Produktfamilie von standardmäßigen Hartmetall-Schaftfräsern zur Verfügung. Diese ist zur Serienfertigung für Anwendungen ausgelegt sind, bei denen eine unschlagbare Leistung nicht unbedingt erforderlich ist.

(IT)

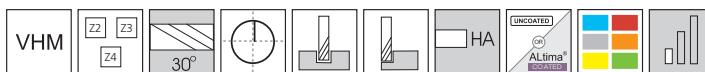
Nel programma FordMax è disponibile una famiglia di utensili in metallo duro per uso generico, idonei alla fresatura di tutti gli acciai, ghise, e della maggior parte dei materiali, compresi l'alluminio e le leghe leggere. Efficienti per lotti di produzione o applicazioni dove non sono necessarie le altissime prestazioni.

(PL)

W celu sprawnego ogólnego frezowania metali, żeliwa i większości materiałów. FordMax to kompletna gama standardowych frezów palcowych pełnowęglkowych zaprojektowanych do produkcji seryjnej w zastosowaniach, gdzie absolutna wydajność nie jest konieczna.

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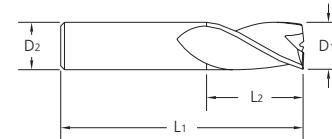
Z2



Z3



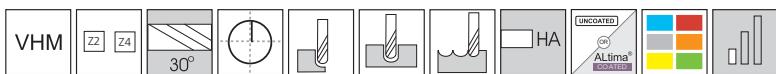
Z4



Series 164		Series 169		Series 163		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Uncoated	Coated	Ø D1	Ø D2	L1	L2
Tool No	Tool No	Tool No	Tool No	Tool No	Tool No				
164 0020	-	-	-	-	-	0.2	3.0	38.0	0.4
164 0030	-	-	-	-	-	0.3	3.0	38.0	0.6
164 0040	-	-	-	-	-	0.4	3.0	38.0	0.8
164 0050	-	-	-	-	-	0.5	3.0	38.0	1.0
164 0060	-	-	-	-	-	0.6	3.0	38.0	1.2
164 0070	-	-	-	-	-	0.7	3.0	38.0	1.4
164 0080	-	-	-	-	-	0.8	3.0	38.0	1.6
164 0090	-	-	-	-	-	0.9	3.0	38.0	1.8
164 0100	-	169 0100	-	163 0100	-	1.0	3.0	38.0	2.0
164 0110	-	-	-	-	-	1.1	3.0	38.0	2.2
164 0120	-	-	-	-	-	1.2	3.0	38.0	2.4
164 0130	-	-	-	-	-	1.3	3.0	38.0	2.6
164 0140	-	-	-	-	-	1.4	3.0	38.0	2.8
164 0150	-	169 0150	-	163 0150	163 0150A	1.5	3.0	38.0	3.0
164 0160	-	-	-	-	-	1.6	3.0	38.0	3.2
164 0170	-	-	-	-	-	1.7	3.0	38.0	3.4
164 0180	-	-	-	-	-	1.8	3.0	38.0	3.6
164 0190	-	-	-	-	-	1.9	3.0	38.0	3.8
164 0200	-	169 0200	-	163 0200	-	2.0	3.0	38.0	4.0
164 0250	-	169 0250	-	163 0250	163 0250A	2.5	3.0	38.0	5.0
164 0300	164 0300A	169 0300	169 0300A	163 0300	163 0300A	3.0	3.0	38.0	6.0
164 0350	-	169 0350	-	163 0350	-	3.5	4.0	51.0	7.0
164 0400	164 0400A	169 0400	169 0400A	163 0400	163 0400A	4.0	4.0	51.0	8.0
164 0450	-	169 0450	-	163 0450	-	4.5	5.0	51.0	9.0
164 0500	164 0500A	169 0500	169 0500A	163 0500	163 0500A	5.0	5.0	51.0	11.0
164 0550	-	169 0550	-	163 0550	-	5.5	6.0	51.0	12.0
164 0600	164 0600A	169 0600	169 0600A	163 0600	163 0600A	6.0	6.0	51.0	13.0
164 0700	-	169 0700	-	163 0700	-	7.0	8.0	51.0	13.0
164 0800	164 0800A	169 0800	169 0800A	163 0800	163 0800A	8.0	8.0	51.0	13.0
164 0900	-	169 0900	-	163 0900	-	9.0	9.0	51.0	14.0
164 1000	164 1000A	169 1000	169 1000A	163 1000	163 1000A	10.0	10.0	51.0	14.0
164 1100	-	169 1100	-	163 1100	-	11.0	11.0	64.0	16.0
164 1200	164 1200A	169 1200	169 1200A	163 1200	163 1200A	12.0	12.0	64.0	16.0
164 1400	-	169 1400	-	163 1400	-	14.0	14.0	70.0	18.0
164 1600	164 1600A	169 1600	169 1600A	163 1600	163 1600A	16.0	16.0	76.0	20.0
164 1800	-	169 1800	-	163 1800	-	18.0	18.0	76.0	25.0
164 2000	164 2000A	169 2000	169 2000A	163 2000	163 2000A	20.0	20.0	76.0	25.0



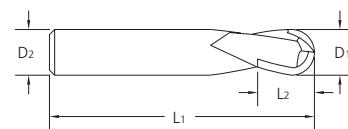
TuffCut® GP Series 166, 165



Z2



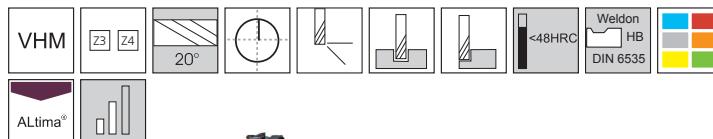
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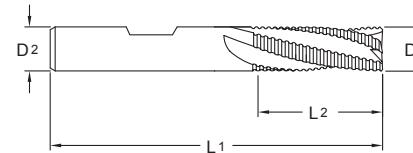
Series 166		Series 165		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Ø D1	Ø D2	L1	L2
Tool No	Tool No	Tool No	Tool No				
166 0100	-	165 0100	-	1.0	3.0	38.0	2.0
166 0150	-	165 0150	-	1.5	3.0	38.0	3.0
166 0200	-	165 0200	-	2.0	3.0	38.0	4.0
166 0250	-	165 0250	-	2.5	3.0	38.0	5.0
166 0300	166 0300A	165 0300	165 0300A	3.0	3.0	38.0	6.0
166 0350	-	165 0350	-	3.5	4.0	51.0	7.0
166 0400	166 0400A	165 0400	165 0400A	4.0	4.0	51.0	8.0
166 0450	-	165 0450	-	4.5	5.0	51.0	9.0
166 0500	166 0500A	165 0500	165 0500A	5.0	5.0	51.0	11.0
166 0550	-	165 0550	-	5.5	6.0	51.0	12.0
166 0600	166 0600A	165 0600	165 0600A	6.0	6.0	51.0	13.0
166 0700	-	165 0700	-	7.0	8.0	51.0	13.0
166 0800	166 0800A	165 0800	165 0800A	8.0	8.0	51.0	13.0
166 0900	-	165 0900	-	9.0	9.0	51.0	14.0
166 1000	166 1000A	165 1000	165 1000A	10.0	10.0	51.0	14.0
166 1100	-	165 1100	-	11.0	11.0	64.0	16.0
166 1200	166 1200A	165 1200	165 1200A	12.0	12.0	64.0	16.0
166 1400	-	165 1400	-	14.0	14.0	70.0	18.0
166 1600	166 1600A	165 1600	165 1600A	16.0	16.0	76.0	20.0
166 1800	-	165 1800	-	18.0	18.0	76.0	25.0
166 2000	166 2000A	165 2000	165 2000A	20.0	20.0	76.0	25.0



TuffCut® GP Series 192



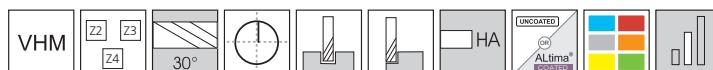
Z3 Z4



Series 192		Tool Dimensions				
Tool No.		Ø D1	Ø D2	L1	L2	Z
192 0800A		8.0	8.0	51.0	8.0	3
192 0801A		8.0	8.0	64.0	16.0	3
192 1000A		10.0	10.0	51.0	10.0	4
192 1001A		10.0	10.0	70.0	20.0	4
192 1200A		12.0	12.0	64.0	12.0	4
192 1201A		12.0	12.0	76.0	25.0	4
192 1600A		16.0	16.0	76.0	16.0	4
192 1601A		16.0	16.0	89.0	32.0	4
192 2000A		20.0	20.0	76.0	20.0	4
192 2001A		20.0	20.0	102.0	38.0	4

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TuffCut® GP Series 121, 116, 111



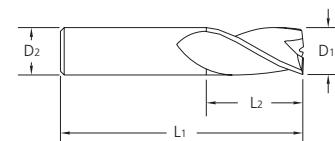
Z2



Z3



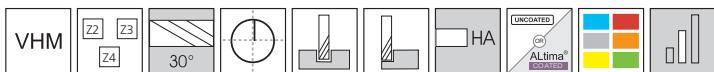
Z4



Series 121		Series 116		Series 111		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Uncoated	Coated	Ø D1	Ø D2	L1	L2
Tool No.	Tool No.	Tool No.	Tool No.	Tool No.	Tool No.				
121 0020	-	-	-	111 0020	-	0.2	3.0	38.0	0.6
121 0030	-	-	-	111 0030	-	0.3	3.0	38.0	0.9
121 0040	-	-	-	111 0040	-	0.4	3.0	38.0	1.2
121 0050	-	-	-	111 0050	-	0.5	3.0	38.0	1.5
121 0060	-	-	-	111 0060	-	0.6	3.0	38.0	1.8
121 0070	-	-	-	111 0070	-	0.7	3.0	38.0	2.1
121 0080	-	-	-	111 0080	-	0.8	3.0	38.0	2.4
121 0090	-	-	-	111 0090	-	0.9	3.0	38.0	2.7
121 0100	121 0100A	116 0100	116 0100A	111 0100	111 0100A	1.0	3.0	38.0	3.0

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TuffCut® GP Series 121, 116, 111



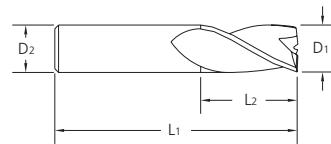
Z2



Z3



Z4

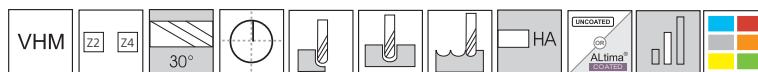


Series 121		Series 116		Series 111		Tool Dimensions				
Uncoated	Coated	Uncoated	Coated	Uncoated	Coated	Ø D1	Ø D2	L1	L2	
Tool No.	Tool No.	Tool No.	Tool No.	Tool No.	Tool No.					
121 0110	-	-	-	111 0110	-	1.1	3.0	38.0	3.3	
121 0120	-	-	-	111 0120	-	1.2	3.0	38.0	3.6	
121 0130	-	-	-	111 0130	-	1.3	3.0	38.0	3.9	
121 0140	-	-	-	111 0140	-	1.4	3.0	38.0	4.2	
121 0150-1	-	-	-	111 0150-1	-	1.5	3.0	38.0	4.5	
121 0150	121 0150A	116 0150	116 0150A	111 0150	111 0150A	1.5	3.0	38.0	6.0	
121 0160	-	-	-	111 0160	-	1.6	3.0	38.0	4.8	
121 0170	-	-	-	111 0170	-	1.7	3.0	38.0	5.1	
121 0180	-	-	-	111 0180	-	1.8	3.0	38.0	5.4	
121 0190	-	-	-	111 0190	-	1.9	3.0	38.0	5.7	
121 0200-1	-	-	-	111 0200-1	-	2.0	3.0	38.0	6.0	
121 0200	121 0200A	116 0200	116 0200A	111 0200	111 0200A	2.0	3.0	38.0	9.0	
121 0250	121 0250A	116 0250	116 0250A	111 0250	111 0250A	2.5	3.0	38.0	12.0	
121 0300	121 0300A	116 0300	116 0300A	111 0300	111 0300A	3.0	3.0	38.0	12.0	
121 0350	121 0350A	116 0350	116 0350A	111 0350	111 0350A	3.5	4.0	51.0	12.0	
121 0400	121 0400A	116 0400	116 0400A	111 0400	111 0400A	4.0	4.0	51.0	14.0	
121 0450	-	116 0450	-	111 0450	-	4.5	5.0	51.0	14.0	
121 0500	121 0500A	116 0500	116 0500A	111 0500	111 0500A	5.0	5.0	51.0	20.0	
121 0550	-	116 0550	-	111 0550	-	5.5	6.0	64.0	20.0	
121 0600	121 0600A	116 0600	116 0600A	111 0600	111 0600A	6.0	6.0	64.0	20.0	
121 0700	-	116 0700	-	111 0700	111 0700A	7.0	8.0	64.0	20.0	
121 0800	121 0800A	116 0800	116 0800A	111 0800	111 0800A	8.0	8.0	64.0	20.0	
121 0900	-	116 0900	-	111 0900	111 0900A	9.0	9.0	64.0	20.0	
121 1000	121 1000A	116 1000	116 1000A	111 1000	111 1000A	10.0	10.0	70.0	25.0	
121 1100	-	116 1100	-	111 1100	-	11.0	11.0	70.0	25.0	
121 1200	121 1200A	116 1200	116 1200A	111 1200	111 1200A	12.0	12.0	76.0	25.0	
121 1400	-	116 1400	-	111 1400	-	14.0	14.0	89.0	30.0	
121 1600	121 1600A	116 1600	116 1600A	111 1600	111 1600A	16.0	16.0	89.0	30.0	
121 1800	-	116 1800	-	111 1800	-	18.0	18.0	102.0	35.0	
121 2000	121 2000A	116 2000	116 2000A	111 2000	111 2000A	20.0	20.0	102.0	38.0	
121 2200	-	116 2200	-	111 2200	-	22.0	22.0	102.0	40.0	
121 2500	121 2500A	116 2500	116 2500A	111 2500	111 2500A	25.0	25.0	102.0	40.0	





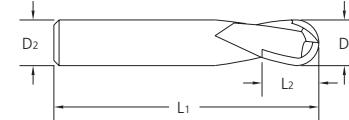
TuffCut® GP Series 150,140



Z2



Z4



Series 150		Series 140		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Ø D1	Ø D2	L1	L2
Tool No.	Tool No.	Tool No.	Tool No.				
150 0040	-	-	-	0.4	3.0	38.0	1.2
150 0050	-	-	-	0.5	3.0	38.0	1.5
150 0060	-	-	-	0.6	3.0	38.0	1.8
150 0070	-	-	-	0.7	3.0	38.0	2.1
150 0080	-	-	-	0.8	3.0	38.0	2.4
150 0090	-	-	-	0.9	3.0	38.0	2.7
150 0100	150 0100A	140 0100	140 0100A	1.0	3.0	38.0	3.0
150 0110	-	-	-	1.1	3.0	38.0	3.3
150 0120	-	-	-	1.2	3.0	38.0	3.6
150 0130	-	-	-	1.3	3.0	38.0	3.9
150 0140	-	-	-	1.4	3.0	38.0	4.2
150 0150-1	-	-	-	1.5	3.0	38.0	4.5
150 0150	150 0150A	140 0150	140 0150A	1.5	3.0	38.0	6.0
150 0160	-	-	-	1.6	3.0	38.0	4.8
150 0170	-	-	-	1.7	3.0	38.0	5.1
150 0180	-	-	-	1.8	3.0	38.0	5.4
150 0190	-	-	-	1.9	3.0	38.0	5.7
150 0200-1	-	-	-	2.0	3.0	38.0	6.0
150 0200	150 0200A	140 0200	140 0200A	2.0	3.0	38.0	9.0
150 0250	150 0250A	140 0250	140 0250A	2.5	3.0	38.0	12.0
150 0300	150 0300A	140 0300	140 0300A	3.0	3.0	38.0	12.0
150 0350	150 0350A	140 0350	140 0350A	3.5	4.0	51.0	12.0
150 0400	150 0400A	140 0400	140 0400A	4.0	4.0	51.0	14.0
150 0450	150 0450A	140 0450	-	4.5	5.0	51.0	14.0
150 0500	150 0500A	140 0500	140 0500A	5.0	5.0	51.0	20.0
150 0550	-	140 0550	-	5.5	6.0	64.0	20.0
150 0600	150 0600A	140 0600	140 0600A	6.0	6.0	64.0	20.0
150 0700	-	140 0700	-	7.0	8.0	64.0	20.0
150 0800	150 0800A	140 0800	140 0800A	8.0	8.0	64.0	20.0
150 0900	-	140 0900	-	9.0	9.0	64.0	20.0
150 1000	150 1000A	140 1000	140 1000A	10.0	10.0	70.0	25.0
150 1100	-	140 1100	-	11.0	11.0	70.0	25.0
150 1200	150 1200A	140 1200	140 1200A	12.0	12.0	76.0	25.0
150 1400	-	140 1400	-	14.0	14.0	89.0	30.0
150 1600	150 1600A	140 1600	140 1600A	16.0	16.0	89.0	30.0
150 1800	-	140 1800	-	18.0	18.0	102.0	35.0
150 2000	150 2000A	140 2000	140 2000A	20.0	20.0	102.0	38.0
150 2200	-	140 2200	-	22.0	22.0	102.0	40.0
150 2500	150 2500A	140 2500	140 2500A	25.0	25.0	102.0	40.0

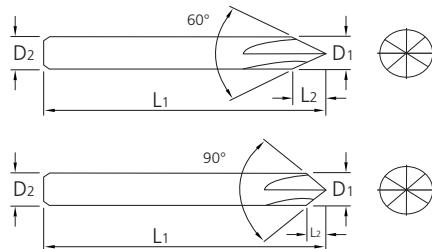
TuffCut® GP Chamfer Mills Series VCM60, VCM90



Z4 Z6



Z4 Z6



End Mills
Fraise en bout
Schafffräser
Frese a Candela
Frez

Series VCM60		Series VCM90		Tool Dimensions					
Uncoated	Coated	Uncoated	Coated	Ø D1	Ø D2	Angle	L1	L2	z
VCM60 0400	VCM60 0400A	-	-	4.0	4.0	60°	51.0	3.3	4
-	-	VCM90 0400	VCM90 0400A	4.0	4.0	90°	51.0	1.8	4
VCM60 0600	VCM60 0600A	-	-	6.0	6.0	60°	64.0	5.0	4
-	-	VCM90 0600	VCM90 0600A	6.0	6.0	90°	64.0	2.8	4
VCM60 0800	VCM60 0800A	-	-	8.0	8.0	60°	64.0	6.8	4
-	-	VCM90 0800	VCM90 0800A	8.0	8.0	90°	64.0	3.8	4
VCM60 1000	VCM60 1000A	-	-	10.0	10.0	60°	73.0	8.5	6
-	-	VCM90 1000	VCM90 1000A	10.0	10.0	90°	73.0	4.8	6
VCM60 1200	VCM60 1200A	-	-	12.0	12.0	60°	84.0	10.0	6
-	-	VCM90 1200	VCM90 1200A	12.0	12.0	90°	84.0	5.8	6
VCM60 1600	VCM60 1600A	-	-	16.0	16.0	60°	93.0	13.5	6
-	-	VCM90 1600	VCM90 1600A	16.0	16.0	90°	93.0	7.8	6

TuffCut® GP Corner Rounding Series ACR



Z4



Series ACR		Tool Dimensions			
Tool No.		Ø D1	D2	L1	R
ACR0300-0.25R		2.3 / 2.4	3.0	51.0	0.25
ACR0400-0.5R		2.8 / 2.9	4.0	51.0	0.5
ACR0500-0.75R		3.3 / 3.4	5.0	57.0	0.75
ACR0500-1.0R		2.7 / 2.9	5.0	57.0	1.0
ACR0600-1.5R		2.7 / 2.9	6.0	64.0	1.5
ACR0600-2.0R		1.7 / 1.9	6.0	64.0	2.0
ACR0800-2.0R		3.7 / 3.9	8.0	64.0	2.0
ACR1000-3.0R		3.7 / 3.9	10.0	73.0	3.0
ACR1200-4.0R		3.7 / 3.9	12.0	84.0	4.0
ACR1600-5.0R		5.7 / 5.9	16.0	93.0	5.0
ACR1600-6.0R		3.7 / 3.9	16.0	93.0	6.0



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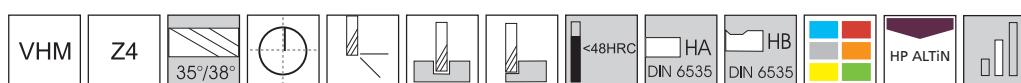
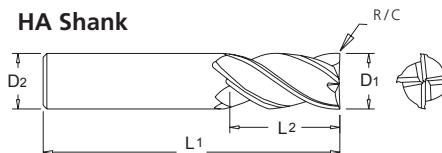
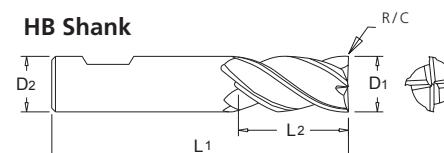
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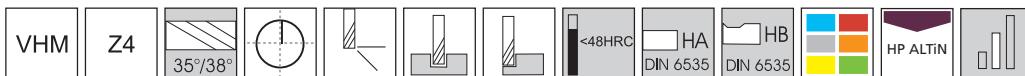


TuffCut® GP Series MV4 with Corner Chamfer or Corner Radius

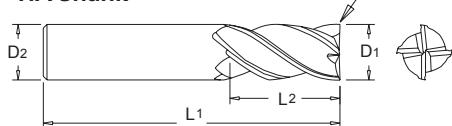

HA Shank

HB Shank


Series MV4	Tool Dimensions							
	Tool No.	Ø D1	Ø D2	L1	L2	R	C x 45°	Shank
MV4 0303HX		3.0	3.0	50.0	6.0	-	0.1	HA
MV4 0303-0.25RHX		3.0	3.0	50.0	6.0	0.25	-	HA
MV4 03HX		3.0	6.0	64.0	6.0	-	0.1	HA
MV4 03-0.25RHX		3.0	6.0	64.0	6.0	0.25	-	HA
MV4 04HX		4.0	6.0	64.0	11.0	-	0.1	HA
MV4 04-0.25RHX		4.0	6.0	64.0	11.0	0.25	-	HA
MV4 04-0.5RHX		4.0	6.0	64.0	11.0	0.5	-	HA
MV4 04-1.0RHX		4.0	6.0	64.0	11.0	1.0	-	HA
MV4 05HX		5.0	6.0	64.0	12.0	-	0.1	HA
MV4 05-0.25RHX		5.0	6.0	64.0	12.0	0.25	-	HA
MV4 05-0.5RHX		5.0	6.0	64.0	12.0	0.5	-	HA
MV4 05-1.0RHX		5.0	6.0	64.0	12.0	1.0	-	HA
MV4 06HX		6.0	6.0	64.0	15.0	-	0.1	HA
MV4 06HXW		6.0	6.0	64.0	15.0	-	0.1	HB
MV4 06-0.25RHX		6.0	6.0	64.0	15.0	0.25	-	HA
MV4 06-0.25RHXW		6.0	6.0	64.0	15.0	0.25	-	HB
MV4 06-0.5RHX		6.0	6.0	64.0	15.0	0.5	-	HA
MV4 06-0.5RHXW		6.0	6.0	64.0	15.0	0.5	-	HB
MV4 06-1.0RHX		6.0	6.0	64.0	15.0	1.0	-	HA
MV4 06-1.0RHXW		6.0	6.0	64.0	15.0	1.0	-	HB
MV4 08HX		8.0	8.0	64.0	22.0	-	0.15	HA
MV4 08HXW		8.0	8.0	64.0	22.0	-	0.15	HB
MV4 08-0.25RHX		8.0	8.0	64.0	22.0	0.25	-	HA
MV4 08-0.25RHXW		8.0	8.0	64.0	22.0	0.25	-	HB
MV4 08-0.5RHX		8.0	8.0	64.0	22.0	0.5	-	HA
MV4 08-0.5RHXW		8.0	8.0	64.0	22.0	0.5	-	HB
MV4 08-1.0RHX		8.0	8.0	64.0	22.0	1.0	-	HA
MV4 08-1.0RHXW		8.0	8.0	64.0	22.0	1.0	-	HB
MV4 08-1.5RHX		8.0	8.0	64.0	22.0	1.5	-	HA
MV4 08-1.5RHXW		8.0	8.0	64.0	22.0	1.5	-	HB
MV4 08-2.0RHX		8.0	8.0	64.0	22.0	2.0	-	HA
MV4 08-2.0RHXW		8.0	8.0	64.0	22.0	2.0	-	HB

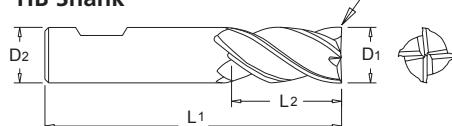
TuffCut® GP Series MV4 with Corner Chamfer or Corner Radius



HA Shank



HB Shank



Series MV4	Tool Dimensions						
	Tool No.	Ø D1	Ø D2	L1	L2	R	C x 45°
MV4 10HX	10.0	10.0	72.0	22.0	-	0.15	HA
MV4 10HXW	10.0	10.0	72.0	22.0	-	0.15	HB
MV4 10-0.5RHX	10.0	10.0	72.0	22.0	0.5	-	HA
MV4 10-0.5RHXW	10.0	10.0	72.0	22.0	0.5	-	HB
MV4 10-1.0RHX	10.0	10.0	72.0	22.0	1.0	-	HA
MV4 10-1.0RHXW	10.0	10.0	72.0	22.0	1.0	-	HB
MV4 10-1.5RHX	10.0	10.0	72.0	22.0	1.5	-	HA
MV4 10-1.5RHXW	10.0	10.0	72.0	22.0	1.5	-	HB
MV4 10-2.0RHX	10.0	10.0	72.0	22.0	2.0	-	HA
MV4 10-2.0RHXW	10.0	10.0	72.0	22.0	2.0	-	HB
MV4 10-2.5RHX	10.0	10.0	72.0	22.0	2.5	-	HA
MV4 10-2.5RHXW	10.0	10.0	72.0	22.0	2.5	-	HB
MV4 10-3.0RHX	10.0	10.0	72.0	22.0	3.0	-	HA
MV4 10-3.0RHXW	10.0	10.0	72.0	22.0	3.0	-	HB
MV4 12HX	12.0	12.0	73.0	27.0	-	0.15	HA
MV4 12HXW	12.0	12.0	83.0	27.0	-	0.15	HB
MV4 12-0.5RHX	12.0	12.0	73.0	27.0	0.5	-	HA
MV4 12-0.5RHXW	12.0	12.0	83.0	27.0	0.5	-	HB
MV4 12-1.0RHX	12.0	12.0	73.0	27.0	1.0	-	HA
MV4 12-1.0RHXW	12.0	12.0	83.0	27.0	1.0	-	HB
MV4 12-1.5RHX	12.0	12.0	73.0	27.0	1.5	-	HA
MV4 12-1.5RHXW	12.0	12.0	83.0	27.0	1.5	-	HB
MV4 12-2.0RHX	12.0	12.0	73.0	27.0	2.0	-	HA
MV4 12-2.0RHXW	12.0	12.0	83.0	27.0	2.0	-	HB
MV4 12-2.5RHX	12.0	12.0	73.0	27.0	2.5	-	HA
MV4 12-2.5RHXW	12.0	12.0	83.0	27.0	2.5	-	HB
MV4 12-3.0RHX	12.0	12.0	73.0	27.0	3.0	-	HA
MV4 12-3.0RHXW	12.0	12.0	83.0	27.0	3.0	-	HB
MV4 16HX	16.0	16.0	92.0	33.0	-	0.3	HA
MV4 16HXW	16.0	16.0	92.0	33.0	-	0.3	HB
MV4 16-0.5RHX	16.0	16.0	92.0	33.0	0.5	-	HA
MV4 16-0.5RHXW	16.0	16.0	92.0	33.0	0.5	-	HB
MV4 16-1.0RHX	16.0	16.0	92.0	33.0	1.0	-	HA
MV4 16-1.0RHXW	16.0	16.0	92.0	33.0	1.0	-	HB
MV4 16-1.5RHX	16.0	16.0	92.0	33.0	1.5	-	HA
MV4 16-1.5RHXW	16.0	16.0	92.0	33.0	1.5	-	HB



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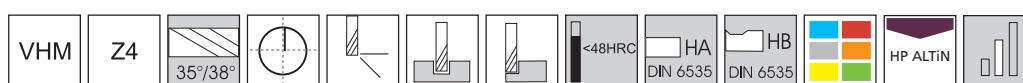
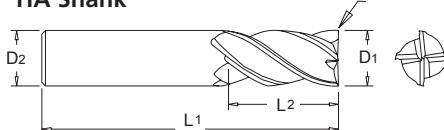
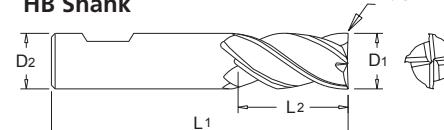
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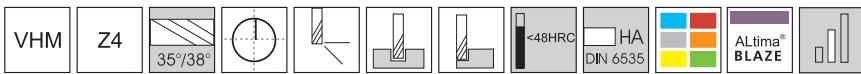
TuffCut[®] GP Series MV4 with Corner Chamfer or Corner Radius


HA Shank

HB Shank


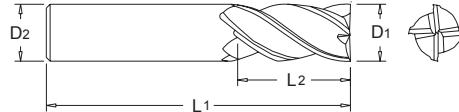
Series MV4		Tool Dimensions						
Tool No.		Ø D1	Ø D2	L1	L2	R	C x 45°	Shank
MV4 16-2.0RHX		16.0	16.0	92.0	33.0	2.0	-	HA
MV4 16-2.0RHGXW		16.0	16.0	92.0	33.0	2.0	-	HB
MV4 16-2.5RHX		16.0	16.0	92.0	33.0	2.5	-	HA
MV4 16-2.5RHGXW		16.0	16.0	92.0	33.0	2.5	-	HB
MV4 16-3.0RHX		16.0	16.0	92.0	33.0	3.0	-	HA
MV4 16-3.0RHGXW		16.0	16.0	92.0	33.0	3.0	-	HB
MV4 20HX		20.0	20.0	104.0	40.0	-	0.3	HA
MV4 20HXW		20.0	20.0	104.0	40.0	-	0.3	HB
MV4 20-1.0RHX		20.0	20.0	104.0	40.0	1.0	-	HA
MV4 20-1.0RHGXW		20.0	20.0	104.0	40.0	1.0	-	HB
MV4 20-1.5RHX		20.0	20.0	104.0	40.0	1.5	-	HA
MV4 20-1.5RHGXW		20.0	20.0	104.0	40.0	1.5	-	HB
MV4 20-2.0RHX		20.0	20.0	104.0	40.0	2.0	-	HA
MV4 20-2.0RHGXW		20.0	20.0	104.0	40.0	2.0	-	HB
MV4 20-3.0RHX		20.0	20.0	104.0	40.0	3.0	-	HA
MV4 20-3.0RHGXW		20.0	20.0	104.0	40.0	3.0	-	HB
MV4 20-4.0RHX		20.0	20.0	104.0	40.0	4.0	-	HA
MV4 20-4.0RHGXW		20.0	20.0	104.0	40.0	4.0	-	HB
MV4 20-5.0RHX		20.0	20.0	104.0	40.0	5.0	-	HA
MV4 20-5.0RHGXW		20.0	20.0	104.0	40.0	5.0	-	HB
MV4 20-6.0RHX		20.0	20.0	104.0	40.0	6.0	-	HA
MV4 20-6.0RHGXW		20.0	20.0	104.0	40.0	6.0	-	HB



TuffCut® GP Series ASV4ACM



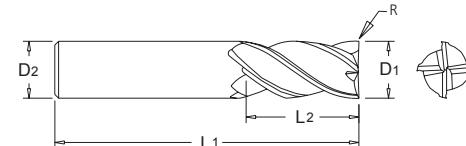
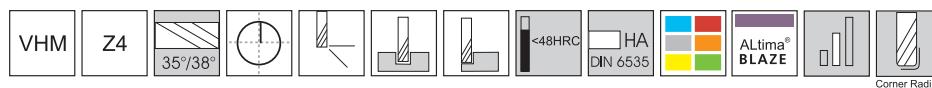
Z4



Series ASV4ACM	Tool Dimensions				
	Ø D1	Ø D2	L1	L2	C x 45°
ASV4ACM0300	3.0	3.0	51.0	6.0	0.1
ASV4ACM0400	4.0	4.0	51.0	11.0	0.1
ASV4ACM0500	5.0	5.0	57.0	12.0	0.1
ASV4ACM0600	6.0	6.0	64.0	15.0	0.1
ASV4ACM0800	8.0	8.0	64.0	22.0	0.15
ASV4ACM1000	10.0	10.0	72.0	22.0	0.15
ASV4ACM1200	12.0	12.0	73.0	27.0	0.15
ASV4ACM1400	14.0	14.0	84.0	30.0	0.3
ASV4ACM1600	16.0	16.0	92.0	33.0	0.3
ASV4ACM2000	20.0	20.0	105.0	40.0	0.3

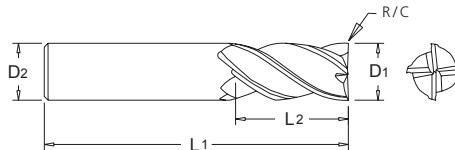
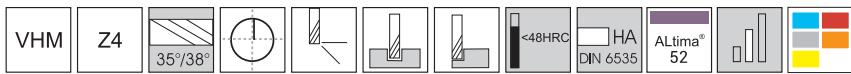
P93

TuffCut® GP Series ASV4ACM-R


Z4

Series ASV4ACM-R		Tool Dimensions				
Tool No.		Ø D1	Ø D2	L1	L2	R
ASV4ACM0400R0.25		4.0	4.0	51.0	11.0	0.25
ASV4ACM0400R0.5		4.0	4.0	51.0	11.0	0.5
ASV4ACM0400R0.75		4.0	4.0	51.0	11.0	0.75
ASV4ACM0400R1.0		4.0	4.0	51.0	11.0	1.0
ASV4ACM0500R0.25		5.0	5.0	57.0	12.0	0.25
ASV4ACM0500R0.5		5.0	5.0	57.0	12.0	0.5
ASV4ACM0500R1.0		5.0	5.0	57.0	12.0	1.0
ASV4ACM0600R0.25		6.0	6.0	64.0	15.0	0.25
ASV4ACM0600R0.5		6.0	6.0	64.0	15.0	0.5
ASV4ACM0600R1.0		6.0	6.0	64.0	15.0	1.0
ASV4ACM0800R0.25		8.0	8.0	64.0	22.0	0.25
ASV4ACM0800R0.5		8.0	8.0	64.0	22.0	0.5
ASV4ACM0800R1.0		8.0	8.0	64.0	22.0	1.0
ASV4ACM0800R1.5		8.0	8.0	64.0	22.0	1.5
ASV4ACM0800R2.0		8.0	8.0	64.0	22.0	2.0
ASV4ACM1000R0.25		10.0	10.0	72.0	22.0	0.25
ASV4ACM1000R0.5		10.0	10.0	72.0	22.0	0.5
ASV4ACM1000R1.0		10.0	10.0	72.0	22.0	1.0
ASV4ACM1000R1.5		10.0	10.0	72.0	22.0	1.5
ASV4ACM1000R2.0		10.0	10.0	72.0	22.0	2.0
ASV4ACM1000R2.5		10.0	10.0	72.0	22.0	2.5
ASV4ACM1000R3.0		10.0	10.0	72.0	22.0	3.0
ASV4ACM1200R0.25		12.0	12.0	73.0	27.0	0.25
ASV4ACM1200R0.5		12.0	12.0	73.0	27.0	0.5
ASV4ACM1200R1.0		12.0	12.0	73.0	27.0	1.0
ASV4ACM1200R1.5		12.0	12.0	73.0	27.0	1.5
ASV4ACM1200R1.75		12.0	12.0	73.0	27.0	1.75
ASV4ACM1200R2.0		12.0	12.0	73.0	27.0	2.0
ASV4ACM1200R2.5		12.0	12.0	73.0	27.0	2.5
ASV4ACM1200R3.0		12.0	12.0	73.0	27.0	3.0
ASV4ACM1200R4.0		12.0	12.0	73.0	27.0	4.0
ASV4ACM1400R0.2		14.0	14.0	84.0	30.0	0.2
ASV4ACM1600R0.5		16.0	16.0	92.0	33.0	0.5
ASV4ACM1600R1.0		16.0	16.0	92.0	33.0	1.0
ASV4ACM1600R1.5		16.0	16.0	92.0	33.0	1.5
ASV4ACM1600R2.0		16.0	16.0	92.0	33.0	2.0
ASV4ACM1600R2.5		16.0	16.0	92.0	33.0	2.5
ASV4ACM1600R3.0		16.0	16.0	92.0	33.0	3.0
ASV4ACM1600R4.0		16.0	16.0	92.0	33.0	4.0

TuffCut® GP Series VMH



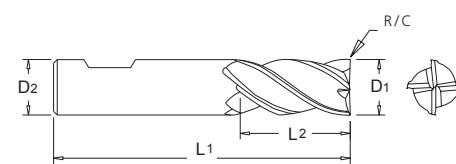
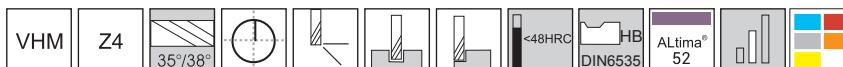
FORDMAX
End Mills
Fraise en bout
Schafffräser
Frese a Candela
Frez

Series VMH	Tool Dimensions					
Tool No.	Ø D1	Ø D2	L1	L2	R	C x 45°
VMH 0300	3.0	6.0	64.0	7.5	-	0.15
VMH 03-0.3R	3.0	6.0	64.0	7.5	0.3	-
VMH 0400	4.0	6.0	64.0	10.0	-	0.2
VMH 04-0.3R	4.0	6.0	64.0	10.0	0.3	-
VMH 0500	5.0	6.0	64.0	12.5	-	0.2
VMH 05-0.3R	5.0	6.0	64.0	12.5	0.3	-
VMH 0600	6.0	6.0	64.0	15.0	-	0.2
VMH 06-0.3R	6.0	6.0	64.0	15.0	0.3	-
VMH 0800	8.0	8.0	64.0	20.0	-	0.25
VMH 08-0.5R	8.0	8.0	64.0	20.0	0.5	-
VMH 1000	10.0	10.0	73.0	25.0	-	0.3
VMH 10-0.5R	10.0	10.0	73.0	25.0	0.5	-
VMH 1200	12.0	12.0	84.0	30.0	-	0.35
VMH 12-1.0R	12.0	12.0	84.0	30.0	1.0	-
VMH 1600	16.0	16.0	93.0	40.0	-	0.4
VMH 16-1.0R	16.0	16.0	93.0	40.0	1.0	-
VMH 2000	20.0	20.0	105.0	50.0	-	0.5
VMH 20-1.0R	20.0	20.0	105.0	50.0	1.0	-





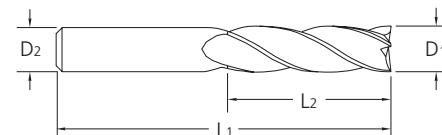
TuffCut® GP Series VMH-W



Series VMH		Tool Dimensions					
Tool No.		Ø D1	Ø D2	L1	L2	R	C x 45°
VMH 0300-W		3.0	6.0	64.0	7.5	-	0.15
VMH 0400-W		4.0	6.0	64.0	10.0	-	0.2
VMH 0500-W		5.0	6.0	64.0	12.5	-	0.2
VMH 0600-W		6.0	6.0	64.0	15.0	-	0.2
VMH 06-1.0RW		6.0	6.0	64.0	15.0	1.0	-
VMH 0800-W		8.0	8.0	64.0	20.0	-	0.25
VMH 08-1.0RW		8.0	8.0	64.0	20.0	1.0	-
VMH 1000-W		10.0	10.0	73.0	25.0	-	0.3
VMH 10-1.0RW		10.0	10.0	73.0	25.0	1.0	-
VMH 1200-W		12.0	12.0	84.0	30.0	-	0.35
VMH 12-1.0RW		12.0	12.0	84.0	30.0	1.0	-
VMH 1600-W		16.0	16.0	93.0	40.0	-	0.4
VMH 16-1.0RW		16.0	16.0	93.0	40.0	1.0	-
VMH 2000-W		20.0	20.0	105.0	50.0	-	0.5
VMH 20-1.0RW		20.0	20.0	105.0	50.0	1.0	-



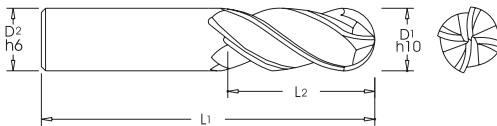
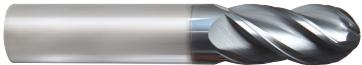
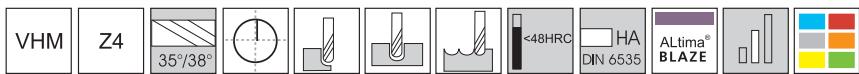
TuffCut® GP Series V4L



Series V4L		Tool Dimensions				
Uncoated	Coated	Ø D1	Ø D2	L1	L2	
Tool No.	Tool No.					
V4L 0600	V4L 0600B	6.0	6.0	75.0	25.0	
V4L 0800	V4L 0800B	8.0	8.0	75.0	25.0	
V4L 1000	V4L 1000B	10.0	10.0	100.0	40.0	
V4L 1200	V4L 1200B	12.0	12.0	100.0	50.0	
V4L 1201	V4L 1201B	12.0	12.0	150.0	75.0	
V4L 1600	V4L 1600B	16.0	16.0	150.0	75.0	
V4L 2000	V4L 2000B	20.0	20.0	150.0	75.0	



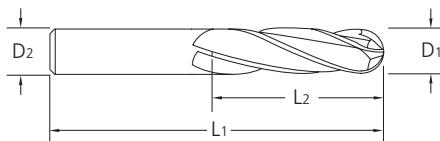
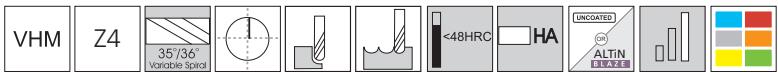
TuffCut® GP Series ASV4ACB



Series ASV4ACB		Tool Dimensions			
Tool No.		Ø D1	Ø D2	L1	L2
ASV4ACBNM0300		3.0	3.0	51.0	6.0
ASV4ACBNM0400		4.0	4.0	51.0	11.0
ASV4ACBNM0500		5.0	5.0	57.0	12.0
ASV4ACBNM0600		6.0	6.0	64.0	15.0
ASV4ACBNM0800		8.0	8.0	64.0	22.0
ASV4ACBNM1000		10.0	10.0	72.0	22.0
ASV4ACBNM1200		12.0	12.0	73.0	27.0
ASV4ACBNM1400		14.0	14.0	84.0	30.0
ASV4ACBNM1600		16.0	16.0	92.0	33.0
ASV4ACBNM2000		20.0	20.0	104.0	40.0

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TuffCut® GP Series V4LB



Series V4LB		Tool Dimensions			
Uncoated	Coated	Ø D1	Ø D2	L1	L2
V4LB 0600	V4LB 0600B	6.0	6.0	75.0	25.0
V4LB 0800	V4LB 0800B	8.0	8.0	75.0	25.0
V4LB 1000	V4LB 1000B	10.0	10.0	100.0	40.0
V4LB 1200	V4LB 1200B	12.0	12.0	100.0	50.0
V4LB 1201	V4LB 1201B	12.0	12.0	150.0	75.0
V4LB 1600	V4LB 1600B	16.0	16.0	150.0	75.0
V4LB 2000	V4LB 2000B	20.0	20.0	150.0	75.0

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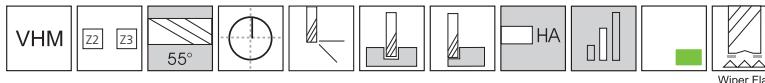


**M.A.
FORDMAX**
RANGE

End Mills

Fraise en bout | Schaftfräser | Frese a candela | Frez

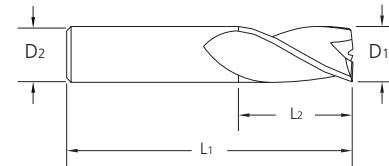
TuffCut® GP Series GT2, GT3



Z2



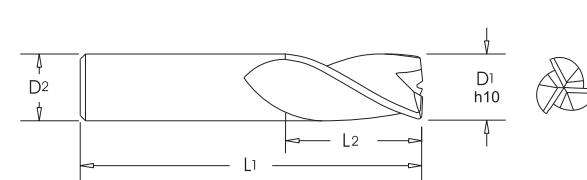
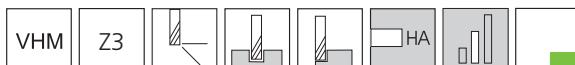
Z3



Series GT2	Series GT3	Tool Dimensions			
Tool No.	Tool No.	Ø D1	Ø D2	L1	L2
GT2 0200	-	2.0	3.0	50.0	7.0
GT2 0250	-	2.5	3.0	50.0	10.0
GT2 0300	GT3 0300	3.0	3.0	51.0	12.0
GT2 0400	GT3 0400	4.0	4.0	51.0	15.0
GT2 0500	GT3 0500	5.0	5.0	57.0	20.0
GT2 0600	GT3 0600	6.0	6.0	64.0	20.0
GT2 0800	GT3 0800	8.0	8.0	64.0	20.0
GT2 1000	GT3 1000	10.0	10.0	73.0	25.0
GT2 1200	GT3 1200	12.0	12.0	73.0	25.0
GT2 1400	GT3 1400	14.0	14.0	84.0	30.0
GT2 1600	GT3 1600	16.0	16.0	93.0	35.0
GT2 2000	GT3 2000	20.0	20.0	105.0	40.0



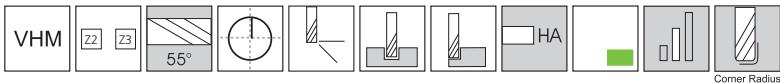
TuffCut® GP Series ASVSM



Series ASVSM	Tool Dimensions			
Tool No.	Ø D1	Ø D2	L1	L2
ASVSM0300	3.0	3.0	51.0	7.0
ASVSM0400	4.0	4.0	51.0	10.0
ASVSM0500	5.0	5.0	57.0	16.0
ASVSM0600	6.0	6.0	64.0	18.0
ASVSM0800	8.0	8.0	64.0	20.0
ASVSM1000	10.0	10.0	73.0	22.0
ASVSM1200	12.0	12.0	73.0	25.0
ASVSM1400	14.0	14.0	84.0	30.0
ASVSM1600	16.0	16.0	93.0	33.0
ASVSM2000	20.0	20.0	105.0	40.0



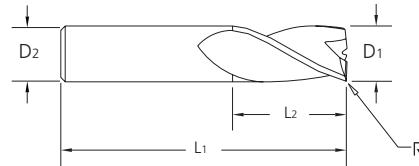
TuffCut® GP Series GT2R, GT3R



Z2



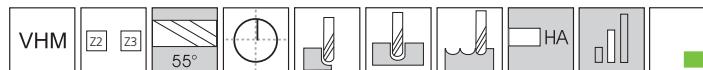
Z3



Series GT2R	Series GT3R	Tool Dimensions				
Tool No.	Tool No.	Ø D1	Ø D2	L1	L2	R
-	GT3 0300-0.3R	3.0	3.0	51.0	12.0	0.3
-	GT3 0300-0.5R	3.0	3.0	51.0	12.0	0.5
GT2 0400-0.25R	GT3 0400-0.25R	4.0	4.0	51.0	15.0	0.25
GT2 0400-0.5R	GT3 0400-0.5R	4.0	4.0	51.0	15.0	0.5
GT2 0400-1.0R	GT3 0400-1.0R	4.0	4.0	51.0	15.0	1.0
GT2 0500-0.25R	GT3 0500-0.25R	5.0	5.0	57.0	20.0	0.25
GT2 0500-0.5R	GT3 0500-0.5R	5.0	5.0	57.0	20.0	0.5
GT2 0500-1.0R	GT3 0500-1.0R	5.0	5.0	57.0	20.0	1.0
-	GT3 0500-1.5R	5.0	5.0	57.0	20.0	1.5
GT2 0600-0.25R	GT3 0600-0.25R	6.0	6.0	64.0	20.0	0.25
GT2 0600-0.5R	GT3 0600-0.5R	6.0	6.0	64.0	20.0	0.5
GT2 0600-1.0R	GT3 0600-1.0R	6.0	6.0	64.0	20.0	1.0
GT2 0600-1.5R	GT3 0600-1.5R	6.0	6.0	64.0	20.0	1.5
GT2 0600-2.0R	GT3 0600-2.0R	6.0	6.0	64.0	20.0	2.0
GT2 0800-0.25R	GT3 0800-0.25R	8.0	8.0	64.0	20.0	0.25
GT2 0800-0.5R	GT3 0800-0.5R	8.0	8.0	64.0	20.0	0.5
GT2 0800-1.0R	GT3 0800-1.0R	8.0	8.0	64.0	20.0	1.0
GT2 0800-1.5R	GT3 0800-1.5R	8.0	8.0	64.0	20.0	1.5
GT2 0800-2.0R	GT3 0800-2.0R	8.0	8.0	64.0	20.0	2.0
GT2 0800-3.0R	GT3 0800-3.0R	8.0	8.0	64.0	20.0	3.0
GT2 1000-0.5R	GT3 1000-0.5R	10.0	10.0	73.0	25.0	0.5
GT2 1000-1.0R	GT3 1000-1.0R	10.0	10.0	73.0	25.0	1.0
GT2 1000-2.0R	GT3 1000-1.5R	10.0	10.0	73.0	25.0	1.5
GT2 1000-3.0R	GT3 1000-2.0R	10.0	10.0	73.0	25.0	2.0
GT2 1200-0.25R	-	12.0	12.0	73.0	25.0	0.25
GT2 1200-0.5R	GT3 1200-0.5R	12.0	12.0	73.0	25.0	0.5
GT2 1200-1.0R	GT3 1200-1.0R	12.0	12.0	73.0	25.0	1.0
GT2 1200-1.5R	GT3 1200-1.5R	12.0	12.0	73.0	25.0	1.5
GT2 1200-2.0R	GT3 1200-2.0R	12.0	12.0	73.0	25.0	2.0
GT2 1200-3.0R	GT3 1200-3.0R	12.0	12.0	73.0	25.0	3.0
-	GT3 1600-0.5R	16.0	16.0	93.0	35.0	0.5
GT2 1600-1.0R	GT3 1600-1.0R	16.0	16.0	93.0	35.0	1.0
-	GT3 1600-1.5R	16.0	16.0	93.0	35.0	1.5
GT2 1600-2.0R	GT3 1600-2.0R	16.0	16.0	93.0	35.0	2.0
-	GT3 1600-3.0R	16.0	16.0	93.0	35.0	3.0

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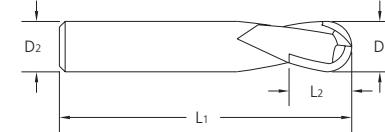
TuffCut® GP Series GT2B, GT3B



Z2



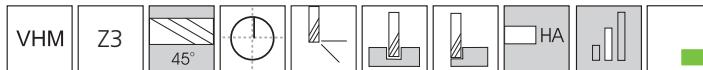
Z3



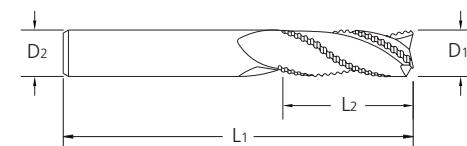
Series GT2B	Series GT3B	Tool Dimensions			
Tool No.	Tool No.	Ø D1	Ø D2	L1	L2
GT2B 0300	GT3B 0300	3.0	3.0	51.0	12.0
GT2B 0400	GT3B 0400	4.0	4.0	51.0	15.0
GT2B 0500	GT3B 0500	5.0	5.0	57.0	20.0
GT2B 0600	GT3B 0600	6.0	6.0	64.0	20.0
GT2B 0800	GT3B 0800	8.0	8.0	64.0	20.0
GT2B 1000	GT3B 1000	10.0	10.0	73.0	25.0
GT2B 1200	GT3B 1200	12.0	12.0	73.0	25.0
GT2B 1400	GT3B 1400	14.0	14.0	84.0	30.0
GT2B 1600	GT3B 1600	16.0	16.0	93.0	35.0
GT2B 2000	GT3B 2000	20.0	20.0	105.0	40.0



TuffCut® GP Series 134



Z3



Series 134	Tool Dimensions			
Tool No.	Ø D1	Ø D2	L1	L2
134 0600	6.0	6.0	64.0	20.0
134 0800	8.0	8.0	64.0	20.0
134 1000	10.0	10.0	70.0	25.0
134 1200	12.0	12.0	76.0	25.0
134 1400	14.0	14.0	89.0	30.0
134 1600	16.0	16.0	89.0	30.0
134 1800	18.0	18.0	102.0	35.0
134 2000	20.0	20.0	102.0	38.0
134 2500	25.0	25.0	102.0	50.0



TuffCut® FORDMAX Carbide Endmills

Series 164, 169, 163, 166, 165, 121, 116, 111, 150, 140, V4L, V4LB

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry



Tool Lengths	2 Flute (Z2)		3 Flute (Z3)		4 Flute (Z4)	
	GP Series		GP Series		GP Series	
Stub/Short	164	166	169	-	163 *	165 *
Standard	121	150	116	-	111 *	140 *
Long	-	-	-	-	V4L **	V4LB **

* Please Note - 4 Flute (Z4) Endmills Are Not Recommended
For Full Diameter Engagement/Slotting Applications

** V4L & V4LB long series Endmills are for profile milling
For V4L & V4LB reduce speed by 20%
For V4L & V4LB - Maximum Radial Cut (Ae) = 0.01 x D

Please use lower Vc values shown for uncoated tools.
Please use higher Vc values shown for ALtima® coated tools

Cutting Speeds By Material Group			Feed Recommendations					
			Tool Diameter (mm)					Feed/Tooth (fz - mm)
Workpiece Material Group		Material Type	Vc (m/min)	3.0	5.0	6.0	8.0	10.0
				Feed/Tooth (fz - mm)				
Steels	P	Low Carbon	100 - 150					
		Medium Carbon	90 - 125	.013 - .020	.025 - .030	.038 - .051	.038 - .051	.053 - .076
		Mould/Tool Steel	60 - 75	.008 - .013	.020 - .025	.030 - .038	.036 - .046	.046 - .051
Stainless Steels	M	Free Machining	70 - 90					
		Ferritic	60 - 85	.013 - .020	.025 - .030	.038 - .051	.038 - .051	.053 - .076
		Austenitic	55 - 70					
		Martensitic	45 - 60	.008 - .013	.020 - .025	.030 - .038	.036 - .046	.046 - .051
		PH Stainless	40 - 50					
Cast Irons	K	Grey Cast Iron	120 - 140					
		Ductile Cast Iron	90 - 120	.013 - .020	.025 - .030	.038 - .051	.038 - .051	.053 - .076
		Mallicable Iron	70 - 90					
Special Alloys	S	High Temp Alloys	10 - 20	.005 - .010	.005 - .012	.005 - .015	.015 - .030	.015 - .030
		Titanium Alloys	20 - 50	.008 - .010	.010 - .015	.015 - .020	.020 - .030	.020 - .030
Hardened Steels	H	35 - 45 HRc	60 - 75					
		45 - 55 Rc Steel	45 - 60	.008 - .013	.010 - .030	.010 - .030	.025 - .050	.025 - .050
Non-Ferrous	N	Aluminium Alloys	150 - 200					
		Brass / Bronze	120 - 180	.020 - .040	.040 - .050	.050 - .060	.060 - .070	.070 - .080
		Magnesium & Alloys	200 - 300					

RPM Formula For Metric Endmills - RPM = (Vc x 318.0) ÷ Endmill Ø

Feedrate Formula For Metric Endmills - Feedrate = RPM x fz x Number Of Cutting Teeth



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Email: sales@mafordeurope.com

TuffCut® FORDMAX Carbide Endmills

Series 164, 169, 163, 166, 165, 121, 116, 111, 150, 140, V4L, V4LB

Recommended cutting data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Please use lower Vc values shown for uncoated tools.
Please use higher Vc values shown for ALtima® coated tools.

Cutting Speeds By Material Group			Feed Recommendations					
			Tool Diameter (mm)					
Workpiece Material Group	Material Type	Vc (m/min)	12.0	16.0	20.0	25.0		
			Feed/Tooth (fz - mm)					
Steels	P	Low Carbon	100 - 150	.051 - .089	.058 - .102	.056 - .110	.080 - .130	
		Medium Carbon	90 - 125		.051 - .089	.058 - .102	.056 - .110	.080 - .130
		Mould/Tool Steel	60 - 75	.051 - .058	.058 - .076	.061 - .081	.061 - .081	
	M	Free Machining	70 - 90	.051 - .089	.058 - .102	.056 - .110	.080 - .130	
		Ferritic	60 - 85		.051 - .058	.058 - .076	.061 - .081	.061 - .081
		Austenitic	55 - 70					
Stainless Steels	M	Martensitic	45 - 60	.051 - .058	.058 - .076	.061 - .081	.061 - .081	
		PH Stainless	40 - 50					
		Grey Cast Iron	120 - 140	.051 - .089	.058 - .102	.056 - .109	.081 - .127	
	K	Ductile Cast Iron	90 - 120		.051 - .089	.058 - .102	.056 - .109	.081 - .127
		Malleable Iron	70 - 90					
Special Alloys	S	High Temp Alloys	10 - 20	.020 - .030	.030 - .040	.030 - .045	.045 - .050	
		Titanium Alloys	20 - 50	.030 - .040	.040 - .045	.045 - .050	.050 - .075	
		35 - 45 HRc	60 - 75	.030 - .060	.050 - .070	.060 - .080	.070 - .090	
	H	45 - 55 Rc Steel	45 - 60					
Non-Ferrous	N	Aluminium Alloys	150 - 200	.080 - .100	.100 - .200	.200 - .250	.200 - .250	
		Brass / Bronze	120 - 180					
		Magnesium & Alloys	200 - 300					

RPM Formula For Metric Endmills - RPM = (Vc x 318.0) ÷ Endmill Ø

Feedrate Formula For Metric Endmills - Feedrate = RPM x fz x Number Of Cutting Teeth

