



# Product Catalogue | Issue 5



Where **high performance**  
is the **standard**<sup>®</sup>





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



## Shaping the future of manufacturing



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 un synonyme 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 Gesamtfertigungsleistung 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 Werkzeugeistung 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 narzędzia, 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 pozazdroszczenia reputację w zakresie wydajności i precyzji.

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

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All technical details and specifications in this catalogue are correct at the time of production. M.A. Ford Europe reserves the right to amend any information and data without prior notification.

M.A. Ford Europe Limited®

## TuffCut® 3D Series XFO

Page NP4

- Engineered to improve 5-Axis finishing operations by reducing cycle times and delivering superior surface finishes.
- Specialised geometries for stainless steels and titanium.
- Variable helix and rake angles ensure smooth, vibration-free performance during finishing operations.
- Featuring ALtima® Q coating for exceptional wear and heat resistance.



## TuffCut® 3D Series XFO-AL

Page NP4

- Engineered to improve 5-Axis finishing operations by reducing cycle times and delivering superior surface finishes.
- Optimised geometry for aluminium.
- Variable helix and rake angles ensure smooth, vibration-free performance during finishing operations.
- Fordlube coating boosts wear resistance and provides superior lubricity.



## TuffCut® XV Series XV5CB

Page NP7

- Featuring ALtima® Q coating for outstanding wear and heat resistance, extending tool life.
- Optimised substrate grade enhances toughness, ideal for dynamic roughing applications.
- Thick-core design provides superior strength for long milling operations.
- Staggered chipbreaker ensures efficient chip evacuation and reduces cutting forces.
- Innovative open-end geometry supports aggressive entry angles, perfect for pocket milling.



## TuffCut® XT Series 277R N4, N5 & N6

Page NP11

- Advanced geometry optimised for machining steels, stainless steels, titanium, and cast irons.
- Enhanced corner protection for improved durability and performance.
- Variable helix geometry ensures smooth cutting and reduced vibrations.
- Expanded lineup of neck lengths to accommodate deep milling applications beyond standard length tools.



## TuffCut® HF Series FHFN N3 & N4

Page NP14

- Specifically designed for high-feed roughing in hardened steels of 50 HRC and above.
- High-hardness coating combined with a fine grain carbide substrate ensures exceptional wear and heat resistance.
- Excellent thermal shock resistance reduces chipping during operations.
- Delivers extended tool life when machining high-hardness materials, including hardened steel of 50 HRC or higher.



## TuffCut® HF Series FHFP N3, N5 & N8

Page NP16

- Ideal for high-feed roughing of 3D shapes, long-reach applications, and shallow forms.
- ALtima® Q coating paired with a tough substrate ensures excellent performance on standard steels, stainless steels, titanium, and high temperature alloys like Inconel® 718.
- Available in three variant lengths, providing versatility for a range of machining depths.
- Through-coolant design enhances chip evacuation in deep applications, improving tool life under high-heat conditions.



## TuffCut® XV

### Series XV7

Page NP19

- Centre-cutting geometry enables higher ramp angles and delivers improved floor finishes.
- 38° helix with variable pitch geometry ensures smooth cutting and reduces harmonics.
- Thick-core design provides added strength for machining difficult materials.
- Available in standard and chipbreaker versions, suitable for both roughing and finishing operations.
- ALtima® Q coating offers exceptional wear and heat resistance, extending tool life across a wide range of materials.
- Available in multiple length variants, offering versatility for machining at various depths.



## TuffCut® XT9

### Series 380 3xD

Page NP26

- Uneven 9-flute design enables high feed rates while reducing harmonics for stable machining.
- ALtima® Q coating provides exceptional wear and heat resistance, extending tool life across a wide range of materials.
- Available in standard and chipbreaker versions, suitable for both roughing and finishing operations.
- Staggered chipbreaker technology reduces cutting forces and improves chip management.
- Available in 3xD flute length for enhanced depth-of-cut capabilities.



## TuffCut® XM

### Series XM2S

#### 2 Flute Square end mill

Page NP28

- Ideal for hardened steels up to 65 HRC, as well as a wide range of softer materials.
- Perfect for semi-finishing and finishing applications.
- High-precision diameter tolerance for exceptional consistency.
- Micro-grain carbide substrate combined with a high-performance coating for enhanced durability and efficiency.



## TuffCut® XM

### Series XM2R

#### 2 Flute Radius end-mill

Page NP31

- High-precision radius type with corner radius tolerance of  $\pm 0.005$  mm.
- Ideal for hardened steels up to 65 HRC, as well as a wide range of softer materials.
- Perfect for semi-finishing and finishing applications.
- Micro-grain carbide substrate combined with a high-performance coating for enhanced durability and efficiency.



**NEW**  
Products  
New Products

## TuffCut® XM

### Series XM2B

#### 2 Flute Ball end mill

Page NP37

- High-precision radius type with corner radius tolerance of  $\pm 0.005$  mm.
- Ideal for hardened steels up to 65 HRC, as well as a wide range of softer materials.
- Perfect for semi-finishing and finishing applications.
- Micro-grain carbide substrate combined with a high-performance coating for enhanced durability and efficiency.



## TuffCut® XM

### Series XM4R

#### 4 Flute Radius end mill

Page NP40

- High-precision radius type with corner radius tolerance of  $\pm 0.005$  mm.
- Four-flute design increases feed rates, improves stability, and provides smoother cutting action.
- Ideal for hardened steels up to 65 HRC, as well as a wide range of softer materials.
- Perfect for semi-finishing and finishing applications.
- Micro-grain carbide substrate combined with a high-performance coating for enhanced durability and efficiency.



## TuffCut® XM

### Series XM2BH

#### 2 Flute Ball end mill

- High-hard ball nose end mills designed for machining hardened steels up to 70 HRC.
- Short length ideal for roughing, semi-finishing, and finishing applications.
- Perfect for shrink-fit applications requiring short shank lengths.
- Micro-grain carbide substrate combined with a high-performance coating for superior durability and efficiency.

Page NP43



## TuffCut® XM

### Series XM4SH

#### 4 Flute Square end mill

- Four-flute design increases feed rates, improves stability, and provides smoother cutting action.
- Ideal for hardened steels up to 65 HRC, as well as a wide range of softer materials.
- Perfect for semi-finishing and finishing applications.
- Micro-grain carbide substrate combined with a high-performance coating for enhanced durability and efficiency.

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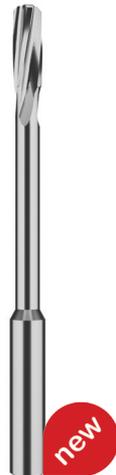


## TrueSize® NC Machine Reamer

### Series 275

- Solid Carbide
- Recommended for CNC reaming applications.
- Common metric shanks for high-accuracy clamping.
- Extended reach for increased hole depths.
- RH Spiral / RH Cut design for both blind and through hole applications.
- Suited for most materials.

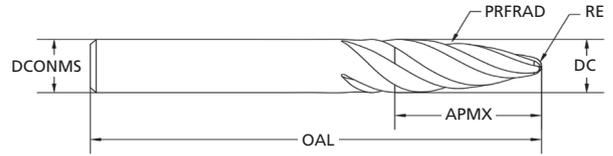
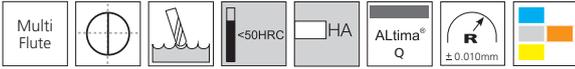
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**NEW**  
Products

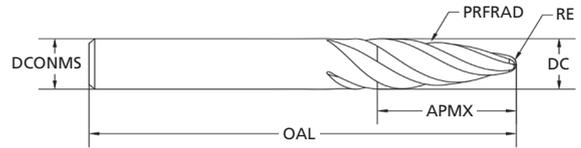
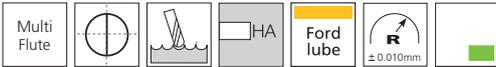
New Products

## TuffCut® 3D Series XFO

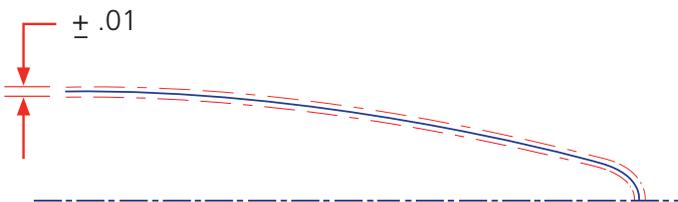


Tool No.	DC	DCONMS (h6)	OAL	APMX	RE	PRFRAD	No. of Flutes
XFO-4M06R95AQ	6.0	6.0	64.0	20.8	1.0	95.0	4
XFO-4M08R90AQ	8.0	8.0	64.0	24.5	1.0	90.0	4
XFO-4M10R85AQ	10.0	10.0	72.0	24.7	2.0	85.0	4
XFO-6M10R85AQ	10.0	10.0	72.0	24.7	2.0	85.0	6
XFO-4M12R80AQ	12.0	12.0	84.0	27.3	2.0	80.0	4
XFO-6M12R80AQ	12.0	12.0	84.0	27.3	2.0	80.0	6

## TuffCut® 3D Series XFO-AL



Tool No.	DC	DCONMS (h6)	OAL	APMX	RE	PRFRAD	No. of Flutes
XFO-AL3M06R95F	6.0	6.0	64.0	20.8	1.0	95.0	3
XFO-AL3M08R90F	8.0	8.0	64.0	24.5	1.0	90.0	3
XFO-AL4M10R85F	10.0	10.0	72.0	24.7	2.0	85.0	4
XFO-AL4M12R80F	12.0	12.0	84.0	27.3	2.0	80.0	4



### Radius form tolerance

The XFO and XFO-AL series are held to a precision radius form tolerance of  $\pm 0.010\text{mm}$  to ensure high accuracy finishing, and prevention of mis-match on component surfaces.

## TuffCut® 3D Series XFO

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

Series XFO						
Workpiece Material Group	ISO	Depths of Cut 			Finishing	Semi-Finishing
					0.01-0.03 x D	0.05-0.07 x D
		Coolant			Vc - M/Min	
		Emulsion	Air	MQL		
Low Carbon	P	●	●	●	450	350
Medium Carbon		●	●	●	345	275
Alloy Steels		●	●	●	315	255
Die / Tool Steels (≤ 45 HRC)		●	●	●	275	220
Free Machining	M	●	X	○	205	165
Austenitic		●	X	○	160	130
Difficult Stainless		●	X	○	125	100
PH Stainless (≤ 45 HRC)		●	X	○	160	130
Cobalt Chrome Alloys		●	X	○	125	100
Duplex (22%)		●	X	○	75	60
Super Duplex (25%)		●	X	○	60	50
High Temp Alloys	S	●	X	X	45	30
Titanium Alloys		●	X	X	110	90

● Preferred ○ Possible X Not Possible

Series XFO									
Material Type	ISO	Tool Diameter (mm)							
		6		8		10		12	
		Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish
		Fz - mm/tooth							
Low Carbon Steels	P	0.048	0.030	0.064	0.040	0.080	0.050	0.096	0.060
Medium Carbon Steels		0.048	0.030	0.064	0.040	0.080	0.050	0.096	0.060
Alloy Steels		0.048	0.030	0.064	0.040	0.080	0.050	0.096	0.060
Die / Tool Steels		0.036	0.024	0.048	0.032	0.060	0.040	0.072	0.048
Free Machining Stainless Steels	M	0.048	0.030	0.064	0.040	0.080	0.050	0.096	0.060
Austenitic Stainless Steels		0.048	0.030	0.064	0.040	0.080	0.050	0.096	0.060
Difficult Stainless Steels		0.048	0.030	0.064	0.040	0.080	0.050	0.096	0.060
PH Stainless Steels		0.036	0.024	0.048	0.032	0.060	0.040	0.072	0.048
Cobalt Chrome Alloys		0.036	0.024	0.048	0.032	0.060	0.040	0.072	0.048
Duplex (22%)		0.036	0.024	0.048	0.032	0.060	0.040	0.072	0.048
Super Duplex (25%)		0.036	0.024	0.048	0.032	0.060	0.040	0.072	0.048
High Temp Alloys	S	0.036	0.024	0.048	0.032	0.060	0.040	0.072	0.048
Titanium Alloys		0.042	0.030	0.056	0.040	0.070	0.050	0.084	0.060

Notes:

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application.
- To prevent chip evacuation issues, utilise 4-flute tools for semi-finishing operations & avoid cutting with the tip of the tool wherever possible.
- Reduced feeds required when cutting with the tip of the tool.

New Products

NEW Products

# TuffCut® 3D Series XFO-AL

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

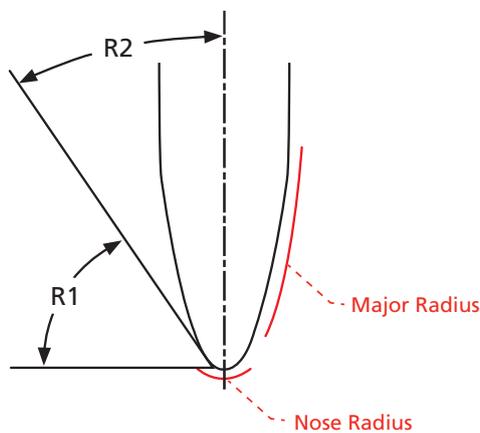
Series XFO-AL						
Workpiece Material Group	ISO	Depths of Cut 			Finishing	Semi-Finishing
					0.01-0.03 x D	0.05-0.07 x D
		Coolant			Vc - M/Min	
Emulsion	Air	MQL				
Aluminium Alloys	N	●	X	○	610	580

● Preferred ○ Possible X Not Possible

Series XFO-AL									
Workpiece Material Group	ISO	Tool Diameter							
		6		8		10		12	
		Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish	Semi Finish	Finish
Fz - mm/tooth									
Aluminium Alloys	N	0.060	0.039	0.080	0.052	0.100	0.065	0.120	0.078

Notes:

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application.
- To prevent chip evacuation issues, avoid cutting with the tip of the tool wherever possible.
- Reduced feeds required when cutting with the tip of the tool.



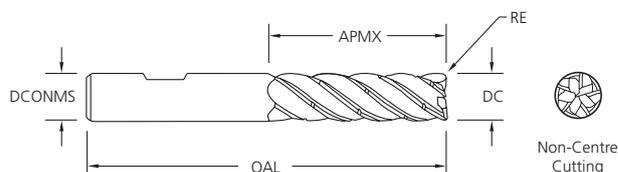
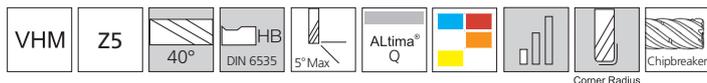
Tool Ø		Nose Radius		Major Radius	
D1	R1	Effective Angle (Max.)	R2	Effective Angle (Max.)	
6	1	78.2°	95	11.8°	
8	1	75.1°	90	14.9°	
10	2	74.6°	85	15.4°	
12	2	71.6°	80	18.4°	

\*Numbers above represent maximum angle values.

## Stepover Distance by Cusp Height

Tool Ø (mm)		Cusp Height (mm)	0.003	0.005	0.008	0.010	0.013
D1	R2		Stepover (mm)				
6	95		1.50	1.95	2.46	2.76	3.14
8	90		1.47	1.90	2.40	2.69	3.06
10	85		1.43	1.84	2.33	2.61	2.97
12	80		1.38	1.79	2.26	2.53	2.88

## TuffCut® XV Series XV5CB 2.5xD

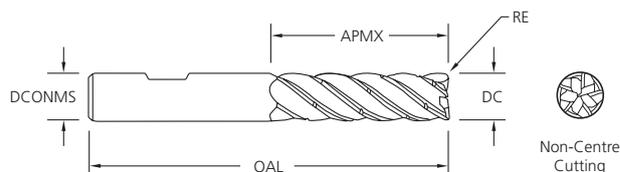


Tool No.	DC	DCONMS	OAL	APMX	RE
XV5CBM1002-R0.5AQW	10.0	10.0	74.0	27.0	0.5
XV5CBM1202-R0.5AQW	12.0	12.0	85.0	32.0	0.5
XV5CBM1602-R0.5AQW	16.0	16.0	98.0	42.0	0.5
XV5CBM2002-R0.5AQW	20.0	20.0	110.0	52.0	0.5

**NEW**  
Products

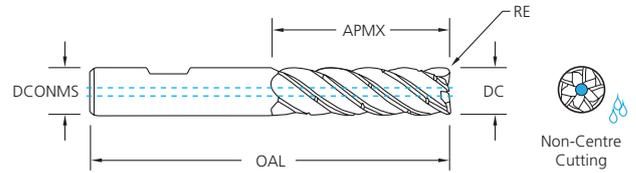
New Products

## TuffCut® XV Series XV5CB 3xD



Tool No.	DC	DCONMS	OAL	APMX	RE
XV5CBM1003-R0.5AQW	10.0	10.0	80.0	33.0	0.5
XV5CBM1203-R0.5AQW	12.0	12.0	93.0	40.0	0.5
XV5CBM1603-R0.5AQW	16.0	16.0	110.0	54.0	0.5
XV5CBM2003-R0.5AQW	20.0	20.0	124.0	66.0	0.5

## TuffCut® XV Series XV5CB 3xD-C

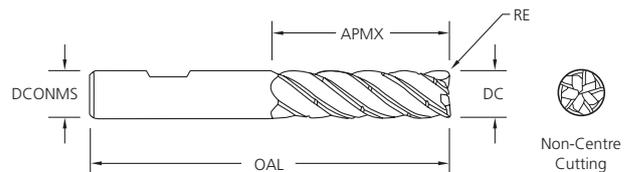
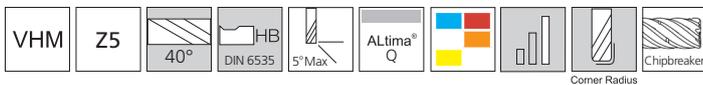


Tool No.	DC	DCONMS	OAL	APMX	RE
XV5CBM1003-R0.5AQW-C	10.0	10.0	80.0	33.0	0.5
XV5CBM1203-R0.5AQW-C	12.0	12.0	93.0	40.0	0.5
XV5CBM1603-R0.5AQW-C	16.0	16.0	110.0	54.0	0.5
XV5CBM2003-R0.5AQW-C	20.0	20.0	124.0	66.0	0.5

**NEW**  
Products

New Products

## TuffCut® XV Series XV5CB 4xD



Tool No.	DC	DCONMS	OAL	APMX	RE
XV5CBM1004-R0.5AQW	10.0	10.0	90.0	43.0	0.5
XV5CBM1204-R0.5AQW	12.0	12.0	104.0	51.0	0.5
XV5CBM1604-R0.5AQW	16.0	16.0	123.0	67.0	0.5
XV5CBM2004-R0.5AQW	20.0	20.0	141.0	83.0	0.5

## TuffCut® XV Series XV5CB 2.5xD, 3xD, 3xD-C, 4xD

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

Series XV5CB - 2.5xD											
Workpiece Material Group	ISO	Coolant			Radial (Ae)			Tool Diameter (mm)			
		Emulsion	Air	MQL	10%	15%	20%	10	12	16	20
					1.67	1.4	1.2	← Multiply fz by this Factor based on ae. When finishing, use the standard fz per chart below. Only use this calculation when roughing or semi-finishing.			
					Vc - M/Min			fz - mm/tooth			
Low Carbon Steels	P	•	•	•	350	300	250	0.060	0.072	0.096	0.120
Medium Carbon Steels		•	•	•	260	240	220	0.060	0.072	0.096	0.120
Alloy Steels		•	•	•	240	220	200	0.060	0.072	0.096	0.120
Die / Tool Steels		•	•	•	220	200	180	0.060	0.072	0.096	0.120
Free Machining Stainless Steels	M	•	•	o	205	180	150	0.060	0.072	0.096	0.120
Austenitic Stainless Steels		•	x	o	160	140	100	0.048	0.058	0.077	0.096
Difficult Stainless Steels		•	x	o	110	90	70	0.040	0.048	0.064	0.080
PH Stainless Steels		•	•	o	160	140	100	0.048	0.058	0.077	0.096
Titanium Alloys	S	•	x	x	120	100	80	0.040	0.048	0.064	0.080

Series XV5CB - 3xD											
Workpiece Material Group	ISO	Coolant			Radial (Ae)			Tool Diameter (mm)			
		Emulsion	Air	MQL	5%	10%	15%	10	12	16	20
					2.3	1.67	1.4	← Multiply fz by this Factor based on ae. When finishing, use the standard fz per chart below. Only use this calculation when roughing or semi-finishing.			
					Vc - M/Min			fz - mm/tooth			
Low Carbon Steels	P	•	•	•	350	300	250	0.060	0.072	0.096	0.120
Medium Carbon Steels		•	•	•	260	240	220	0.060	0.072	0.096	0.120
Alloy Steels		•	•	•	240	220	200	0.060	0.072	0.096	0.120
Die / Tool Steels		•	•	•	220	200	180	0.060	0.072	0.096	0.120
Free Machining Stainless Steels	M	•	•	o	205	180	150	0.060	0.072	0.096	0.120
Austenitic Stainless Steels		•	x	o	160	140	100	0.048	0.058	0.077	0.096
Difficult Stainless Steels		•	x	o	110	90	70	0.040	0.048	0.064	0.080
PH Stainless Steels		•	•	o	160	140	100	0.048	0.058	0.077	0.096
Titanium Alloys	S	•	x	x	120	100	80	0.040	0.048	0.064	0.080

Series XV5CB - 4xD											
Workpiece Material Group	ISO	Coolant			Radial (Ae)			Tool Diameter (mm)			
		Emulsion	Air	MQL	5%	7%	10%	10	12	16	20
					2.3	2.0	1.67	← Multiply fz by this Factor based on ae. When finishing, use the standard fz per chart below. Only use this calculation when roughing or semi-finishing.			
					Vc - M/Min			fz - mm/tooth			
Low Carbon Steels	P	•	•	•	300	275	250	0.040	0.048	0.064	0.080
Medium Carbon Steels		•	•	•	240	230	220	0.040	0.048	0.064	0.080
Alloy Steels		•	•	•	220	210	200	0.040	0.048	0.064	0.080
Die / Tool Steels		•	•	•	200	190	180	0.040	0.048	0.064	0.080
Free Machining Stainless Steels	M	•	•	o	180	165	150	0.040	0.048	0.064	0.080
Austenitic Stainless Steels		•	x	o	160	150	140	0.028	0.034	0.045	0.056
Difficult Stainless Steels		•	x	o	90	80	70	0.024	0.029	0.038	0.048
PH Stainless Steels		•	•	o	160	150	140	0.028	0.034	0.045	0.056
Titanium Alloys	S	•	x	x	100	90	80	0.024	0.029	0.038	0.048

• Preferred o Possible x Not Possible

### Notes

Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc. The XV5CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended. For optimal performance in ISO S materials, ae = ≤ 0.1 x D

# TuffCut® XV Series XV5CB Profile Milling with 2.5xD, 3xD & 4xD APMX

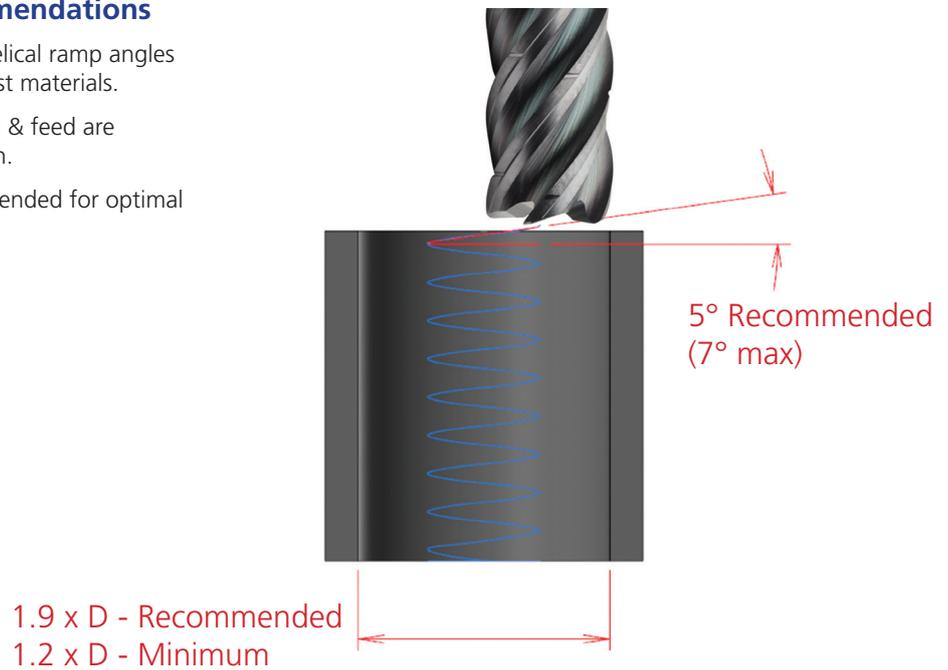
## Helical interpolation recommendations

Under optimal conditions, up to 5° helical ramp angles are achievable with the XV5CB in most materials.

A reduction of 30-50% in both speed & feed are recommended for helical interpolation.

A hole diameter of 1.9 x D is recommended for optimal helical interpolation performance.

Minimum hole diameter = 1.2 x D



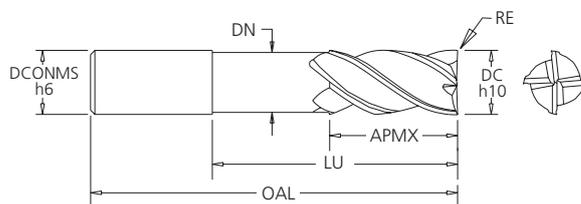
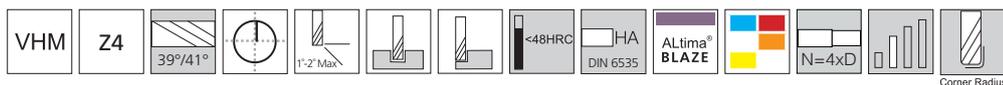
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Radial Width of Cut (Ae)	Chip Thickness Compensation Factor
5%	2.30
7%	1.96
8%	1.84
10%	1.67
15%	1.40
20%	1.20

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.

## TuffCut® XT Series 277R N4

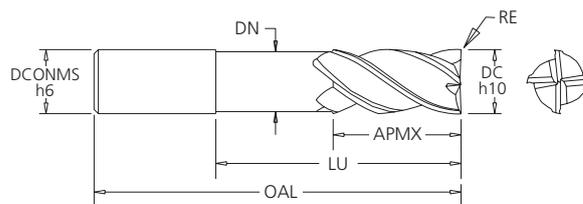
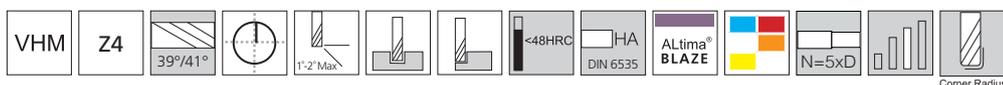


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
277 06N4-0.5RB	6.0	6.0	5.8	64.0	13.0	26.0	0.5
277 08N4-0.5RB	8.0	8.0	7.6	75.0	19.0	34.0	0.5
277 10N4-0.5RB	10.0	10.0	9.6	82.0	22.0	42.0	0.5
277 12N4-0.5RB	12.0	12.0	11.4	100.0	26.0	50.0	0.5
277 12N4-3.0RB	12.0	12.0	11.4	100.0	26.0	50.0	3.0
277 16N4-0.5RB	16.0	16.0	15.2	120.0	32.0	66.0	0.5
277 16N4-3.0RB	16.0	16.0	15.2	120.0	32.0	66.0	3.0

NEW Products

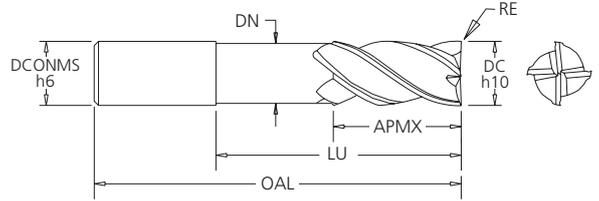
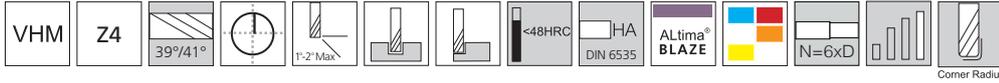
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## TuffCut® XV Series 277R N5



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
277 06N5-0.5RB	6.0	6.0	5.8	70.0	13.0	32.0	0.5
277 08N5-0.5RB	8.0	8.0	7.6	80.0	19.0	42.0	0.5
277 10N5-0.5RB	10.0	10.0	9.6	92.0	22.0	52.0	0.5
277 12N5-0.5RB	12.0	12.0	11.4	110.0	26.0	62.0	0.5
277 12N5-3.0RB	12.0	12.0	11.4	110.0	26.0	62.0	3.0
277 16N5-0.5RB	16.0	16.0	15.2	130.0	32.0	82.0	0.5
277 16N5-3.0RB	16.0	16.0	15.2	130.0	32.0	82.0	3.0

# TuffCut® XT Series 277R N6



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
277 06N6-0.5RB	6.0	6.0	5.8	75.0	13.0	38.0	0.5
277 08N6-0.5RB	8.0	8.0	7.6	90.0	19.0	50.0	0.5
277 10N6-0.5RB	10.0	10.0	9.6	105.0	22.0	62.0	0.5
277 12N6-0.5RB	12.0	12.0	11.4	120.0	26.0	74.0	0.5
277 12N6-3.0RB	12.0	12.0	11.4	120.0	26.0	74.0	3.0
277 16N6-0.5RB	16.0	16.0	15.2	150.0	32.0	98.0	0.5
277 16N6-3.0RB	16.0	16.0	15.2	150.0	32.0	98.0	3.0



New Products

## TuffCut® XT Series 277R N4, N5 & N6

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

Series 277NR - 4xD														
Workpiece Material Group	ISO	Coolant			Application	Depths of Cut		Vc-M/min	Tool Diameter (mm)					
		Emulsion	Air	MQL		Axial (Ap)	Radial (Ae)		6	8	10	12	16	
									fz - mm/tooth by Cutter Diameter					
Low Carbon Steels	P	•	•	•	Profiling	1xD	0.4xD	300	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.5xD	-	200	0.03	0.04	0.05	0.06	0.08	
Medium Carbon Steels		•	•	•	Profiling	1xD	0.4xD	230	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.5xD	-	155	0.03	0.04	0.05	0.06	0.08	
Alloy Steels		•	•	•	Profiling	1xD	0.4xD	205	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.5xD	-	135	0.03	0.04	0.05	0.06	0.08	
Die / Tool Steels		•	•	•	Profiling	1xD	0.4xD	170	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.5xD	-	115	0.03	0.04	0.05	0.06	0.08	
Austenitic Stainless Steels		M	•	x	o	Profiling	1xD	0.4xD	120	0.06	0.08	0.1	0.12	0.16
						Slotting	0.5xD	-	80	0.03	0.04	0.05	0.06	0.08
Duplex (22%)	•		x	o	Profiling	1xD	0.4xD	80	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.5xD	-	55	0.03	0.04	0.05	0.06	0.08	
Supper Duplex (25%)	•		x	o	Profiling	1xD	0.4xD	50	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.5xD	-	35	0.03	0.04	0.05	0.06	0.08	
Titanium Alloys	S		•	x	x	Profiling	1xD	0.4xD	60	0.06	0.08	0.1	0.12	0.16
						Slotting	0.5xD	-	40	0.03	0.04	0.05	0.06	0.08

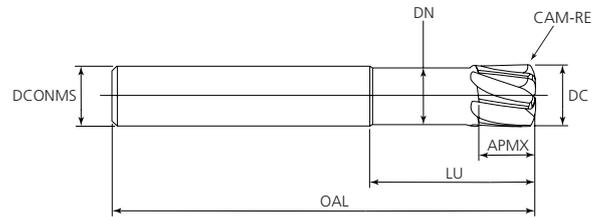
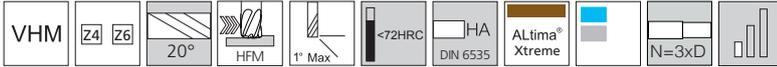
Series 277NR - 5xD														
Workpiece Material Group	ISO	Coolant			Application	Depths of Cut		Vc-M/min	Tool Diameter (mm)					
		Emulsion	Air	MQL		Axial (Ap)	Radial (Ae)		6	8	10	12	16	
									fz - mm/tooth by Cutter Diameter					
Low Carbon Steels	P	•	•	•	Profiling	1xD	0.25xD	270	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	180	0.03	0.04	0.05	0.06	0.08	
Medium Carbon Steels		•	•	•	Profiling	1xD	0.25xD	205	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	135	0.03	0.04	0.05	0.06	0.08	
Alloy Steels		•	•	•	Profiling	1xD	0.25xD	185	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	125	0.03	0.04	0.05	0.06	0.08	
Die / Tool Steels		•	•	•	Profiling	1xD	0.25xD	153	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	105	0.03	0.04	0.05	0.06	0.08	
Austenitic Stainless Steels		M	•	x	o	Profiling	1xD	0.25xD	80	0.06	0.08	0.1	0.12	0.16
						Slotting	0.3xD	-	55	0.03	0.04	0.05	0.06	0.08
Duplex (22%)	•		x	o	Profiling	1xD	0.25xD	70	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	45	0.03	0.04	0.05	0.06	0.08	
Supper Duplex (25%)	•		x	o	Profiling	1xD	0.25xD	45	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	30	0.03	0.04	0.05	0.06	0.08	
Titanium Alloys	S		•	x	x	Profiling	1xD	0.25xD	75	0.06	0.08	0.1	0.12	0.16
						Slotting	0.3xD	-	50	0.03	0.04	0.05	0.06	0.08

Series 277NR - 6xD														
Workpiece Material Group	ISO	Coolant			Application	Depths of Cut		Vc-M/min	Tool Diameter (mm)					
		Emulsion	Air	MQL		Axial (Ap)	Radial (Ae)		6	8	10	12	16	
									fz - mm/tooth by Cutter Diameter					
Low Carbon Steels	P	•	•	•	Profiling	1xD	0.25xD	240	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	160	0.03	0.04	0.05	0.06	0.08	
Medium Carbon Steels		•	•	•	Profiling	1xD	0.25xD	184	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	125	0.03	0.04	0.05	0.06	0.08	
Alloy Steels		•	•	•	Profiling	1xD	0.25xD	164	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	110	0.03	0.04	0.05	0.06	0.08	
Die / Tool Steels		•	•	•	Profiling	1xD	0.25xD	136	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	90	0.03	0.04	0.05	0.06	0.08	
Austenitic Stainless Steels		M	•	x	o	Profiling	1xD	0.25xD	75	0.06	0.08	0.1	0.12	0.16
						Slotting	0.3xD	-	50	0.03	0.04	0.05	0.06	0.08
Duplex (22%)	•		x	o	Profiling	1xD	0.25xD	65	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	45	0.03	0.04	0.05	0.06	0.08	
Supper Duplex (25%)	•		x	o	Profiling	1xD	0.25xD	35	0.06	0.08	0.1	0.12	0.16	
					Slotting	0.3xD	-	25	0.03	0.04	0.05	0.06	0.08	
Titanium Alloys	S		•	x	x	Profiling	1xD	0.25xD	64	0.06	0.08	0.1	0.12	0.16
						Slotting	0.3xD	-	45	0.03	0.04	0.05	0.06	0.08

• Preferred o Possible x Not Possible



## TuffCut® HF Series FHFN N3

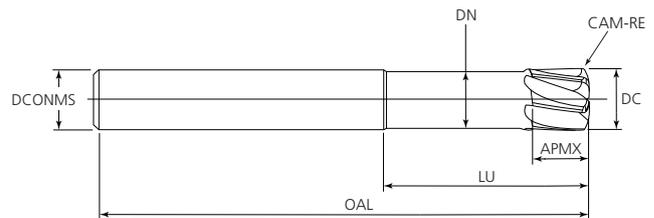


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	NOF	CAM-RE
FHFN 03N3-AX	3.0	6.0	2.9	60.0	3.0	9.0	4	0.25
FHFN 04N3-AX	4.0	6.0	3.9	60.0	4.0	12.0	4	0.3
FHFN 05N3-AX	5.0	6.0	4.7	60.0	5.0	15.0	4	0.35
FHFN 06N3-AX	6.0	6.0	5.5	60.0	5.0	18.0	6	0.45
FHFN 08N3-AX	8.0	8.0	7.5	75.0	7.0	24.0	6	0.6
FHFN 10N3-AX	10.0	10.0	9.5	90.0	8.0	30.0	6	0.75
FHFN 12N3-AX	12.0	12.0	11.5	100.0	10.0	36.0	6	0.9

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## TuffCut® HF Series FHFN N4



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	NOF	CAM-RE
FHFN 06N4-AX	6.0	6.0	5.5	100.0	5.0	24.0	6	0.45
FHFN 08N4-AX	8.0	8.0	7.5	100.0	7.0	32.0	6	0.6
FHFN 10N4-AX	10.0	10.0	9.5	120.0	8.0	40.0	6	0.75
FHFN 12N4-AX	12.0	12.0	11.5	150.0	10.0	48.0	6	0.9

# TuffCut® HF Series FHFN N3 & N4

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

Series FHFN - 3xD																	
Workpiece Material Group	ISO	Coolant			Vc- m/min	Tool Diameter & CAM-R											
		Emulsion	Air	MQL		3mm x R0.25			4mm x R0.3			5mm x R0.35			6mm x R0.45		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Pre-Hardened Steels 35-45HRC	P	○	●	●	100	0.1	1.7	0.09	0.15	2.2	0.12	0.18	2.8	0.15	0.300	3.3	0.180
Hardened Steels 50 - 55HRC	H	X	●	○	80	0.1	1.7	0.115	0.15	2.2	0.155	0.18	2.8	0.19	0.240	3.3	0.230
Hardened Steels 55 - 60HRC		X	●	○	60	0.07	1.7	0.075	0.095	2.2	0.1	0.115	2.8	0.12	0.140	3.3	0.145
Hardened Steels 60 - 65HRC		X	●	○	50	0.055	1.7	0.055	0.075	2.2	0.07	0.09	2.8	0.09	0.110	3.3	0.105
Hardened Steels 65 - 70HRC		X	●	○	40	0.04	1.5	0.04	0.055	2	0.05	0.065	2.5	0.065	0.080	3.0	0.075

Series FHFN - 3xD														
Workpiece Material Group	ISO	Coolant			Vc- m/min	Tool Diameter & CAM-R								
		Emulsion	Air	MQL		8mm x R0.6			10mm x R0.75			12mm x R0.9		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Pre-Hardened Steels 35-45HRC	P	○	●	●	100	0.4	4.4	0.240	0.5	5.5	0.300	0.6	6.6	0.360
Hardened Steels 50 - 55HRC	H	X	●	○	80	0.32	4.4	0.305	0.4	5.5	0.380	0.48	6.6	0.460
Hardened Steels 55 - 60HRC		X	●	○	60	0.185	4.4	0.195	0.23	5.5	0.240	0.28	6.6	0.290
Hardened Steels 60 - 65HRC		X	●	○	50	0.145	4.4	0.140	0.18	5.5	0.175	0.22	6.6	0.210
Hardened Steels 65 - 70HRC		X	●	○	40	0.105	4.0	0.100	0.13	5.0	0.125	0.16	6.0	0.150

Series FHFN - 4xD																	
Workpiece Material Group	ISO	Coolant			Vc- m/min	Tool Diameter & CAM-R											
		Emulsion	Air	MQL		6mm x R0.45			8mm x R0.6			10mm x R0.75			12mm x R0.9		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Pre-Hardened Steels 35-45HRC	P	○	●	●	90	0.260	3.3	0.180	0.34	4.4	0.240	0.43	5.5	0.300	0.51	6.6	0.360
Hardened Steels 50 - 55HRC	H	X	●	○	75	0.200	3.3	0.230	0.27	4.4	0.305	0.34	5.5	0.380	0.41	6.6	0.460
Hardened Steels 55 - 60HRC		X	●	○	55	0.120	3.3	0.145	0.16	4.4	0.195	0.2	5.5	0.240	0.24	6.6	0.290
Hardened Steels 60 - 65HRC		X	●	○	45	0.090	3.3	0.105	0.12	4.4	0.140	0.15	5.5	0.175	0.19	6.6	0.210
Hardened Steels 65 - 70HRC		X	●	○	35	0.070	3.0	0.075	0.09	4.0	0.100	0.11	5.0	0.125	0.14	6.0	0.150

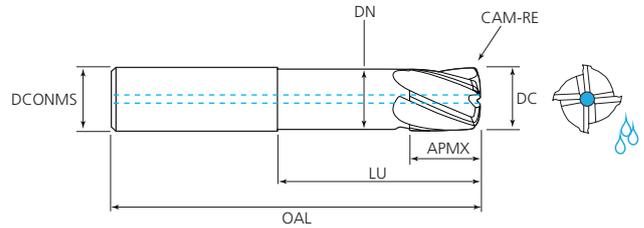
● Preferred ○ Possible X Not Possible

**Notes:**

Ramp angle 0.5° or less

For roughing, area clearance, slotting and pocketing operations

## TuffCut® HF Series FHFP N3

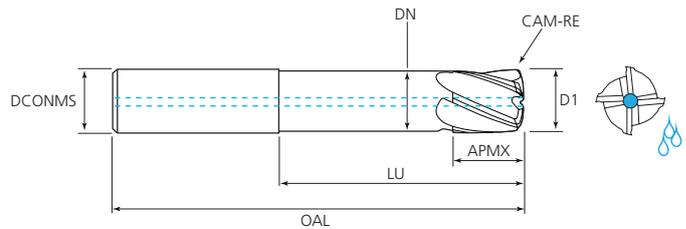
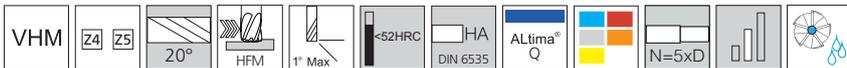


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	NOF	CAM-RE
FHFP 02N3-AQ	2.0	4.0	1.8	57.0	2.0	7.0	4	0.2
FHFP 03N3-AQ	3.0	6.0	2.8	57.0	3.0	10.0	4	0.3
FHFP 04N3-CCAQ	4.0	6.0	3.8	57.0	4.0	13.0	4	0.4
FHFP 05N3-CCAQ	5.0	6.0	4.8	57.0	5.0	16.0	4	0.5
FHFP 06N3-CCAQ	6.0	6.0	5.8	57.0	6.0	20.0	4	0.6
FHFP 08N3-CCAQ	8.0	8.0	7.8	63.0	8.0	26.0	4	0.8
FHFP 10N3-CCAQ	10.0	10.0	9.8	72.0	10.0	32.0	4	1.0
FHFP 12N3-CCAQ	12.0	12.0	11.8	83.0	12.0	38.0	5	1.2
FHFP 16N3-CCAQ	16.0	16.0	15.8	100.0	16.0	50.0	5	1.6

**NEW**  
Products

New Products

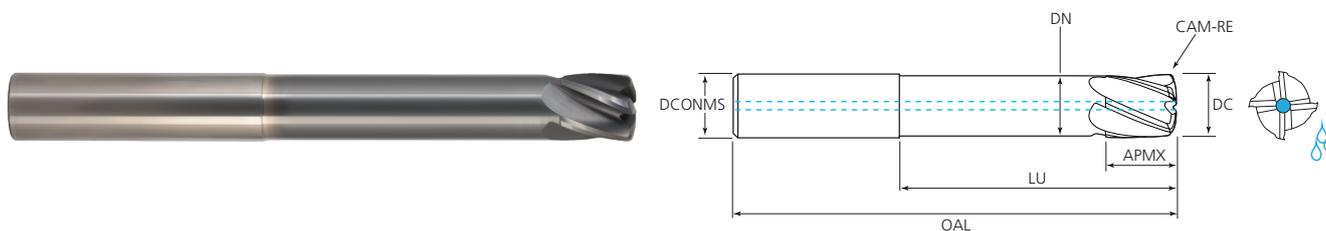
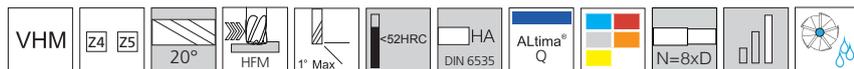
## TuffCut® HF Series FHFP N5



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	NOF	CAM-RE
FHFP 02N5-AQ	2.0	4.0	1.8	57.0	2.0	11.0	4	0.2
FHFP 03N5-AQ	3.0	6.0	2.8	57.0	3.0	16.0	4	0.3
FHFP 04N5-CCAQ	4.0	6.0	3.8	57.0	4.0	21.0	4	0.4
FHFP 05N5-CCAQ	5.0	6.0	4.8	64.0	5.0	26.0	4	0.5
FHFP 06N5-CCAQ	6.0	6.0	5.8	75.0	6.0	32.0	4	0.6
FHFP 08N5-CCAQ	8.0	8.0	7.8	83.0	8.0	42.0	4	0.8
FHFP 10N5-CCAQ	10.0	10.0	9.8	100.0	10.0	52.0	4	1.0
FHFP 12N5-CCAQ	12.0	12.0	11.8	110.0	12.0	62.0	5	1.2
FHFP 16N5-CCAQ	16.0	16.0	15.8	133.0	16.0	82.0	5	1.6

Note: The 2.0 and 3.0 tool diameters do not include a through-coolant feature.

## TuffCut® HF Series FHFP N8



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	NOF	CAM-RE
FHFP 02N8-AQ	2.0	4.0	1.8	57.0	2.0	17.0	4	0.2
FHFP 03N8-AQ	3.0	6.0	2.8	57.0	5.0	25.0	4	0.3
FHFP 04N8-CCAQ	4.0	6.0	3.8	64.0	4.0	33.0	4	0.4
FHFP 05N8-CCAQ	5.0	6.0	4.8	75.0	5.0	41.0	4	0.5
FHFP 06N8-CCAQ	6.0	6.0	5.8	90.0	6.0	50.0	4	0.6
FHFP 08N8-CCAQ	8.0	8.0	7.8	110.0	8.0	66.0	4	0.8
FHFP 10N8-CCAQ	10.0	10.0	9.8	130.0	10.0	82.0	4	1.0
FHFP 12N8-CCAQ	12.0	12.0	11.8	150.0	12.0	98.0	5	1.2
FHFP 16N8-CCAQ	16.0	16.0	15.8	190.0	16.0	126.0	5	1.6

Note: The 2.0 and 3.0 tool diameters do not include a through-coolant feature.

**NEW**  
Products

New Products

# TuffCut® HF Series FHFP N3

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

Series FHFP - 3xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		2mm x R0.2			3mm x R0.3			4mm x R0.4		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	300	0.10	1.5	0.13	0.15	2.3	0.20	0.20	3.0	0.26
Medium Carbon Steels		●	●	●	250	0.10	1.5	0.12	0.15	2.3	0.18	0.20	3.0	0.24
Alloy Steels		●	●	●	200	0.10	1.5	0.11	0.15	2.3	0.17	0.20	3.0	0.22
Die/Tool Steels		●	●	●	150	0.10	1.5	0.10	0.15	2.3	0.15	0.20	3.0	0.20
Austenitic Stainless Steels	M	●	X	○	120	0.08	1.2	0.08	0.12	1.8	0.12	0.16	2.4	0.16
Duplex (22%)		●	X	○	90	0.07	1.2	0.08	0.11	1.8	0.12	0.14	2.4	0.16
Super Duplex (25%)		●	X	○	75	0.06	0.8	0.08	0.09	1.2	0.12	0.12	1.6	0.16
Titanium Alloys	S	●	X	X	100	0.06	0.8	0.08	0.09	1.2	0.12	0.12	1.6	0.16
High Temp Alloys		●	X	X	30	0.05	0.6	0.05	0.08	0.9	0.08	0.10	1.2	0.11
Hardened Steels 45 - 50HRC	H	●	X	X	90	0.09	1.5	0.09	0.14	2.3	0.14	0.18	3.0	0.18
Hardened Steels 50 - 55HRC		●	X	X	80	0.08	1.2	0.07	0.12	1.8	0.11	0.16	2.4	0.14

Series FHFP - 3xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		5mm x R0.5			6mm x R0.6			8mm x R0.8		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	300	0.25	3.8	0.33	0.30	4.5	0.39	0.40	6.0	0.52
Medium Carbon Steels		●	●	●	250	0.25	3.8	0.30	0.30	4.5	0.36	0.40	6.0	0.48
Alloy Steels		●	●	●	200	0.25	3.8	0.28	0.30	4.5	0.33	0.40	6.0	0.44
Die/Tool Steels		●	●	●	150	0.25	3.8	0.25	0.30	4.5	0.30	0.40	6.0	0.40
Austenitic Stainless Steels	M	●	X	○	120	0.20	3.0	0.20	0.24	3.6	0.24	0.32	4.8	0.32
Duplex (22%)		●	X	○	90	0.18	3.0	0.20	0.21	3.6	0.24	0.28	4.8	0.32
Super Duplex (25%)		●	X	○	75	0.15	2.0	0.20	0.18	2.4	0.24	0.24	3.2	0.32
Titanium Alloys	S	●	X	X	100	0.15	2.0	0.20	0.18	2.4	0.24	0.24	3.2	0.32
High Temp Alloys		●	X	X	30	0.13	1.5	0.14	0.15	1.8	0.16	0.20	2.4	0.22
Hardened Steels 45 - 50HRC	H	●	X	X	90	0.23	3.8	0.23	0.27	4.5	0.27	0.36	6.0	0.36
Hardened Steels 50 - 55HRC		●	X	X	80	0.20	3.0	0.18	0.24	3.6	0.21	0.32	4.8	0.28

Series FHFP - 3xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		10mm x R1.0			12mm x R1.2			16mm x R1.6		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	300	0.50	7.5	0.65	0.60	9.0	0.78	0.70	12.0	1.04
Medium Carbon Steels		●	●	●	250	0.50	7.5	0.60	0.60	9.0	0.72	0.70	12.0	0.96
Alloy Steels		●	●	●	200	0.50	7.5	0.55	0.60	9.0	0.66	0.70	12.0	0.88
Die/Tool Steels		●	●	●	150	0.50	7.5	0.50	0.60	9.0	0.60	0.70	12.0	0.80
Austenitic Stainless Steels	M	●	X	○	120	0.40	6.0	0.40	0.48	7.2	0.48	0.56	9.6	0.64
Duplex (22%)		●	X	○	90	0.35	6.0	0.40	0.42	7.2	0.48	0.49	9.6	0.64
Super Duplex (25%)		●	X	○	75	0.30	4.0	0.40	0.36	4.8	0.48	0.42	6.4	0.64
Titanium Alloys	S	●	X	X	100	0.30	4.0	0.40	0.36	4.8	0.48	0.42	6.4	0.64
High Temp Alloys		●	X	X	30	0.25	3.0	0.27	0.30	3.6	0.32	0.35	4.8	0.43
Hardened Steels 45 - 50HRC	H	●	X	X	90	0.45	7.5	0.45	0.54	9.0	0.54	0.63	12.0	0.72
Hardened Steels 50 - 55HRC		●	X	X	80	0.40	6.0	0.35	0.48	7.2	0.42	0.56	9.6	0.56

● Preferred ○ Possible X Not Possible

Note: If the calculated feed cannot be achieved due to limitations such as machine capability or component size, adjust the cutting speed (RPM) to achieve the required feed per tooth (fz). For full slotting a reduction in Ap may be required to maintain an effective cutting strategy.

## TuffCut® HF Series FHFP N5

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

Series FHFP - 5xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		2mm x R0.2			3mm x R0.3			4mm x R0.4		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	270	0.08	1.5	0.13	0.12	2.3	0.20	0.16	3.0	0.26
Medium Carbon Steels		●	●	●	225	0.08	1.5	0.12	0.12	2.3	0.18	0.16	3.0	0.24
Alloy Steels		●	●	●	180	0.08	1.5	0.11	0.12	2.3	0.17	0.16	3.0	0.22
Die/Tool Steels		●	●	●	135	0.08	1.5	0.10	0.12	2.3	0.15	0.16	3.0	0.20
Austenitic Stainless Steels	M	●	X	○	110	0.06	1.2	0.08	0.10	1.8	0.12	0.13	2.4	0.16
Duplex (22%)		●	X	○	80	0.06	1.2	0.08	0.09	1.8	0.12	0.11	2.4	0.16
Super Duplex (25%)		●	X	○	70	0.05	0.8	0.08	0.07	1.2	0.12	0.10	1.6	0.16
Titanium Alloys	S	●	X	X	90	0.05	0.8	0.08	0.07	1.2	0.12	0.10	1.6	0.16
High Temp Alloys		●	X	X	30	0.04	0.6	0.05	0.06	0.9	0.08	0.08	1.2	0.11
Hardened Steels 45 - 50HRC	H	●	X	X	80	0.07	1.5	0.09	0.11	2.3	0.14	0.15	3.0	0.18
Hardened Steels 50 - 55HRC		●	X	X	70	0.06	1.2	0.07	0.10	1.8	0.11	0.13	2.4	0.14

Series FHFP - 5xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		5mm x R0.5			6mm x R0.6			8mm x R0.8		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	270	0.20	0.3	0.33	0.24	4.5	0.39	0.32	6.0	0.52
Medium Carbon Steels		●	●	●	225	0.20	0.3	0.30	0.24	4.5	0.36	0.32	6.0	0.48
Alloy Steels		●	●	●	180	0.20	0.3	0.28	0.24	4.5	0.33	0.32	6.0	0.44
Die/Tool Steels		●	●	●	135	0.20	0.3	0.25	0.24	4.5	0.3	0.32	6.0	0.4
Austenitic Stainless Steels	M	●	X	○	110	0.16	0.2	0.20	0.19	3.6	0.24	0.26	4.8	0.32
Duplex (22%)		●	X	○	80	0.14	0.2	0.20	0.17	3.6	0.24	0.22	4.8	0.32
Super Duplex (25%)		●	X	○	70	0.12	0.2	0.20	0.14	2.4	0.24	0.19	3.2	0.32
Titanium Alloys	S	●	X	X	90	0.12	0.2	0.20	0.14	2.4	0.24	0.19	3.2	0.32
High Temp Alloys		●	X	X	30	0.10	0.1	0.14	0.12	1.8	0.16	0.16	2.4	0.22
Hardened Steels 45 - 50HRC	H	●	X	X	80	0.18	0.2	0.23	0.22	4.5	0.27	0.29	6.0	0.36
Hardened Steels 50 - 55HRC		●	X	X	70	0.16	0.2	0.18	0.19	3.6	0.21	0.26	4.8	0.28

Series FHFP - 5xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		10mm x R1.0			12mm x R1.2			16mm x R1.6		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	270	0.4	7.5	0.65	0.48	9.0	0.78	0.56	12.0	1.04
Medium Carbon Steels		●	●	●	225	0.4	7.5	0.6	0.48	9.0	0.72	0.56	12.0	0.96
Alloy Steels		●	●	●	180	0.4	7.5	0.55	0.48	9.0	0.66	0.56	12.0	0.88
Die/Tool Steels		●	●	●	135	0.4	7.5	0.5	0.48	9.0	0.6	0.56	12.0	0.8
Austenitic Stainless Steels	M	●	X	○	110	0.32	6.0	0.4	0.38	7.2	0.48	0.45	9.6	0.64
Duplex (22%)		●	X	○	80	0.28	6.0	0.4	0.34	7.2	0.48	0.39	9.6	0.64
Super Duplex (25%)		●	X	○	70	0.24	4.0	0.4	0.29	4.8	0.48	0.34	6.4	0.64
Titanium Alloys	S	●	X	X	90	0.24	4.0	0.4	0.29	4.8	0.48	0.34	6.4	0.64
High Temp Alloys		●	X	X	30	0.2	3.0	0.27	0.24	3.6	0.32	0.28	4.8	0.43
Hardened Steels 45 - 50HRC	H	●	X	X	80	0.36	7.5	0.45	0.43	9.0	0.54	0.5	12.0	0.72
Hardened Steels 50 - 55HRC		●	X	X	70	0.32	6.0	0.35	0.38	7.2	0.42	0.45	9.6	0.56

● Preferred ○ Possible X Not Possible

Note: If the calculated feed cannot be achieved due to limitations such as machine capability or component size, adjust the cutting speed (RPM) to achieve the required feed per tooth (fz). For full slotting a reduction in Ap may be required to maintain an effective cutting strategy.

# TuffCut® HF Series FHFP N8

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

Series FHFP - 8xD																	
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R											
		Max	Air	MMS		2mm x R0.2			3mm x R0.3			4mm x R0.4			5mm x R0.5		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	245	0.06	1.2	0.13	0.09	1.8	0.20	0.12	2.4	0.26	0.15	3.0	0.33
Medium Carbon Steels		●	●	●	205	0.06	1.2	0.12	0.09	1.8	0.18	0.12	2.4	0.24	0.15	3.0	0.30
Alloy Steels		●	●	●	160	0.06	1.2	0.11	0.09	1.8	0.17	0.12	2.4	0.22	0.15	3.0	0.28
Die/Tool Steels		●	●	●	120	0.06	1.2	0.10	0.09	1.8	0.15	0.12	2.4	0.20	0.15	3.0	0.25
Austenitic Stainless Steels	M	●	X	○	100	0.05	1.2	0.08	0.07	1.8	0.12	0.10	2.4	0.16	0.12	3.0	0.20
Duplex (22%)		●	X	○	70	0.04	0.8	0.08	0.07	1.2	0.12	0.09	1.6	0.16	0.11	2.0	0.20
Super Duplex (25%)		●	X	○	65	0.04	0.8	0.08	0.06	1.2	0.12	0.07	1.6	0.16	0.09	2.0	0.20
Titanium Alloys	S	●	X	X	80	0.04	0.8	0.08	0.06	1.2	0.12	0.07	1.6	0.16	0.09	2.0	0.20
High Temp Alloys		●	X	X	30	0.03	0.6	0.05	0.05	0.9	0.08	0.06	1.2	0.11	0.08	1.5	0.14
Hardened Steels 45 - 50HRC	H	●	X	X	70	0.05	1.2	0.09	0.08	1.8	0.14	0.11	2.4	0.18	0.14	3.0	0.23
Hardened Steels 50 - 55HRC		●	X	X	65	0.05	0.8	0.07	0.07	1.2	0.11	0.10	1.6	0.14	0.12	2.0	0.18

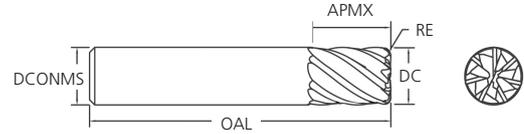
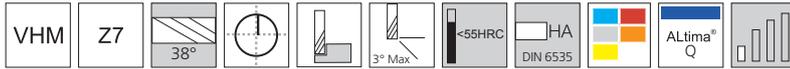
Series FHFP - 8xD														
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R								
		Max	Air	MMS		6mm x R0.6			8mm x R0.8			10mm x R1.0		
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	150	0.18	3.6	0.39	0.24	4.8	0.52	0.3	6.0	0.65
Medium Carbon Steels		●	●	●	120	0.18	3.6	0.36	0.24	4.8	0.48	0.3	6.0	0.6
Alloy Steels		●	●	●	100	0.18	3.6	0.33	0.24	4.8	0.44	0.3	6.0	0.55
Die/Tool Steels		●	●	●	100	0.18	3.6	0.3	0.24	4.8	0.4	0.3	6.0	0.5
Austenitic Stainless Steels	M	●	X	○	80	0.14	3.6	0.24	0.19	4.8	0.32	0.24	6.0	0.4
Duplex (22%)		●	X	○	60	0.13	2.4	0.24	0.17	3.2	0.32	0.21	4.0	0.4
Super Duplex (25%)		●	X	○	50	0.11	2.4	0.24	0.14	3.2	0.32	0.18	4.0	0.4
Titanium Alloys	S	●	X	X	70	0.11	2.4	0.24	0.14	3.2	0.32	0.18	4.0	0.4
High Temp Alloys		●	X	X	20	0.09	1.8	0.16	0.12	2.4	0.22	0.15	3.0	0.27
Hardened Steels 45 - 50HRC	H	●	X	X	60	0.16	3.6	0.27	0.22	4.8	0.36	0.27	6.0	0.45
Hardened Steels 50 - 55HRC		●	X	X	50	0.14	2.4	0.21	0.19	3.2	0.28	0.24	4.0	0.35

Series FHFP - 8xD											
Workpiece Material Group	ISO	Coolant			Vc-m/min	End Mill Diameter and CAM-R					
		Max	Air	MMS		12mm x R1.2			16mm x R1.6		
						Ap	Ae	Fz	Ap	Ae	Fz
Low Carbon Steels	P	●	●	●	150	0.36	7.2	0.78	0.42	9.6	1.04
Medium Carbon Steels		●	●	●	120	0.36	7.2	0.72	0.42	9.6	0.96
Alloy Steels		●	●	●	100	0.36	7.2	0.66	0.42	9.6	0.88
Die/Tool Steels		●	●	●	100	0.36	7.2	0.6	0.42	9.6	0.8
Austenitic Stainless Steels	M	●	X	○	80	0.29	7.2	0.48	0.34	9.6	0.64
Duplex (22%)		●	X	○	60	0.25	4.8	0.48	0.29	6.4	0.64
Super Duplex (25%)		●	X	○	50	0.22	4.8	0.48	0.25	6.4	0.64
Titanium Alloys	S	●	X	X	70	0.22	4.8	0.48	0.25	6.4	0.64
High Temp Alloys		●	X	X	20	0.18	3.6	0.32	0.21	4.8	0.43
Hardened Steels 45 - 50HRC	H	●	X	X	60	0.32	7.2	0.54	0.38	9.6	0.72
Hardened Steels 50 - 55HRC		●	X	X	50	0.29	4.8	0.42	0.34	6.4	0.56

● Preferred ○ Possible X Not Possible

Note: If the calculated feed cannot be achieved due to limitations such as machine capability or component size, adjust the cutting speed (RPM) to achieve the required feed per tooth (fz). For full slotting a reduction in Ap may be required to maintain an effective cutting strategy.

## TuffCut® XV Series XV7 1xD

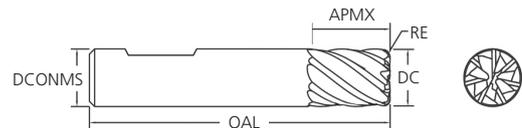
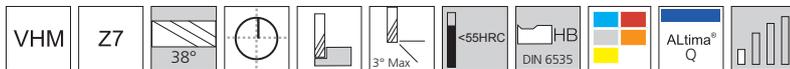


Tool No.	DC	DCONMS	OAL	APMX	RE
XV7M1001AQ	10.0	10.0	51.0	12.0	
XV7M1001-R0.5AQ	10.0	10.0	51.0	12.0	0.5

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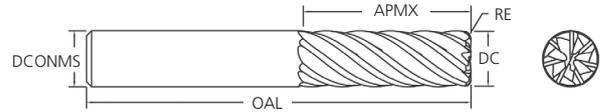
New Products

## TuffCut® XV Series XV7 1xD-W



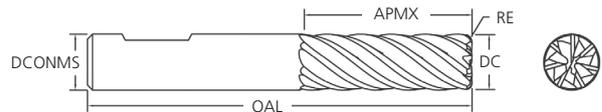
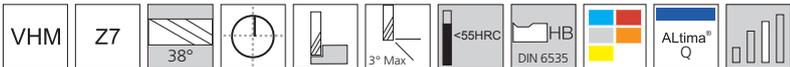
Tool No.	DC	DCONMS	OAL	APMX	RE
XV7M1201AQW	12.0	12.0	63.0	14.0	
XV7M1201-R0.5AQW	12.0	12.0	63.0	14.0	0.5
XV7M1601AQW	16.0	16.0	75.0	18.0	
XV7M1601-R0.5AQW	16.0	16.0	75.0	18.0	0.5

## TuffCut® XV Series XV7 3xD



Tool No.	DC	DCONMS	OAL	APMX	RE
XV7M0603-R0.25AQ	6.0	6.0	63.0	21.0	0.25
XV7M0803-R0.5AQ	8.0	8.0	72.0	27.0	0.5
XV7M1003-R0.5AQ	10.0	10.0	80.0	33.0	0.5

## TuffCut® XV Series XV7 3xD-W



Tool No.	DC	DCONMS	OAL	APMX	RE
XV7M1203-R0.5AQW	12.0	12.0	93.0	40.0	0.5
XV7M1203-R1.0AQW	12.0	12.0	93.0	40.0	1.0
XV7M1203-R3.0AQW	12.0	12.0	93.0	40.0	3.0
XV7M1603-R1.0AQW	16.0	16.0	110.0	54.0	1.0
XV7M1603-R3.0AQW	16.0	16.0	110.0	54.0	3.0

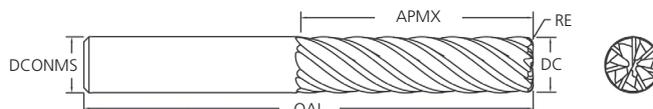
## TuffCut® XV Series XV7CB 3xD-W



Tool No.	DC	DCONMS	OAL	APMX	RE
XV7CBM1003-R0.5AQW	10.0	10.0	80.0	33.0	0.5
XV7CBM1203-R0.5AQW	12.0	12.0	93.0	40.0	0.5
XV7CBM1603-R1.0AQW	16.0	16.0	110.0	54.0	1.0

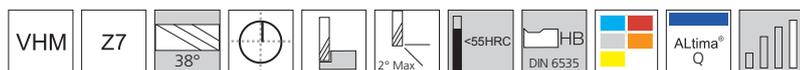
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## TuffCut® XV Series XV7 4xD



Tool No.	DC	DCONMS	OAL	APMX	RE
XV7M0604-R0.25AQ	6.0	6.0	63.0	25.0	0.25
XV7M0804-R0.5AQ	8.0	8.0	75.0	33.0	0.5
XV7M1004-R0.5AQ	10.0	10.0	90.0	43.0	0.5

## TuffCut® XV Series XV7 4xD-W



Tool No.	DC	DCONMS	OAL	APMX	RE
XV7M1204-R0.5AQW	12.0	12.0	104.0	51.0	0.5
XV7M1204-R3.0AQW	12.0	12.0	104.0	51.0	3.0
XV7M1604-R1.0AQW	16.0	16.0	123.0	67.0	1.0
XV7M1604-R3.0AQW	16.0	16.0	123.0	67.0	3.0

## TuffCut® XV Series XV7CB 4xD-W



Close up of chipbreaker grind



Tool No.	DC	DCONMS	OAL	APMX	RE
XV7CBM1004-R0.5AQW	10.0	10.0	90.0	43.0	0.5
XV7CBM1204-R0.5AQW	12.0	12.0	104.0	51.0	0.5
XV7CBM1604-R1.0AQW	16.0	16.0	125.0	67.0	1.0

# TuffCut® XV XV7CB - Profile Milling with 1xD APMX

Recommended Cutting Data · Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio Raccomandati · Zalecane Parametry

Workpiece Material Group	ISO	Coolant			RWOC (Ae)				End Mill Diameter (mm)					
		Emulsion	Air	MQL					6	8	10	12	16	20
					5%	10%	15%	20%	← 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.					
					2.3	1.67	1.4	1.2						
				Vc - M/Min										
Low Carbon Steels	P	o	•	o	380	350	300	290	0.036	0.048	0.060	0.072	0.096	0.120
Medium Carbon Steels		o	•	o	270	260	240	230	0.036	0.048	0.060	0.072	0.096	0.120
Alloy Steels		o	•	o	260	240	220	210	0.036	0.048	0.060	0.072	0.096	0.120
Die / Tool Steels		o	•	o	220	200	180	170	0.036	0.048	0.060	0.072	0.096	0.120
Free Machining Stainless Steels	M	•	•	o	205	180	150	140	0.036	0.048	0.060	0.072	0.096	0.120
Austenitic Stainless Steels		•	x	o	160	140	100	90	0.030	0.040	0.050	0.060	0.080	0.100
Difficult Stainless Steels		•	x	o	110	90	70	65	0.024	0.032	0.040	0.048	0.064	0.080
PH Stainless Steels		•	•	o	160	140	100	90	0.024	0.032	0.040	0.048	0.064	0.080
Cobalt Chrome Alloys		•	x	o	120	100	80	75	0.024	0.032	0.040	0.048	0.064	0.080
Duplex (22%)		•	x	o	75	65	60	55	0.024	0.032	0.040	0.048	0.064	0.080
Super Duplex (25%)		•	x	o	70	60	55	50	0.024	0.032	0.040	0.048	0.064	0.080
High Temp Alloys		•	x	x	50	40	-	-	0.024	0.032	0.040	0.048	0.064	0.080
Titanium Alloys	•	x	x	120	90	80	75	0.024	0.032	0.040	0.048	0.064	0.080	
Gray Cast Irons	K	•	o	o	360	350	300	290	0.036	0.048	0.060	0.072	0.096	0.120
Ductile Cast Irons		•	o	o	270	260	240	230	0.036	0.048	0.060	0.072	0.096	0.120
Malleable Cast Irons		•	o	o	160	150	140	130	0.036	0.048	0.060	0.072	0.096	0.120
Hardened Steels 45-50 HRC	H	o	•	o	160	140	130	110	0.030	0.040	0.050	0.060	0.080	0.100
Hardened Steels 50-55 HRC		o	•	o	150	130	115	100	0.024	0.032	0.040	0.048	0.064	0.080

• Preferred    o Possible    x Not Possible

## Notes

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc.
- The XV7 / XV7CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended.

## Helical interpolation recommendations:

- Under optimal conditions, with proper coolant flow/air blast techniques, up to 3° helical ramp angles are achievable with the XV7 / XV7CB in most materials
- A reduction of 30-50% in feed per tooth (fz) are recommended
- Recommended hole diameter = 1.9 x D

## TuffCut® XV XV7 & XV7CB - Profile Milling with 3xD APMX

Recommended Cutting Data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group	ISO	Coolant			RWOC (Ae)		End Mill Diameter (mm)					
		Emulsion	Air	MQL			6	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.					
					2.3	1.67						
Vc - M/Min					fz - mm/tooth							
Low Carbon Steels	P	o	•	o	380	350	0.036	0.048	0.060	0.072	0.096	0.120
Medium Carbon Steels		o	•	o	270	260	0.036	0.048	0.060	0.072	0.096	0.120
Alloy Steels		o	•	o	260	240	0.036	0.048	0.060	0.072	0.096	0.120
Die / Tool Steels		o	•	o	220	200	0.036	0.048	0.060	0.072	0.096	0.120
Free Machining Stainless Steels	M	•	•	o	205	180	0.036	0.048	0.060	0.072	0.096	0.120
Austenitic Stainless Steels		•	x	o	160	140	0.030	0.040	0.050	0.060	0.080	0.100
Difficult Stainless Steels		•	x	o	110	90	0.024	0.032	0.040	0.048	0.064	0.080
PH Stainless Steels		•	•	o	160	140	0.024	0.032	0.040	0.048	0.064	0.080
Cobalt Chrome Alloys		•	x	o	120	100	0.024	0.032	0.040	0.048	0.064	0.080
Duplex (22%)		•	x	o	75	65	0.024	0.032	0.040	0.048	0.064	0.080
Super Duplex (25%)		•	x	o	70	60	0.024	0.032	0.040	0.048	0.064	0.080
High Temp Alloys	S	•	x	x	45	38	0.024	0.032	0.040	0.048	0.064	0.080
Titanium Alloys		•	x	x	120	90	0.024	0.032	0.040	0.048	0.064	0.080
Gray Cast Irons	K	•	o	o	360	350	0.036	0.048	0.060	0.072	0.096	0.120
Ductile Cast Irons		•	o	o	270	260	0.036	0.048	0.060	0.072	0.096	0.120
Malleable Cast Irons		•	o	o	160	150	0.036	0.048	0.060	0.072	0.096	0.120
Hardened Steels 45-50 HRC	H	o	•	o	160	140	0.030	0.040	0.050	0.060	0.080	0.100
Hardened Steels 50-55 HRC		o	•	o	150	130	0.024	0.032	0.040	0.048	0.064	0.080

• Preferred   o Possible   x Not Possible

### Notes

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc.
- The XV7 / XV7CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended.

### Helical interpolation recommendations:

- Under optimal conditions, with proper coolant flow/air blast techniques, up to 3° helical ramp angles are achievable with the XV7 / XV7CB in most materials
- A reduction of 30-50% in feed per tooth (fz) are recommended
- Recommended hole diameter = 1.9 x D

# TuffCut® XV Change to XV7 & XV7CB - Profile Milling with 4xD APMX

Recommended Cutting Data · Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio Raccomandati · Zalecane Parametry

Workpiece Material Group	ISO	Coolant			RWOC (Ae)		End Mill Diameter (mm)					
		Emulsion	Air	MQL	3%	5%	6	8	10	12	16	20
					2.93	2.3	← 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.					
					Vc - M/Min							
Low Carbon Steels	P	o	•	o	320	300	0.024	0.032	0.040	0.048	0.064	0.080
Medium Carbon Steels		o	•	o	250	240	0.024	0.032	0.040	0.048	0.064	0.080
Alloy Steels		o	•	o	230	220	0.024	0.032	0.040	0.048	0.064	0.080
Die / Tool Steels		o	•	o	210	200	0.024	0.032	0.040	0.048	0.064	0.080
Free Machining Stainless Steels	M	•	•	o	200	180	0.024	0.032	0.040	0.048	0.064	0.080
Austenitic Stainless Steels		•	x	o	150	140	0.018	0.024	0.030	0.036	0.048	0.060
Difficult Stainless Steels		•	x	o	100	90	0.015	0.020	0.025	0.030	0.040	0.050
PH Stainless Steels		•	•	o	150	140	0.015	0.020	0.025	0.030	0.040	0.050
Cobalt Chrome Alloys		•	x	o	90	80	0.015	0.020	0.025	0.030	0.040	0.050
Duplex (22%)		•	x	o	75	65	0.015	0.020	0.025	0.030	0.040	0.050
Super Duplex (25%)		•	x	o	55	45	0.015	0.020	0.025	0.030	0.040	0.050
High Temp Alloys	S	•	x	x	40	35	0.012	0.016	0.020	0.024	0.032	0.040
Titanium Alloys		•	x	x	90	80	0.015	0.020	0.025	0.030	0.040	0.050
Gray Cast Irons	K	•	o	o	300	290	0.024	0.032	0.040	0.048	0.064	0.080
Ductile Cast Irons		•	o	o	230	215	0.024	0.032	0.040	0.048	0.064	0.080
Malleable Cast Irons		•	o	o	140	120	0.024	0.032	0.040	0.048	0.064	0.080
Hardened Steels 45-50 HRC	H	o	•	o	140	130	0.024	0.032	0.040	0.048	0.064	0.080
Hardened Steels 50-55 HRC		o	•	o	120	110	0.012	0.016	0.020	0.024	0.032	0.040

• Preferred    o Possible    x Not Possible

## Notes

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc.
- The XV7 / XV7CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended.

## Helical interpolation recommendations:

- Under optimal conditions, with proper coolant flow/air blast techniques, up to 3° helical ramp angles are achievable with the XV7 / XV7CB in most materials
- A reduction of 30-50% in feed per tooth (fz) are recommended
- Recommended hole diameter = 1.9 x D



## New Products

Nouveaux Produits | Neue Produkte | Nuovi Prodotti | Nowe Produkty

# TuffCut® XV XV7 / XV7CB Series - Chip Thickness Compensation Factors - Metric

RWOC (Ae)	Chip Thickness Compensation Factor
5%	2.30
7%	1.96
8%	1.84
10%	1.67
13%	1.49
15%	1.40
20%	1.20

During profile milling with a radial width of less than 50% of the cutter diameter, the actual chip thickness at the cutting edge is reduced relative to the programmed feed per tooth (fz).

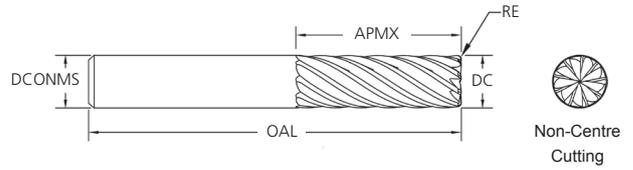
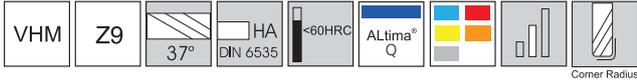
The accompanying table provides a factor that indicates how much the fz can be increased, depending on the radial width of the cut. To determine the correct feed rate, multiply the recommended fz from the table by the appropriate compensation factor.



New Products



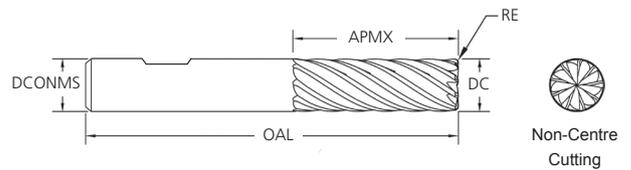
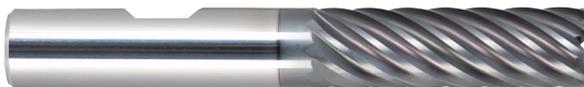
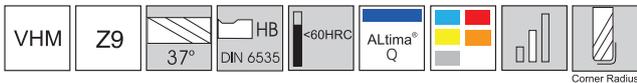
## TuffCut® XT9 Series 380 3xD



Tool No.	DC	DCONMS	OAL	APMX	RE
380M0803-0.5RAQ	8.0	8.0	75.0	26.0	0.5
380M1003-0.5RAQ	10.0	10.0	80.0	32.0	0.5
380M1003-1.0RAQ	10.0	10.0	80.0	32.0	1.0



## TuffCut® XT9 Series 380 3xD-W

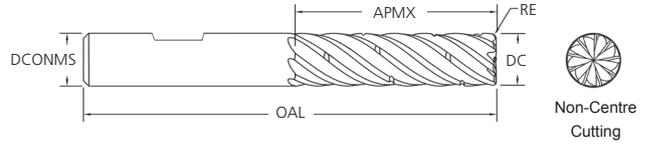


Tool No.	DC	DCONMS	OAL	APMX	RE
380M1003-0.5RAQW	10.0	10.0	80.0	32.0	0.5
380M1003-1.0RAQW	10.0	10.0	80.0	32.0	1.0
380M1203-0.5RAQW	12.0	12.0	84.0	38.0	0.5
380M1203-1.0RAQW	12.0	12.0	84.0	38.0	1.0
380M1603-0.5RAQW	16.0	16.0	105.0	50.0	0.5
380M1603-1.0RAQW	16.0	16.0	105.0	50.0	1.0
380M2003-0.5RAQW	20.0	20.0	120.0	62.0	0.5
380M2003-1.0RAQW	20.0	20.0	120.0	62.0	1.0



Please note: Due to manufacturing specification changes, the future OAL dimension of this tool will be subject to modification.

## TuffCut® XT9 Series 380CB 3xD-W



Tool No.	DC	DCONMS	OAL	APMX	RE
380CBM1003-0.5RAQW	10.0	10.0	80.0	32.0	0.5
380CBM1003-1.0RAQW	10.0	10.0	80.0	32.0	1.0
380CBM1203-0.5RAQW	12.0	12.0	84.0	38.0	0.5
380CBM1203-1.0RAQW	12.0	12.0	84.0	38.0	1.0
380CBM1603-0.5RAQW	16.0	16.0	105.0	50.0	0.5
380CBM1603-1.0RAQW	16.0	16.0	105.0	50.0	1.0
380CBM2003-0.5RAQW	20.0	20.0	120.0	62.0	0.5
380CBM2003-1.0RAQW	20.0	20.0	120.0	62.0	1.0

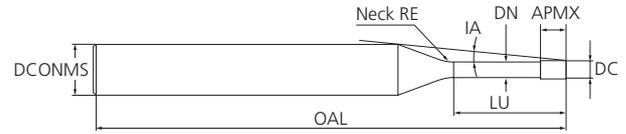


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Please note: Due to manufacturing specification changes, the future OAL dimension of this tool will be subject to modification.

# TuffCut® XM Series XM2S



Tool No.	DC	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
									0.5°	1°	1.5°	2°	3°
									XM2S-001N0.3X	0.1	0.3	0.15	0.08
XM2S-001N0.5X	0.5	14.03°	0.52	0.55	0.58	0.60	0.65						
XM2S-001N1X	1.0	13.22°	1.05	1.09	1.13	1.18	1.27						
XM2S-002N0.5X	0.2	0.5	0.3	0.17	50.0	4.0	1.0	14.03°	0.52	0.54	0.57	0.59	0.64
XM2S-002N1X		1.0						13.2°	1.04	1.08	1.12	1.16	1.26
XM2S-002N1.5X		1.5						12.45°	1.56	1.62	1.67	1.74	1.88
XM2S-002N2X	0.3	2.0	0.45	0.27	50.0	4.0	2.0	11.79°	2.08	2.15	2.23	2.31	2.50
XM2S-002N3X		3.0						10.65°	3.11	3.22	3.34	3.46	3.74
XM2S-003N1X		1.0						13.06°	1.06	1.12	1.18	1.23	1.33
XM2S-003N1.5X	0.3	1.5	0.45	0.27	50.0	4.0	2.0	12.31°	1.59	1.67	1.74	1.81	1.95
XM2S-003N2X		2.0						11.65°	2.12	2.21	2.29	2.38	2.57
XM2S-003N2.5X		2.5						11.05°	2.64	2.75	2.85	2.96	3.20
XM2S-003N3X	0.4	3.0	0.6	0.37	50.0	4.0	2.0	10.51°	3.16	3.28	3.40	3.53	3.82
XM2S-004N1X		1.0						13.01°	1.06	1.12	1.18	1.23	1.33
XM2S-004N1.5X		1.5						12.25°	1.59	1.67	1.74	1.81	1.95
XM2S-004N2X	0.5	2.0	0.75	0.47	50.0	4.0	2.0	11.57°	2.12	2.21	2.29	2.38	2.57
XM2S-004N2.5X		2.5						10.97°	2.64	2.75	2.85	2.96	3.20
XM2S-004N3X		3.0						10.42°	3.16	3.28	3.40	3.53	3.82
XM2S-004N3.5X	0.6	3.5	0.9	0.57	50.0	4.0	4.0	9.92°	3.68	3.82	3.96	4.11	4.44
XM2S-004N4X		4.0						9.47°	4.20	4.35	4.51	4.68	5.06
XM2S-004N5X		5.0						8.68°	5.24	5.42	5.62	5.83	6.30
XM2S-004N6X	0.7	6.0	1.05	0.67	50.0	4.0	4.0	8.01°	6.27	6.49	6.73	6.98	7.55
XM2S-004N8X		8.0						6.94°	8.34	8.63	8.94	9.28	10.03
XM2S-004N10X		10.0						6.12°	10.41	10.77	11.16	11.58	12.52
XM2S-005N1X	0.6	1.0	0.9	0.57	50.0	4.0	4.0	12.96°	1.06	1.12	1.18	1.23	1.33
XM2S-005N1.5X		1.5						12.19°	1.59	1.67	1.74	1.81	1.95
XM2S-005N2X		2.0						11.5°	2.12	2.21	2.29	2.38	2.57
XM2S-005N2.5X	0.7	2.5	1.05	0.67	50.0	4.0	4.0	10.88°	2.64	2.75	2.85	2.96	3.20
XM2S-005N3X		3.0						10.33°	3.16	3.28	3.40	3.53	3.82
XM2S-005N4X		4.0						9.37°	4.20	4.35	4.51	4.68	5.06
XM2S-005N5X	0.8	5.0	1.05	0.67	50.0	4.0	4.0	8.58°	5.24	5.42	5.62	5.83	6.30
XM2S-005N6X		6.0						7.91°	6.27	6.49	6.73	6.98	7.55
XM2S-005N8X		8.0						6.84°	8.34	8.63	8.94	9.28	10.03
XM2S-005N10X	0.9	10.0	1.05	0.67	50.0	4.0	4.0	6.02°	10.41	10.77	11.16	11.58	12.52
XM2S-006N2X		2.0						11.21°	2.17	2.31	2.44	2.56	2.78
XM2S-006N3X		3.0						10.07°	3.24	3.42	3.58	3.72	4.02
XM2S-006N4X	0.6	4.0	0.9	0.57	50.0	4.0	4.0	9.13°	4.30	4.51	4.69	4.87	5.26
XM2S-006N5X		5.0						8.36°	5.35	5.59	5.80	6.02	6.50
XM2S-006N6X		6.0						14.39°	0.31	0.33	0.35	0.37	0.40
XM2S-006N7X	0.7	7.0	1.05	0.67	50.0	4.0	4.0	14.03°	0.52	0.55	0.58	0.60	0.65
XM2S-006N8X		8.0						13.22°	1.05	1.09	1.13	1.18	1.27
XM2S-006N9X		9.0						14.03°	0.52	0.54	0.57	0.59	0.64
XM2S-006N10X	0.8	10.0	1.05	0.67	50.0	4.0	4.0	13.2°	1.04	1.08	1.12	1.16	1.26
XM2S-007N2X		2.0						12.45°	1.56	1.62	1.67	1.74	1.88
XM2S-007N4X		4.0						11.79°	2.08	2.15	2.23	2.31	2.50
XM2S-007N6X	0.9	6.0	1.05	0.67	50.0	4.0	4.0	10.65°	3.11	3.22	3.34	3.46	3.74



New Products

## Series XM2S

Tool No.	DC	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
									0.5°	1°	1.5°	2°	3°
XM2S-007N8X	0.7	8.0	1.05	0.67	50.0	4.0	4.0	13.06°	1.06	1.12	1.18	1.23	1.33
XM2S-007N10X		10.0						12.31°	1.59	1.67	1.74	1.81	1.95
XM2S-008N4X	0.8	4.0	1.20	0.76	50.0	4.0	4.0	11.65°	2.12	2.21	2.29	2.38	2.57
XM2S-008N6X		6.0						11.05°	2.64	2.75	2.85	2.96	3.20
XM2S-008N8X		8.0						10.51°	3.16	3.28	3.40	3.53	3.82
XM2S-008N10X		10.0			13.01°			1.06	1.12	1.18	1.23	1.33	
XM2S-008N12X		12.0			12.25°			1.59	1.67	1.74	1.81	1.95	
XM2S-009N6X	0.9	6.0	1.35	0.86	50.0	4.0	4.0	11.57°	2.12	2.21	2.29	2.38	2.57
XM2S-009N8X		8.0						10.97°	2.64	2.75	2.85	2.96	3.20
XM2S-009N10X		10.0			10.42°			3.16	3.28	3.40	3.53	3.82	
XM2S-009N12X		12.0			9.92°			3.68	3.82	3.96	4.11	4.44	
XM2S-010N2X	1.0	2.0	1.5	0.96	50.0	4.0	4.0	9.47°	4.20	4.35	4.51	4.68	5.06
XM2S-010N3X		3.0						8.68°	5.24	5.42	5.62	5.83	6.30
XM2S-010N4X		4.0						8.01°	6.27	6.49	6.73	6.98	7.55
XM2S-010N5X		5.0						6.94°	8.34	8.63	8.94	9.28	10.03
XM2S-010N6X		6.0						6.12°	10.41	10.77	11.16	11.58	12.52
XM2S-010N7X		7.0						12.96°	1.06	1.12	1.18	1.23	1.33
XM2S-010N8X		8.0			12.19°			1.59	1.67	1.74	1.81	1.95	
XM2S-010N9X		9.0			11.5°			2.12	2.21	2.29	2.38	2.57	
XM2S-010N10X		10.0			10.88°			2.64	2.75	2.85	2.96	3.20	
XM2S-010N12X		12.0			10.33°			3.16	3.28	3.40	3.53	3.82	
XM2S-010N14X		14.0			9.37°			4.20	4.35	4.51	4.68	5.06	
XM2S-010N16X		16.0			8.58°			5.24	5.42	5.62	5.83	6.30	
XM2S-010N20X		20.0			7.91°			6.27	6.49	6.73	6.98	7.55	
XM2S-010N25X		25.0			65.0			-	8.34	8.63	8.94	9.28	10.03
XM2S-012N6X	1.2	6.0	1.8	1.15	50.0	4.0	4.0	14.39°	0.31	0.33	0.35	0.37	0.40
XM2S-012N8X		8.0						14.03°	0.52	0.55	0.58	0.60	0.65
XM2S-012N10X		10.0			13.22°			1.05	1.09	1.13	1.18	1.27	
XM2S-012N12X		12.0			14.03°			0.52	0.54	0.57	0.59	0.64	
XM2S-012N16X	16.0	13.2°	1.04	1.08	1.12	1.16	1.26						
XM2S-014N6X	1.4	6.0	2.1	1.34	50.0	4.0	4.0	12.45°	1.56	1.62	1.67	1.74	1.88
XM2S-014N12X		12.0			55.0			11.79°	2.08	2.15	2.23	2.31	2.50
XM2S-015N4X	1.5	4.0	2.25	1.44	50.0	4.0	4.0	10.65°	3.11	3.22	3.34	3.46	3.74
XM2S-015N6X		6.0						13.06°	1.06	1.12	1.18	1.23	1.33
XM2S-015N8X		8.0						12.31°	1.59	1.67	1.74	1.81	1.95
XM2S-015N10X		10.0						11.65°	2.12	2.21	2.29	2.38	2.57
XM2S-015N12X		12.0						11.05°	2.64	2.75	2.85	2.96	3.20
XM2S-015N14X		14.0						10.51°	3.16	3.28	3.40	3.53	3.82
XM2S-015N16X		16.0			13.01°			1.06	1.12	1.18	1.23	1.33	
XM2S-015N18X		18.0			4°			4.00	1.67	1.74	1.81	1.95	
XM2S-015N20X		20.0			11.57°			2.12	2.21	2.29	2.38	2.57	
XM2S-015N25X		25.0			10.97°			2.64	2.75	2.85	2.96	3.20	
XM2S-015N30X		30.0			10.42°			3.16	3.28	3.40	3.53	3.82	
XM2S-015N35X		35.0			9.92°			3.68	3.82	3.96	4.11	4.44	
XM2S-015N40X	40.0	80.0	9.47°	4.20	4.35	4.51	4.68	5.06					
XM2S-016N6X	1.6	6.0	2.4	1.54	50.0	4.0	4.0	8.68°	5.24	5.42	5.62	5.83	6.30
XM2S-016N8X		8.0						8.01°	6.27	6.49	6.73	6.98	7.55
XM2S-018N6X	1.8	6.0	2.7	1.73	50.0	4.0	4.0	6.94°	8.34	8.63	8.94	9.28	10.03
XM2S-018N8X		8.0						6.12°	10.41	10.77	11.16	11.58	12.52
XM2S-020N4X	2.0	4.0	3.0	1.92	50.0	4.0	4.0	12.96°	1.06	1.12	1.18	1.23	1.33
XM2S-020N6X		6.0						12.19°	1.59	1.67	1.74	1.81	1.95
XM2S-020N8X		8.0						11.5°	2.12	2.21	2.29	2.38	2.57
XM2S-020N10X		10.0						10.88°	2.64	2.75	2.85	2.96	3.20
XM2S-020N12X		12.0			10.33°			3.16	3.28	3.40	3.53	3.82	
XM2S-020N14X		14.0			9.37°			4.20	4.35	4.51	4.68	5.06	
XM2S-020N16X		16.0			8.58°			5.24	5.42	5.62	5.83	6.30	



New Products

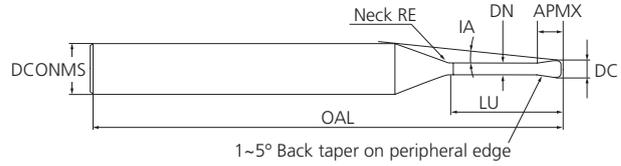
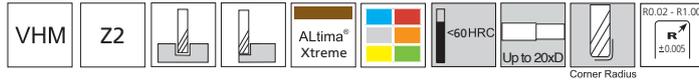
## Series XM2S

Tool No.	DC	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
									0.5°	1°	1.5°	2°	3°
									XM2S-020N18X	2.0	18.0	3.0	1.92
XM2S-020N20X	20.0	6.84°	8.34	8.63	8.94	9.28	10.03						
XM2S-020N25X	25.0	6.02°	10.41	10.77	11.16	11.58	12.52						
XM2S-020N30X	30.0	11.21°	2.17	2.31	2.44	2.56	2.78						
XM2S-020N35X	35.0	10.07°	3.24	3.42	3.58	3.72	4.02						
XM2S-020N40X	40.0	9.13°	4.30	4.51	4.69	4.87	5.26						
XM2S-020N50X	50.0	8.36°	5.35	5.59	5.80	6.02	6.50						
XM2S-025N8X	2.5	8.0	3.75	2.4	50.0	4.0	4.0	14.39°	0.31	0.33	0.35	0.37	0.40
XM2S-025N12X		12.0						14.03°	0.52	0.55	0.58	0.60	0.65
XM2S-025N16X		16.0						13.22°	1.05	1.09	1.13	1.18	1.27
XM2S-025N20X		20.0						14.03°	0.52	0.54	0.57	0.59	0.64
XM2S-025N30X		30.0						13.2°	1.04	1.08	1.12	1.16	1.26
XM2S-025N40X		40.0						12.45°	1.56	1.62	1.67	1.74	1.88
XM2S-025N50X		50.0						11.79°	2.08	2.15	2.23	2.31	2.50
XM2S-030N8X	3.0	8.0	4.5	2.88	55.0	6.0	4.0	10.65°	3.11	3.22	3.34	3.46	3.74
XM2S-030N12X		12.0						13.06°	1.06	1.12	1.18	1.23	1.33
XM2S-030N16X		16.0						12.31°	1.59	1.67	1.74	1.81	1.95
XM2S-030N20X		20.0						11.65°	2.12	2.21	2.29	2.38	2.57
XM2S-030N25X		25.0						11.05°	2.64	2.75	2.85	2.96	3.20
XM2S-030N30X		30.0						10.51°	3.16	3.28	3.40	3.53	3.82
XM2S-030N40X		40.0						13.01°	1.06	1.12	1.18	1.23	1.33
XM2S-030N50X	50.0	4°	4.00	1.67	1.74	1.81	1.95						
XM2S-040N12X	4.0	12.0	6.0	3.86	60.0	6.0	4.0	11.57°	2.12	2.21	2.29	2.38	2.57
XM2S-040N16X		16.0						10.97°	2.64	2.75	2.85	2.96	3.20
XM2S-040N20X		20.0						10.42°	3.16	3.28	3.40	3.53	3.82
XM2S-040N25X		25.0						9.92°	3.68	3.82	3.96	4.11	4.44
XM2S-040N30X		30.0						9.47°	4.20	4.35	4.51	4.68	5.06
XM2S-040N35X		35.0						8.68°	5.24	5.42	5.62	5.83	6.30
XM2S-040N40X		40.0						8.01°	6.27	6.49	6.73	6.98	7.55
XM2S-040N50X	50.0	6.94°	8.34	8.63	8.94	9.28	10.03						
XM2S-050N20X	5.0	20.0	7.5	4.85	70.0	6.0	4.0	6.12°	10.41	10.77	11.16	11.58	12.52
XM2S-050N25X		25.0						12.96°	1.06	1.12	1.18	1.23	1.33
XM2S-050N30X		30.0						12.19°	1.59	1.67	1.74	1.81	1.95
XM2S-050N40X		40.0						11.5°	2.12	2.21	2.29	2.38	2.57
XM2S-050N50X		50.0						10.88°	2.64	2.75	2.85	2.96	3.20
XM2S-060N20X	6.0	20.0	9.0	5.85	70.0	6.0	-	10.33°	3.16	3.28	3.40	3.53	3.82
XM2S-060N30X		30.0						9.37°	4.20	4.35	4.51	4.68	5.06
XM2S-060N40X		40.0						8.58°	5.24	5.42	5.62	5.83	6.30
XM2S-060N50X		50.0						7.91°	6.27	6.49	6.73	6.98	7.55

**NEW**  
Products

New Products

## TuffCut<sup>®</sup> XM Series XM2R



Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
										0.5°	1°	1.5°	2°	3°
										XM2R-002N0.5-0.02RX	0.2	0.02	0.5	0.16
XM2R-002N1-0.02RX	1.0	13.23°	1.04	1.08	1.12	1.16	1.25							
XM2R-002N2-0.02RX	2.0	11.82°	2.08	2.15	2.23	2.31	2.50							
XM2R-002N0.5-0.05RX	0.05	0.5	14.12°	0.52	0.54	0.56	0.58	0.62						
XM2R-002N1-0.05RX		1.0	13.28°	1.04	1.08	1.11	1.15	1.24						
XM2R-002N1.5-0.05RX		1.5	12.53°	1.56	1.61	1.67	1.73	1.87						
XM2R-002N2-0.05RX	2.0	11.85°	2.08	2.15	2.22	2.30	2.49							
XM2R-003N1-0.02RX	0.3	0.02	1.0	0.24	0.27	50.0	4.0	2.0	13.09°	1.06	1.12	1.17	1.23	1.33
XM2R-003N2-0.02RX			2.0						11.67°	2.11	2.21	2.29	2.38	2.57
XM2R-003N3-0.02RX			3.0						10.53°	3.16	3.28	3.40	3.53	3.81
XM2R-003N1-0.05RX		0.05	1.0						13.14°	1.06	1.12	1.17	1.22	1.32
XM2R-003N1.5-0.05RX			1.5						12.38°	1.59	1.66	1.73	1.80	1.94
XM2R-003N2-0.05RX			2.0						11.71°	2.11	2.21	2.29	2.37	2.56
XM2R-003N2.5-0.05RX	2.5	11.11°	2.64	2.75	2.84	2.95	3.18							
XM2R-003N3-0.05RX	3.0	10.56°	3.16	3.28	3.40	3.52	3.81							
XM2R-004N1-0.02RX	0.4	0.02	1.0	0.32	0.37	50.0	4.0	2.0	13.04°	1.06	1.12	1.17	1.23	1.33
XM2R-004N2-0.02RX			2.0						11.6°	2.11	2.21	2.29	2.38	2.57
XM2R-004N3-0.02RX			3.0						10.44°	3.16	3.28	3.40	3.53	3.81
XM2R-004N4-0.02RX		4.0	9.49°						4.20	4.35	4.51	4.68	5.06	
XM2R-004N1-0.05RX		0.05	1.0						13.09°	1.06	1.12	1.17	1.22	1.32
XM2R-004N1.5-0.05RX			1.5						12.32°	1.59	1.66	1.73	1.80	1.94
XM2R-004N2-0.05RX	2.0		11.64°	2.11	2.21	2.29	2.37	2.56						
XM2R-004N2.5-0.05RX	2.5	11.03°	2.64	2.75	2.84	2.95	3.18							
XM2R-004N3-0.05RX	3.0	10.47°	3.16	3.28	3.40	3.52	3.81							
XM2R-004N3.5-0.05RX	3.5	9.97°	3.68	3.82	3.95	4.10	4.43							
XM2R-004N4-0.05RX	4.0	9.52°	4.20	4.35	4.51	4.67	5.05							
XM2R-004N1-0.1RX	0.1	1.0	13.17°	1.06	1.11	1.16	1.21	1.31						
XM2R-004N2-0.1RX		2.0	11.7°	2.11	2.20	2.28	2.37	2.55						
XM2R-004N3-0.1RX		3.0	10.53°	3.16	3.28	3.39	3.52	3.79						
XM2R-004N4-0.1RX		4.0	9.56°	4.20	4.35	4.50	4.67	5.04						
XM2R-005N1-0.02RX	0.5	0.02	1.0	0.4	0.47	50.0	4.0	2.0	13°	1.06	1.12	1.17	1.23	1.33
XM2R-005N2-0.02RX			2.0						11.53°	2.11	2.21	2.29	2.38	2.57
XM2R-005N3-0.02RX			3.0						10.35°	3.16	3.28	3.40	3.53	3.81
XM2R-005N4-0.02RX		4.0	9.39°						4.20	4.35	4.51	4.68	5.06	
XM2R-005N6-0.02RX		6.0	7.92°						6.27	6.49	6.73	6.98	7.54	
XM2R-005N1-0.05RX		0.05	1.0						13.05°	1.06	1.12	1.17	1.22	1.32
XM2R-005N2-0.05RX	2.0		11.56°	2.11	2.21	2.29	2.37	2.56						
XM2R-005N3-0.05RX	3.0		10.38°	3.16	3.28	3.40	3.52	3.81						
XM2R-005N4-0.05RX	4.0	9.42°	4.20	4.35	4.51	4.67	5.05							
XM2R-005N5-0.05RX	5.0	8.62°	5.24	5.42	5.61	5.82	6.29							
XM2R-005N6-0.05RX	6.0	7.94°	6.27	6.49	6.72	6.97	7.53							
XM2R-005N1-0.1RX	0.1	1.0	13.13°	1.06	1.11	1.16	1.21	1.31						
XM2R-005N2-0.1RX		2.0	11.63°	2.11	2.20	2.28	2.37	2.55						
XM2R-005N3-0.1RX		3.0	10.44°	3.16	3.28	3.39	3.52	3.79						
XM2R-005N4-0.1RX		4.0	9.46°	4.20	4.35	4.50	4.67	5.04						
XM2R-005N5-0.1RX		5.0	8.65°	5.24	5.42	5.61	5.82	6.28						
XM2R-005N6-0.1RX		6.0	7.97°	6.27	6.49	6.72	6.97	7.52						

NEW Products

## Series XM2R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
										0.5°	1°	1.5°	2°	3°
										XM2R-006N2-0.02RX	0.6	0.02	2.0	0.48
XM2R-006N4-0.02RX	4.0	9.15°	4.29	4.51	4.69	4.86	5.26							
XM2R-006N6-0.02RX	6.0	7.71°	6.40	6.66	6.90	7.16	7.74							
XM2R-006N2-0.05RX	0.05	2.0	11.27°	2.17	2.31	2.43	2.55	2.76						
XM2R-006N4-0.05RX		4.0	9.18°	4.29	4.51	4.68	4.86	5.25						
XM2R-006N6-0.05RX		6.0	7.73°	6.40	6.66	6.90	7.16	7.74						
XM2R-006N8-0.05RX	0.1	8.0	6.68°	8.49	8.80	9.12	9.46	10.22						
XM2R-006N10-0.05RX		10.0	5.88°	10.57	10.94	11.33	11.76	12.71						
XM2R-006N2-0.1RX		2.0	11.34°	2.16	2.30	2.43	2.54	2.75						
XM2R-006N4-0.1RX	0.1	4.0	9.22°	4.29	4.50	4.68	4.85	5.24						
XM2R-006N6-0.1RX		6.0	7.76°	6.39	6.66	6.90	7.15	7.72						
XM2R-006N8-0.1RX		8.0	6.7°	8.48	8.80	9.11	9.45	10.21						
XM2R-006N10-0.1RX		10.0	5.89°	10.57	10.94	11.33	11.75	12.70						
XM2R-007N4-0.05RX	0.7	0.05	4.0	0.56	0.67	50.0	4.0	4.0	9.07°	4.29		4.51	4.68	
XM2R-007N6-0.05RX			6.0						7.62°	6.40	6.66	6.90	7.16	7.74
XM2R-007N4-0.1RX		0.1	4.0						9.11°	4.29	4.50	4.68	4.85	5.24
XM2R-007N6-0.1RX			6.0						7.65°	6.39	6.66	6.90	7.15	7.72
XM2R-008N4-0.02RX	0.8	0.02	4.0	0.64	0.76	50.0	4.0	4.0	8.96°	4.27	4.47	4.65	4.82	5.21
XM2R-008N6-0.02RX			6.0						7.51°	6.37	6.63	6.87	7.12	7.70
XM2R-008N4-0.05RX		0.05	4.0			8.99°			4.27	4.47	4.65	4.82	5.21	
XM2R-008N6-0.05RX			6.0			7.52°			6.37	6.63	6.86	7.12	7.69	
XM2R-008N8-0.05RX			8.0			6.47°			8.45	8.76	9.08	9.42	10.18	
XM2R-008N12-0.05RX		0.1	12.0			55.0			5.05°	12.61	13.04	13.51	14.02	15.15
XM2R-008N4-0.1RX			4.0			50.0			9.03°	4.26	4.47	4.64	4.81	5.19
XM2R-008N6-0.1RX		0.1	6.0			7.55°			6.37	6.62	6.86	7.11	7.68	
XM2R-008N8-0.1RX			8.0			6.49°			8.45	8.76	9.07	9.41	10.17	
XM2R-008N12-0.1RX		0.2	12.0			5.06°			12.60	13.04	13.51	14.01	15.14	
XM2R-008N4-0.2RX			4.0			9.12°			4.26	4.46	4.63	4.80	5.17	
XM2R-008N6-0.2RX			6.0			7.62°			6.36	6.61	6.85	7.10	7.66	
XM2R-008N8-0.2RX			8.0			6.54°			8.45	8.75	9.06	9.40	10.14	
XM2R-008N12-0.2RX			12.0			5.09°			12.60	13.03	13.50	14.00	15.11	
XM2R-010N2-0.02RX	1.0		0.02	2.0	0.80	0.96	50.0	4.0	4.0	10.92°	2.15	2.28	2.40	2.52
XM2R-010N4-0.02RX		4.0		8.72°						4.27	4.47	4.65	4.82	5.21
XM2R-010N6-0.02RX		6.0		7.26°						6.37	6.63	6.87	7.12	7.70
XM2R-010N8-0.02RX		8.0		6.22°						8.46	8.77	9.08	9.42	10.19
XM2R-010N10-0.02RX		10.0		5.44°						10.53	10.91	11.30	11.72	12.67
XM2R-010N12-0.02RX		12.0		4.83°						12.61	13.05	13.52	14.02	15.16
XM2R-010N2-0.05RX		0.05		2.0						10.96°	2.15	2.28	2.40	2.51
XM2R-010N3-0.05RX			3.0	9.73°			3.21			3.38	3.53	3.67	3.96	
XM2R-010N4-0.05RX			4.0	8.75°			4.27			4.47	4.65	4.82	5.21	
XM2R-010N5-0.05RX			5.0	7.95°			5.32			5.55	5.75	5.97	6.45	
XM2R-010N6-0.05RX			6.0	7.28°			6.37			6.63	6.86	7.12	7.69	
XM2R-010N8-0.05RX			8.0	6.23°			8.45			8.76	9.08	9.42	10.18	
XM2R-010N10-0.05RX			10.0	5.45°			10.53			10.90	11.30	11.72	12.67	
XM2R-010N12-0.05RX		0.1	12.0	4.84°			12.61			13.04	13.51	14.02	15.15	
XM2R-010N16-0.05RX	16.0		3.95°	16.74	17.32	17.95	18.62	20.12						
XM2R-010N20-0.05RX	20.0		3.34°	20.88	21.60	22.38	23.22	25.10						
XM2R-010N2-0.1RX	2.0		11.03°	2.14	2.27	2.39	2.50	2.71						
XM2R-010N3-0.1RX	3.0		9.79°	3.21	3.38	3.53	3.66	3.95						
XM2R-010N4-0.1RX	4.0		8.8°	4.26	4.47	4.64	4.81	5.19						
XM2R-010N5-0.1RX	5.0		7.99°	5.32	5.55	5.75	5.96	6.44						
XM2R-010N6-0.1RX	6.0		7.31°	6.37	6.62	6.86	7.11	7.68						
XM2R-010N8-0.1RX	8.0		6.25°	8.45	8.76	9.07	9.41	10.17						
XM2R-010N10-0.1RX	10.0		5.46°	10.53	10.90	11.29	11.71	12.65						
XM2R-010N12-0.1RX	12.0	4.85°	12.60	13.04	13.51	14.01	15.14							
XM2R-010N16-0.1RX	0.1	16.0	3.96°	16.74	17.32	17.94	18.61	20.11						
XM2R-010N20-0.1RX		20.0	3.35°	20.87	21.60	22.37	23.21	25.08						

**NEW**  
Products

New Products

## Series XM2R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle					
										0.5°	1°	1.5°	2°	3°	
										XM2R-010N2-0.2RX	1.0	0.2	2.0	0.80	0.96
XM2R-010N3-0.2RX	3.0	9.9°	3.20	3.37	3.51	3.65	3.93								
XM2R-010N4-0.2RX	4.0	8.89°	4.26	4.46	4.63	4.80	5.17								
XM2R-010N5-0.2RX	5.0	8.06°	5.31	5.54	5.74	5.95	6.41								
XM2R-010N6-0.2RX	6.0	7.37°	6.36	6.61	6.85	7.10	7.66								
XM2R-010N8-0.2RX	8.0	6.3°	8.45	8.75	9.06	9.40	10.14								
XM2R-010N10-0.2RX	10.0	5.5°	10.53	10.89	11.28	11.70	12.63								
XM2R-010N12-0.2RX	12.0	4.88°	12.60	13.03	13.50	14.00	15.11								
XM2R-010N16-0.2RX	16.0	3.98°	16.74	17.31	17.93	18.59	20.09								
XM2R-010N20-0.2RX	20.0	3.36°	20.87	21.59	22.36	23.19	25.06								
XM2R-010N2-0.3RX	0.3	2.0	0.80	0.96	4.0	4.0	11.32°	2.13	2.25	2.36		2.47	2.66		
XM2R-010N3-0.3RX		3.0					10.01°	3.20	3.36	3.50		3.63	3.90		
XM2R-010N4-0.3RX		4.0					8.98°	4.25	4.45	4.62		4.78	5.15		
XM2R-010N5-0.3RX		5.0					8.14°	5.31	5.53	5.73		5.93	6.39		
XM2R-010N6-0.3RX		6.0					7.44°	6.36	6.61	6.84		7.08	7.63		
XM2R-010N8-0.3RX		8.0					6.35°	8.44	8.75	9.05		9.38	10.12		
XM2R-010N10-0.3RX		10.0					5.53°	10.52	10.89	11.27		11.68	12.60		
XM2R-010N12-0.3RX		12.0					4.9°	12.60	13.03	13.49		13.98	15.09		
XM2R-010N16-0.3RX		16.0					4°	16.73	17.30	17.92		18.58	20.06		
XM2R-010N20-0.3RX		20.0					3.37°	20.87	21.58	22.35		23.18	25.04		
XM2R-0125N5-0.1RX	1.25	0.1	5.0	1.0	1.2	50.0	4.0	4.0	7.68°	5.30	5.52	5.72	5.93	6.40	
XM2R-0125N10-0.1RX			10.0						5.17°	10.50	10.87	11.26	11.68	12.62	
XM2R-0125N15-0.1RX			15.0						3.9°	15.68	16.22	16.80	17.43	18.83	
XM2R-0125N20-0.1RX			20.0						3.13°	20.84	21.57	22.34	23.18	25.05	
XM2R-0125N5-0.2RX			5.0						7.75°	5.29	5.51	5.71	5.91	6.38	
XM2R-0125N10-0.2RX		10.0	5.21°	10.50	10.86	11.25	11.66	12.59							
XM2R-0125N15-0.2RX		15.0	3.92°	15.67	16.21	16.79	17.41	18.81							
XM2R-0125N20-0.2RX		20.0	3.14°	20.84	21.56	22.33	23.16	25.02							
XM2R-0125N5-0.3RX		5.0	7.83°	5.29	5.50	5.70	5.90	6.35							
XM2R-0125N10-0.3RX		10.0	5.24°	10.50	10.86	11.24	11.65	12.57							
XM2R-0125N15-0.3RX		15.0	3.94°	15.67	16.20	16.78	17.40	18.78							
XM2R-0125N20-0.3RX		20.0	3.15°	20.84	21.55	22.32	23.15	25.00							
XM2R-015N4-0.1RX		1.5	0.1	4.0	1.2	1.44	50.0	4.0	4.0	8.17°	4.23	4.42	4.58	4.75	5.13
XM2R-015N6-0.1RX				6.0						6.66°	6.32	6.57	6.80	7.05	7.62
XM2R-015N8-0.1RX				8.0						5.62°	8.41	8.71	9.02	9.35	10.10
XM2R-015N12-0.1RX				12.0						4.28°	12.55	12.98	13.45	13.95	15.07
XM2R-015N15-0.1RX				15.0						3.63°	15.65	16.19	16.77	17.40	18.80
XM2R-015N20-0.1RX			20.0	2.9°	20.82	21.54	22.32	23.15	-						
XM2R-015N4-0.2RX			4.0	8.26°	4.23	4.41	4.57	4.74	5.10						
XM2R-015N6-0.2RX			6.0	6.72°	6.32	6.56	6.79	7.04	7.59						
XM2R-015N8-0.2RX	8.0		5.66°	8.40	8.70	9.01	9.34	10.08							
XM2R-015N12-0.2RX	12.0		4.31°	12.55	12.98	13.44	13.94	15.05							
XM2R-015N15-0.2RX	15.0		3.65°	15.65	16.19	16.76	17.38	18.78							
XM2R-015N20-0.2RX	20.0		2.91°	20.82	21.53	22.31	23.13	-							
XM2R-015N4-0.3RX	4.0		8.36°	4.22	4.40	4.56	4.72	5.08							
XM2R-015N6-0.3RX	6.0		6.78°	6.31	6.55	6.78	7.02	7.57							
XM2R-015N8-0.3RX	8.0		5.71°	8.40	8.69	8.99	9.32	10.05							
XM2R-015N12-0.3RX	12.0		4.33°	12.54	12.97	13.43	13.92	15.03							
XM2R-015N15-0.3RX	15.0		3.67°	15.64	16.18	16.75	17.37	18.76							
XM2R-015N20-0.3RX	20.0		2.92°	20.81	21.53	22.29	23.12	-							
XM2R-015N4-0.5RX	4.0		8.55°	4.21	4.39	4.54	4.69	5.03							
XM2R-015N6-0.5RX	6.0		6.91°	6.31	6.54	6.76	6.99	7.52							
XM2R-015N8-0.5RX	8.0	5.8°	8.39	8.68	8.97	9.29	10.00								
XM2R-015N12-0.5RX	12.0	4.39°	12.54	12.96	13.41	13.89	14.98								
XM2R-015N15-0.5RX	15.0	3.71°	15.64	16.17	16.73	17.34	18.71								
XM2R-015N20-0.5RX	20.0	2.95°	20.81	21.51	22.27	23.09	-								



New Products

## Series XM2R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle						
										0.5°	1°	1.5°	2°	3°		
										XM2R-0175N5-0.1RX	1.75	0.1	5.0	1.4	1.68	50.0
XM2R-0175N10-0.1RX	10.0	4.53°	10.46	10.82	11.21	11.63	12.56									
XM2R-0175N15-0.1RX	15.0	3.35°	15.63	16.17	16.75	17.38	18.78									
XM2R-0175N20-0.1RX	20.0	2.66°	20.80	21.52	22.29	23.13	-									
XM2R-0175N5-0.2RX	0.2	5.0	50.0	7.03°	5.26	5.47	5.66	5.86	6.32							
XM2R-0175N10-0.2RX		10.0		4.56°	10.46	10.82	11.20	11.61	12.54							
XM2R-0175N15-0.2RX		15.0		3.37°	15.63	16.16	16.74	17.36	18.75							
XM2R-0175N20-0.2RX		20.0		2.67°	20.80	21.51	22.28	23.11	-							
XM2R-0175N5-0.3RX	0.3	5.0	50.0	7.11°	5.25	5.46	5.65	5.85	6.30							
XM2R-0175N10-0.3RX		10.0		4.59°	10.45	10.81	11.19	11.60	12.51							
XM2R-0175N15-0.3RX		15.0		3.39°	15.62	16.16	16.73	17.35	18.73							
XM2R-0175N20-0.3RX		20.0		2.69°	20.79	21.51	22.27	23.10	-							
XM2R-020N4-0.1RX	2.0	0.1	4.0	1.60	1.92	50.0	4.0	4.0	7.36°	4.21	4.38	4.54	4.71	5.08		
XM2R-020N6-0.1RX			6.0						5.86°	6.29	6.53	6.76	7.01	7.57		
XM2R-020N8-0.1RX			8.0						4.87°	8.37	8.66	8.97	9.31	10.05		
XM2R-020N12-0.1RX			12.0						3.64°	12.51	12.94	13.41	13.91	15.03		
XM2R-020N16-0.1RX			16.0			2.9°			16.65	17.22	17.84	18.51	-			
XM2R-020N20-0.1RX			20.0			2.42°			20.78	21.50	22.27	23.11	-			
XM2R-020N25-0.1RX			25.0			2°			25.95	26.85	27.82	-	-			
XM2R-020N30-0.1RX			30.0			1.7°			31.12	32.20	33.36	-	-			
XM2R-020N4-0.2RX			0.2			4.0			50.0	7.46°	4.20	4.37	4.53	4.69	5.06	
XM2R-020N6-0.2RX						6.0				5.93°	6.29	6.52	6.75	6.99	7.54	
XM2R-020N8-0.2RX						8.0				4.91°	8.37	8.66	8.96	9.29	10.03	
XM2R-020N12-0.2RX						12.0				3.66°	12.51	12.94	13.40	13.89	15.00	
XM2R-020N16-0.2RX		16.0				2.92°				16.64	17.22	17.83	18.49	-		
XM2R-020N20-0.2RX		20.0				2.43°				20.78	21.49	22.26	23.09	-		
XM2R-020N25-0.2RX		25.0				2°				25.95	26.84	27.80	-	-		
XM2R-020N30-0.2RX		30.0				1.71°				31.11	32.19	33.35	-	-		
XM2R-020N4-0.3RX		0.3				4.0				50.0	7.56°	4.20	4.37	4.52	4.68	5.03
XM2R-020N6-0.3RX						6.0					5.99°	6.28	6.51	6.74	6.98	7.52
XM2R-020N8-0.3RX						8.0					4.96°	8.36	8.65	8.95	9.28	10.01
XM2R-020N12-0.3RX						12.0					3.69°	12.50	12.93	13.39	13.88	14.98
XM2R-020N16-0.3RX			16.0			2.93°			16.64		17.21	17.82	18.48	-		
XM2R-020N20-0.3RX			20.0			2.44°			20.77		21.49	22.25	23.08	-		
XM2R-020N25-0.3RX			25.0			2.01°			25.94		26.84	27.79	28.82	-		
XM2R-020N30-0.3RX			30.0			1.71°			31.11		32.18	33.34	-	-		
XM2R-020N6-0.5RX			0.5			6.0			50.0		6.11°	6.28	6.50	6.71	6.95	7.47
XM2R-020N8-0.5RX						8.0					5.04°	8.36	8.64	8.93	9.25	9.96
XM2R-020N12-0.5RX						12.0					3.73°	12.50	12.92	13.36	13.85	14.93
XM2R-020N16-0.5RX						16.0					2.96°	16.63	17.19	17.80	18.45	-
XM2R-020N20-0.5RX		20.0				2.46°				20.77	21.47	22.23	23.05	-		
XM2R-020N25-0.5RX		25.0				2.03°				25.94	26.82	27.77	28.79	-		
XM2R-020N30-0.5RX		30.0				1.72°				31.10	32.17	33.31	-	-		
XM2R-020N6-0.8RX		0.8				6.0				50.0	6.31°	6.26	6.48	6.68	6.90	7.40
XM2R-020N8-0.8RX						8.0					5.18°	8.35	8.62	8.90	9.20	9.88
XM2R-020N12-0.8RX						12.0					3.81°	12.49	12.89	13.33	13.80	14.86
XM2R-020N16-0.8RX						16.0					3.01°	16.62	17.17	17.77	18.40	19.83
XM2R-020N20-0.8RX						20.0					2.49°	20.76	21.45	22.20	23.00	-
XM2R-020N25-0.8RX	25.0		2.05°	25.93	26.80	27.74	28.75	-								
XM2R-020N30-0.8RX	30.0		1.74°	31.09	32.15	33.28	-	-								
XM2R-025N10-0.1RX	2.5		0.1	10.0	2.0	2.4	50.0	4.0	4.0		3.36°	10.41	10.77	11.16	11.57	12.50
XM2R-025N20-0.1RX				20.0			1.89°				20.75	21.47	22.24	-	-	
XM2R-025N30-0.1RX				30.0			1.32°				31.09	32.17	-	-	-	
XM2R-025N10-0.2RX			0.2	10.0			50.0				3.39°	10.41	10.77	11.15	11.56	12.48
XM2R-025N20-0.2RX				20.0			1.9°				20.75	21.46	22.23	-	-	
XM2R-025N30-0.2RX		30.0		1.32°			31.08			32.16	-	-	-			



New Products

## Series XM2R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle I $\alpha$	Effective Under-Neck Length (LU) For Inclined Angle					
										0.5°	1°	1.5°	2°	3°	
										XM2R-025N10-0.3RX	2.5	0.3	10.0	2.0	2.40
XM2R-025N20-0.3RX	20.0	60.0	1.91°	20.74	21.46	22.22	-	-							
XM2R-025N30-0.3RX	30.0	70.0	1.32°	31.08	32.15	-	-	-							
XM2R-025N10-0.5RX	0.5	10.0	50.0	3.47°	10.40	10.75	11.12	11.51	12.41						
XM2R-025N20-0.5RX		20.0	60.0	1.92°	20.74	21.44	22.20	-	-						
XM2R-025N30-0.5RX		30.0	70.0	1.33°	31.07	32.14	-	-	-						
XM2R-030N6-0.1RX	3.0	0.1	6.0	2.4	2.88	50.0	6.0	4.0	7.4°	6.25	6.47	6.70	6.95	7.50	
XM2R-030N8-0.1RX			8.0			55.0			6.32°	8.32	8.61	8.92	9.25	9.99	
XM2R-030N12-0.1RX			12.0			60.0			4.89°	12.46	12.89	13.35	13.85	14.96	
XM2R-030N16-0.1RX			16.0			65.0			3.99°	16.59	17.17	17.78	18.45	19.94	
XM2R-030N18-0.1RX			18.0						3.65°	18.66	19.31	20.00	20.75	22.42	
XM2R-030N20-0.1RX			20.0						3.36°	20.73	21.45	22.22	23.05	24.91	
XM2R-030N30-0.1RX			30.0			75.0			2.42°	31.06	32.14	33.30	34.55	-	
XM2R-030N35-0.1RX			35.0			80.0			2.12°	36.23	37.49	38.84	40.29	-	
XM2R-030N6-0.2RX			0.2			6.0			50.0	7.46°	6.25	6.46	6.69	6.93	7.48
XM2R-030N8-0.2RX						8.0			55.0	6.36°	8.32	8.60	8.91	9.23	9.97
XM2R-030N12-0.2RX						12.0			60.0	4.92°	12.45	12.88	13.34	13.83	14.94
XM2R-030N16-0.2RX						16.0			65.0	4°	16.59	17.16	17.77	18.43	19.91
XM2R-030N18-0.2RX						18.0				3.66°	18.66	19.30	19.99	20.73	22.40
XM2R-030N20-0.2RX						20.0				3.38°	20.72	21.44	22.21	23.03	24.88
XM2R-030N30-0.2RX			30.0			75.0			2.43°	31.06	32.14	33.29	34.53	-	
XM2R-030N35-0.2RX		35.0	80.0			2.13°			36.23	37.48	38.83	40.28	-		
XM2R-030N6-0.3RX		0.3	6.0			50.0			7.53°	6.24	6.46	6.68	6.92	7.46	
XM2R-030N8-0.3RX			8.0			55.0			6.41°	8.32	8.60	8.90	9.22	9.94	
XM2R-030N12-0.3RX			12.0			60.0			4.94°	12.45	12.87	13.33	13.82	14.91	
XM2R-030N16-0.3RX			16.0			65.0			4.02°	16.59	17.15	17.76	18.42	19.89	
XM2R-030N18-0.3RX			18.0						3.68°	18.65	19.29	19.98	20.72	22.37	
XM2R-030N20-0.3RX			20.0						3.39°	20.72	21.43	22.20	23.02	24.86	
XM2R-030N30-0.3RX			30.0			75.0			2.43°	31.06	32.13	33.28	34.52	-	
XM2R-030N35-0.3RX			35.0			80.0			2.13°	36.23	37.48	38.82	40.26	-	
XM2R-030N8-0.5RX			0.5			8.0			55.0	6.51°	8.31	8.58	8.87	9.19	9.89
XM2R-030N12-0.5RX						12.0			60.0	5°	12.44	12.86	13.31	13.79	14.87
XM2R-030N16-0.5RX						16.0			65.0	4.06°	16.58	17.14	17.74	18.39	19.84
XM2R-030N18-0.5RX						18.0				3.71°	18.65	19.28	19.96	20.69	22.33
XM2R-030N20-0.5RX						20.0				3.42°	20.71	21.42	22.17	22.99	24.81
XM2R-030N30-0.5RX						30.0			75.0	2.45°	31.05	32.12	33.26	34.49	-
XM2R-030N35-0.5RX	35.0		80.0	2.14°	36.22	37.46	38.80	40.23	-						
XM2R-030N8-1.0RX	1.0	8.0	55.0	6.76°	8.29	8.55	8.82	9.11	9.77						
XM2R-030N12-1.0RX		12.0	60.0	5.15°	12.43	12.83	13.25	13.71	14.74						
XM2R-030N16-1.0RX		16.0	65.0	4.16°	16.56	17.10	17.69	18.31	19.72						
XM2R-030N18-1.0RX		18.0		3.79°	18.63	19.24	19.90	20.61	22.20						
XM2R-030N20-1.0RX		20.0		3.49°	20.70	21.38	22.12	22.91	24.69						
XM2R-030N30-1.0RX		30.0	75.0	2.48°	31.03	32.08	33.20	34.41	-						
XM2R-030N35-1.0RX	35.0	80.0	2.17°	36.20	37.43	38.74	40.16	-							
XM2R-040N8-0.1RX	4.0	0.1	8.0	3.2	3.86	55.0	6.0	4.0	4.9°	8.31	8.59	8.90	9.23	9.97	
XM2R-040N12-0.1RX			12.0			60.0			3.66°	12.44	12.87	13.33	13.83	14.94	
XM2R-040N16-0.1RX			16.0			65.0			2.91°	16.57	17.15	17.76	18.43	-	
XM2R-040N20-0.1RX			20.0						2.42°	20.71	21.43	22.20	23.03	-	
XM2R-040N30-0.1RX			30.0						1.71°	31.05	32.12	33.28	-	-	
XM2R-040N35-0.1RX			35.0			80.0			1.49°	36.21	37.47	-	-	-	
XM2R-040N45-0.1RX		45.0	90.0			1.18°			46.55	48.17	-	-	-		
XM2R-040N8-0.2RX		0.2	8.0			55.0			4.94°	8.30	8.58	8.89	9.21	9.94	
XM2R-040N12-0.2RX			12.0			60.0			3.68°	12.44	12.86	13.32	13.81	14.92	
XM2R-040N16-0.2RX			16.0			65.0			2.93°	16.57	17.14	17.75	18.41	-	
XM2R-040N20-0.2RX			20.0						2.43°	20.71	21.42	22.19	23.01	-	
XM2R-040N30-0.2RX			30.0						1.71°	31.04	32.12	33.27	-	-	



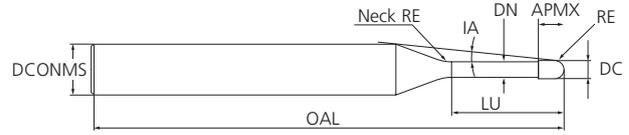
### Series XM2R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle					
										0.5°	1°	1.5°	2°	3°	
										XM2R-040N35-0.2RX	4.0	0.2	35.0	3.2	3.86
XM2R-040N45-0.2RX	45.0	90.0	1.18°	46.55	48.16	-	-	-							
XM2R-040N8-0.3RX	0.3	8.0	55.0	4.99°	8.30	8.58	8.88	9.20	9.92						
XM2R-040N12-0.3RX		12.0	60.0	3.7°	12.43	12.86	13.31	13.80	14.89						
XM2R-040N16-0.3RX		16.0	65.0	2.94°	16.57	17.13	17.74	18.40	-						
XM2R-040N20-0.3RX		20.0	75.0	2.44°	20.70	21.41	22.18	23.00	-						
XM2R-040N30-0.3RX		30.0	80.0	1.72°	31.04	32.11	33.26	-	-						
XM2R-040N35-0.3RX		35.0	90.0	1.49°	36.21	37.46	-	-	-						
XM2R-040N45-0.3RX		45.0	60.0	1.19°	46.54	48.16	-	-	-						
XM2R-040N12-0.5RX		0.5	12.0	60.0	3.75°	12.43	12.84	13.29	13.77	14.84					
XM2R-040N16-0.5RX	16.0		65.0	2.97°	16.56	17.12	17.72	18.37	-						
XM2R-040N20-0.5RX	20.0		75.0	2.47°	20.70	21.40	22.15	22.97	-						
XM2R-040N30-0.5RX	30.0		80.0	1.73°	31.03	32.10	33.24	-	-						
XM2R-040N35-0.5RX	35.0		90.0	1.5°	36.20	37.44	-	-	-						
XM2R-040N45-0.5RX	45.0		60.0	1.19°	46.54	48.14	-	-	-						
XM2R-040N12-1.0RX	1.0		12.0	60.0	3.88°	12.41	12.81	13.23	13.69	14.72					
XM2R-040N16-1.0RX			16.0	65.0	3.05°	16.54	17.09	17.67	18.29	19.70					
XM2R-040N20-1.0RX		20.0	75.0	2.52°	20.68	21.36	22.10	22.89	-						
XM2R-040N30-1.0RX		30.0	80.0	1.75°	31.02	32.06	33.18	-	-						
XM2R-040N35-1.0RX		35.0	90.0	1.52°	36.18	37.41	38.73	-	-						
XM2R-040N45-1.0RX		45.0	65.0	1.2°	46.52	48.11	-	-	-						
XM2R-050N20-0.1RX		5.0	0.1	20.0	4.0	4.85	65.0	6.0	4.0	1.32°	20.7	21.42	-	-	-
XM2R-050N40-0.1RX				40.0			85.0			0.69°	41.38	-	-	-	-
XM2R-050N20-0.2RX	20.0		65.0	1.32°			20.7			21.41	-	-	-		
XM2R-050N40-0.2RX	40.0		85.0	0.69°			41.37			-	-	-	-		
XM2R-050N20-0.3RX	20.0		65.0	1.33°			20.69			21.41	-	-	-		
XM2R-050N40-0.3RX	40.0		85.0	0.69°			41.37			-	-	-	-		
XM2R-050N20-0.5RX	20.0		65.0	1.34°			20.69			21.39	-	-	-		
XM2R-050N40-0.5RX	40.0		85.0	0.7°			41.36			-	-	-	-		
XM2R-050N20-1.0RX	20.0		65.0	1.38°			20.67			21.36	-	-	-		
XM2R-050N40-1.0RX	40.0		85.0	0.71°			41.35			-	-	-	-		
XM2R-060N12-0.1RX	6.0	0.1	12.0	4.8	5.85	50.0	6.0	-	-	-	-	-	-	-	
XM2R-060N18-0.1RX			18.0			60.0			-	-	-	-	-		
XM2R-060N24-0.1RX			24.0			70.0			-	-	-	-	-		
XM2R-060N35-0.1RX			35.0			80.0			-	-	-	-	-		
XM2R-060N55-0.1RX			55.0			100.0			-	-	-	-	-		
XM2R-060N12-0.2RX		0.2	12.0			50.0			-	-	-	-	-		
XM2R-060N18-0.2RX			18.0			60.0			-	-	-	-	-		
XM2R-060N24-0.2RX			24.0			70.0			-	-	-	-	-		
XM2R-060N35-0.2RX			35.0			80.0			-	-	-	-	-		
XM2R-060N55-0.2RX			55.0			100.0			-	-	-	-	-		
XM2R-060N12-0.3RX		0.3	12.0			50.0			-	-	-	-	-		
XM2R-060N18-0.3RX			18.0			60.0			-	-	-	-	-		
XM2R-060N24-0.3RX			24.0			70.0			-	-	-	-	-		
XM2R-060N35-0.3RX			35.0			80.0			-	-	-	-	-		
XM2R-060N55-0.3RX			55.0			100.0			-	-	-	-	-		
XM2R-060N18-0.5RX		0.5	18.0			60.0			-	-	-	-	-		
XM2R-060N24-0.5RX			24.0			70.0			-	-	-	-	-		
XM2R-060N35-0.5RX			35.0			80.0			-	-	-	-	-		
XM2R-060N55-0.5RX			55.0			100.0			-	-	-	-	-		
XM2R-060N18-1.0RX			1.0			18.0			60.0	-	-	-	-	-	
XM2R-060N24-1.0RX	24.0	70.0		-	-	-	-	-							
XM2R-060N35-1.0RX	35.0	80.0		-	-	-	-	-							
XM2R-060N55-1.0RX	55.0	100.0		-	-	-	-	-							

**NEW**  
Products

New Products

## TuffCut<sup>®</sup> XM Series XM2B



Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle											
										0.5°	1°	1.5°	2°	3°							
XM2B-001N0.2X	0.1	0.05	0.2	0.08	0.08	50.0	4.0	1.0	14.66°	0.20	0.21	0.22	0.24	0.26							
XM2B-001N0.3X			0.3						14.48°	0.31	0.33	0.34	0.36	0.39							
XM2B-001N0.5X			0.5						14.12°	0.52	0.55	0.57	0.59	0.64							
XM2B-002N0.5X	0.2	0.1	0.5	0.16	0.17	50.0	4.0	1.0	14.21°	0.51	0.53	0.55	0.57	0.61							
XM2B-002N0.75X			0.75						13.77°	0.78	0.80	0.83	0.86	0.92							
XM2B-002N1X			1.0						13.36°	1.04	1.07	1.11	1.15	1.23							
XM2B-002N1.25X			1.25						12.97°	1.30	1.34	1.39	1.43	1.54							
XM2B-002N1.5X			1.5						12.6°	1.56	1.61	1.66	1.72	1.85							
XM2B-002N2X			2.0						11.92°	2.07	2.14	2.22	2.30	2.48							
XM2B-002N2.5X			2.5						11.31°	2.59	2.68	2.77	2.87	3.10							
XM2B-002N3X			3.0						10.76°	3.11	3.21	3.33	3.45	3.72							
XM2B-003N0.5X			0.3						0.15	0.5	0.24	0.27	50.0	4.0	2.0	14.17°	0.52	0.55	0.57	0.60	0.66
XM2B-003N0.75X										0.75						13.72°	0.79	0.83	0.87	0.91	0.98
XM2B-003N1X	1.0	13.3°		1.05	1.11	1.16	1.20	1.29													
XM2B-003N1.25X	1.25	12.9°		1.32	1.38	1.44	1.50	1.61													
XM2B-003N1.5X	1.5	12.53°		1.58	1.66	1.72	1.78	1.92													
XM2B-003N2X	2.0	11.84°		2.11	2.20	2.28	2.36	2.54													
XM2B-003N2.5X	2.5	11.22°		2.63	2.74	2.83	2.93	3.16													
XM2B-003N3X	3.0	10.66°		3.15	3.27	3.39	3.51	3.78													
XM2B-004N0.75X	0.4	0.2		0.75	0.32	0.37	50.0	4.0		2.0						13.78°	0.78	0.82	0.86	0.90	0.97
XM2B-004N1X				1.0												13.34°	1.05	1.10	1.15	1.19	1.28
XM2B-004N1.5X			1.5	12.55°					1.58		1.65	1.72	1.78	1.90							
XM2B-004N2X			2.0	11.84°					2.11		2.19	2.27	2.35	2.53							
XM2B-004N2.5X			2.5	11.2°					2.63		2.73	2.83	2.93	3.15							
XM2B-004N3X			3.0	10.63°					3.15		3.27	3.38	3.50	3.77							
XM2B-004N3.5X			3.5	10.12°					3.67		3.80	3.94	4.08	4.39							
XM2B-004N4X			4.0	9.65°					4.19		4.34	4.49	4.65	5.01							
XM2B-004N4.5X			4.5	9.22°					4.71		4.87	5.04	5.23	5.63							
XM2B-005N1X			0.5	0.25					1.0		0.4	0.47	50.0	4.0	2.0	13.39°	1.05	1.09	1.14	1.19	1.27
XM2B-005N1.5X	1.5	12.56°			1.58	1.65	1.71	1.77	1.89												
XM2B-005N2X	2.0	11.83°			2.10	2.19	2.27	2.34	2.51												
XM2B-005N2.5X	2.5	11.18°			2.63	2.73	2.82	2.92	3.14												
XM2B-005N3X	3.0	10.6°			3.15	3.27	3.38	3.49	3.76												
XM2B-005N4X	4.0	9.6°			4.19	4.34	4.48	4.64	5.00												
XM2B-005N5X	5.0	8.77°			5.23	5.41	5.59	5.79	6.24												
XM2B-005N5.5X	5.5	8.4°			5.75	5.94	6.15	6.37	6.86												
XM2B-005N6X	6.0	8.07°			6.27	6.48	6.70	6.94	7.49												
XM2B-005N8X	8.0	6.96°			8.33	8.62	8.92	9.24	9.97												
XM2B-006N1X	0.6	0.3	1.0	0.48	0.57	50.0	4.0	4.0	13.15°	1.07	1.14	1.20	1.27	1.41							
XM2B-006N2X			2.0						11.61°	2.15	2.28	2.39	2.50	2.70							
XM2B-006N2.5X			2.5						10.96°	2.68	2.84	2.97	3.09	3.32							
XM2B-006N3X			3.0						10.38°	3.22	3.39	3.54	3.67	3.95							
XM2B-006N3.5X			3.5						9.86°	3.75	3.94	4.10	4.25	4.57							
XM2B-006N4X			4.0						9.39°	4.28	4.48	4.66	4.82	5.19							
XM2B-006N4.5X			4.5						8.97°	4.81	5.03	5.21	5.40	5.81							

NEW Products

## Series XM2B

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
										0.5°	1°	1.5°	2°	3°
XM2B-006N5X	0.6	0.3	5.0	0.48	0.57	50.0	4.0	4.0	8.57°	5.33	5.57	5.77	5.97	6.43
XM2B-006N5.5X			5.5						8.22°	5.86	6.11	6.32	6.55	7.05
XM2B-006N6X			6.0						7.89°	6.38	6.64	6.87	7.12	7.67
XM2B-006N7X			7.0						7.3°	7.43	7.71	7.98	8.27	8.92
XM2B-006N8X			8.0						6.79°	8.48	8.78	9.09	9.42	10.16
XM2B-006N9X			9.0						6.35°	9.52	9.85	10.20	10.57	11.40
XM2B-006N10X			10.0						5.97°	10.56	10.92	11.31	11.72	12.65
XM2B-006N12X			12.0						5.32°	12.63	13.06	13.52	14.02	15.13
XM2B-007N2X	0.7	0.35	2.0	0.56	0.67	50.0	4.0	4.0	11.6°	2.14	2.27	2.39	2.49	2.69
XM2B-007N4X			4.0						9.33°	4.27	4.48	4.65	4.81	5.18
XM2B-007N6X			6.0						7.81°	6.38	6.64	6.87	7.11	7.66
XM2B-007N8X			8.0						6.71°	8.47	8.78	9.09	9.41	10.15
XM2B-008N2X	0.8	0.4	2.0	0.64	0.76	50.0	4.0	4.0	11.64°	2.12	2.24	2.35	2.45	2.63
XM2B-008N4X			4.0						9.3°	4.25	4.44	4.61	4.77	5.12
XM2B-008N5X			5.0						8.45°	5.30	5.53	5.72	5.92	6.36
XM2B-008N6X			6.0						7.74°	6.35	6.60	6.83	7.07	7.61
XM2B-008N8X			8.0						6.63°	8.44	8.74	9.04	9.37	10.09
XM2B-008N10X			10.0						5.8°	10.52	10.88	11.26	11.67	12.58
XM2B-009N2X	0.9	0.45	2.0	0.72	0.86	50.0	4.0	4.0	11.63°	2.12	2.23	2.34	2.44	2.62
XM2B-009N4X			4.0						9.24°	4.25	4.44	4.60	4.76	5.11
XM2B-009N6X			6.0						7.66°	6.35	6.60	6.82	7.06	7.60
XM2B-009N8X			8.0						6.54°	8.44	8.74	9.04	9.36	10.08
XM2B-010N2X	1.0	0.5	2.0	0.8	0.96	50.0	4.0	4.0	11.62°	2.12	2.23	2.33	2.43	2.61
XM2B-010N3X			3.0						10.25°	3.18	3.34	3.48	3.60	3.85
XM2B-010N4X			4.0						9.17°	4.24	4.43	4.60	4.75	5.10
XM2B-010N5X			5.0						8.29°	5.30	5.52	5.71	5.90	6.34
XM2B-010N6X			6.0						7.57°	6.35	6.59	6.81	7.05	7.58
XM2B-010N7X			7.0						6.96°	7.39	7.66	7.92	8.20	8.83
XM2B-010N8X			8.0			6.44°			8.44	8.73	9.03	9.35	10.07	
XM2B-010N9X			9.0			5.99°			9.48	9.80	10.14	10.50	11.31	
XM2B-010N10X			10.0			5.6°			10.52	10.87	11.25	11.65	12.56	
XM2B-010N12X			12.0			4.96°			12.59	13.01	13.46	13.95	15.04	
XM2B-010N13X			13.0			4.69°			13.62	14.08	14.57	15.10	16.29	
XM2B-010N14X			14.0			4.45°			14.66	15.15	15.68	16.25	17.53	
XM2B-010N16X	16.0	4.03°	16.73	17.29	17.90	18.55	20.01							
XM2B-010N18X	18.0	3.69°	18.79	19.43	20.11	20.85	22.50							
XM2B-010N20X	20.0	3.4°	20.86	21.57	22.33	23.15	24.99							
XM2B-011N2X	1.1	0.55	2.0	0.88	1.06	50.0	4.0	4.0	11.61°	2.11	2.22	2.32	2.42	2.60
XM2B-011N4X			4.0						9.09°	4.24	4.43	4.59	4.74	5.08
XM2B-011N6X			6.0						7.47°	6.34	6.59	6.81	7.04	7.57
XM2B-011N8X			8.0						6.34°	8.43	8.73	9.03	9.34	10.06
XM2B-011N10X	10.0	5.5°	10.51	10.87	11.24	11.64	12.54							
XM2B-012N4X	1.2	0.6	4.0	0.96	1.15	50.0	4.0	4.0	9.05°	4.22	4.40	4.55	4.70	5.04
XM2B-012N8X			8.0						6.25°	8.41	8.70	8.99	9.30	10.01
XM2B-012N10X			10.0			5.41°			10.49	10.84	11.21	11.60	12.50	
XM2B-012N12X			12.0			4.77°			12.56	12.97	13.42	13.90	14.98	
XM2B-014N8X	1.4	0.7	8.0	1.12	1.34	50.0	4.0	4.0	6.04°	8.38	8.66	8.95	9.26	9.96
XM2B-014N12X			12.0			4.56°			12.53	12.94	13.38	13.86	14.93	
XM2B-014N16X			16.0			3.67°			16.66	17.22	17.82	18.46	19.90	
XM2B-015N4X	1.5	0.75	4.0	1.2	1.44	50.0	4.0	4.0	8.82°	4.20	4.36	4.51	4.65	4.97
XM2B-015N6X			6.0						7.08°	6.29	6.52	6.73	6.95	7.46
XM2B-015N8X			8.0						5.92°	8.38	8.66	8.95	9.25	9.94
XM2B-015N10X			10.0						5.08°	10.46	10.80	11.16	11.55	12.43
XM2B-015N12X			12.0			4.45°			12.53	12.94	13.38	13.85	14.92	
XM2B-015N14X			14.0			3.96°			14.60	15.08	15.60	16.15	17.40	
XM2B-015N16X			16.0			3.57°			16.66	17.22	17.81	18.45	19.89	
XM2B-015N18X			18.0			3.25°			18.73	19.36	20.03	20.75	22.38	
XM2B-015N20X			20.0			2.98°			20.80	21.50	22.25	23.05	-	



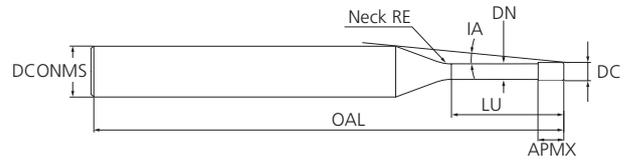
## Series XM2B

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle				
										0.5°	1°	1.5°	2°	3°
XM2B-016N8X	1.6	0.8	8.0	1.28	1.54	50.0	4.0	4.0	5.8°	8.38	8.66	8.94	9.25	9.93
XM2B-016N12X			12.0			4.34°			12.53	12.94	13.37	13.85	14.90	
XM2B-016N16X			16.0			3.47°			16.66	17.21	17.81	18.44	19.88	
XM2B-016N20X			20.0			2.89°			20.80	21.49	22.24	23.04	-	
XM2B-018N8X	1.8	0.90	8.0	1.44	1.73	50.0	4.0	4.0	5.55°	8.36	8.63	8.91	9.21	9.88
XM2B-018N12X			8.0			4.11°			12.50	12.91	13.34	13.81	14.85	
XM2B-018N16X			16.0			3.26°			16.64	17.19	17.77	18.41	19.83	
XM2B-018N20X			20.0			2.7°			20.77	21.46	22.21	23.01	-	
XM2B-020N3X	2.0	1.0	3.0	1.6	1.92	50.0	4.0	4.0	9.72°	3.11	3.22	3.32	3.42	3.62
XM2B-020N4X			4.0						8.32°	4.16	4.31	4.44	4.57	4.86
XM2B-020N6X			6.0						6.46°	6.26	6.46	6.66	6.87	7.35
XM2B-020N8X			8.0						5.27°	8.34	8.60	8.88	9.17	9.84
XM2B-020N10X			10.0			4.46°			10.41	10.74	11.09	11.47	12.32	
XM2B-020N12X			12.0			3.86°			12.48	12.88	13.31	13.77	14.81	
XM2B-020N13X			13.0			3.62°			13.51	13.95	14.42	14.92	16.05	
XM2B-020N14X			14.0			3.4°			14.55	15.02	15.53	16.07	17.29	
XM2B-020N16X			16.0			3.04°			16.62	17.16	17.74	18.37	19.78	
XM2B-020N18X			18.0			2.75°			18.68	19.30	19.96	20.67	-	
XM2B-020N20X			20.0			2.51°			20.75	21.44	22.18	22.97	-	
XM2B-020N22X			22.0			2.31°			22.82	23.58	24.39	25.27	-	
XM2B-020N25X			25.0			2.06°			25.92	26.79	27.72	28.72	-	
XM2B-020N30X			30.0			1.75°			31.09	32.14	33.26	-	-	
XM2B-020N35X			35.0			1.52°			36.26	37.48	38.80	-	-	
XM2B-020N40X			40.0			1.34°			41.42	42.83	-	-	-	
XM2B-025N6X	2.5	1.25	6.0	2.0	2.4	50.0	4.0	4.0	5.62°	6.22	6.41	6.60	6.80	7.25
XM2B-025N10X			10.0			3.69°			10.37	10.69	11.03	11.40	12.23	
XM2B-025N15X			15.0			2.59°			15.54	16.04	16.58	17.15	-	
XM2B-025N20X			20.0			1.99°			20.71	21.39	22.12	-	-	
XM2B-025N25X			25.0			1.62°			25.88	26.74	27.66	-	-	
XM2B-025N30X			30.0			1.36°			31.05	32.09	-	-	-	
XM2B-030N8X	3.0	1.5	8.0	2.4	2.88	55.0	6.0	4.0	7.04°	8.27	8.51	8.77	9.04	9.65
XM2B-030N10X			10.0			6.05°			10.34	10.65	10.98	11.34	12.14	
XM2B-030N13X			13.0			5°			13.44	13.86	14.31	14.79	15.87	
XM2B-030N16X			16.0			4.26°			16.55	17.07	17.63	18.24	19.60	
XM2B-030N20X			20.0			3.56°			20.68	21.35	22.07	22.84	24.57	
XM2B-030N25X			25.0			2.95°			25.85	26.70	27.61	28.59	-	
XM2B-030N30X	30.0	2.52°	31.02	32.05	33.15	34.34	-							
XM2B-030N35X	35.0	2.2°	36.19	37.39	38.69	40.08	-							
XM2B-035N15X	3.5	1.75	15.0	2.8	3.36	60.0	6.0	4.0	3.99°	15.49	15.96	16.48	17.03	18.27
XM2B-035N25X			25.0			2.56°			25.82	26.66	27.56	28.53	-	
XM2B-035N35X			35.0			1.89°			36.16	37.36	38.64	-	-	
XM2B-035N45X			45.0			1.5°			46.50	48.05	-	-	-	
XM2B-040N10X	4.0	2.0	10.0	3.2	3.86	55.0	6.0	4.0	4.86°	10.31	10.60	10.91	11.24	11.99
XM2B-040N13X			13.0			3.88°			13.41	13.81	14.23	14.69	15.72	
XM2B-040N16X			16.0			3.23°			16.51	17.02	17.56	18.14	19.45	
XM2B-040N20X			20.0			2.63°			20.65	21.30	21.99	22.74	-	
XM2B-040N25X			25.0			2.14°			25.81	26.64	27.53	28.49	-	
XM2B-040N30X			30.0			1.81°			30.98	31.99	33.08	-	-	
XM2B-040N35X	35.0	1.56°	36.15	37.34	38.62	-	-							
XM2B-040N40X	4.0	2.0	40.0	3.2	3.86	80.0	6.0	4.0	1.38°	41.32	42.69	-	-	-
XM2B-040N45X			45.0			1.23°			46.49	48.04	-	-	-	
XM2B-040N50X			50.0			1.11°			51.66	53.39	-	-	-	
XM2B-050N20X	5.0	2.5	20.0	4.0	4.85	65.0	6.0	4.0	1.48°	20.62	21.25	-	-	-
XM2B-050N25X			25.0			1.18°			25.79	26.60	-	-	-	
XM2B-050N30X			30.0			0.98°			30.96	-	-	-	-	
XM2B-050N40X			40.0			0.73°			41.29	-	-	-	-	
XM2B-060N12X	6.0	3.0	12.0	6.0	5.85	60.0	6.0	-	-	-	-	-	-	-
XM2B-060N20X			20.0			-			-	-	-	-	-	
XM2B-060N30X			30.0			-			-	-	-	-	-	
XM2B-060N50X			50.0			-			-	-	-	-	-	



New Products

# TuffCut<sup>®</sup> XM Series XM4R



Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle					
										0.5°	1°	1.5°	2°	3°	
										XM4R-010N4-0.05RX	1.0	0.05	4.0	0.8	0.96
XM4R-010N6-0.05RX	6.0	7.28°	6.37	6.63	6.86	7.12	7.69								
XM4R-010N8-0.05RX	8.0	6.23°	8.45	8.76	9.08	9.42	10.18								
XM4R-010N10-0.05RX	10.0	5.45°	10.53	10.90	11.30	11.72	12.67								
XM4R-010N12-0.05RX	12.0	4.84°	12.61	13.04	13.51	14.02	15.15								
XM4R-010N16-0.05RX	16.0	3.95°	16.74	17.32	17.95	18.62	20.12								
XM4R-010N20-0.05RX	20.0	3.34°	20.88	21.60	22.38	23.22	25.10								
XM4R-010N4-0.1RX	0.1	0.1	4.0	1.2	1.44	50.0	4.0	4.0	8.8°	4.26		4.47	4.64	4.81	5.19
XM4R-010N6-0.1RX			6.0						7.31°	6.37		6.62	6.86	7.11	7.68
XM4R-010N8-0.1RX			8.0						6.25°	8.45		8.76	9.07	9.41	10.17
XM4R-010N10-0.1RX			10.0						5.46°	10.53		10.90	11.29	11.71	12.65
XM4R-010N12-0.1RX			12.0						4.85°	12.60		13.04	13.51	14.01	15.14
XM4R-010N16-0.1RX			16.0						3.96°	16.74	17.32	17.94	18.61	20.11	
XM4R-010N20-0.1RX	20.0	3.35°	20.87	21.60	22.37	23.21	25.08								
XM4R-015N4-0.05RX	1.5	0.05	4.0	1.6	1.92	50.0	4.0	4.0	8.12°	4.23	4.42	4.59	4.76	5.14	
XM4R-015N8-0.05RX			8.0						5.6°	8.41	8.71	9.02	9.36	10.11	
XM4R-015N12-0.05RX			12.0						4.27°	12.55	12.99	13.46	13.96	15.09	
XM4R-015N15-0.05RX			15.0						3.62°	15.65	16.20	16.78	17.41	18.82	
XM4R-015N20-0.05RX			20.0						2.89°	20.82	21.55	22.32	23.16	-	
XM4R-015N4-0.1RX			0.1						0.1	4.0	1.6	1.92	60.0	4.0	4.0
XM4R-015N8-0.1RX		8.0		5.62°	8.41	8.71	9.02	9.35		10.10					
XM4R-015N12-0.1RX		12.0		4.28°	12.55	12.98	13.45	13.95		15.07					
XM4R-015N15-0.1RX		15.0		3.63°	15.65	16.19	16.77	17.40		18.80					
XM4R-015N20-0.1RX		20.0		2.9°	20.82	21.54	22.32	23.15		-					
XM4R-020N4-0.05RX		2.0		0.05	4.0	1.6	1.92	50.0		4.0					
XM4R-020N6-0.05RX			6.0		7.28°				6.37		6.63	6.86	7.12	7.69	
XM4R-020N8-0.05RX	8.0		6.23°		8.45				8.76		9.08	9.42	10.18		
XM4R-020N12-0.05RX	12.0		5.45°		10.53				10.90		11.30	11.72	12.67		
XM4R-020N16-0.05RX	16.0		4.84°		12.61				13.04		13.51	14.02	15.15		
XM4R-020N20-0.05RX	20.0		3.95°		16.74				17.32		17.95	18.62	20.12		
XM4R-020N4-0.1RX	0.1		0.1	4.0	1.6	1.92	60.0	4.0	4.0	3.34°	20.88	21.60	22.38	23.22	25.10
XM4R-020N6-0.1RX				6.0						8.8°	4.26	4.47	4.64	4.81	5.19
XM4R-020N8-0.1RX				8.0						7.31°	6.37	6.62	6.86	7.11	7.68
XM4R-020N12-0.1RX				12.0						6.25°	8.45	8.76	9.07	9.41	10.17
XM4R-020N16-0.1RX				16.0						5.46°	10.53	10.90	11.29	11.71	12.65
XM4R-020N20-0.1RX				20.0						4.85°	12.60	13.04	13.51	14.01	15.14
XM4R-020N4-0.2RX	0.2	0.2	4.0	1.6	1.92	50.0	4.0	4.0	3.96°	16.74	17.32	17.94	18.61	20.11	
XM4R-020N6-0.2RX			6.0						3.35°	20.87	21.60	22.37	23.21	25.08	
XM4R-020N8-0.2RX			8.0						8.12°	4.23	4.42	4.59	4.76	5.14	
XM4R-020N12-0.2RX			12.0						5.6°	8.41	8.71	9.02	9.36	10.11	
XM4R-020N16-0.2RX			16.0						4.27°	12.55	12.99	13.46	13.96	15.09	
XM4R-020N20-0.2RX			20.0						3.62°	15.65	16.20	16.78	17.41	18.82	
XM4R-020N25-0.2RX	0.3	0.3	25.0	1.6	1.92	70.0	4.0	4.0	2.89°	20.82	21.55	22.32	23.16	-	
XM4R-020N30-0.2RX			30.0						8.17°	4.23	4.42	4.58	4.75	5.13	
XM4R-020N4-0.3RX	0.3	0.3	4.0	1.6	1.92	50.0	4.0	4.0	5.62°	8.41	8.71	9.02	9.35	10.10	
XM4R-020N8-0.3RX			8.0						4.28°	12.55	12.98	13.45	13.95	15.07	

**NEW**  
Products

New Products

## Series XM4R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCOMMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle													
										0.5°	1°	1.5°	2°	3°									
										XM4R-020N12-0.3RX	2.0	0.3	12.0	1.6	1.92	60.0	4.0	4.0	3.63°	15.65	16.19	16.77	17.40
XM4R-020N16-0.3RX	16.0	2.9°	20.82	21.54	22.32	23.15	-																
XM4R-020N20-0.3RX	20.0	2.44°	20.77	21.49	22.25	23.08	-																
XM4R-020N4-0.5RX	4.0	7.76°	4.19	4.35	4.50	4.65	4.98																
XM4R-020N6-0.5RX	6.0	6.11°	6.28	6.50	6.71	6.95	7.47																
XM4R-020N8-0.5RX	8.0	5.04°	8.36	8.64	8.93	9.25	9.96																
XM4R-020N12-0.5RX	0.5	12.0	50.0	4.0	4.0	3.73°	12.50	12.92	13.36	13.85		14.93											
XM4R-020N16-0.5RX		16.0				2.96°	16.63	17.19	17.80	18.45		-											
XM4R-020N20-0.5RX		20.0				2.46°	20.77	21.47	22.23	23.05		-											
XM4R-020N25-0.5RX		25.0				2.03°	25.94	26.82	27.77	28.79		-											
XM4R-020N30-0.5RX		30.0				1.72°	31.10	32.17	33.31	-		-											
XM4R-025N8-0.1RX		2.50				0.1	8.0	2.0	2.4	50.0		4.0	4.0			3.98°			8.34	8.63	8.94	9.27	10.02
XM4R-025N16-0.1RX	16.0						2.29°				16.62			17.19	17.81	18.47	-						
XM4R-025N20-0.1RX	20.0						1.89°				20.75			21.47	22.24	-	-						
XM4R-025N8-0.2RX	8.0						4.02°				8.34			8.63	8.93	9.26	9.99						
XM4R-025N16-0.2RX	16.0						2.3°				16.61			17.18	17.80	18.46	-						
XM4R-025N20-0.2RX	20.0						1.9°				20.75			21.46	22.23	-	-						
XM4R-025N12-0.3RX	0.3					12.0	50.0			4.0	4.0			2.95°	12.47	12.90	13.35	13.84	-				
XM4R-025N20-0.3RX			20.0	1.91°	20.74	21.46								22.22	-	-							
XM4R-025N12-0.5RX			12.0	2.99°	12.47	12.88								13.33	13.81	-							
XM4R-025N20-0.5RX			20.0	1.92°	20.74	21.44								22.20	-	-							
XM4R-030N8-0.1RX			3.0	0.1	8.0	2.44								2.88	60.0	6.0	4.0	6.32°	8.32	8.61	8.92	9.25	9.99
XM4R-030N16-0.1RX					16.0													3.99°	16.59	17.17	17.78	18.45	19.94
XM4R-030N25-0.1RX	25.0	2.82°			25.90		26.79	27.76	28.80			-											
XM4R-030N30-0.1RX	30.0	2.42°			31.06		32.14	33.30	34.55			-											
XM4R-030N8-0.2RX	8.0	6.36°			8.32		8.60	8.91	9.23			9.97											
XM4R-030N12-0.2RX	12.0	4.92°			12.45		12.88	13.34	13.83			14.94											
XM4R-030N16-0.2RX	0.2	16.0		60.0	6.0		4.0	4°	16.59			17.16	17.77		18.43			19.91					
XM4R-030N20-0.2RX		20.0						3.38°	20.72			21.44	22.21		23.03			24.88					
XM4R-030N25-0.2RX		25.0						2.82°	25.89	26.79	27.75	28.78	-										
XM4R-030N30-0.2RX		30.0						2.43°	31.06	32.14	33.29	34.53	-										
XM4R-030N8-0.3RX		8.0						6.41°	8.32	8.60	8.90	9.22	9.94										
XM4R-030N16-0.3RX		16.0						4.02°	16.59	17.15	17.76	18.42	19.89										
XM4R-030N20-0.3RX	0.3	20.0	70.0	6.0		4.0		3.39°	20.72	21.43	22.20	23.02	24.86										
XM4R-030N25-0.3RX		25.0						2.83°	25.89	26.78	27.74	28.77	-										
XM4R-030N30-0.3RX		30.0						2.43°	31.06	32.13	33.28	34.52	-										
XM4R-030N8-0.5RX		8.0						6.51°	8.31	8.58	8.87	9.19	9.89										
XM4R-030N12-0.5RX		12.0						5°	12.44	12.86	13.31	13.79	14.87										
XM4R-030N16-0.5RX		16.0						4.06°	16.58	17.14	17.74	18.39	19.84										
XM4R-030N20-0.5RX	0.5	20.0	70.0		6.0		4.0	3.42°	20.71	21.42	22.17	22.99	24.81										
XM4R-030N25-0.5RX		25.0						2.85°	25.88	26.77	27.72	28.74	-										
XM4R-030N30-0.5RX		30.0						2.45°	31.05	32.12	33.26	34.49	-										
XM4R-030N35-0.5RX		35.0						2.14°	36.22	37.46	38.80	40.23	-										
XM4R-040N12-0.1RX		4.0						0.1	12.0	3.2	3.86	60.0	6.0	4.0	3.66°	12.44	12.87	13.33	13.83	14.94			
XM4R-040N20-0.1RX									20.0						2.42°	20.71	21.43	22.20	23.03	-			
XM4R-040N30-0.1RX	30.0		1.71°	31.05		32.12			33.28						-	-							
XM4R-040N40-0.1RX	40.0		1.32°	41.38		42.82			-						-	-							
XM4R-040N12-0.2RX	12.0		3.68°	12.44		12.86			13.32						13.81	14.92							
XM4R-040N20-0.2RX	20.0		2.43°	20.71		21.42			22.19						23.01	-							
XM4R-040N30-0.2RX	0.2		30.0	80.0		6.0		4.0	1.71°			31.04			32.12	33.27	-	-					
XM4R-040N40-0.2RX			40.0						1.32°			41.38			42.81	-	-	-					
XM4R-040N12-0.3RX			12.0		3.7°		12.43		12.86			13.31			13.80	14.89							
XM4R-040N20-0.3RX			20.0		2.44°		20.70		21.41			22.18			23.00	-							
XM4R-040N30-0.3RX			30.0		1.72°		31.04		32.11			33.26			-	-							
XM4R-040N40-0.3RX			40.0		1.32°		41.38		42.81			-			-	-							
XM4R-040N12-0.5RX	0.5	12.0	60.0	6.0	4.0		3.75°		12.43	12.84	13.29	13.77	14.84										



New Products

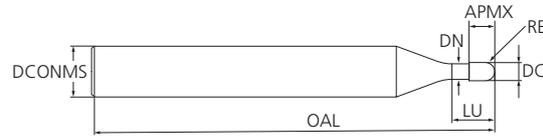
## Series XM4R

Tool No.	DC	RE	LU	APMX	DN	OAL	DCONMS	Neck RE	Interference Angle IA	Effective Under-Neck Length (LU) For Inclined Angle									
										0.5°	1°	1.5°	2°	3°					
XM4R-040N20-0.5RX	4.0	0.5	20.0	3.2	3.86	60.0	6.0	4.0	2.47°	20.70	21.40	22.15	22.97	-					
XM4R-040N30-0.5RX			30.0			80.0			1.73°	31.03	32.10	33.24	-	-					
XM4R-040N40-0.5RX			40.0			80.0			1.33°	41.37	42.79	-	-	-					
XM4R-050N20-0.1RX	5.0	0.1	20.0	4.0	4.85	70.0	6.0	4.0	1.32°	20.70	21.42	-	-	-					
XM4R-050N40-0.1RX			40.0			90.0			0.69°	41.38	-	-	-	-					
XM4R-050N20-0.2RX		0.2	20.0			70.0			1.32°	20.70	21.41	-	-	-					
XM4R-050N40-0.2RX			40.0			90.0			0.69°	41.37	-	-	-	-					
XM4R-050N20-0.3RX		0.3	20.0			70.0			1.33°	20.69	21.41	-	-	-					
XM4R-050N40-0.3RX			40.0			90.0			0.69°	41.37	-	-	-	-					
XM4R-050N20-0.5RX		0.5	20.0			70.0			1.34°	20.69	21.39	-	-	-					
XM4R-050N40-0.5RX			40.0			90.0			0.7°	41.36	-	-	-	-					
XM4R-050N20-1.0RX		1.0	20.0			70.0			1.38°	20.67	21.36	-	-	-					
XM4R-050N40-1.0RX			40.0			90.0			0.71°	41.34	-	-	-	-					
XM4R-060N30-0.2RX		6.0	0.2			30.0			4.8	5.85	80.0	6.0	4.0	-	-	-	-	-	-
XM4R-060N54-0.2RX						54.0					100.0			-	-	-	-	-	
XM4R-060N72-0.2RX						72.0					120.0			-	-	-	-	-	
XM4R-060N30-0.3RX			0.3			30.0					80.0			-	-	-	-	-	
XM4R-060N54-0.3RX	54.0			100.0	-	-	-	-			-								
XM4R-060N72-0.3RX	72.0			120.0	-	-	-	-			-								
XM4R-060N30-0.5RX	0.5		30.0	80.0	-	-	-	-			-								
XM4R-060N54-0.5RX			54.0	100.0	-	-	-	-			-								
XM4R-060N72-0.5RX			72.0	120.0	-	-	-	-			-								
XM4R-060N30-1.0RX	1.0		30.0	80.0	-	-	-	-			-								
XM4R-060N54-1.0RX			54.0	100.0	-	-	-	-			-								
XM4R-060N72-1.0RX			72.0	120.0	-	-	-	-			-								
XM4R-060N72-1.0RX			72.0	120.0	-	-	-	-			-								



New Products

## TuffCut<sup>®</sup> XM Series XM2BH

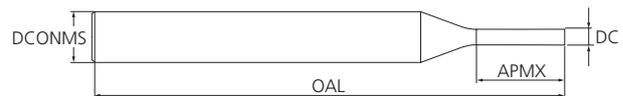


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	NOF
XM2BH-01061X	1.0	6.0	0.95	50.0	1.0	2.5	0.5	2
XM2BH-02061X	2.0		1.95		2.0	5.0	1.0	2
XM2BH-03061X	3.0		2.9		3.0	7.5	1.5	2
XM2BH-04061X	4.0		3.9		4.0	10.0	2.0	2
XM2BH-05061X	5.0		4.9		5.0	12.5	2.5	2
XM2BH-06061X	6.0		5.9		6.0	15.0	3.0	2

**NEW**  
Products

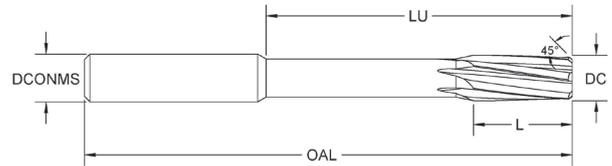
New Products

## TuffCut<sup>®</sup> XM Series XM4SH



Tool Number	DC	DCONMS	OAL	APMX	NOF
XM4SH-01061X	1.0	6.0	60.0	3.5	4
XM4SH-02061X	2.0			7.0	4
XM4SH-025061X	2.5			8.0	4
XM4SH-03061X	3.0			10.0	4
XM4SH-04061X	4.0			12.0	4
XM4SH-05061X	5.0			15.0	4

# TrueSize® NC Machine Reamer Series 275



Metric (mm) Sizes	
DC	Tolerance
1.00 - 12.00	DIN 1420 H7
DCONMS	Tolerance (h6)
0.00 - 3.00	+0/-0.006
3.01 - 6.00	+0/-0.008
6.01 - 10.00	+0/-0.009
10.01 - 14.00	+0/-0.011

DIN1420 H7	
DC	Tolerance
≤ 3mm	+0.0041/+0.0078
> 3mm - 6mm	+0.0051/+0.0100
> 6mm - 10mm	+0.0061/+0.0120
> 10mm - 12mm	+0.0078/+0.0150

Lead Chamfer Width (45° ± 1°)	
DC	Width
0.00 - 2.45	21% - 23% of DC
2.46 - 3.45	0.38 - 23% of DC
3.46 - 9.52	0.5 - 1.02
9.53 - 12.00	0.76 - 1.27

Tool No.	EDP	DC	DCONMS	OAL	L	LU	NOF
		mm					
275M0100	27530	1.0	3.0	50.0	6.0	22.0	4
275M0150	27531	1.5	3.0	50.0	9.0	22.0	4
275M0200	27535	2.0	3.0	50.0	12.0	22.0	4
275M0250	27538	2.5	3.0	50.0	12.0	22.0	4
275M0300	27539	3.0	4.0	66.0	12.0	38.0	4
275M0350	27546	3.5	4.0	66.0	12.0	38.0	4
275M0400	27548	4.0	6.0	76.0	12.0	40.0	4
275M0450	27549	4.5	6.0	76.0	12.0	40.0	4
275M0500	27554	5.0	6.0	76.0	12.0	40.0	4
275M0550	27555	5.5	6.0	76.0	12.0	40.0	4
275M0600	27557	6.0	8.0	101.0	12.0	65.0	4
275M0650	27562	6.5	8.0	101.0	16.0	65.0	6
275M0700	27563	7.0	8.0	101.0	16.0	65.0	6
275M0750	27566	7.5	8.0	101.0	16.0	65.0	6
275M0800	27568	8.0	10.0	103.0	16.0	63.0	6
275M0850	27569	8.5	10.0	103.0	19.0	63.0	6
275M0900	27570	9.0	10.0	103.0	19.0	63.0	6
275M0950	27571	9.5	10.0	103.0	19.0	63.0	6
275M1000	27575	10.0	12.0	120.0	19.0	75.0	6
275M1050	27576	10.5	12.0	120.0	19.0	75.0	6
275M1100	27577	11.0	12.0	120.0	19.0	75.0	6
275M1150	27579	11.5	12.0	120.0	19.0	75.0	6
275M1200	27581	12.0	14.0	125.0	19.0	80.0	6

**NEW**  
Products

New Products

# TrueSize® NC Machine Reamer Series 275 - Metric

Recommended Cutting Data | Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane Parametry

Workpiece Material Group	I S O	Vc - M/Min Low - High	Drill Diameter (mm)					
			1.0 - 1.5	1.6 - 3.0	3.1 - 5.0	5.1 - 7.0	7.1 - 9.5	9.6 - 12.0
			Feed (mm/rev)					
Low Carbon Steels	P	30 - 45	0.08 - 0.200	0.20 - 0.35	0.20 - 0.40	0.25 - 0.55	0.40 - 0.70	0.40 - 0.75
Medium Carbon Steels		25 - 35	0.08 - 0.200	0.20 - 0.35	0.20 - 0.40	0.25 - 0.55	0.40 - 0.70	0.40 - 0.75
Alloy Steels		20 - 35	0.08 - 0.200	0.20 - 0.35	0.20 - 0.40	0.25 - 0.55	0.40 - 0.70	0.40 - 0.75
Die / Tool Steels		15 - 25	0.08 - 0.200	0.20 - 0.35	0.20 - 0.40	0.25 - 0.55	0.40 - 0.70	0.40 - 0.75
Free Machining Stainless Steels	M	20 - 30	0.08 - 0.200	0.20 - 0.35	0.20 - 0.40	0.28 - 0.53	0.40 - 0.70	0.40 - 0.75
Austenitic Stainless Steels		10 - 20	0.03 - 0.12	0.15 - 0.30	0.20 - 0.30	0.20 - 0.40	0.30 - 0.50	0.30 - 0.60
Difficult Stainless Steels		5 - 15	0.03 - 0.12	0.15 - 0.30	0.20 - 0.30	0.20 - 0.40	0.30 - 0.50	0.30 - 0.60
PH Stainless Steels		10 - 20	0.03 - 0.12	0.15 - 0.30	0.20 - 0.30	0.20 - 0.40	0.30 - 0.50	0.30 - 0.60
High Temp Alloys	S	5 - 15	0.02 - 0.07	0.10 - 0.20	0.15 - 0.30	0.20 - 0.30	0.20 - 0.40	0.25 - 0.45
Titanium Alloys		10 - 20	0.03 - 0.13	0.15 - 0.30	0.20 - 0.30	0.20 - 0.40	0.30 - 0.50	0.30 - 0.60
Gray Cast Irons	K	25 - 35	0.12 - 0.30	0.25 - 0.45	0.35 - 0.65	0.40 - 0.78	0.50 - 0.85	0.60 - 1.00
Ductile Cast Irons		20 - 35	0.12 - 0.30	0.25 - 0.45	0.35 - 0.65	0.40 - 0.78	0.50 - 0.85	0.60 - 1.00
Malleable Cast Irons		20 - 30	0.12 - 0.30	0.25 - 0.45	0.35 - 0.65	0.40 - 0.78	0.50 - 0.85	0.60 - 1.00
Aluminium - ≤ 10% Si	N	75 - 105	0.12 - 0.30	0.25 - 0.45	0.35 - 0.65	0.40 - 0.78	0.50 - 0.85	0.60 - 1.00
Aluminium - > 10% Si		60 - 90	0.12 - 0.30	0.25 - 0.45	0.35 - 0.65	0.40 - 0.78	0.50 - 0.85	0.60 - 1.00
Copper / Brass		55 - 75	0.12 - 0.30	0.25 - 0.45	0.35 - 0.65	0.40 - 0.78	0.50 - 0.85	0.60 - 1.00
Hardened Steels 45-50 HRC	H	10 - 20	0.08 - 0.20	0.20 - 0.33	0.20 - 0.40	0.28 - 0.53	0.40 - 0.70	0.40 - 0.78
Hardened Steels 50-55 HRC		10 - 15	0.03 - 0.12	0.15 - 0.30	0.20 - 0.30	0.20 - 0.40	0.30 - 0.50	0.30 - 0.60

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Stock Allowance for NC Machine Reamers - Metric	
Reamer Diameter (mm)	Total Allowance
1.0 - 1.5	0.08 - 0.15
1.5 - 3.0	0.13 - 0.23
3.0 - 6.0	0.18 - 0.30
6.0 - 12.0	0.25 - 0.38

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

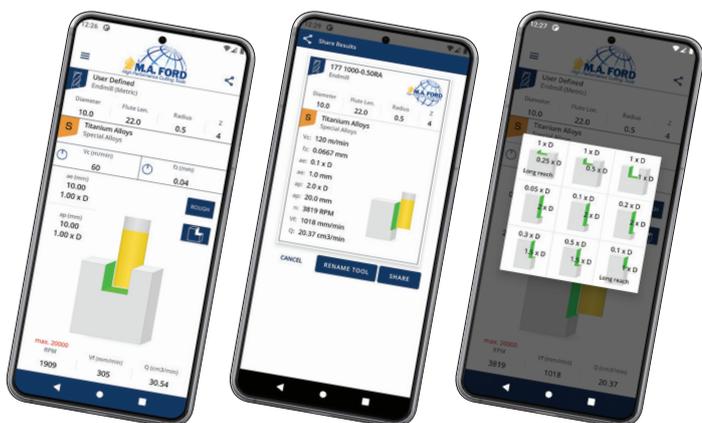
# The M.A. Ford interactive cutting data app

- Everything you need at your fingertips

Our interactive app for iOS and Android devices makes tool cutting data calculations simpler and faster by minimising text input and using 3D graphics that respond instantly to changing cutting parameters, using smart-phone or tablet touch screens.

Developed around our proven cutting data, the app supports a wide range of ISO materials including steel, aluminium alloys, stainless steel and titanium, as well as cast iron, hardened steels and exotic alloys.

Once basic information has been selected from 'drop down' menus, such as tool type, diameter and material, the app allows you to 'drag' the tool graphic display to change the radial engagement and depth of cut, which instantly calculates speeds and feeds.



Colour coded feedback guides you toward the recommended cutting conditions based on the chosen input parameters. User over-ride controls allow cutting data to be fine-tuned for individual applications, as well as enabling calculations to be made that compare multiple scenarios instantly.

Proven cutting data can be stored via the 'Save' feature for future reference or shared with other app users. A hyperlink to M.A. Ford Europe's website also allows immediate access to online information and downloads.

Radial chip thinning data is also calculated for use with high-speed machining (HSM) strategies, which can significantly reduce cycle times and improve tool life.



For further information please contact our support team on: 01332 267960



## TuffCut® XR - XT Carbide End Mills

· Fraises carbure en bout · Hartmetall-Schaftfräser · Frese in Metallo Duro Integrale · Frezy palcowe pełnowęglkowe

Series	Tool Illustration	Z	Length	Ø Range (mm)	Corner Prep	Application Area	Matrial Group	Page
3MVS		3		0.5 - 3.0	0 - 0.5			15
3MVR		3		0.5 - 3.0	0 - 0.2			16
158		4		2.0 - 16.0	0.1 - 3.00mm Radius			17
177		4		1.5 - 3.0	Sharp Corner			20
177-W		4		6.0 - 20.0	Sharp Corner			20
177R		4		3.0 - 25.0	0.25 - 6.0mm Radius			21
177RW		4		12.0 - 20.0	0.5 - 1.0mm Radius			22
177S		4		3.0 - 20.0	0.2 - 1.0mm Radius			22
177LR N5		4		6.0 - 20.0	0.3 - 3.0mm Radius			23
277N		4		3.0 - 20.0	Sharp Corner			24
277N-W		4		8.0 - 16.0	Sharp Corner			24
277NR		4		3.0 - 20.0	0.25 - 6.0mm Radius			25
277NR-W		4		8.0 - 20.0	0.5 - 6.0mm Radius			26
178		5		3.0 - 25.0	Sharp Corner			27
178-W		5		6.0 - 20.0	Sharp Corner			28
178R		5		6.0 - 25.0	0.5 - 1.0mm Radius			28
178-1		5		3.0 - 20.0	Sharp Corner			29
178-1W		5		6.0 - 20.0	Sharp Corner			29
278R N3		5		3.0 - 25.0	0.5 - 4.0mm Radius			30
278R N3-W		5		10.0 - 16.0	0.5 - 4.0mm Radius			31
278CBR N3		5		10.0 - 16.0	1.0mm Radius			32
278CBR N3-W		5		10.0 - 16.0	1.0mm Radius			32
278R N4		5		12.0 - 25.0	0.5 - 3.0mm Radius			33
278R N5		5		16.0 - 25.0	1.0 - 3.0mm Radius			33



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**TuffCut® XR - XT Carbide End Mills**

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



Series	Tool Illustration	Z	Length	Ø Range (mm)	Corner Prep	Application Area	Matrial Group	Page
278R N5CT		5		12.0	0.5 - 4.0mm Radius			34
V5LCB		5		6.0 - 16.0	0.5mm Radius	VSLCB 3xD Cutting Length  VSLCB 4xD Cutting Length		35
113A		6		3.0 - 20.0	Sharp Corner			37
180		7		6.0 - 10.0	Sharp Corner			38
180R		7		6.0 - 20.0	0.5 - 4.0mm Radius			38
180CBR		7		10.0 - 16.0	1.0mm Radius			39
180 CBR-W		7		10.0 - 16.0	1.0mm Radius			39
180R N5		7		12.0 - 20.0	1.0 - 4.0mm Radius			40
380		9		8.0 - 20.0	0.50 - 1.00mm Radius			41
380-W		9		10.0 - 20.0	0.50 - 1.00mm Radius			41
380CB 380CB-W		9		8.0 - 20.0	0.50 - 1.00mm Radius			42
380 N4/N5 380 N4/N5 -W		9		12.0 - 16.0	1.0mm Radius			43
380CB N4/N5 380CB N4/ N5 -W		9		12.0 - 16.0	1.0mm Radius			44
380L		9		12.0 - 16.0	1.0mm Radius			45
380CBL		9		12.0 - 16.0	1.0mm Radius			45
250		2		1.0 - 16.0	0.5 - 8.0mm Radius			46
179		4		1.5 - 16.0	N/A			47
179L N5		4		3.0 - 16.0	N/A			47
279		4		3.0 - 16.0	N/A			48
MFPB		Multi		6.0 - 20.0	N/A			49
MFTB		Multi		R2 - R8	N/A			49
MFNB		Multi		4.0 - 16.0	N/A			50

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## TuffCut® X-AL Carbide End Mills

Fraises carbure en bout · Hartmetall-Schaftfräser · Frese in Metallo Duro Integrale · Frezy palcowe pełnowęglkowe

Series	Tool Illustration	Z	Length	Ø Range (mm)	Corner Prep	Application Area	Material Group	Page
135		2		3.0 - 25.0	0.2 - 0.75mm Radius			53
135 N		2		3.0 - 25.0	0.2 - 0.75mm Radius			54
135 N3		2		3.0 - 25.0	0 - 5.0mm Radius			55
135 N5		2		3.0 - 25.0	0 - 5.0mm Radius			57
137V N3		3		3.0 - 20.0	0 - 6.0mm Radius			59
137V N3 AL		3		3.0 - 20.0	0 - 6.0mm Radius			59
137V N4		3		3.0 - 20.0	0 - 4.0mm Radius			61
137V N4 AL		3		3.0 - 20.0	0 - 4.0mm Radius			61
137V N5		3		3.0 - 20.0	0 - 4.0mm Radius			63
137V N5 AL		3		3.0 - 20.0	0 - 4.0mm Radius			63
137VR N3		3		12.0 - 20.0	1.0mm Radius			65
137VR N5		3		12.0 - 20.0	1.0mm Radius			65
137V5		5		10.0 - 20.0	1.0 - 3.0mm Radius			66
137VF		3		3.0 - 20.0	0 - 2.0mm Radius			67
135B N3		2		3.0 - 16.0	N/A			69
135B N5		2		2.0 - 16.0	N/A			69
138B		3		3.0 - 16.0	N/A			70
138B N5		3		2.0 - 16.0	N/A			70
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**Carbide End Mills**

Fraises carbure en bout · Hartmetall-Schaftfräser · Frese in Metallo Duro Integrale · Frezy palcowe pełnowęglkowe



Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
164		2		0.20 - 20.0			93
164A		2		3.0 - 20.0			93
169		3		1.0 - 20.0			93
169A		3		3.0 - 20.0			93
163		4		1.0 - 20.0			93
163A		4		1.5 - 20.0			93
192		3-4		8.0 - 20.0			94
121		2		0.2 - 25.0			94
121A		2		0.5 - 25.0			94
116		3		1.0 - 25.0			94
116A		3		1.0 - 25.0			94
111		4		0.2 - 25.0			94
111A		4		1.0 - 25.0			94
MV4		4		6.0 - 20.0 R0.25 - R6.0			96
ASV4ACM		4		3.0 - 20.0			99
ASV 4ACM-R		4		3.0 - 20.0			100
VMH		4		3.0 - 20.0			101
VMH-W		4		3.0 - 20.0			102
V4L		4		6.0 - 20.0			102
V4LB Coated		4		6.0 - 20.0			102
165		4		1.0 - 20.0			103
150		2		0.4 - 25.0			104
150A		2		1.0 - 25.0			104

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## Carbide End Mills

Fraises carbure en bout · Hartmetall-Schaftfräser · Frese in Metallo Duro Integrale · Frezy palcowe pełnowęglkowe

Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
140		4		1.0 - 25.0			104
140A		4		1.0 - 25.0			104
ASV4ACB		4		3.0 - 20.0			105
V4LB		4		6.0 - 20.0			105
V4LB-B Coated		4		6.0 - 20.0			105
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## Carbide End Mills For Aluminium

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

Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
GT2		2		1.0 - 20.0			106
GT3		3		3.0 - 20.0			106
ASVSM		3		3.0 - 20.0			106
134		3		6.0 - 25.0			107
GT2B		2		3.0 - 20.0			107
GT3B		3		3.0 - 20.0			107
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## 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	0.1 - 3.0	-	-		117
305AM		Various	0.3 - 3.0	-	ALtima® Micro		119
MPDCS		2 x D	1.0 - 2.95		ALtima®		120
MXDSR		5 x D	0.5 - 2.95	-	ALtima®		121
MXDCR		5 x D	1.0 - 2.95		ALtima®		122
200S		Spot Drill	3.0 - 16.0	-	ALtima®		123
CXDSS		3 x D	3.0 - 20.0	-	ALtima® Plus		123
CXDCS		3 x D	3.0 - 16.0		ALtima® Plus		123
CXDSR		5 x D	3.0 - 16.0	-	ALtima® Plus		127
CXDCR		5 x D	3.0 - 20.0		ALtima® Plus		127
XDSRM		5 x D	0.5 - 16.0	-	ALtima®		130
XDCRM		5 x D	3.0 - 20.0		ALtima®		130
XDCLM		7+ x D	3.0 - 12.0		ALtima®		133
XDSSM		3 x D	2.5 - 20.0	-	ALtima®		136
XDCSM		3 x D	3.0 - 16.0		ALtima®		136
CXDCLM		8 x D	3.0 - 16.0		ALtima® Plus		139
CXDCEM		15 x D	3.0 - 12.0		ALtima® Plus		143
MDCLM		10 x D	2.0 - 2.95		ALtima®		144
MXDCL		12 x D	1.0 - 2.95		ALtima®		145
XDCEM		12+ x D	4.0 - 12.7		ALtima®		146
CDACRM		5 x D	3.0 - 12.5		-		147
<b>Technical Information</b>   Informations Techniques   Technische Daten   Informazioni Tecniche   Informacje Techniczne							150-161

## General Purpose Drills

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

Series	Tool Illustration	Drilling Depth	Ø Range (mm)	Internal Coolant	Coating	Material Group	Page
302		Various	0.1 - 3.15	-	-		163
200		3 x D	0.8 - 20.0	-	-		164
207		5 x D	2.4 - 12.0	-	-		166
205		5 x D	0.3 - 20.0	-	-		167
300		5 x D	0.5 - 3.15	-	-		169
HPDSS		3 x D	3.0 - 16.0	-	ALtima®		170
HPDCS		3 x D	3.0 - 16.0		ALtima®		170
HPDSR		5 x D	3.0 - 16.0	-	ALtima®		173
HPDCR		5 x D	3.0 - 16.0		ALtima®		173
229		4-5 x D	2.0 - 16.0	-	-		176
224		5 x D	0.3 - 20.0	-	-		177
402		Centre Drill	0.5 - 5.0	-	-		179
404		Spot Drill 90°	5.0 - 12.0	-	-		180
403		Spot Drill 120°	5.0 - 12.0	-	-		181
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## Reamers

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 - 16.0	-	H7		188
<b>Technical Information</b>   Informations Techniques   Technische Daten   Informazioni Tecniche   Informacje Techniczne								197-198

## Chamfer and Profile Mills

Fraises à Chanfreiner et à Profiler | Fasen- und Profilfräser | Frese per Smussi e Profili | Frezy do Fazowania i Profilowania



Series	Tool Illustration	Z	Length	Ø Range (mm)	Application Area	Material Group	Page
5HC 90		5		6.0 - 16.0	Chamfer		201
5HC 60		5		6.0 - 16.0	Chamfer		201
VCM60		4, 6		4.0 -16.0	Chamfer		202
VCM60A		4, 6		4.0 -16.0	Chamfer		202
VCM90		4, 6		4.0 -16.0	Chamfer		202
VCM90A		4, 6		4.0 -16.0	Chamfer		202
ACR		4		3.0 - 16.0 R0.25 - R6.0	Corner Rounding		202
FBCM		Multi		4.0 - 12.0	Chamfer		203
FBPM		2		4.0 - 12.0	Profile Mill		204
<b>Technical Information</b>   Informations Techniques   Technische Daten   Informazioni Tecniche   Informacje Techniczne							205-207



End Mill	Previous Designation		New Designation (ISO 13399)	
Square & Corner Radius				
	Parameter	Definition	Parameter	Definition
	D1	Diameter	DC	Cutting Diameter
	D2	Shank Diameter	DCONMS	Connection Diameter Machine Side
	D3	Neck Diameter	DN	Neck Diameter
	L1	Overall Length	OAL	Overall Length
	L2	Flute Length	APMX	Depth of Cut Maximum
	L3	Neck Length	LU	Usable Length
	R	Corner Radius	RE	Corner Radius
	No. of Flutes	NOF	Flute Count	



Quick Find Contents

End Mill	Previous Designation		New Designation (ISO 13399)	
Ball Nose				
	Parameter	Definition	Parameter	Definition
	D1	Diameter	DC	Cutting diameter
	D2	Shank diameter	DCONMS	Connection diameter machine side
	D3	Neck diameter	DN	Neck diameter
	L1	Overall length	OAL	Overall length
	L2	Flute length	APMX	Depth of cut maximum
	L3	Neck length	LU	Usable length
	R	Ball radius	RE	Ball radius
	No. of Flutes	NOF	Flute count	

Hole Making	Previous Designation	New Designation (ISO 13399)		
<b>Drill</b>				
	<b>Parameter</b>	<b>Definition</b>	<b>Parameter</b>	<b>Definition</b>
	D1	Diameter	DC	Cutting Diameter
	D2	Shank Diameter	DCONMS	Connection Diameter Machine Side
	L1	Overall Length	OAL	Overall Length
	L2	Flute Length	LCF	Length Chip Flute
	L3	Drill Length	LU	Usable Length
			$LU = LCF - (1.5 \times DC)$	

End Mill	Previous Designation	New Designation (ISO 13399)		
<b>Chamfer Mill</b>				
	<b>Parameter</b>	<b>Definition</b>	<b>Parameter</b>	<b>Definition</b>
	D3	Tip diameter	DC	Cutting diameter
	D2	Shank diameter	DCONMS	Connection diameter machine side
	L1	Overall length	OAL	Overall length
	L2	Flute length	APMX	Depth of cut maximum
	L3	Theoretical tip length	LTHEO	Theoretical length
	A	Included angle	SIG	Point angle
	No. of Flutes	NOF	Flute count	


**Tool Material**

Matière de l'outil  
Werkzeugmaterial  
Materiale Tagliente  
Materiał 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  
Zentrumschnitt  
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  
Nutfräsen  
Scanalatura  
Dłutowanie


**3D Scanning**

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


**Shank**

Tiges  
Schaft  
Gambo  
Chwył


**Neck Relief**

Encolure  
Abgesetzter Schaft  
Collo Scaricato  
Zwolnienie szyjki


**Material Hardness**

Dureté du matériau  
Materialhärte  
Durezza del materiale  
Twardość materiału


**Coating**

Revêtement  
Beschichtung  
Rivestimento  
Powłoka


**Uncoated or Coated**

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


**Uncoated**

Sans revêtement  
Unbeschichtet  
Non rivestito  
Niepowlekane


**Solid**

Solide  
Fest  
Solido  
Lity


**Coolant Feed**

Liquide de refroidissement  
Kühlmittelzufuhr  
Con fori di lubrificazione  
Chłodziwo


**Drill Point Angle**

Foret à angle de pointe  
Spitzenwinkel der Bohrspitze  
Angolo al vertice della punta  
Kąt wiercenia


**DIN Specs**

Normes DIN  
DIN-Normen  
Norme DIN  
Specyfikacje DIN


**Lead Chamfer**

Chanfrein de bec  
Einführschräge  
Smusso d'imbocco  
Główna faza


**Right Hand Cutting**

Coupe à droite  
Rechts schneidend  
Taglio destro  
Prawostronnie cięcie


**Included Angles**

Angle inclus  
Eingeschlüssener Winkel  
Angoli inclusi  
Kąt zawarty


**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



### 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  
Założ okulary ochronne



### Wear Ear Defenders

Portez des protège-oreilles  
Gehörschutz tragen  
Usare le protezioni auricolari  
Założ ochroniacze słuchu



### Wear Protective Mask

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



### Wear Protective Gloves

Portez des gants de protection  
Schutzhandschuhe tragen  
Indossare I guanti di protezione  
Założ ochronne rękawice



Wiper Flat

### Wiper Flat

Essuie-glace Plat  
Wischer Flach  
Wiper Flat  
Wycieraczka Płaska



### Read Instructions

Lisez les instructions  
Die Anleitung beachten  
Leggere le istruzioni  
Przeczytaj instrukcje



P01

### Technical Information

Informations techniques  
Technische Daten  
Informazioni tecniche  
Informacje techniczne



### Corner Radius

Rayon d'angle  
Eckenradius  
Spigolo Raggiato  
Promień naroża



### Ballnose

Nez boule  
Kugelnase  
Naso a palla  
Nos kulisty



Chipbreaker

### Chipbreaker

Brise-copeaux  
Spanbrecher  
Rompitruciolo  
Łamacz wiórów



### Thread Forms

Formes de fil  
Faden bildet  
Forme di filo  
Formy wątków



### Cam Radius

Rayon de came  
Nockenradius  
Raggio di camma  
Promień krzywki



### Depth of Cut

Profondeur de coupe  
Schnitttiefe  
Profondità di taglio  
Głębokość cięcia



### Tolerance Range

Plage de tolérance  
Toleranzbereich  
Intervallo di tolleranza  
Zakres tolerancji



### Profiling

Profilage  
Profilierung  
Profilazione  
Profilowanie



### X Shape

Forme en X  
X-Form  
Forma a X  
X kształt





## 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

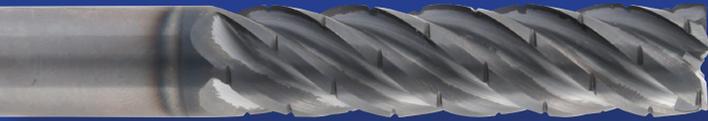
Aciers inoxydables  
Rostfreier Stahl  
Acciai inossidabili  
Stale nierdzewne



### 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)

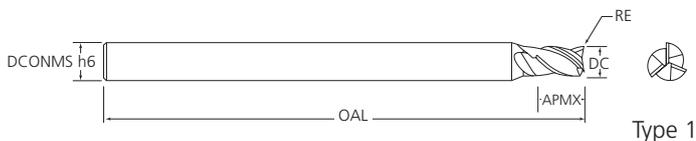
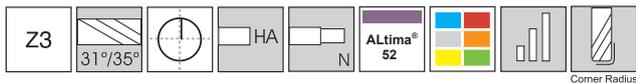
Le frese TuffCut® XR e XT sono il fulcro del nostro programma di utensili ad alte prestazioni APG e permettono di ottenere risultati eccezionali per massimizzare la produttività, ridurre al minimo il tempo di inattività dei processi e ottimizzare i costi su materiali quali acciai inossidabili, leghe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

(PL)

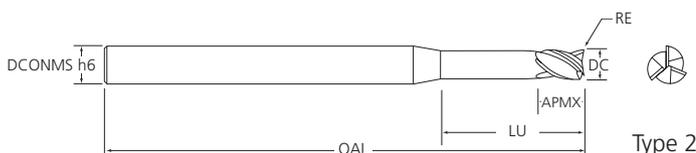
Frezy TuffCut® XR i XT stanowią kluczową część naszego wysokowydajnego asortymentu APG i zapewniają znakomite rezultaty. Gwarantujemy zwiększenie wydajności, obniżenie czasu obróbki i optymalizacji kosztów w takich materiałach jak stal nierdzewna, stopy wysokotemperaturowe i stal hartowana.

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<b>TuffCut® XT</b> Series 277R N3	25-26
<b>TuffCut® XT</b> Series 277R N3-W	26-27
<b>TuffCut® XR</b> Series 178, 178-W	27-28
<b>TuffCut® XR</b> Series 178R, 178-1, 178-1W	28-29
<b>TuffCut® XT</b> Series 278R N3, 278R N3-W	30-31
<b>TuffCut® XT</b> Series 278CBR N3, 278CBR N3-W	32
<b>TuffCut® XT</b> Series 278R N4, 278R N5	33
<b>TuffCut® XT</b> Series 278R N5CT	34
<b>TuffCut® XT</b> Series V5LCB-CT & V5LCB-W-CT with Central Coolant	35
<b>TuffCut® XT</b> Series V5LCB, V5LCB-W	36
<b>TuffCut® XR</b> Series 113A	37
<b>TuffCut® XR7</b> Series 180, 180R, 180CBR, 180CBR-W, 180N5	38-40
<b>TuffCut® XT9</b> Series 380, 380-W	41
<b>TuffCut® XR-XT</b> Series 380CB, 380CB-W	42
<b>TuffCut® XR-XT</b> Series 380 N4 & N5, 380 N4-W & N5-W	43
<b>TuffCut® XR-XT</b> Series 380CB N4 & N5, 380CB N4-W & N5-W	44
<b>TuffCut® XR-XT</b> Series 380L, 380CB L	45
<b>TuffCut® 3D</b> Series 250	46
<b>TuffCut® XR</b> Series 179, 179L N5	47
<b>TuffCut® XT</b> Series 279	48
<b>TuffCut® XT</b> Series MFPB, MFTB, MFNB	49-50
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**TuffCut® Series 3MVS**


Type 1



Type 2

Tool No.	DC	DCONMS	OAL	APMX	LU	RE	Type
3MVSM0050AH	0.5	4.0	50.0	0.75	-	-	1
3MVSM0050R.10AH	0.5	4.0	50.0	0.75	-	0.1	1
3MVSM0050R.10N5AH	0.5	4.0	50.0	0.75	2.5	0.1	2
3MVSM0050R.10N8AH	0.5	4.0	50.0	0.75	4.0	0.1	2
3MVSM0100AH	1.0	4.0	50.0	1.5	-	-	1
3MVSM0100N5AH	1.0	4.0	50.0	1.5	5.0	-	2
3MVSM0100N8AH	1.0	4.0	50.0	1.5	8.0	-	2
3MVSM0100R.10AH	1.0	4.0	50.0	1.5	-	0.1	1
3MVSM0100R.10N5AH	1.0	4.0	50.0	1.5	5.0	0.1	2
3MVSM0100R.10N8AH	1.0	4.0	50.0	1.5	8.0	0.1	2
3MVSM0150AH	1.5	4.0	50.0	2.25	-	-	1
3MVSM0150R.20AH	1.5	4.0	50.0	2.25	-	0.2	1
3MVSM0150R.20N5AH	1.5	4.0	50.0	2.25	7.5	0.2	2
3MVSM0150R.20N8AH	1.5	4.0	50.0	2.25	12	0.2	2
3MVSM0150R.50AH	1.5	4.0	50.0	2.25	-	0.5	1
3MVSM0150R.50N6AH	1.5	4.0	50.0	2.25	10.0	0.5	2
3MVSM0150R.50N8AH	1.5	4.0	50.0	2.25	12.0	0.5	2
3MVSM0200AH	2.0	4.0	50.0	3.0	-	-	1
3MVSM0200N5AH	2.0	4.0	50.0	3.0	10.0	-	2
3MVSM0200N8AH	2.0	4.0	50.0	3.0	16.0	-	2
3MVSM0200R.20AH	2.0	4.0	50.0	3.0	-	0.2	1
3MVSM0200R.20N5AH	2.0	4.0	50.0	3.0	10.0	0.2	2
3MVSM0200R.20N8AH	2.0	4.0	50.0	3.0	16.0	0.2	2
3MVSM0250AH	2.5	4.0	50.0	3.75	-	-	1
3MVSM0300AH	3.0	4.0	50.0	4.5	-	-	1
3MVSM0300N5AH	3.0	4.0	50.0	4.5	15.0	-	2
3MVSM0300N8AH	3.0	4.0	50.0	4.5	24.0	-	2
3MVSM0300R.20AH	3.0	4.0	50.0	4.5	-	0.2	1
3MVSM0300R.20N5AH	3.0	4.0	50.0	4.5	15.0	0.2	2
3MVSM0300R.20N8AH	3.0	4.0	50.0	4.5	24.0	0.2	2



# TuffCut® Series 3MVR



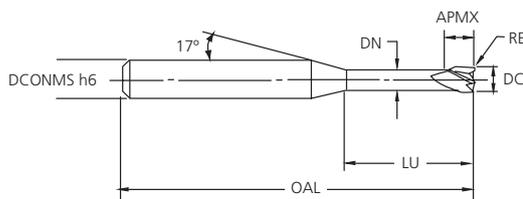
Tool No.	DC	DCONMS	OAL	APMX	RE
3MVRM0050AH	0.5	4.0	50.0	1.5	-
3MVRM0050R.10AH	0.5	4.0	50.0	1.5	0.1
3MVRM0100AH	1.0	4.0	50.0	3.0	-
3MVRM0100R.10AH	1.0	4.0	50.0	3.0	0.1
3MVRM0100R.20AH	1.0	4.0	50.0	3.0	0.2
3MVRM0150AH	1.5	4.0	50.0	4.5	-
3MVRM0150R.20AH	1.5	4.0	50.0	4.5	0.2
3MVRM0200AH	2.0	4.0	50.0	6.0	-
3MVRM0200R.20AH	2.0	4.0	50.0	6.0	0.2
3MVRM0250AH	2.5	4.0	50.0	7.5	-
3MVRM0300AH	3.0	4.0	50.0	9.0	-
3MVRM0300R.20AH	3.0	4.0	50.0	9.0	0.2



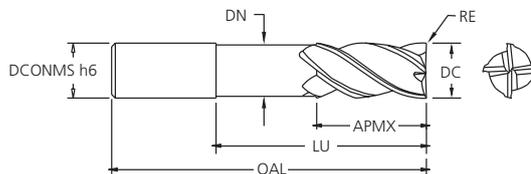
# TuffCut® Series 158 Corner Radius



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



Type 1



Type 2

 End Mills  
 Series 158 Corner Radius

Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Type
158 02N06-0.1RA	2.0	6.0	1.9	63.0	3.0	6.0	0.1	1
158 02N08-0.1RA	2.0	6.0	1.9	63.0	3.0	8.0	0.1	1
158 02N12-0.1RA	2.0	6.0	1.9	63.0	3.0	12.0	0.1	1
158 02N16-0.1RA	2.0	6.0	1.9	63.0	3.0	16.0	0.1	1
158 02N20-0.1RA	2.0	6.0	1.9	75.0	3.0	20.0	0.1	1
158 02N06-0.2RA	2.0	6.0	1.9	63.0	3.0	6.0	0.2	1
158 02N08-0.2RA	2.0	6.0	1.9	63.0	3.0	8.0	0.2	1
158 02N12-0.2RA	2.0	6.0	1.9	63.0	3.0	12.0	0.2	1
158 02N16-0.2RA	2.0	6.0	1.9	63.0	3.0	16.0	0.2	1
158 02N20-0.2RA	2.0	6.0	1.9	75.0	3.0	20.0	0.2	1
158 03N10-0.2RA	3.0	6.0	2.9	63.0	5.0	10.0	0.2	1
158 03N12-0.2RA	3.0	6.0	2.9	63.0	5.0	12.0	0.2	1
158 03N16-0.2RA	3.0	6.0	2.9	63.0	5.0	16.0	0.2	1
158 03N20-0.2RA	3.0	6.0	2.9	75.0	5.0	20.0	0.2	1
158 03N25-0.2RA	3.0	6.0	2.9	75.0	5.0	25.0	0.2	1
158 03N30-0.2RA	3.0	6.0	2.9	75.0	5.0	30.0	0.2	1
158 03N10-0.5RA	3.0	6.0	2.9	63.0	5.0	10.0	0.5	1
158 03N12-0.5RA	3.0	6.0	2.9	63.0	5.0	12.0	0.5	1
158 03N16-0.5RA	3.0	6.0	2.9	63.0	5.0	16.0	0.5	1
158 03N20-0.5RA	3.0	6.0	2.9	75.0	5.0	20.0	0.5	1
158 03N25-0.5RA	3.0	6.0	2.9	75.0	5.0	25.0	0.5	1
158 03N30-0.5RA	3.0	6.0	2.9	75.0	5.0	30.0	0.5	1

## TuffCut® Series 158 Corner Radius

Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Type
158 04N10-0.2RA	4.0	6.0	3.9	63.0	6.0	10.0	0.2	1
158 04N12-0.2RA	4.0	6.0	3.9	63.0	6.0	12.0	0.2	1
158 04N16-0.2RA	4.0	6.0	3.9	63.0	6.0	16.0	0.2	1
158 04N20-0.2RA	4.0	6.0	3.9	75.0	6.0	20.0	0.2	1
158 04N25-0.2RA	4.0	6.0	3.9	75.0	6.0	25.0	0.2	1
158 04N30-0.2RA	4.0	6.0	3.9	75.0	6.0	30.0	0.2	1
158 04N10-0.5RA	4.0	6.0	3.9	63.0	6.0	10.0	0.5	1
158 04N12-0.5RA	4.0	6.0	3.9	63.0	6.0	12.0	0.5	1
158 04N16-0.5RA	4.0	6.0	3.9	63.0	6.0	16.0	0.5	1
158 04N20-0.5RA	4.0	6.0	3.9	75.0	6.0	20.0	0.5	1
158 04N25-0.5RA	4.0	6.0	3.9	75.0	6.0	25.0	0.5	1
158 04N30-0.5RA	4.0	6.0	3.9	75.0	6.0	30.0	0.5	1
158 06N20-0.3RA	6.0	6.0	5.8	75.0	9.0	20.0	0.3	2
158 06N20-0.5RA	6.0	6.0	5.8	75.0	9.0	20.0	0.5	2
158 06N20-1.0RA	6.0	6.0	5.8	75.0	9.0	20.0	1.0	2
158 06N30-0.3RA	6.0	6.0	5.8	100.0	9.0	30.0	0.3	2
158 06N30-0.5RA	6.0	6.0	5.8	100.0	9.0	30.0	0.5	2
158 06N30-1.0RA	6.0	6.0	5.8	100.0	9.0	30.0	1.0	2
158 08N30-0.3RA	8.0	8.0	7.6	75.0	12.0	30.0	0.3	2
158 08N30-0.5RA	8.0	8.0	7.6	75.0	12.0	30.0	0.5	2
158 08N30-1.0RA	8.0	8.0	7.6	75.0	12.0	30.0	1.0	2
158 08N40-0.3RA	8.0	8.0	7.6	100.0	12.0	40.0	0.3	2
158 08N40-0.5RA	8.0	8.0	7.6	100.0	12.0	40.0	0.5	2
158 08N40-1.0RA	8.0	8.0	7.6	100.0	12.0	40.0	1.0	2
158 08N50-0.3RA	8.0	8.0	7.6	120.0	12.0	50.0	0.3	2
158 08N50-0.5RA	8.0	8.0	7.6	120.0	12.0	50.0	0.5	2
158 08N50-1.0RA	8.0	8.0	7.6	120.0	12.0	50.0	1.0	2
158 10N30-0.3RA	10.0	10.0	9.6	75.0	15.0	30.0	0.3	2
158 10N30-0.5RA	10.0	10.0	9.6	75.0	15.0	30.0	0.5	2
158 10N30-1.0RA	10.0	10.0	9.6	75.0	15.0	30.0	1.0	2
158 10N50-0.3RA	10.0	10.0	9.6	100.0	15.0	50.0	0.3	2
158 10N50-0.5RA	10.0	10.0	9.6	100.0	15.0	50.0	0.5	2
158 10N50-1.0RA	10.0	10.0	9.6	100.0	15.0	50.0	1.0	2
158 10N60-0.3RA	10.0	10.0	9.6	130.0	15.0	60.0	0.3	2
158 10N60-0.5RA	10.0	10.0	9.6	130.0	15.0	60.0	0.5	2
158 10N60-1.0RA	10.0	10.0	9.6	130.0	15.0	60.0	1.0	2
158 12N40-0.3RA	12.0	12.0	11.4	100.0	18.0	40.0	0.3	2
158 12N40-1.0RA	12.0	12.0	11.4	100.0	18.0	40.0	1.0	2
158 12N60-0.3RA	12.0	12.0	11.4	140.0	18.0	60.0	0.3	2
158 12N60-1.0RA	12.0	12.0	11.4	140.0	18.0	60.0	1.0	2
158 16N50-0.3RA	16.0	16.0	15.2	100.0	24.0	50.0	0.3	2
158 16N50-1.0RA	16.0	16.0	15.2	100.0	24.0	50.0	1.0	2
158 16N70-0.3RA	16.0	16.0	15.2	150.0	24.0	70.0	0.3	2
158 16N70-1.0RA	16.0	16.0	15.2	150.0	24.0	70.0	1.0	2

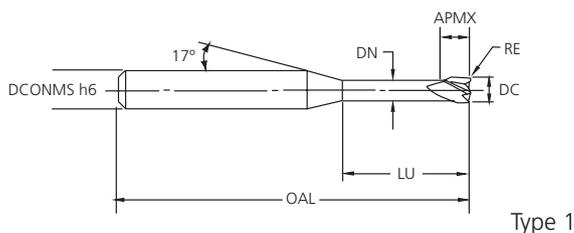
End Mills  
Series 158 Corner Radius



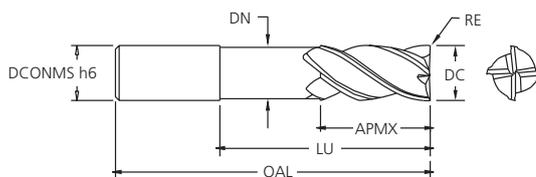
# TuffCut® Series 158 Corner Radius - High Feed Roughing



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



Type 1



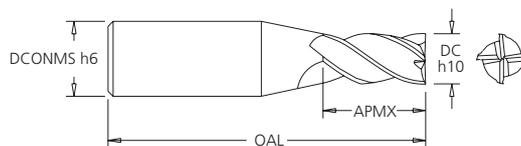
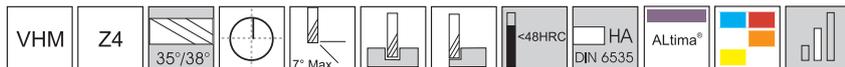
Type 2

End Mills Series 158 Corner Radius - High Feed Roughing

Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Type
158 02N08-0.5RA	2.0	6.0	1.9	63.0	3.0	8.0	0.5	1
158 03N10-0.8RA	3.0	6.0	2.9	63.0	5.0	10.0	0.8	1
158 04N12-1.0RA	4.0	6.0	3.9	63.0	6.0	12.0	1.0	1
158 06N20-1.5RA	6.0	6.0	5.8	75.0	9.0	20.0	1.5	2
158 06N30-1.5RA	6.0	6.0	5.8	100.0	9.0	30.0	1.5	2
158 08N30-2.0RA	8.0	8.0	7.6	75.0	12.0	30.0	2.0	2
158 08N40-2.0RA	8.0	8.0	7.6	100.0	12.0	40.0	2.0	2
158 08N50-2.0RA	8.0	8.0	7.6	120.0	12.0	50.0	2.0	2
158 10N30-2.0RA	10.0	10.0	9.6	75.0	15.0	30.0	2.0	2
158 10N50-2.0RA	10.0	10.0	9.6	100.0	15.0	50.0	2.0	2
158 10N60-2.0RA	10.0	10.0	9.6	130.0	15.0	60.0	2.0	2
158 12N40-2.0RA	12.0	12.0	11.4	100.0	18.0	40.0	2.0	2
158 12N60-2.0RA	12.0	12.0	11.4	140.0	18.0	60.0	2.0	2
158 16N50-3.0RA	16.0	16.0	15.2	100.0	24.0	50.0	3.0	2
158 16N70-3.0RA	16.0	16.0	15.2	150.0	24.0	70.0	3.0	2



## TuffCut® XR Series 177



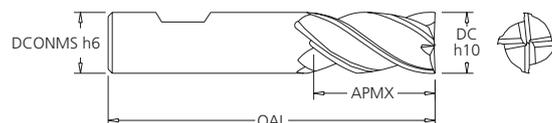
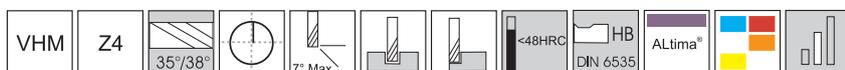
Tool No.	DC	DCONMS	OAL	APMX
177 0150A	1.5	3.0	38.0	3.0
177 0200A	2.0	3.0	38.0	4.0
177 0250A	2.5	3.0	38.0	5.0
177 0303A	3.0	3.0	38.0	6.0



Tool No.	DC	DCONMS	OAL	APMX
177 0300A	3.0	6.0	57.0	8.0
177 0350A	3.5	6.0	57.0	7.0
177 0400A	4.0	6.0	57.0	11.0
177 0450A	4.5	6.0	57.0	9.0
177 0500A	5.0	6.0	57.0	13.0
177 0600A	6.0	6.0	57.0	13.0
177 0800A	8.0	8.0	63.0	19.0
177 1000A	10.0	10.0	72.0	22.0
177 1200A	12.0	12.0	83.0	26.0
177 1400A	14.0	14.0	83.0	26.0
177 1600A	16.0	16.0	92.0	32.0
177 1800A	18.0	18.0	92.0	32.0
177 2000A	20.0	20.0	104.0	38.0
177 2500A	25.0	25.0	104.0	38.0



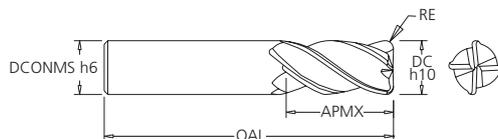
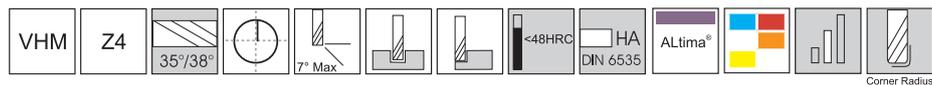
## TuffCut® XR Series 177-W



Tool No.	DC	DCONMS	OAL	APMX
177 0600AW	6.0	6.0	57.0	13.0
177 0800AW	8.0	8.0	63.0	19.0
177 1000AW	10.0	10.0	72.0	22.0
177 1200AW	12.0	12.0	83.0	26.0
177 1600AW	16.0	16.0	92.0	32.0
177 2000AW	20.0	20.0	104.0	38.0



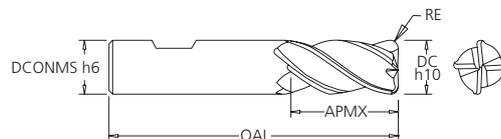
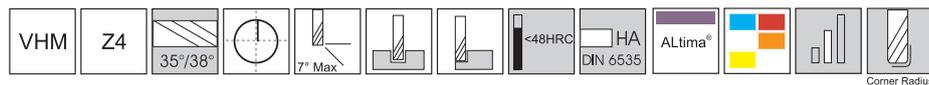
# TuffCut® XR Series 177R



Tool No.	DC	DCONMS	OAL	APMX	RE
177 0300-0.25RA	3.0	6.0	57.0	8.0	0.25
177 0300-0.50RA	3.0	6.0	57.0	8.0	0.5
177 0400-0.25RA	4.0	6.0	57.0	11.0	0.25
177 0400-0.50RA	4.0	6.0	57.0	11.0	0.5
177 0500-0.25RA	5.0	6.0	57.0	13.0	0.25
177 0500-0.50RA	5.0	6.0	57.0	13.0	0.5
177 0600-0.25RA	6.0	6.0	57.0	13.0	0.25
177 0600-0.50RA	6.0	6.0	57.0	13.0	0.5
177 0600-1.0RA	6.0	6.0	57.0	13.0	1.0
177 0600-1.5RA	6.0	6.0	57.0	13.0	1.5
177 0600-2.0RA	6.0	6.0	57.0	13.0	2.0
177 0800-0.50RA	8.0	8.0	63.0	19.0	0.5
177 0800-1.0RA	8.0	8.0	63.0	19.0	1.0
177 0800-1.5RA	8.0	8.0	63.0	19.0	1.5
177 0800-2.0RA	8.0	8.0	63.0	19.0	2.0
177 0800-3.0RA	8.0	8.0	63.0	19.0	3.0
177 1000-0.50RA	10.0	10.0	72.0	22.0	0.5
177 1000-1.0RA	10.0	10.0	72.0	22.0	1.0
177 1000-1.5RA	10.0	10.0	72.0	22.0	1.5
177 1000-2.0RA	10.0	10.0	72.0	22.0	2.0
177 1000-3.0RA	10.0	10.0	72.0	22.0	3.0
177 1200-0.50RA	12.0	12.0	83.0	26.0	0.5
177 1200-0.75RA	12.0	12.0	83.0	26.0	0.75
177 1200-1.0RA	12.0	12.0	83.0	26.0	1.0
177 1200-1.5RA	12.0	12.0	83.0	26.0	1.5
177 1200-2.0RA	12.0	12.0	83.0	26.0	2.0
177 1200-2.5RA	12.0	12.0	83.0	26.0	2.5
177 1200-3.0RA	12.0	12.0	83.0	26.0	3.0
177 1200-4.0RA	12.0	12.0	83.0	26.0	4.0
177 1400-0.75RA	14.0	14.0	83.0	26.0	0.75
177 1600-0.50RA	16.0	16.0	92.0	32.0	0.5
177 1600-1.0RA	16.0	16.0	92.0	32.0	1.0
177 1600-1.5RA	16.0	16.0	92.0	32.0	1.5
177 1600-2.0RA	16.0	16.0	92.0	32.0	2.0
177 1600-2.5RA	16.0	16.0	92.0	32.0	2.5
177 1600-3.0RA	16.0	16.0	92.0	32.0	3.0
177 1600-4.0RA	16.0	16.0	92.0	32.0	4.0
177 1800-1.0RA	18.0	18.0	92.0	32.0	1.0
177 2000-1.0RA	20.0	20.0	104.0	38.0	1.0
177 2000-1.5RA	20.0	20.0	104.0	38.0	1.5
177 2000-2.0RA	20.0	20.0	104.0	38.0	2.0
177 2000-3.0RA	20.0	20.0	104.0	38.0	3.0
177 2000-4.0RA	20.0	20.0	104.0	38.0	4.0
177 2000-5.0RA	20.0	20.0	104.0	38.0	5.0
177 2000-6.0RA	20.0	20.0	104.0	38.0	6.0
177 2500-1.0RA	25.0	25.0	104.0	38.0	1.0

 End Mills  
 Series 177R

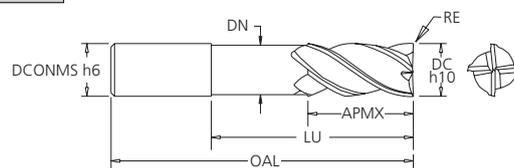
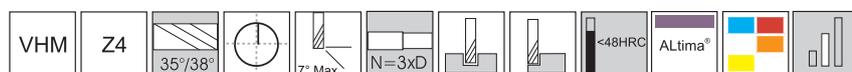

## TuffCut® XR Series 177R-W



Tool No.	DC	DCONMS	OAL	APMX	RE
177 1200-0.50RAW	12.0	12.0	83.0	26.0	0.5
177 2000-1.0RAW	20.0	20.0	104.0	38.0	1.0



## TuffCut® XR Series 177S



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	Shank
177S 0300A	3.0	6.0	2.9	50.0	5.0	11.0	DIN 6535 HA
177S 0400A	4.0	6.0	3.9	50.0	6.0	14.0	DIN 6535 HA
177S 0500A	5.0	6.0	4.9	57.0	8.0	17.0	DIN 6535 HA
177S 0600A	6.0	6.0	5.8	57.0	9.0	20.0	DIN 6535 HA
177S 0800A	8.0	8.0	7.6	63.0	12.0	26.0	DIN 6535 HA
177S 1000A	10.0	10.0	9.6	72.0	15.0	32.0	DIN 6535 HA
177S 1200A	12.0	12.0	11.4	83.0	18.0	38.0	DIN 6535 HA
177S 1600A	16.0	16.0	15.2	98.0	24.0	50.0	DIN 6535 HA
177S 2000A	20.0	20.0	19.2	112.0	30.0	62.0	DIN 6535 HA



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	Shank
177S 0300AW	3.0	6.0	2.9	50.0	5.0	11.0	DIN 6535 HB
177S 0400AW	4.0	6.0	3.9	50.0	6.0	14.0	DIN 6535 HB
177S 0500AW	5.0	6.0	4.9	57.0	8.0	17.0	DIN 6535 HB
177S 0600AW	6.0	6.0	5.8	57.0	9.0	20.0	DIN 6535 HB
177S 0800AW	8.0	8.0	7.6	63.0	12.0	26.0	DIN 6535 HB
177S 1000AW	10.0	10.0	9.6	72.0	15.0	32.0	DIN 6535 HB
177S 1200AW	12.0	12.0	11.4	83.0	18.0	38.0	DIN 6535 HB
177S 1600AW	16.0	16.0	15.2	98.0	24.0	50.0	DIN 6535 HB
177S 2000AW	20.0	20.0	19.2	112.0	30.0	62.0	DIN 6535 HB

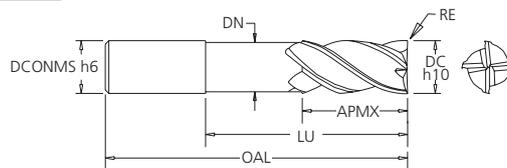


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Shank
177S 03-0.2RA	3.0	6.0	2.9	50.0	5.0	11.0	0.2	DIN 6535 HA
177S 04-0.2RA	4.0	6.0	3.9	50.0	6.0	14.0	0.2	DIN 6535 HA
177S 05-0.2RA	5.0	6.0	4.9	57.0	8.0	17.0	0.2	DIN 6535 HA
177S 06-0.3RA	6.0	6.0	5.8	57.0	9.0	20.0	0.3	DIN 6535 HA
177S 08-0.5RA	8.0	8.0	7.6	63.0	12.0	26.0	0.5	DIN 6535 HA
177S 10-0.5RA	10.0	10.0	9.6	72.0	15.0	32.0	0.5	DIN 6535 HA
177S 12-0.5RA	12.0	12.0	11.4	83.0	18.0	38.0	0.5	DIN 6535 HA
177S 16-1.0RA	16.0	16.0	15.2	98.0	24.0	50.0	1.0	DIN 6535 HA
177S 20-1.0RA	20.0	20.0	19.2	112.0	30.0	62.0	1.0	DIN 6535 HA



End Mills  
Series 177R-W / 177S

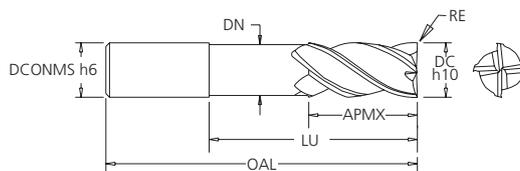
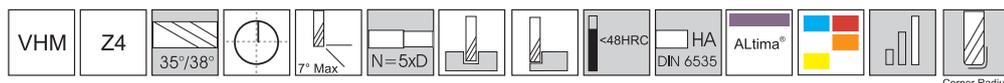
## TuffCut® XR Series 177S



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Shank
177S 03-0.2RAW	3.0	6.0	2.9	50.0	5.0	11.0	0.2	DIN 6535 HB
177S 04-0.2RAW	4.0	6.0	3.9	50.0	6.0	14.0	0.2	DIN 6535 HB
177S 05-0.2RAW	5.0	6.0	4.9	57.0	8.0	17.0	0.2	DIN 6535 HB
177S 06-0.3RAW	6.0	6.0	5.8	57.0	9.0	20.0	0.3	DIN 6535 HB
177S 08-0.5RAW	8.0	8.0	7.6	63.0	12.0	26.0	0.5	DIN 6535 HB
177S 10-0.5RAW	10.0	10.0	9.6	72.0	15.0	32.0	0.5	DIN 6535 HB
177S 12-0.5RAW	12.0	12.0	11.4	83.0	18.0	38.0	0.5	DIN 6535 HB
177S 16-1.0RAW	16.0	16.0	15.2	98.0	24.0	50.0	1.0	DIN 6535 HB
177S 20-1.0RAW	20.0	20.0	19.2	112.0	30.0	62.0	1.0	DIN 6535 HB



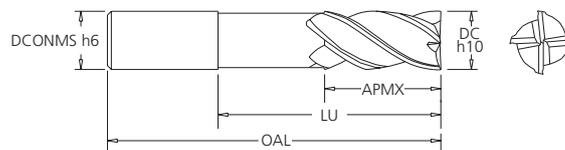
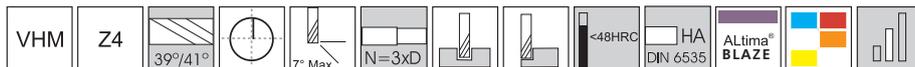
## TuffCut® XR Series 177LR N5



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
177L 06N5-0.25RA	6.0	6.0	5.8	101.0	12.0	30.0	0.25
177L 06N5-0.5RA	6.0	6.0	5.8	101.0	12.0	30.0	0.5
177L 06N5-1.0RA	6.0	6.0	5.8	101.0	12.0	30.0	1.0
177L 08N5-0.5RA	8.0	8.0	7.6	101.0	16.0	40.0	0.5
177L 08N5-1.0RA	8.0	8.0	7.6	101.0	16.0	40.0	1.0
177L 08N5-2.0RA	8.0	8.0	7.6	101.0	16.0	40.0	2.0
177L 08N5-3.0RA	8.0	8.0	7.6	101.0	16.0	40.0	3.0
177L 10N5-0.5RA	10.0	10.0	9.6	127.0	20.0	50.0	0.5
177L 10N5-1.0RA	10.0	10.0	9.6	127.0	20.0	50.0	1.0
177L 10N5-2.0RA	10.0	10.0	9.6	127.0	20.0	50.0	2.0
177L 10N5-3.0RA	10.0	10.0	9.6	127.0	20.0	50.0	3.0
177L 12N5-0.5RA	12.0	12.0	11.4	152.0	24.0	60.0	0.5
177L 12N5-1.0RA	12.0	12.0	11.4	152.0	24.0	60.0	1.0
177L 12N5-2.0RA	12.0	12.0	11.4	152.0	24.0	60.0	2.0
177L 12N5-3.0RA	12.0	12.0	11.4	152.0	24.0	60.0	3.0
177L 12N5-4.0RA	12.0	12.0	11.4	152.0	24.0	60.0	4.0
177L 16N5-0.5RA	16.0	16.0	15.2	152.0	32.0	80.0	0.5
177L 16N5-1.0RA	16.0	16.0	15.2	152.0	32.0	80.0	1.0
177L 16N5-2.0RA	16.0	16.0	15.2	152.0	32.0	80.0	2.0
177L 16N5-3.0RA	16.0	16.0	15.2	152.0	32.0	80.0	3.0
177L 20N5-0.5RA	20.0	20.0	19.2	152.0	40.0	100.0	0.5
177L 20N5-1.0RA	20.0	20.0	19.2	152.0	40.0	100.0	1.0
177L 20N5-3.0RA	20.0	20.0	19.2	152.0	40.0	100.0	3.0



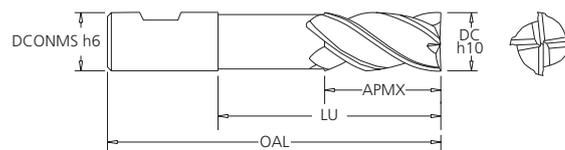
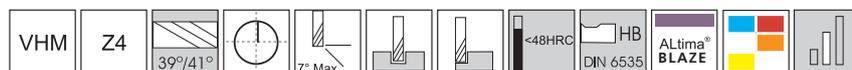
## TuffCut® XT Series 277 N3



Tool No.	DC	DCONM	DN	OAL	APMX	LU
277 03N3B	3.0	6.0	2.9	64.0	8.0	11.0
277 04N3B	4.0	6.0	3.9	64.0	11.0	14.0
277 05N3B	5.0	6.0	4.9	64.0	13.0	17.0
277 06N3B	6.0	6.0	5.9	64.0	13.0	20.0
277 08N3B	8.0	8.0	7.8	64.0	19.0	26.0
277 10N3B	10.0	10.0	9.8	73.0	22.0	32.0
277 12N3B	12.0	12.0	11.4	84.0	26.0	38.0
277 16N3B	16.0	16.0	15.2	100.0	32.0	50.0
277 20N3B	20.0	20.0	19.2	112.0	40.0	62.0



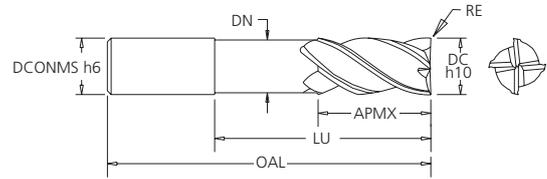
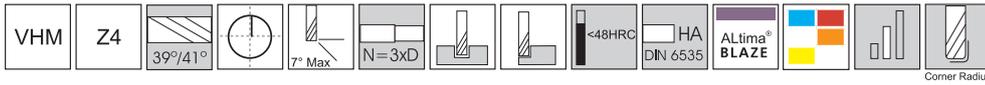
## TuffCut® XT Series 277N-W



Tool No.	DC	DCONM	DN	OAL	APMX	LU
277 08N3BW	8.0	8.0	7.8	64.0	19.0	26.0
277 10N3BW	10.0	10.0	9.8	73.0	22.0	32.0
277 12N3BW	12.0	12.0	11.4	84.0	26.0	38.0
277 16N3BW	16.0	16.0	15.2	100.0	32.0	50.0



# TuffCut® XT Series 277R N3

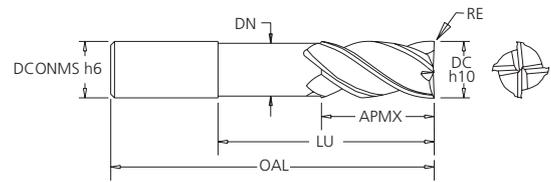
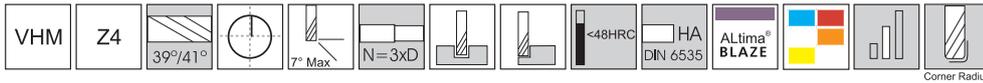


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
277 03N3-0.25RB	3.0	6.0	2.9	64.0	8.0	11.0	0.25
277 03N3-0.3RB	3.0	6.0	2.9	64.0	8.0	11.0	0.3
277 03N3-0.5RB	3.0	6.0	2.9	64.0	8.0	11.0	0.5
277 04N3-0.25RB	4.0	6.0	3.9	64.0	11.0	14.0	0.25
277 04N3-0.3RB	4.0	6.0	3.9	64.0	11.0	14.0	0.3
277 04N3-0.5RB	4.0	6.0	3.9	64.0	11.0	14.0	0.5
277 04N3-1.0RB	4.0	6.0	3.9	64.0	11.0	14.0	1.0
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 05N3-1.0RB	5.0	6.0	4.9	64.0	13.0	17.0	1.0
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 08N3-0.8RB	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 12N3-1.2RB	12.0	12.0	11.4	84.0	26.0	38.0	1.2
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 16N3-1.2RB	16.0	16.0	15.2	100.0	32.0	50.0	1.2
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



P79

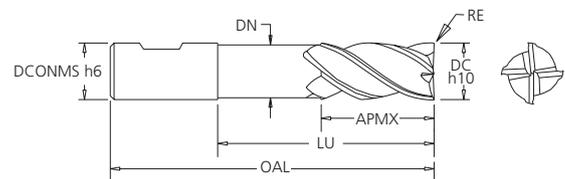
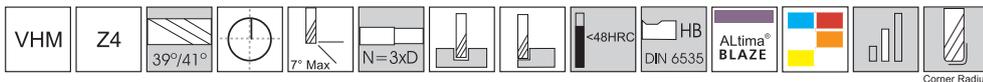
## TuffCut® XT Series 277R N3



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
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



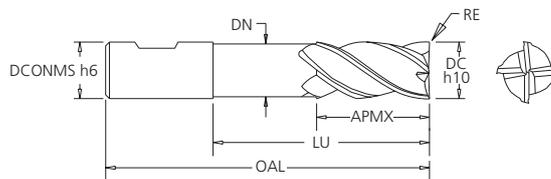
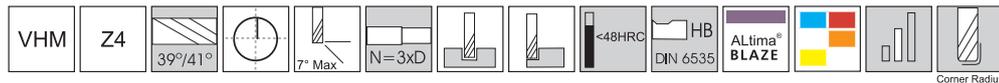
## TuffCut® XT Series 277R N3-W



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
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



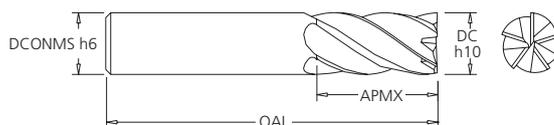
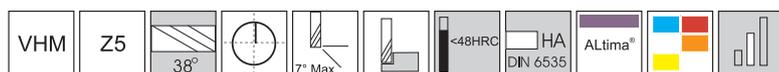
## TuffCut® XT Series 277R N3-W



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
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 16N3-1.2RBW	16.0	16.0	15.2	100.0	32.0	50.0	1.2
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


 End Mills  
 Series 277R N3-W / 178

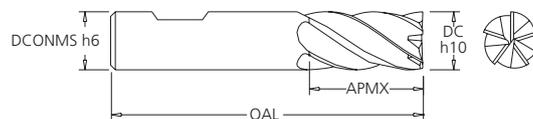
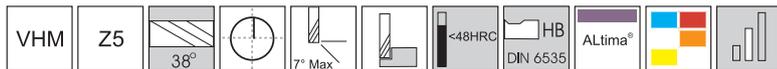
## TuffCut® XR Series 178



Tool No.	DC	DCONMS	OAL	APMX
178 0300A	3.0	6.0	57.0	8.0
178 0400A	4.0	6.0	57.0	11.0
178 0500A	5.0	6.0	57.0	13.0
178 0600A	6.0	6.0	57.0	13.0
178 0800A	8.0	8.0	63.0	19.0
178 1000A	10.0	10.0	72.0	22.0
178 1200A	12.0	12.0	83.0	26.0
178 1400A	14.0	14.0	83.0	26.0
178 1600A	16.0	16.0	92.0	32.0
178 1800A	18.0	18.0	92.0	32.0
178 2000A	20.0	20.0	104.0	38.0
178 2500A	25.0	25.0	104.0	38.0



## TuffCut® XR Series 178-W

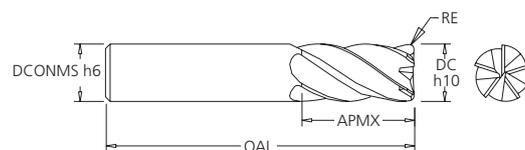
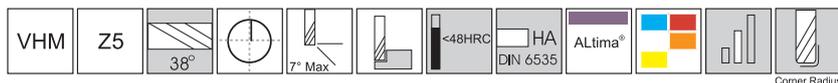


Tool No.	DC	DCONMS	OAL	APMX
178 0600AW	6.0	6.0	57.0	13.0
178 0800AW	8.0	8.0	63.0	19.0
178 1000AW	10.0	10.0	72.0	22.0
178 1200AW	12.0	12.0	83.0	26.0
178 1400AW	14.0	14.0	83.0	26.0
178 1600AW	16.0	16.0	92.0	32.0
178 2000AW	20.0	20.0	104.0	38.0



End Mills  
Series 178-W / 178R

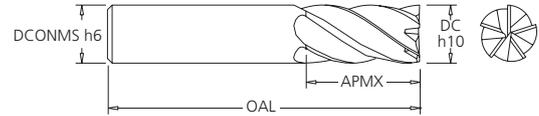
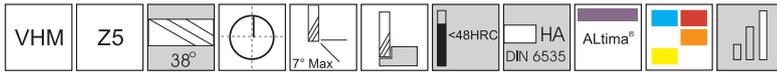
## TuffCut® XR Series 178R



Tool No.	DC	DCONMS	OAL	APMX	RE
178 0600-0.50RA	6.0	6.0	57.0	13.0	0.5
178 0800-0.50RA	8.0	8.0	63.0	19.0	0.5
178 1000-0.50RA	10.0	10.0	72.0	22.0	0.5
178 1200-0.75RA	12.0	12.0	83.0	26.0	0.75
178 1400-0.75RA	14.0	14.0	83.0	26.0	0.75
178 1600-1.0RA	16.0	16.0	92.0	32.0	1.0
178 1800-1.0RA	18.0	18.0	92.0	32.0	1.0
178 2000-1.0RA	20.0	20.0	104.0	38.0	1.0
178 2500-1.0RA	25.0	25.0	104.0	38.0	1.0



## TuffCut® XR Series 178-1

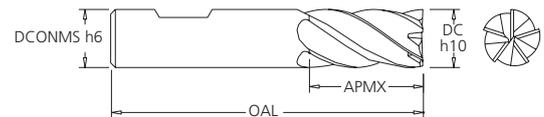
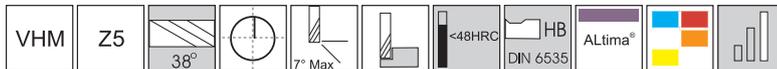


Tool No.	DC	DCONMS	OAL	APMX
178 0300-1A	3.0	3.0	75.0	25.0
178 0400-1A	4.0	4.0	75.0	25.0
178 0500-1A	5.0	5.0	75.0	25.0
178 0600-1A	6.0	6.0	75.0	25.0
178 0800-1A	8.0	8.0	75.0	30.0
178 1000-1A	10.0	10.0	100.0	45.0
178 1200-1A	12.0	12.0	150.0	75.0
178 1600-1A	16.0	16.0	150.0	75.0
178 2000-1A	20.0	20.0	150.0	75.0



End Mills  
Series 178-1 / 178-1W

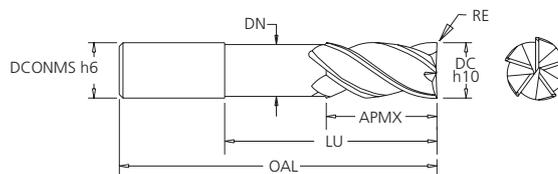
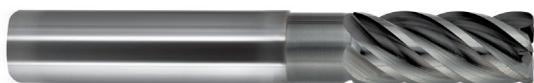
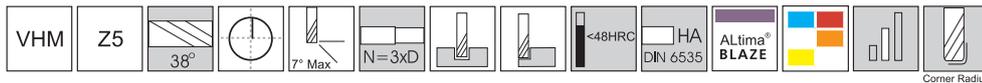
## TuffCut® XR Series 178-1W



Tool No.	DC	DCONMS	OAL	APMX
178 0600-1AW	6.0	6.0	75.0	25.0
178 0800-1AW	8.0	8.0	75.0	30.0
178 1000-1AW	10.0	10.0	100.0	45.0
178 1200-1AW	12.0	12.0	150.0	75.0
178 1600-1AW	16.0	16.0	150.0	75.0
178 2000-1AW	20.0	20.0	150.0	75.0



# TuffCut® XT Series 278R N3

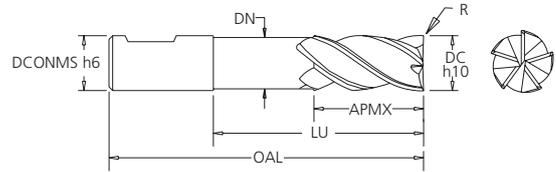
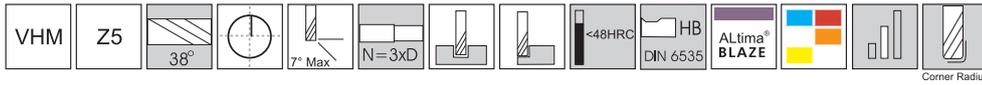


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
278 0300N3-0.25RB	3.0	6.0	2.9	57.0	8.0	10.0	0.25
278 0300N3-0.5RB	3.0	6.0	2.9	57.0	8.0	10.0	0.5
278 0400N3-0.25RB	4.0	6.0	3.9	57.0	11.0	13.0	0.25
278 0400N3-0.5RB	4.0	6.0	3.9	57.0	11.0	13.0	0.5
278 0500N3-0.25RB	5.0	6.0	4.9	57.0	13.0	16.0	0.25
278 0500N3-0.5RB	5.0	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 1200N3-1.0RB	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 1600N3-1.0RB	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 1600N3-2.5RB	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 1600N3-4.0RB	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

End Mills  
Series 278R N3



# TuffCut® XT Series 278R N3-W

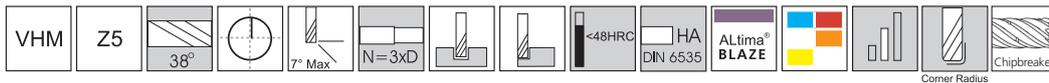


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
278 0600N3-0.5RBW	6.0	6.0	5.9	57.0	13.0	19.0	0.5
278 0800N3-0.5RBW	8.0	8.0	7.8	63.0	19.0	25.0	0.5
278 0800N3-1.0RBW	8.0	8.0	7.8	63.0	19.0	25.0	1.0
278 1000N3-0.5RBW	10.0	10.0	9.8	72.0	22.0	31.0	0.5
278 1000N3-1.0RBW	10.0	10.0	9.8	72.0	22.0	31.0	1.0
278 1200N3-0.5RBW	12.0	12.0	11.4	84.0	26.0	38.0	0.5
278 1200N3-1.0RBW	12.0	12.0	11.4	84.0	26.0	38.0	1.0
278 1600N3-0.5RBW	16.0	16.0	15.2	100.0	35.0	50.0	0.5
278 1600N3-1.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	1.0
278 1600N3-1.5RBW	16.0	16.0	15.2	100.0	35.0	50.0	1.5
278 1600N3-3.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	3.0
278 1600N3-4.0RBW	16.0	16.0	15.2	100.0	35.0	50.0	4.0

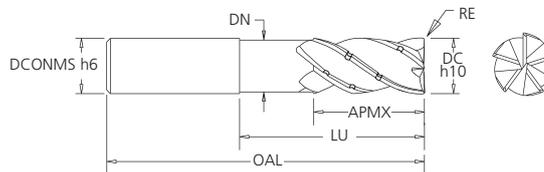
**End Mills**  
 Series 278R N3-W



## TuffCut® XT Series 278CBR N3



Close up of chipbreaker grind

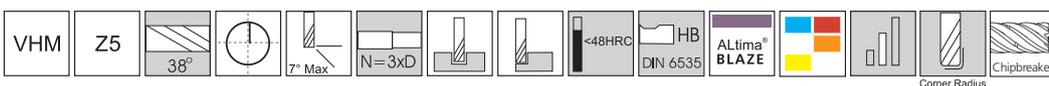


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
278CB 10N3-1.0RB	10.0	10.0	9.8	72.0	22.0	31.0	1.0
278CB 12N3-1.0RB	12.0	12.0	11.4	84.0	26.0	38.0	1.0
278CB 16N3-1.0RB	16.0	16.0	15.2	100.0	35.0	50.0	1.0

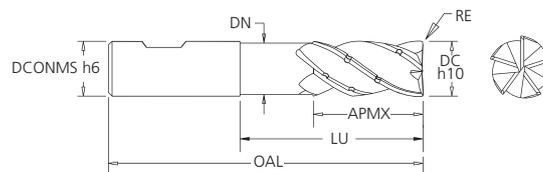


End Mills  
Series 278CBR N3 / 278CBR N3-W

## TuffCut® XT Series 278CBR N3-W



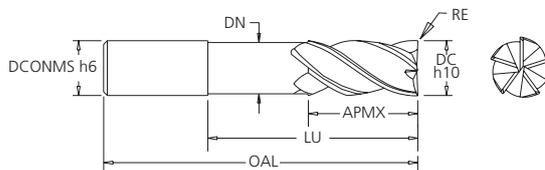
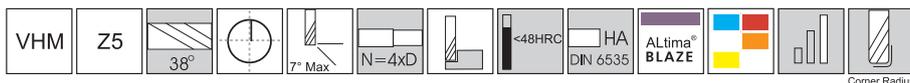
Close up of chipbreaker grind



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
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



# TuffCut® XT Series 278R N4

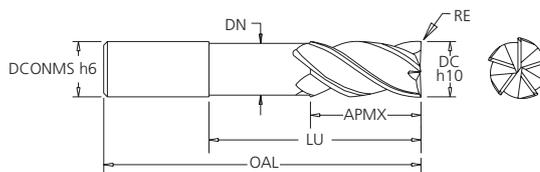
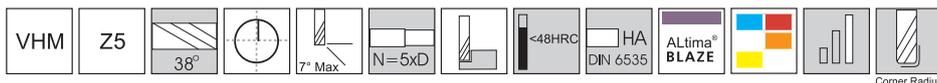


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
278 1200N4-0.5RB	12.0	12.0	11.4	100.0	18.0	50.0	0.5
278 1200N4-1.0RB	12.0	12.0	11.4	100.0	18.0	50.0	1.0
278 1200N4-1.5RB	12.0	12.0	11.4	100.0	18.0	50.0	1.5
278 1200N4-2.0RB	12.0	12.0	11.4	100.0	18.0	50.0	2.0
278 1200N4-3.0RB	12.0	12.0	11.4	100.0	18.0	50.0	3.0
278 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 1600N4-1.0RBW*	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

\* Indicates Weldon


 End Mills  
 Series 278R N4 & N5

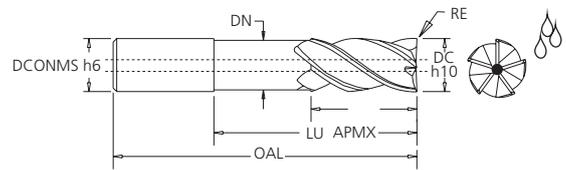
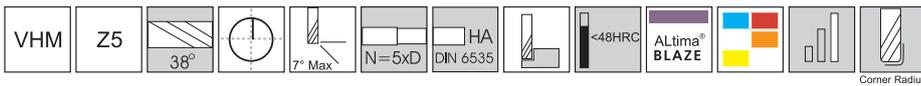
# TuffCut® XT Series 278R N5



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
278 1600N5-1.0RB	16.0	16.0	15.2	133.0	35.0	82.0	1.0
278 1600N5-3.0RB	16.0	16.0	15.2	133.0	35.0	82.0	3.0
278 2000N5-1.0RB	20.0	20.0	19.2	152.0	40.0	102.0	1.0
278 2000N5-3.0RB	20.0	20.0	19.2	152.0	40.0	102.0	3.0
278 2500N5-1.0RB	25.0	25.0	24.6	180.0	40.0	125.0	1.0
278 2500N5-3.0RB	25.0	25.0	24.6	180.0	40.0	125.0	3.0



# TuffCut® XT Series 278R N5CT With Central Coolant

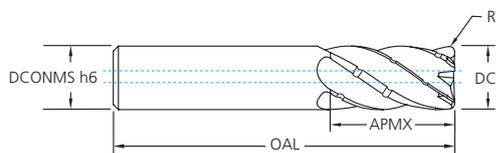


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
278 1200N5-0.5RBCT	12.0	12.0	11.4	110.0	18.0	62.0	0.5
278 1200N5-1.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	1.0
278 1200N5-1.5RBCT	12.0	12.0	11.4	110.0	18.0	62.0	1.5
278 1200N5-2.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	2.0
278 1200N5-3.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	3.0
278 1200N5-4.0RBCT	12.0	12.0	11.4	110.0	18.0	62.0	4.0



End Mills  
Series 278R N5CT

## TuffCut® XT V5LCB 3xD-C

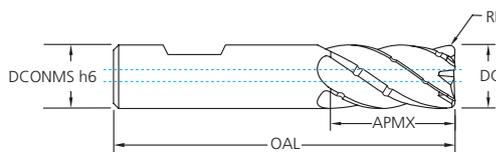


Tool No.	DC	DCONMS	OAL	APMX	RE
V5LCB 0603-0.5RB-CT	6.0	6.0	64.0	19.0	0.5
V5LCB 0803-0.5RB-CT	8.0	8.0	70.0	25.0	0.5
V5LCB 1003-0.5RB-CT	10.0	10.0	80.0	31.0	0.5
V5LCB 1203-0.5RB-CT	12.0	12.0	84.0	37.0	0.5
V5LCB 1603-0.5RB-CT	16.0	16.0	110.0	49.0	0.5



End Mills  
Series V5LCB-CT / V5LCB-W-CT

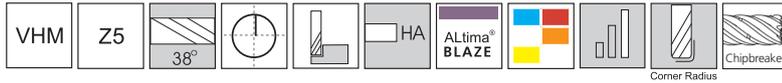
## TuffCut® XT V5LCB 3xD W-C



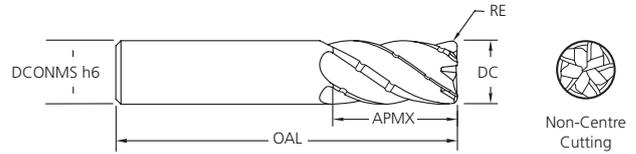
Tool No.	DC	DCONMS	OAL	APMX	RE
V5LCB 0803-0.5RBW-CT	8.0	8.0	70.0	25.0	0.5
V5LCB 1003-0.5RBW-CT	10.0	10.0	80.0	31.0	0.5
V5LCB 1203-0.5RBW-CT	12.0	12.0	84.0	37.0	0.5
V5LCB 1603-0.5RBW-CT	16.0	16.0	110.0	49.0	0.5



## TuffCut® XT V5LCB 4xD



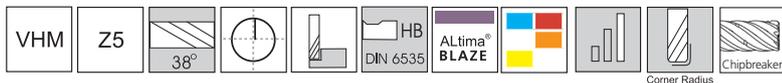
Close up of chipbreaker grind



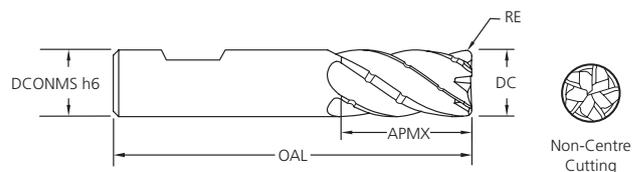
Tool No.	DC	DCONMS	OAL	APMX	RE
V5LCB 0604-0.5RB	6.0	6.0	75.0	24.0	0.5
V5LCB 0804-0.5RB	8.0	8.0	75.0	32.0	0.5
V5LCB 1004-0.5RB	10.0	10.0	90.0	40.0	0.5
V5LCB 1204-0.5RB	12.0	12.0	100.0	48.0	0.5
V5LCB 1604-0.5RB	16.0	16.0	120.0	64.0	0.5



## TuffCut® XT V5LCB 4xD W



Close up of chipbreaker grind

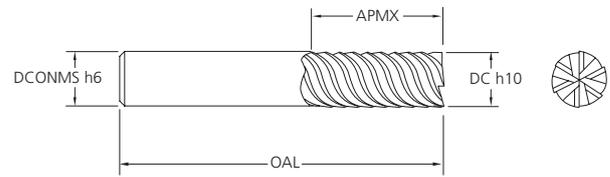


Tool No.	DC	DCONMS	OAL	APMX	RE
V5LCB 0804-0.5RBW	8.0	8.0	75.0	32.0	0.5
V5LCB 1004-0.5RBW	10.0	10.0	90.0	40.0	0.5
V5LCB 1204-0.5RBW	12.0	12.0	100.0	48.0	0.5
V5LCB 1604-0.5RBW	16.0	16.0	120.0	64.0	0.5



End Mills  
Series V5LCB-W

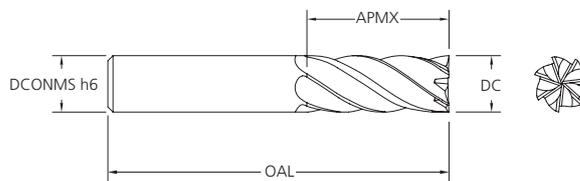
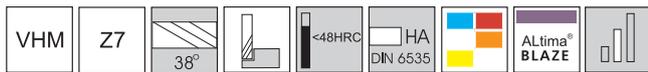
# TuffCut® XR Series 113A



Tool No.	DC	DCONMS	OAL	APMX
113 0300A	3.0	3.0	38.0	12.0
113 0400A	4.0	4.0	51.0	14.0
113 0500A	5.0	5.0	51.0	20.0
113 0600A	6.0	6.0	64.0	20.0
113 0800A	8.0	8.0	64.0	20.0
113 1000A	10.0	10.0	70.0	25.0
113 1200A	12.0	12.0	76.0	25.0
113 1600A	16.0	16.0	89.0	30.0
113 2000A	20.0	20.0	102.0	38.0



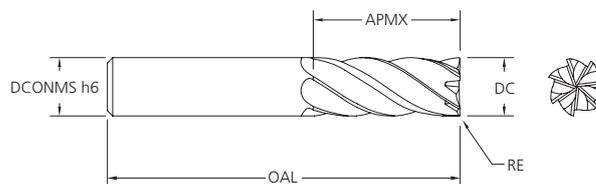
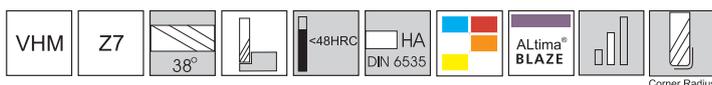
## TuffCut® XR7 Series 180



Tool No.	DC	DCONMS	OAL	APMX
180 0600B	6.0	6.0	57.0	13.0
180 0800B	8.0	8.0	63.0	19.0
180 1000B	10.0	10.0	72.0	22.0



## TuffCut® XR7 Series 180R

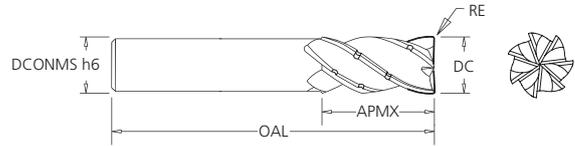
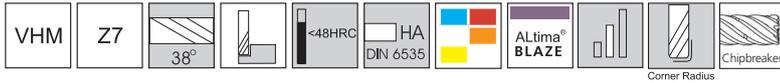


Tool No.	DC	DCONMS	OAL	APMX	RE
180 0600-0.5RB	6.0	6.0	57.0	13.0	0.5
180 0800-0.5RB	8.0	8.0	63.0	19.0	0.5
180 1000-0.5RB	10.0	10.0	72.0	22.0	0.5
180 1200-0.5RB	12.0	12.0	84.0	32.0	0.5
180 1200-1.0RB	12.0	12.0	84.0	32.0	1.0
180 1200-2.0RB	12.0	12.0	84.0	32.0	2.0
180 1200-3.0RB	12.0	12.0	84.0	32.0	3.0
180 1200-4.0RB	12.0	12.0	84.0	32.0	4.0
180 1600-0.5RB	16.0	16.0	92.0	42.0	0.5
180 1600-1.0RB	16.0	16.0	92.0	42.0	1.0
180 1600-2.0RB	16.0	16.0	92.0	42.0	2.0
180 1600-3.0RB	16.0	16.0	92.0	42.0	3.0
180 1600-4.0RB	16.0	16.0	92.0	42.0	4.0
180 2000-0.5RB	20.0	20.0	102.0	52.0	0.5
180 2000-1.0RB	20.0	20.0	102.0	52.0	1.0
180 2000-2.0RB	20.0	20.0	102.0	52.0	2.0
180 2000-3.0RB	20.0	20.0	102.0	52.0	3.0
180 2000-4.0RB	20.0	20.0	102.0	52.0	4.0



End Mills  
Series 180 / 180R

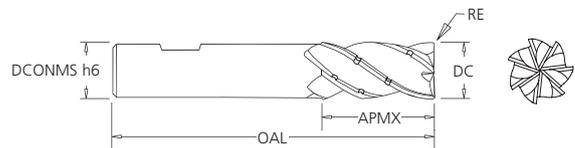
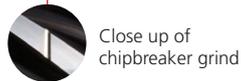
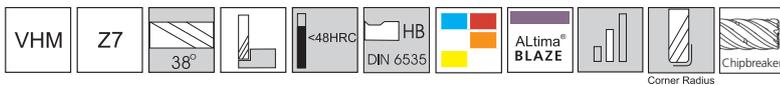
## TuffCut® XR7 Series 180CBR



Tool No.	DC	DCONMS	OAL	APMX	RE
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



## TuffCut® XR7 Series 180CBR-W

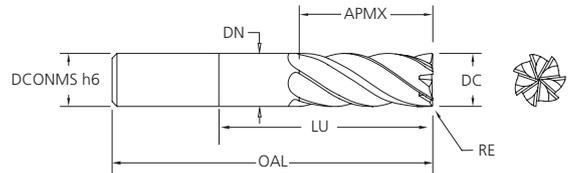
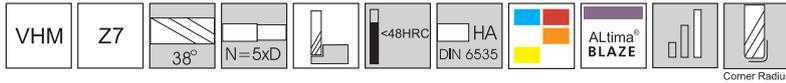


Tool No.	DC	DCONMS	OAL	APMX	RE
180CB 1000-1.0RBW	10.0	10.0	72.0	22.0	1.0
180CB 1200-1.0RBW	12.0	12.0	84.0	32.0	1.0
180CB 1600-1.0RBW	16.0	16.0	92.0	42.0	1.0



End Mills  
Series 180CBR / 180CBR-W

# TuffCut® XR7 Series 180R N5

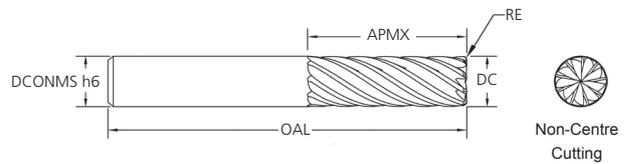
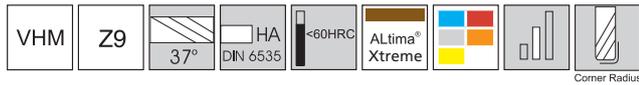


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
180 1200N5-1.0RB	12.0	12.0	11.4	120.0	30.0	60.0	1.0
180 1200N5-2.0RB	12.0	12.0	11.4	120.0	30.0	60.0	2.0
180 1200N5-3.0RB	12.0	12.0	11.4	120.0	30.0	60.0	3.0
180 1200N5-4.0RB	12.0	12.0	11.4	120.0	30.0	60.0	4.0
180 1600N5-1.0RB	16.0	16.0	15.2	150.0	40.0	80.0	1.0
180 1600N5-2.0RB	16.0	16.0	15.2	150.0	40.0	80.0	2.0
180 1600N5-3.0RB	16.0	16.0	15.2	150.0	40.0	80.0	3.0
180 1600N5-4.0RB	16.0	16.0	15.2	150.0	40.0	80.0	4.0
180 2000N5-1.0RB	20.0	20.0	19.2	150.0	50.0	100.0	1.0
180 2000N5-2.0RB	20.0	20.0	19.2	150.0	50.0	100.0	2.0
180 2000N5-3.0RB	20.0	20.0	19.2	150.0	50.0	100.0	3.0
180 2000N5-4.0RB	20.0	20.0	19.2	150.0	50.0	100.0	4.0



End Mills  
Series 180R N5

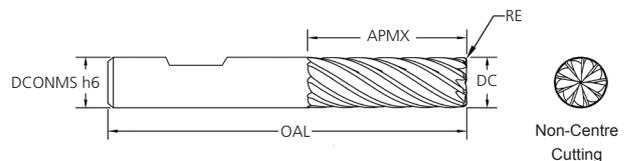
## TuffCut® XT9 Series 380



Tool No.	DC	DCONMS	OAL	APMX	RE
380M0800-0.5RAX	8.0	8.0	63.0	22.0	0.5
380M0800-0.8RAX	8.0	8.0	63.0	22.0	0.8
380M0800-1.0RAX	8.0	8.0	63.0	22.0	1.0
380M0800-2.0RAX	8.0	8.0	63.0	22.0	2.0
380M1000-0.5RAX	10.0	10.0	72.0	27.0	0.5
380M1000-1.0RAX	10.0	10.0	72.0	27.0	1.0
380M1000-2.0RAX	10.0	10.0	72.0	27.0	2.0
380M1200-0.5RAX	12.0	12.0	81.0	32.0	0.5
380M1200-1.0RAX	12.0	12.0	81.0	32.0	1.0
380M1200-2.0RAX	12.0	12.0	81.0	32.0	2.0
380M1200-3.0RAX	12.0	12.0	81.0	32.0	3.0
380M1600-0.5RAX	16.0	16.0	92.0	42.0	0.5
380M1600-1.0RAX	16.0	16.0	92.0	42.0	1.0
380M1600-2.0RAX	16.0	16.0	92.0	42.0	2.0
380M1600-3.0RAX	16.0	16.0	92.0	42.0	3.0
380M1600-4.0RAX	16.0	16.0	92.0	42.0	4.0
380M2000-0.5RAX	20.0	20.0	104.0	52.0	0.5
380M2000-1.0RAX	20.0	20.0	104.0	52.0	1.0



## TuffCut® XT9 Series 380-W

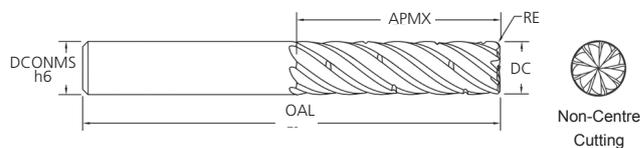
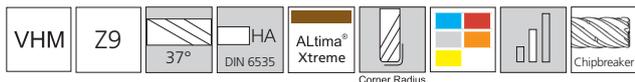


Tool No.	DC	DCONMS	OAL	APMX	RE
380M1000-0.5RAXW	10.0	10.0	72.0	27.0	0.5
380M1000-1.0RAXW	10.0	10.0	72.0	27.0	1.0
380M1200-0.5RAXW	12.0	12.0	81.0	32.0	0.5
380M1200-1.0RAXW	12.0	12.0	81.0	32.0	1.0
380M1600-0.5RAXW	16.0	16.0	92.0	42.0	0.5
380M1600-1.0RAXW	16.0	16.0	92.0	42.0	1.0
380M1600-3.0RAXW	16.0	16.0	92.0	42.0	3.0
380M2000-0.5RAXW	20.0	20.0	104.0	52.0	0.5
380M2000-1.0RAXW	20.0	20.0	104.0	52.0	1.0



Please note: Due to manufacturing specification changes, the future OAL dimension of this tool will be subject to modification.

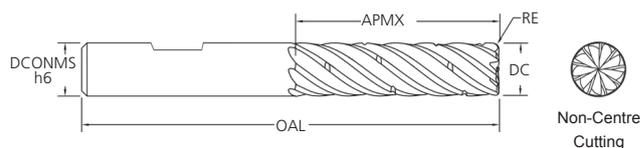
## TuffCut® XT9 Series 380CB



Tool No.	DC	DCONMS	OAL	APMX	RE
380CBM0800-0.5RAX	8.0	8.0	63.0	22.0	0.5
380CBM0800-1.0RAX	8.0	8.0	63.0	22.0	1.0
380CBM1000-0.5RAX	10.0	10.0	72.0	27.0	0.5
380CBM1000-1.0RAX	10.0	10.0	72.0	27.0	1.0
380CBM1200-0.5RAX	12.0	12.0	81.0	32.0	0.5
380CBM1200-1.0RAX	12.0	12.0	81.0	32.0	1.0
380CBM1600-0.5RAX	16.0	16.0	92.0	42.0	0.5
380CBM1600-1.0RAX	16.0	16.0	92.0	42.0	1.0
380CBM2000-0.5RAX	20.0	20.0	104.0	52.0	0.5
380CBM2000-1.0RAX	20.0	20.0	104.0	52.0	1.0



## TuffCut® XT9 Series 380CB-W

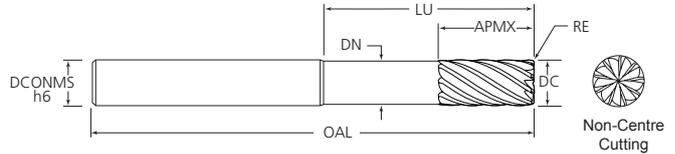
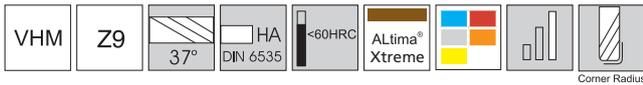


Tool No.	DC	DCONMS	OAL	APMX	RE
380CBM0800-0.5RAXW	8.0	8.0	63.0	22.0	0.5
380CBM0800-1.0RAXW	8.0	8.0	63.0	22.0	1.0
380CBM1000-0.5RAXW	10.0	10.0	72.0	27.0	0.5
380CBM1000-1.0RAXW	10.0	10.0	72.0	27.0	1.0
380CBM1200-0.5RAXW	12.0	12.0	81.0	32.0	0.5
380CBM1200-1.0RAXW	12.0	12.0	81.0	32.0	1.0
380CBM1600-0.5RAXW	16.0	16.0	92.0	42.0	0.5
380CBM1600-1.0RAXW	16.0	16.0	92.0	42.0	1.0
380CBM2000-0.5RAXW	20.0	20.0	104.0	52.0	0.5
380CBM2000-1.0RAXW	20.0	20.0	104.0	52.0	1.0



Please note: Due to manufacturing specification changes, the future OAL dimension of this tool will be subject to modification.

## TuffCut® XT9 Series 380 N4 & N5

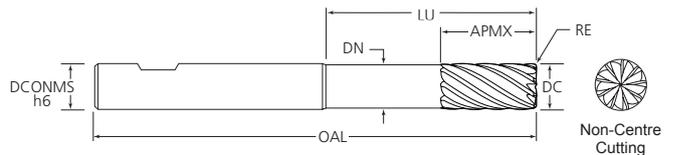
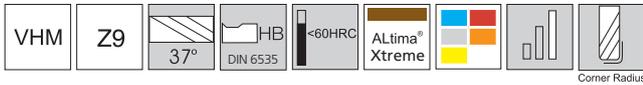


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
380M1200N4-1.0RAX	12.0	12.0	11.4	100.0	18.0	50.0	1.0
380M1200N5-1.0RAX	12.0	12.0	11.4	110.0	18.0	62.0	1.0
380M1600N4-1.0RAX	16.0	16.0	15.2	120.0	35.0	66.0	1.0
380M1600N5-1.0RAX	16.0	16.0	15.2	133.0	35.0	82.0	1.0



End Mills  
Series 380 N4 & N5 / N4-W & N5-W

## TuffCut® XT9 Series 380 N4-W & N5-W

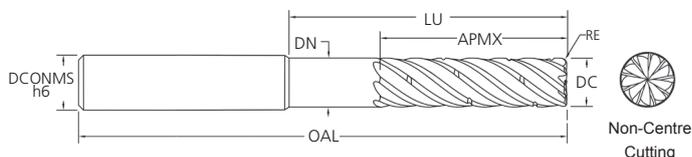


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
380M1200N4-1.0RAXW	12.0	12.0	11.4	100.0	18.0	50.0	1.0
380M1200N5-1.0RAXW	12.0	12.0	11.4	110.0	18.0	62.0	1.0
380M1600N4-1.0RAXW	16.0	16.0	15.2	120.0	35.0	66.0	1.0
380M1600N5-1.0RAXW	16.0	16.0	15.2	133.0	35.0	82.0	1.0



Please note: Due to manufacturing specification changes, the future OAL dimension of this tool will be subject to modification.

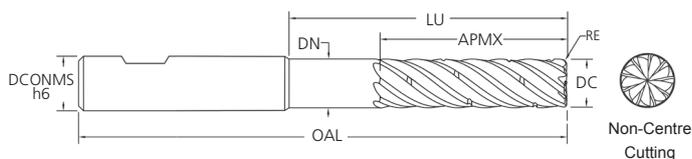
## TuffCut® XT9 Series 380CB N4 & N5



Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
380CBM12N4-1.0RAX	12.0	12.0	11.4	100.0	27.0	50.0	1.0
380CBM12N5-1.0RAX	12.0	12.0	11.4	110.0	27.0	62.0	1.0
380CBM16N4-1.0RAX	16.0	16.0	15.2	120.0	35.0	66.0	1.0
380CBM16N5-1.0RAX	16.0	16.0	15.2	133.0	35.0	82.0	1.0



## TuffCut® XT9 Series 380CB N4-W & N5-W

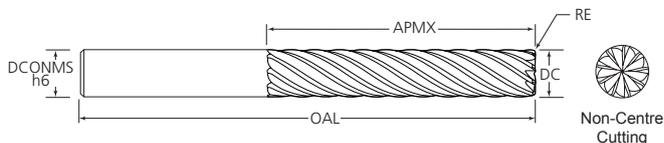


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE
380CBM12N4-1.0RAXW	12.0	12.0	11.4	100.0	27.0	50.0	1.0
380CBM12N5-1.0RAXW	12.0	12.0	11.4	110.0	27.0	62.0	1.0
380CBM16N4-1.0RAXW	16.0	16.0	15.2	120.0	35.0	66.0	1.0
380CBM16N5-1.0RAXW	16.0	16.0	15.2	133.0	35.0	82.0	1.0



End Mills Series 380CB N4 & N5 / N4-W & N5-W

## TuffCut® XT9 Series 380L

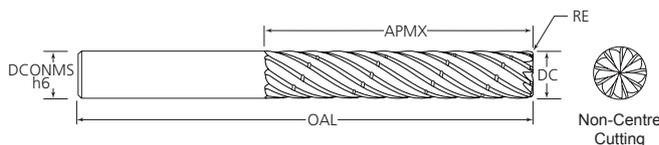


Tool No.	DC	DCONMS	OAL	APMX	RE
380M1204-1.0RAX	12.0	12.0	100.0	50.0	1.0
380M1205-1.0RAX	12.0	12.0	120.0	62.0	1.0
380M1604-1.0RAX	16.0	16.0	120.0	66.0	1.0
380M1605-1.0RAX	16.0	16.0	150.0	82.0	1.0



End Mills  
Series 380L / 380CB L

## TuffCut® XT9 Series 380CB L



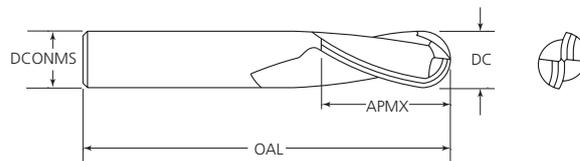
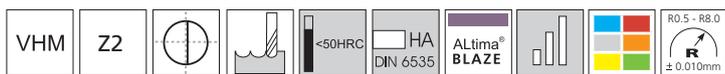
Close up of  
chipbreaker grind



Tool No.	DC	DCONMS	OAL	APMX	RE
380CBM1204-1.0RAX	12.0	12.0	100.0	50.0	1.0
380CBM1205-1.0RAX	12.0	12.0	120.0	62.0	1.0
380CBM1604-1.0RAX	16.0	16.0	120.0	66.0	1.0
380CBM1605-1.0RAX	16.0	16.0	150.0	82.0	1.0



## TuffCut® 3D Series 250

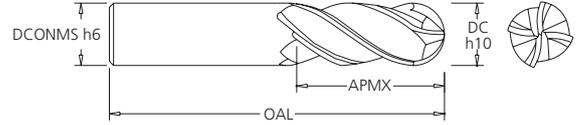
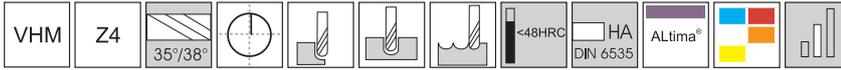


Tool No.	DC	RE	DCONMS	OAL	APMX
250M01041B	1.0	0.5	4.0	50.0	2.0
250M015041B	1.5	0.75	4.0	50.0	3.0
250M02041B	2.0	1.0	4.0	50.0	4.0
250M03041B	3.0	1.5	4.0	50.0	6.0
250M04041B	4.0	2.0	4.0	50.0	6.0
250M04061B	4.0	2.0	6.0	50.0	6.0
250M05061B	5.0	2.5	6.0	50.0	7.5
250M06061B	6.0	3.0	6.0	50.0	9.0
250M06062B	6.0	3.0	6.0	75.0	9.0
250M06063B	6.0	3.0	6.0	100.0	12.0
250M08081B	8.0	4.0	8.0	63.0	12.0
250M08082B	8.0	4.0	8.0	75.0	12.0
250M08083B	8.0	4.0	8.0	100.0	16.0
250M10101B	10.0	5.0	10.0	75.0	15.0
250M10102B	10.0	5.0	10.0	100.0	20.0
250M12121B	12.0	6.0	12.0	75.0	18.0
250M12122B	12.0	6.0	12.0	100.0	24.0
250M16161B	16.0	8.0	16.0	75.0	24.0
250M16162B	16.0	8.0	16.0	100.0	32.0

End Mills  
Series 250



## TuffCut® XR Series 179

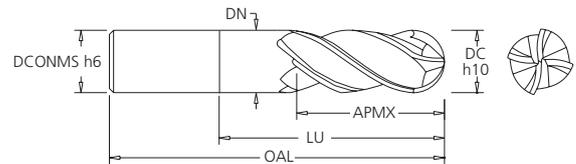
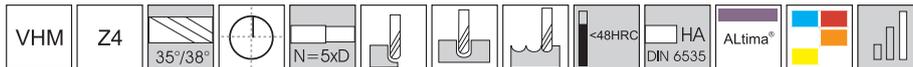


Tool No.	DC	DCONMS	OAL	APMX
179 0150A	1.5	3.0	38.0	3.0
179 0200A	2.0	3.0	38.0	4.0
179 0250A	2.5	3.0	38.0	5.0
179 0300A	3.0	6.0	57.0	8.0
179 0303A	3.0	3.0	38.0	6.0
179 0350A	3.5	6.0	57.0	7.0
179 0400A	4.0	6.0	57.0	11.0
179 0450A	4.5	6.0	57.0	9.0
179 0500A	5.0	6.0	57.0	13.0
179 0600A	6.0	6.0	57.0	13.0
179 0800A	8.0	8.0	63.0	19.0
179 1000A	10.0	10.0	72.0	22.0
179 1200A	12.0	12.0	83.0	26.0
179 1600A	16.0	16.0	92.0	32.0



End Mills  
Series 179 / 179LN5

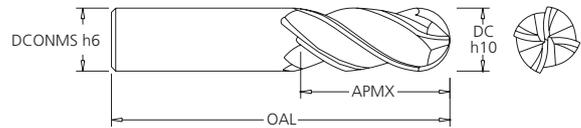
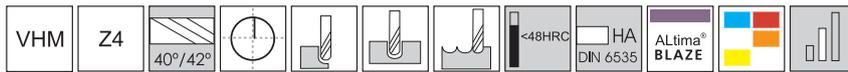
## TuffCut® XR Series 179L N5



Tool No.	DC	DCONMS	DN	OAL	APMX	LU
179L 03N5A	3.0	6.0	2.9	75.0	4.5	17.0
179L 04N5A	4.0	6.0	3.9	75.0	6.0	22.0
179L 05N5A	5.0	6.0	4.9	75.0	7.5	27.0
179L 06N5A	6.0	6.0	5.8	101.0	9.0	32.0
179L 08N5A	8.0	8.0	7.6	101.0	12.0	42.0
179L 10N5A	10.0	10.0	9.6	127.0	15.0	52.0
179L 12N5A	12.0	12.0	11.4	152.0	18.0	62.0
179L 16N5A	16.0	16.0	15.2	152.0	24.0	82.0



## TuffCut® XT Series 279

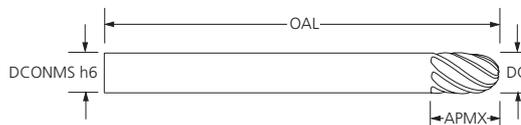
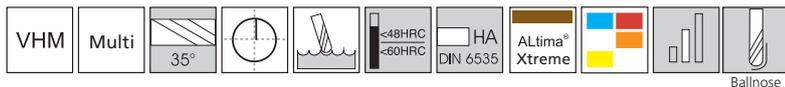


Tool No.	DC	DCONMS	OAL	APMX
279 0300B	3.0	6.0	57.0	8.0
279 0400B	4.0	6.0	57.0	11.0
279 0500B	5.0	6.0	57.0	13.0
279 0600B	6.0	6.0	57.0	13.0
279 0800B	8.0	8.0	63.0	19.0
279 1000B	10.0	10.0	72.0	22.0
279 1200B	12.0	12.0	83.0	26.0
279 1600B	16.0	16.0	92.0	32.0



End Mills  
Series 279

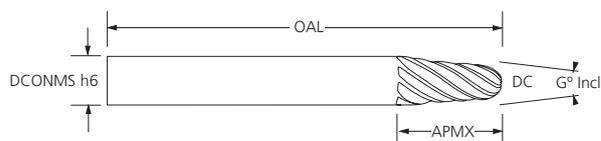
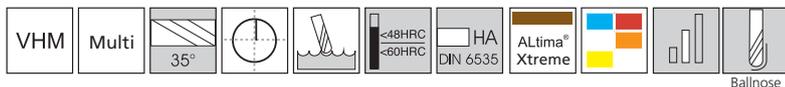
## TuffCut® XT Series MFPB - Multi Flute Parallel Ballnose



Tool No.	RE	DC	DCONMS	OAL	APMX	LU	G°	NOF
MFPB 0601AX	R3	6.0	6.0	100.0	9.0	-	-	6
MFPB 0801AX	R4	8.0	8.0	100.0	12.0	-	-	8
MFPB 1001AX	R5	10.0	10.0	108.0	15.0	-	-	8
MFPB 1201AX	R6	12.0	12.0	108.0	18.0	-	-	8
MFPB 1601AX	R8	16.0	16.0	108.0	24.0	-	-	8
MFPB 2001AX	R10	20.0	20.0	150.0	30.0	-	-	10


 End Mills  
 Series MFPB / MFTB

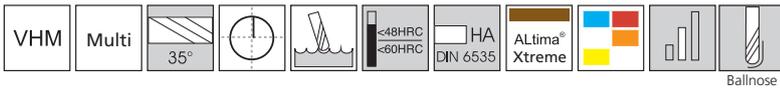
## TuffCut® XT Series MFTB - Multi Flute Tapered Ballnose



Tool No.	RE	DC	DCONMS	OAL	APMX	LU	G°	NOF
MFTB 0402AX	R2	-	6.0	100.0	24.0	-	5°	6
MFTB 0502AX	R2.5	-	6.0	100.0	13.0	-	5°	6
MFTB 0602AX	R3	-	8.0	100.0	25.0	-	5°	6
MFTB 0802AX	R4	-	10.0	100.0	26.0	-	5°	8
MFTB 1002AX	R5	-	12.0	108.0	27.0	-	5°	8
MFTB 1202AX	R6	-	16.0	108.0	51.0	-	5°	8
MFTB 1602AX	R8	-	20.0	108.0	53.0	-	5°	8



## TuffCut® XT Series MFNB - Multi Flute Necked Ballnose



Tool No.	RE	DC	DCONMS	OAL	APMX	LU	G°	NOF
MFNB 0403AX	R2	4.0	6.0	100.0	6.0	8.0	-	6
MFNB 0503AX	R2.5	5.0	6.0	100.0	7.5	10.0	-	6
MFNB 0603AX	R3	6.0	8.0	100.0	9.0	12.0	-	6
MFNB 0803AX	R4	8.0	10.0	100.0	12.0	16.0	-	8
MFNB 1003AX	R5	10.0	12.0	108.0	15.0	23.0	-	8
MFNB 1203AX	R6	12.0	16.0	108.0	18.0	24.0	-	8
MFNB 1603AX	R8	16.0	20.0	108.0	24.0	32.0	-	8



End Mills  
Series MFNB



## 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 Schafffräsern, 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 Schafffräser 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 Schafffräser 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.



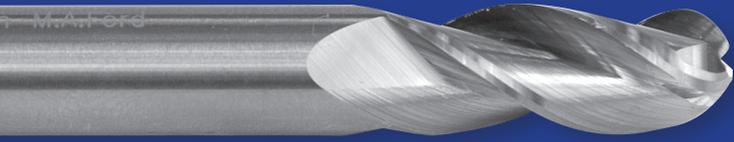
Kiedy Twoje frezy wykonały swoją pracę, pozwól nam zregenerować narzędzie zgodnie z naszymi standardami, aby znów mogły wykonać swoją pracę. Wybierając frezy M.A.Ford® Europe stawiasz na precyzję i wydajność

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

### Full regrind and re-coat service available



For further information please contact our support team on: +44 (0)1332 267960



# TuffCut® X-AL

## Carbide End Mills

Fraises Carbure en Bout · Hartmetall-Schaftfräser · Frese in Metallo Duro Integrale · Frezy Palcowe Pełnowęglkowe

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)

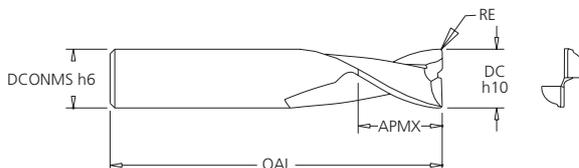
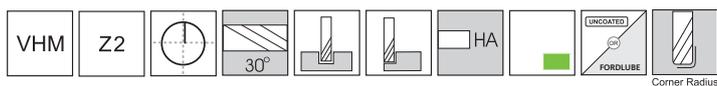
Zaprojektowany tak, aby zapewnić wyjątkową szybkość usuwania materiału i odprowadzania wiórów w aluminium, stopach aluminium i materiałach nieżelaznych. Typoszereg TuffCut® X-AL stał się preferowanym wyborem narzędzi dla wielu precyzyjnych producentów w różnych gałęziach przemysłu.

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# TuffCut® X-AL Series 135



Tool No.	DC	DCONMS	OAL	APMX	RE
135 0300	3.0	3.0	38.0	3.5	0.2
135 0400	4.0	4.0	51.0	4.8	0.2
135 0500	5.0	5.0	51.0	6.0	0.25
135 0600	6.0	6.0	64.0	7.0	0.3
135 0800	8.0	8.0	64.0	9.5	0.35
135 1000	10.0	10.0	70.0	12.0	0.5
135 1200	12.0	12.0	76.0	14.0	0.5
135 1400	14.0	14.0	89.0	16.0	0.5
135 1600	16.0	16.0	89.0	18.0	0.75
135 1800	18.0	18.0	102.0	20.0	0.75
135 2000	20.0	20.0	102.0	22.0	0.75
135 2500	25.0	25.0	102.0	25.0	0.75



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Tool No.	DC	DCONMS	OAL	APMX	RE
135 1001	10.0	10.0	76.0	12.0	0.5
135 1201	12.0	12.0	102.0	14.0	0.5
135 1401	14.0	14.0	102.0	16.0	0.5
135 1601	16.0	16.0	117.0	18.0	0.75
135 1801	18.0	18.0	127.0	20.0	0.75
135 2001	20.0	20.0	127.0	22.0	0.75
135 2501	25.0	25.0	127.0	25.0	0.75



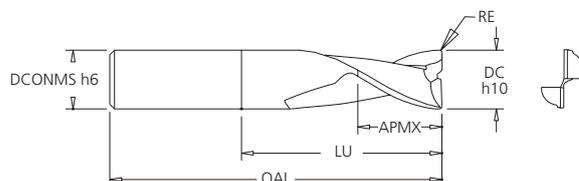
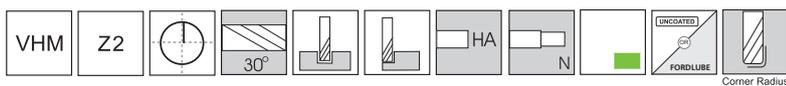
P88

Tool No.	DC	DCONMS	OAL	APMX	RE
135 1002	10.0	10.0	89.0	12.0	0.5
135 1202	12.0	12.0	127.0	14.0	0.5
135 1402	14.0	14.0	127.0	16.0	0.5
135 1602	16.0	16.0	133.0	18.0	0.75
135 1802	18.0	18.0	152.0	20.0	0.75
135 2002	20.0	20.0	152.0	22.0	0.75
135 2502	25.0	25.0	152.0	25.0	0.75



P88

# TuffCut® X-AL Series 135N



Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 0300N	3.0	3.0	38.0	3.5	11.0	0.2
135 0400N	4.0	4.0	51.0	4.8	22.0	0.2
135 0500N	5.0	5.0	51.0	6.0	22.0	0.25
135 0600N	6.0	6.0	64.0	7.0	26.0	0.3
135 0800N	8.0	8.0	64.0	9.5	26.0	0.35
135 1000N	10.0	10.0	70.0	12.0	28.0	0.5
135 1200N	12.0	12.0	76.0	14.0	28.0	0.5
135 1400N	14.0	14.0	89.0	16.0	42.0	0.5
135 1600N	16.0	16.0	89.0	18.0	39.0	0.75
135 1800N	18.0	18.0	102.0	20.0	52.0	0.75
135 2000N	20.0	20.0	102.0	22.0	50.0	0.75
135 2500N	25.0	25.0	102.0	25.0	36.0	0.75



End Mills  
Series 135N

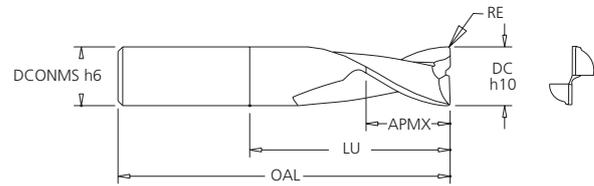
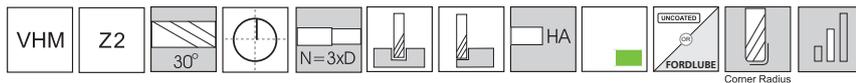
Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 1001N	10.0	10.0	76.0	12.0	34.0	0.5
135 1201N	12.0	12.0	102.0	14.0	54.0	0.5
135 1401N	14.0	14.0	102.0	16.0	55.0	0.5
135 1601N	16.0	16.0	117.0	18.0	83.0	0.75
135 1801N	18.0	18.0	127.0	20.0	77.0	0.75
135 2001N	20.0	20.0	127.0	22.0	75.0	0.75
135 2501N	25.0	25.0	127.0	25.0	61.0	0.75



Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 1002N	10.0	10.0	89.0	12.0	47.0	0.5
135 1202N	12.0	12.0	127.0	14.0	79.0	0.5
135 1402N	14.0	14.0	127.0	16.0	80.0	0.5
135 1602N	16.0	16.0	133.0	18.0	99.0	0.75
135 1802N	18.0	18.0	152.0	20.0	102.0	0.75
135 2002N	20.0	20.0	152.0	22.0	100.0	0.75
135 2502N	25.0	25.0	152.0	25.0	86.0	0.75



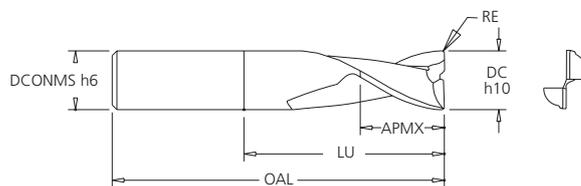
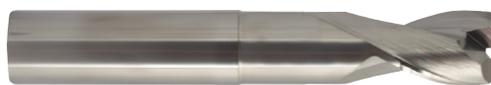
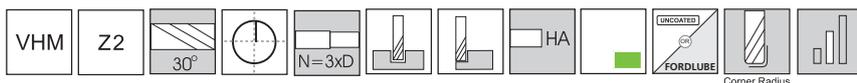
# TuffCut® X-AL Series 135 N3



Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 03N3	3.0	3.0	38.0	3.5	11.0	-
135 03N3-0.5R	3.0	3.0	38.0	3.5	11.0	0.5
135 03N3-1.0R	3.0	3.0	38.0	3.5	11.0	1.0
135 04N3	4.0	4.0	51.0	4.8	14.0	-
135 04N3-0.5R	4.0	4.0	51.0	4.8	14.0	0.5
135 04N3-1.0R	4.0	4.0	51.0	4.8	14.0	1.0
135 05N3	5.0	6.0	64.0	6.0	17.0	-
135 05N3-0.5R	5.0	6.0	64.0	6.0	17.0	0.5
135 05N3-1.0R	5.0	6.0	64.0	6.0	17.0	1.0
135 06N3	6.0	6.0	64.0	7.0	20.0	-
135 06N3-0.5R	6.0	6.0	64.0	7.0	20.0	0.5
135 06N3-1.0R	6.0	6.0	64.0	7.0	20.0	1.0
135 06N3-1.5R	6.0	6.0	64.0	7.0	20.0	1.5
135 06N3-2.0R	6.0	6.0	64.0	7.0	20.0	2.0
135 08N3	8.0	8.0	64.0	9.5	26.0	-
135 08N3-0.5R	8.0	8.0	64.0	9.5	26.0	0.5
135 08N3-1.0R	8.0	8.0	64.0	9.5	26.0	1.0
135 08N3-1.5R	8.0	8.0	64.0	9.5	26.0	1.5
135 08N3-2.0R	8.0	8.0	64.0	9.5	26.0	2.0
135 08N3-3.0R	8.0	8.0	64.0	9.5	26.0	3.0
135 10N3	10.0	10.0	76.0	12.0	34.0	-
135 1001N	10.0	10.0	76.0	12.0	34.0	0.5
135 10N3-1.0R	10.0	10.0	76.0	12.0	34.0	1.0
135 10N3-1.5R	10.0	10.0	76.0	12.0	34.0	1.5
135 10N3-2.0R	10.0	10.0	76.0	12.0	34.0	2.0
135 10N3-3.0R	10.0	10.0	76.0	12.0	34.0	3.0
135 12N3	12.0	12.0	76.0	14.0	38.0	-



# TuffCut® X-AL Series 135 N3

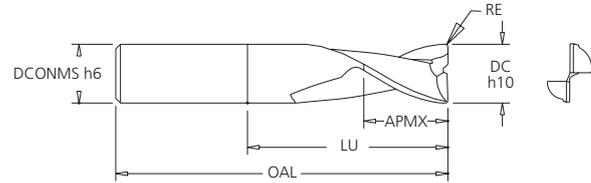
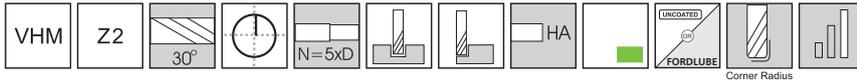


Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 12N3-0.5R	12.0	12.0	76.0	14.0	38.0	0.5
135 12N3-1.0R	12.0	12.0	76.0	14.0	38.0	1.0
135 12N3-1.5R	12.0	12.0	76.0	14.0	38.0	1.5
135 12N3-2.0R	12.0	12.0	76.0	14.0	38.0	2.0
135 12N3-3.0R	12.0	12.0	76.0	14.0	38.0	3.0
135 12N3-4.0R	12.0	12.0	76.0	14.0	38.0	4.0
135 16N3	16.0	16.0	117.0	18.0	53.0	-
135 16N3-0.5R	16.0	16.0	117.0	18.0	53.0	0.5
135 16N3-1.0R	16.0	16.0	117.0	18.0	53.0	1.0
135 16N3-1.5R	16.0	16.0	117.0	18.0	53.0	1.5
135 16N3-2.0R	16.0	16.0	117.0	18.0	53.0	2.0
135 16N3-3.0R	16.0	16.0	117.0	18.0	53.0	3.0
135 16N3-4.0R	16.0	16.0	117.0	18.0	53.0	4.0
135 20N3-0.5R	20.0	20.0	127.0	22.0	65.0	0.5
135 20N3-1.0R	20.0	20.0	127.0	22.0	65.0	1.0
135 20N3-1.5R	20.0	20.0	127.0	22.0	65.0	1.5
135 20N3-2.0R	20.0	20.0	127.0	22.0	65.0	2.0
135 20N3-3.0R	20.0	20.0	127.0	22.0	65.0	3.0
135 20N3-4.0R	20.0	20.0	127.0	22.0	65.0	4.0
135 20N3-5.0R	20.0	20.0	127.0	22.0	65.0	5.0
135 25N3-0.5R	25.0	25.0	127.0	25.0	80.0	0.5
135 25N3-1.0R	25.0	25.0	127.0	25.0	80.0	1.0
135 25N3-1.5R	25.0	25.0	127.0	25.0	80.0	1.5
135 25N3-2.0R	25.0	25.0	127.0	25.0	80.0	2.0
135 25N3-3.0R	25.0	25.0	127.0	25.0	80.0	3.0
135 25N3-4.0R	25.0	25.0	127.0	25.0	80.0	4.0

End Mills  
Series 135 N3



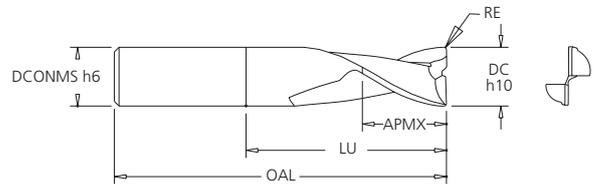
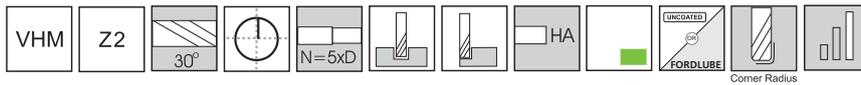
# TuffCut® X-AL Series 135 N5



Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 03N5	3.0	3.0	38.0	3.5	16.0	-
135 03N5-0.5R	3.0	3.0	38.0	3.5	16.0	0.5
135 03N5-1.0R	3.0	3.0	38.0	3.5	16.0	1.0
135 04N5	4.0	4.0	51.0	4.8	22.0	-
135 04N5-0.5R	4.0	4.0	51.0	4.8	22.0	0.5
135 04N5-1.0R	4.0	4.0	51.0	4.8	22.0	1.0
135 05N5	5.0	6.0	64.0	6.0	27.0	-
135 05N5-0.5R	5.0	6.0	64.0	6.0	27.0	0.5
135 05N5-1.0R	5.0	6.0	64.0	6.0	27.0	1.0
135 06N5	6.0	6.0	64.0	7.0	32.0	-
135 06N5-0.5R	6.0	6.0	64.0	7.0	32.0	0.5
135 06N5-1.0R	6.0	6.0	64.0	7.0	32.0	1.0
135 06N5-1.5R	6.0	6.0	64.0	7.0	32.0	1.5
135 06N5-2.0R	6.0	6.0	64.0	7.0	32.0	2.0
135 08N5	8.0	8.0	75.0	9.5	42.0	-
135 08N5-0.5R	8.0	8.0	75.0	9.5	42.0	0.5
135 08N5-1.0R	8.0	8.0	75.0	9.5	42.0	1.0
135 08N5-1.5R	8.0	8.0	75.0	9.5	42.0	1.5
135 08N5-2.0R	8.0	8.0	75.0	9.5	42.0	2.0
135 08N5-3.0R	8.0	8.0	75.0	9.5	42.0	3.0
135 10N5-0.5R	10.0	10.0	89.0	12.0	52.0	0.5
135 10N5-1.0R	10.0	10.0	89.0	12.0	52.0	1.0
135 10N5-1.5R	10.0	10.0	89.0	12.0	52.0	1.5
135 10N5-2.0R	10.0	10.0	89.0	12.0	52.0	2.0
135 10N5-3.0R	10.0	10.0	89.0	12.0	52.0	3.0
135 12N5-0.5R	12.0	12.0	110.0	14.0	62.0	0.5



# TuffCut® X-AL Series 135 N5

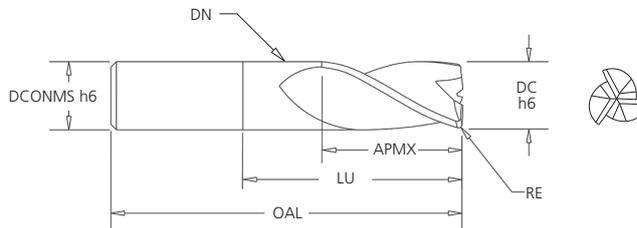
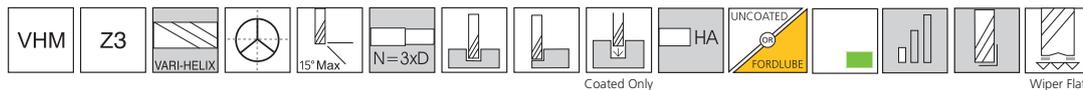


Tool No.	DC	DCONMS	OAL	APMX	LU	RE
135 12N5-1.0R	12.0	12.0	110.0	14.0	62.0	1.0
135 12N5-1.5R	12.0	12.0	110.0	14.0	62.0	1.5
135 12N5-2.0R	12.0	12.0	110.0	14.0	62.0	2.0
135 12N5-3.0R	12.0	12.0	110.0	14.0	62.0	3.0
135 12N5-4.0R	12.0	12.0	110.0	14.0	62.0	4.0
135 12N5-5.0R	12.0	12.0	110.0	14.0	62.0	5.0
135 16N5-0.5R	16.0	16.0	127.0	18.0	85.0	0.5
135 16N5-1.0R	16.0	16.0	127.0	18.0	85.0	1.0
135 16N5-1.5R	16.0	16.0	127.0	18.0	85.0	1.5
135 16N5-2.0R	16.0	16.0	127.0	18.0	85.0	2.0
135 16N5-3.0R	16.0	16.0	127.0	18.0	85.0	3.0
135 16N5-4.0R	16.0	16.0	127.0	18.0	85.0	4.0
135 20N5-0.5R	20.0	20.0	152.0	22.0	105.0	0.5
135 20N5-1.0R	20.0	20.0	152.0	22.0	105.0	1.0
135 20N5-1.5R	20.0	20.0	152.0	22.0	105.0	1.5
135 20N5-2.0R	20.0	20.0	152.0	22.0	105.0	2.0
135 20N5-3.0R	20.0	20.0	152.0	22.0	105.0	3.0
135 20N5-4.0R	20.0	20.0	152.0	22.0	105.0	4.0
135 20N5-5.0R	20.0	20.0	152.0	22.0	105.0	5.0
135 25N5-0.5R	25.0	25.0	180.0	25.0	130.0	0.5
135 25N5-1.0R	25.0	25.0	180.0	25.0	130.0	1.0
135 25N5-1.5R	25.0	25.0	180.0	25.0	130.0	1.5
135 25N5-2.0R	25.0	25.0	180.0	25.0	130.0	2.0
135 25N5-3.0R	25.0	25.0	180.0	25.0	130.0	3.0
135 25N5-4.0R	25.0	25.0	180.0	25.0	130.0	4.0

End Mills  
Series 135 N5



# TuffCut® X-AL Series 137V N3 & 137V N3 AL

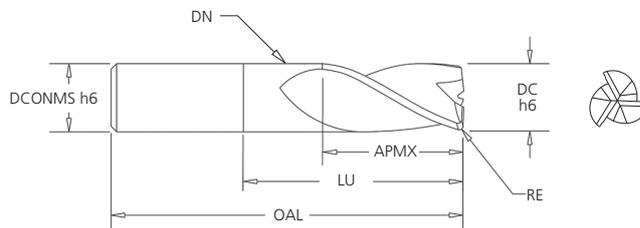
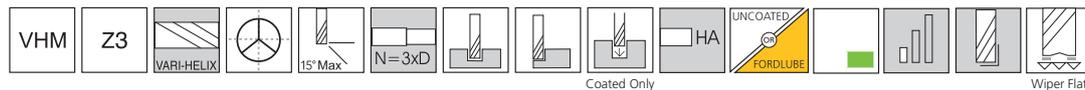


Tool No.				DC	DCONMS	DN	OAL	APMX	LU	RE
Uncoated	Stk	Fordlube Coating	Stk							
137V 03N3	●	137V 03N3AL	●	3.0	3.0	2.8	51.0	8.0	11.0	-
137V 03N3-0.2R	●	137V 03N3-0.2RAL	●	3.0	3.0	2.8	51.0	8.0	11.0	0.2
137V 03N3-0.5R	●	137V 03N3-0.5RAL	●	3.0	3.0	2.8	51.0	8.0	11.0	0.5
137V 03N3-1.0R	●	137V 03N3-1.0RAL	●	3.0	3.0	2.8	51.0	8.0	11.0	1.0
137V 04N3	●	137V 04N3AL	●	4.0	4.0	3.8	51.0	11.0	14.0	-
137V 04N3-0.2R	●	137V 04N3-0.2RAL	●	4.0	4.0	3.8	51.0	11.0	14.0	0.2
137V 04N3-0.5R	●	137V 04N3-0.5RAL	●	4.0	4.0	3.8	51.0	11.0	14.0	0.5
137V 04N3-1.0R	●	137V 04N3-1.0RAL	●	4.0	4.0	3.8	51.0	11.0	14.0	1.0
137V 05N3	●	137V 05N3AL	●	5.0	5.0	4.8	57.0	13.0	17.0	-
137V 05N3-0.2R	●	137V 05N3-0.2RAL	●	5.0	5.0	4.8	57.0	13.0	17.0	0.2
137V 05N3-0.5R	●	137V 05N3-0.5RAL	●	5.0	5.0	4.8	57.0	13.0	17.0	0.5
137V 05N3-1.0R	●	137V 05N3-1.0RAL	●	5.0	5.0	4.8	57.0	13.0	17.0	1.0
137V 06N3	●	137V 06N3AL	●	6.0	6.0	5.8	64.0	13.0	20.0	-
137V 06N3-0.2R	●	137V 06N3-0.2RAL	●	6.0	6.0	5.8	64.0	13.0	20.0	0.2
137V 06N3-0.5R	●	137V 06N3-0.5RAL	●	6.0	6.0	5.8	64.0	13.0	20.0	0.5
137V 06N3-1.0R	●	137V 06N3-1.0RAL	●	6.0	6.0	5.8	64.0	13.0	20.0	1.0
137V 06N3-1.5R	●	137V 06N3-1.5RAL	●	6.0	6.0	5.8	64.0	13.0	20.0	1.5
137V 06N3-2.0R	●	137V 06N3-2.0RAL	●	6.0	6.0	5.8	64.0	13.0	20.0	2.0
137V 08N3	●	137V 08N3AL	●	8.0	8.0	7.8	64.0	19.0	26.0	-
137V 08N3-0.2R	●	137V 08N3-0.2RAL	●	8.0	8.0	7.8	64.0	19.0	26.0	0.2
137V 08N3-0.5R	●	137V 08N3-0.5RAL	●	8.0	8.0	7.8	64.0	19.0	26.0	0.5
137V 08N3-1.0R	●	137V 08N3-1.0RAL	●	8.0	8.0	7.8	64.0	19.0	26.0	1.0
137V 08N3-1.5R	●	137V 08N3-1.5RAL	○	8.0	8.0	7.8	64.0	19.0	26.0	1.5
137V 08N3-2.0R	●	137V 08N3-2.0RAL	●	8.0	8.0	7.8	64.0	19.0	26.0	2.0
137V 08N3-3.0R	●	137V 08N3-3.0RAL	●	8.0	8.0	7.8	64.0	19.0	26.0	3.0
137V 10N3	●	137V 10N3AL	●	10.0	10.0	9.8	73.0	22.0	32.0	-
137V 10N3-0.2R	●	137V 10N3-0.2RAL	●	10.0	10.0	9.8	73.0	22.0	32.0	0.2
137V 10N3-0.3R	○	137V 10N3-0.3RAL	○	10.0	10.0	9.8	73.0	22.0	32.0	0.3
137V 10N3-0.5R	●	137V 10N3-0.5RAL	●	10.0	10.0	9.8	73.0	22.0	32.0	0.5
137V 10N3-1.0R	●	137V 10N3-1.0RAL	●	10.0	10.0	9.8	73.0	22.0	32.0	1.0
137V 10N3-1.5R	●	137V 10N3-1.5RAL	●	10.0	10.0	9.8	73.0	22.0	32.0	1.5
137V 10N3-2.0R	●	137V 10N3-2.0RAL	●	10.0	10.0	9.8	73.0	22.0	32.0	2.0
137V 10N3-3.0R	●	137V 10N3-3.0RAL	●	10.0	10.0	9.8	73.0	22.0	32.0	3.0
137V 10N3-4.0R	●	137V 10N3-4.0RAL	○	10.0	10.0	9.8	73.0	22.0	32.0	4.0

● Stock ○ Check Availability



# TuffCut® X-AL Series 137V N3 & 137V N3 AL



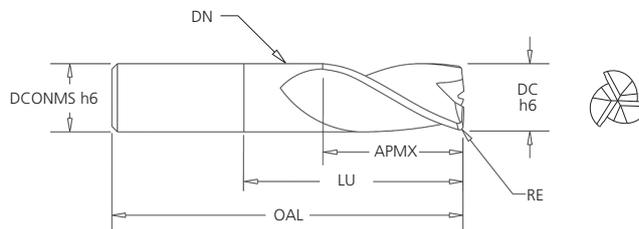
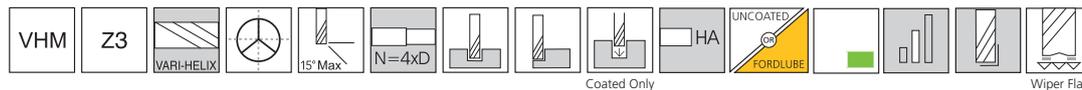
Tool No.				DC	DCONMS	DN	OAL	APMX	LU	RE
Uncoated	Stk	Fordlube Coating	Stk							
137V 12N3	●	137V 12N3AL	●	12.0	12.0	11.8	84.0	26.0	38.0	-
137V 12N3-0.2R	●	137V 12N3-0.2RAL	●	12.0	12.0	11.8	84.0	26.0	38.0	0.2
137V 12N3-0.5R	●	137V 12N3-0.5RAL	○	12.0	12.0	11.8	84.0	26.0	38.0	0.5
137V 12N3-1.0R	●	137V 12N3-1.0RAL	●	12.0	12.0	11.8	84.0	26.0	38.0	1.0
137V 12N3-1.5R	●	137V 12N3-1.5RAL	○	12.0	12.0	11.8	84.0	26.0	38.0	1.5
137V 12N3-2.0R	●	137V 12N3-2.0RAL	●	12.0	12.0	11.8	84.0	26.0	38.0	2.0
137V 12N3-2.5R	●	137V 12N3-2.5RAL	○	12.0	12.0	11.8	84.0	26.0	38.0	2.5
137V 12N3-3.0R	●	137V 12N3-3.0RAL	●	12.0	12.0	11.8	84.0	26.0	38.0	3.0
137V 12N3-4.0R	●	137V 12N3-4.0RAL	●	12.0	12.0	11.8	84.0	26.0	38.0	4.0
137V 16N3	●	137V 16N3AL	●	16.0	16.0	15.8	93.0	32.0	50.0	-
137V 16N3-0.2R	●	137V 16N3-0.2RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	0.2
137V 16N3-0.5R	●	137V 16N3-0.5RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	0.5
137V 16N3-1.0R	●	137V 16N3-1.0RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	1.0
137V 16N3-1.5R	●	137V 16N3-1.5RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	1.5
137V 16N3-2.0R	●	137V 16N3-2.0RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	2.0
137V 16N3-3.0R	●	137V 16N3-3.0RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	3.0
137V 16N3-4.0R	●	137V 16N3-4.0RAL	●	16.0	16.0	15.8	93.0	32.0	50.0	4.0
137V 20N3	●	137V 20N3AL	●	20.0	20.0	19.8	105.0	38.0	62.0	-
137V 20N3-0.2R	●	137V 20N3-0.2RAL	●	20.0	20.0	19.8	105.0	38.0	62.0	0.2
137V 20N3-0.5R	●	137V 20N3-0.5RAL	●	20.0	20.0	19.8	105.0	38.0	62.0	0.5
137V 20N3-1.0R	●	137V 20N3-1.0RAL	●	20.0	20.0	19.8	105.0	38.0	62.0	1.0
137V 20N3-1.5R	●	137V 20N3-1.5RAL	○	20.0	20.0	19.8	105.0	38.0	62.0	1.5
137V 20N3-2.0R	●	137V 20N3-2.0RAL	●	20.0	20.0	19.8	105.0	38.0	62.0	2.0
137V 20N3-3.0R	●	137V 20N3-3.0RAL	●	20.0	20.0	19.8	105.0	38.0	62.0	3.0
137V 20N3-4.0R	●	137V 20N3-4.0RAL	●	20.0	20.0	19.8	105.0	38.0	62.0	4.0
137V 20N3-5.0R	●	137V 20N3-5.0RAL	○	20.0	20.0	19.8	105.0	38.0	62.0	5.0
137V 20N3-6.0R	●	137V 20N3-6.0RAL	○	20.0	20.0	19.8	105.0	38.0	62.0	6.0

● Stock ○ Check Availability



End Mills  
Series 137V N3 & N3 AL

# TuffCut® X-AL Series 137V N4 & 137V N4 AL

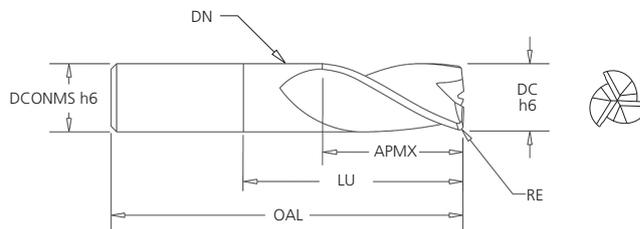
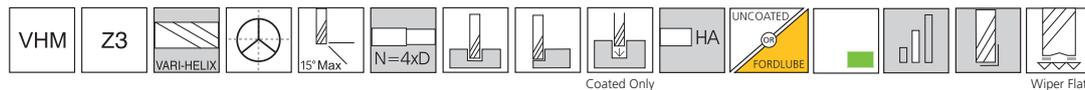


Tool No.				DC	DCONMS	DN	OAL	APMX	LU	RE
Uncoated	Stk	Fordlube Coating	Stk							
137V 03N4	●	137V 03N4AL	○	3.0	3.0	2.8	51.0	4.5	14.0	-
137V 03N4-0.2R	●	137V 03N4-0.2RAL	●	3.0	3.0	2.8	51.0	4.5	14.0	0.2
137V 03N4-0.5R	●	137V 03N4-0.5RAL	●	3.0	3.0	2.8	51.0	4.5	14.0	0.5
137V 03N4-1.0R	●	137V 03N4-1.0RAL	○	3.0	3.0	2.8	51.0	4.5	14.0	1.0
137V 04N4	●	137V 04N4AL	●	4.0	4.0	3.8	51.0	6.0	18.0	-
137V 04N4-0.2R	●	137V 04N4-0.2RAL	●	4.0	4.0	3.8	51.0	6.0	18.0	0.2
137V 04N4-0.5R	●	137V 04N4-0.5RAL	●	4.0	4.0	3.8	51.0	6.0	18.0	0.5
137V 04N4-1.0R	●	137V 04N4-1.0RAL	●	4.0	4.0	3.8	51.0	6.0	18.0	1.0
137V 05N4	●	137V 05N4AL	●	5.0	5.0	4.8	57.0	7.5	22.0	-
137V 05N4-0.2R	●	137V 05N4-0.2RAL	●	5.0	5.0	4.8	57.0	7.5	22.0	0.2
137V 05N4-0.5R	●	137V 05N4-0.5RAL	○	5.0	5.0	4.8	57.0	7.5	22.0	0.5
137V 05N4-1.0R	●	137V 05N4-1.0RAL	●	5.0	5.0	4.8	57.0	7.5	22.0	1.0
137V 06N4	●	137V 06N4AL	●	6.0	6.0	5.8	64.0	9.0	26.0	-
137V 06N4-0.2R	●	137V 06N4-0.2RAL	●	6.0	6.0	5.8	64.0	9.0	26.0	0.2
137V 06N4-0.5R	●	137V 06N4-0.5RAL	●	6.0	6.0	5.8	64.0	9.0	26.0	0.5
137V 06N4-1.0R	●	137V 06N4-1.0RAL	●	6.0	6.0	5.8	64.0	9.0	26.0	1.0
137V 06N4-1.5R	●	137V 06N4-1.5RAL	○	6.0	6.0	5.8	64.0	9.0	26.0	1.5
137V 06N4-2.0R	●	137V 06N4-2.0RAL	○	6.0	6.0	5.8	64.0	9.0	26.0	2.0
137V 08N4	●	137V 08N4AL	●	8.0	8.0	7.8	70.0	12.0	34.0	-
137V 08N4-0.2R	●	137V 08N4-0.2RAL	●	8.0	8.0	7.8	70.0	12.0	34.0	0.2
137V 08N4-0.5R	●	137V 08N4-0.5RAL	○	8.0	8.0	7.8	70.0	12.0	34.0	0.5
137V 08N4-1.0R	●	137V 08N4-1.0RAL	●	8.0	8.0	7.8	70.0	12.0	34.0	1.0
137V 08N4-1.5R	●	137V 08N4-1.5RAL	○	8.0	8.0	7.8	70.0	12.0	34.0	1.5
137V 08N4-2.0R	●	137V 08N4-2.0RAL	●	8.0	8.0	7.8	70.0	12.0	34.0	2.0
137V 08N4-3.0R	●	137V 08N4-3.0RAL	●	8.0	8.0	7.8	70.0	12.0	34.0	3.0
137V 10N4	●	137V 10N4AL	●	10.0	10.0	9.8	90.0	15.0	42.0	-
137V 10N4-0.2R	●	137V 10N4-0.2RAL	●	10.0	10.0	9.8	90.0	15.0	42.0	0.2
137V 10N4-0.5R	●	137V 10N4-0.5RAL	●	10.0	10.0	9.8	90.0	15.0	42.0	0.5
137V 10N4-1.0R	●	137V 10N4-1.0RAL	●	10.0	10.0	9.8	90.0	15.0	42.0	1.0
137V 10N4-1.5R	●	137V 10N4-1.5RAL	●	10.0	10.0	9.8	90.0	15.0	42.0	1.5
137V 10N4-2.0R	●	137V 10N4-2.0RAL	●	10.0	10.0	9.8	90.0	15.0	42.0	2.0
137V 10N4-3.0R	●	137V 10N4-3.0RAL	●	10.0	10.0	9.8	90.0	15.0	42.0	3.0
137V 10N4-4.0R	●	137V 10N4-4.0RAL	○	10.0	10.0	9.8	90.0	15.0	42.0	4.0

● Stock ○ Check Availability



# TuffCut® X-AL Series 137V N4 & 137V N4 AL



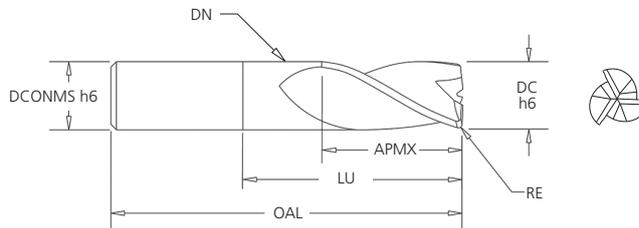
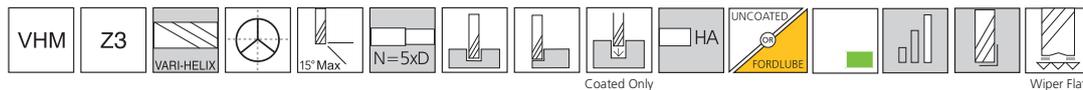
Tool No.				DC	DCONMS	DN	OAL	APMX	LU	RE
Uncoated	Stk	Fordlube Coating	Stk							
137V 12N4	●	137V 12N4AL	●	12.0	12.0	11.8	100.0	18.0	50.0	-
137V 12N4-0.2R	●	137V 12N4-0.2RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	0.2
137V 12N4-0.5R	●	137V 12N4-0.5RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	0.5
137V 12N4-1.0R	●	137V 12N4-1.0RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	1.0
137V 12N4-1.5R	●	137V 12N4-1.5RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	1.5
137V 12N4-2.0R	●	137V 12N4-2.0RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	2.0
137V 12N4-3.0R	●	137V 12N4-3.0RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	3.0
137V 12N4-4.0R	●	137V 12N4-4.0RAL	●	12.0	12.0	11.8	100.0	18.0	50.0	4.0
137V 16N4	●	137V 16N4AL	●	16.0	16.0	15.8	120.0	24.0	66.0	-
137V 16N4-0.2R	●	137V 16N4-0.2RAL	●	16.0	16.0	15.8	120.0	24.0	66.0	0.2
137V 16N4-0.5R	●	137V 16N4-0.5RAL	●	16.0	16.0	15.8	120.0	24.0	66.0	0.5
137V 16N4-1.0R	●	137V 16N4-1.0RAL	●	16.0	16.0	15.8	120.0	24.0	66.0	1.0
137V 16N4-1.5R	●	137V 16N4-1.5RAL	○	16.0	16.0	15.8	120.0	24.0	66.0	1.5
137V 16N4-2.0R	●	137V 16N4-2.0RAL	○	16.0	16.0	15.8	120.0	24.0	66.0	2.0
137V 16N4-3.0R	●	137V 16N4-3.0RAL	○	16.0	16.0	15.8	120.0	24.0	66.0	3.0
137V 16N4-4.0R	●	137V 16N4-4.0RAL	●	16.0	16.0	15.8	120.0	24.0	66.0	4.0
137V 20N4	●	137V 20N4AL	●	20.0	20.0	19.8	135.0	30.0	82.0	-
137V 20N4-0.2R	●	137V 20N4-0.2RAL	○	20.0	20.0	19.8	135.0	30.0	82.0	0.2
137V 20N4-0.5R	●	137V 20N4-0.5RAL	○	20.0	20.0	19.8	135.0	30.0	82.0	0.5
137V 20N4-1.0R	●	137V 20N4-1.0RAL	●	20.0	20.0	19.8	135.0	30.0	82.0	1.0
137V 20N4-1.5R	●	137V 20N4-1.5RAL	○	20.0	20.0	19.8	135.0	30.0	82.0	1.5
137V 20N4-2.0R	●	137V 20N4-2.0RAL	●	20.0	20.0	19.8	135.0	30.0	82.0	2.0
137V 20N4-3.0R	●	137V 20N4-3.0RAL	○	20.0	20.0	19.8	135.0	30.0	82.0	3.0
137V 20N4-4.0R	●	137V 20N4-4.0RAL	○	20.0	20.0	19.8	135.0	30.0	82.0	4.0

● Stock ○ Check Availability



End Mills  
Series 137V N4 & N4 AL

# TuffCut® X-AL Series 137V N5 & 137V N5 AL

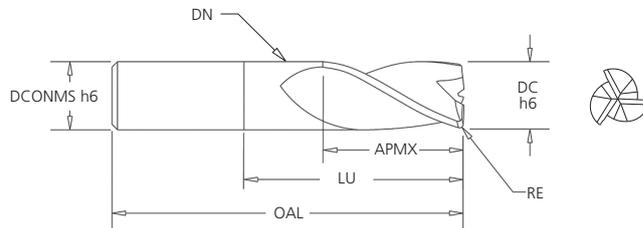
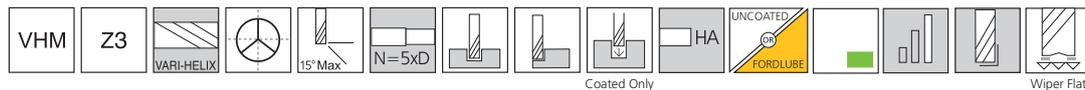


Tool No.				DC	DCONMS	DN	OAL	APMX	LU	RE
Uncoated	Stk	Fordlube Coating	Stk							
137V 03N5	●	137V 03N5AL	●	3.0	3.0	2.8	51.0	4.5	17.0	-
137V 03N5-0.2R	●	137V 03N5-0.2RAL	●	3.0	3.0	2.8	51.0	4.5	17.0	0.2
137V 03N5-0.5R	●	137V 03N5-0.5RAL	●	3.0	3.0	2.8	51.0	4.5	17.0	0.5
137V 03N5-1.0R	●	137V 03N5-1.0RAL	○	3.0	3.0	2.8	51.0	4.5	17.0	1.0
137V 04N5	●	137V 04N5AL	●	4.0	4.0	3.8	51.0	6.0	22.0	-
137V 04N5-0.2R	●	137V 04N5-0.2RAL	●	4.0	4.0	3.8	51.0	6.0	22.0	0.2
137V 04N5-0.5R	●	137V 04N5-0.5RAL	●	4.0	4.0	3.8	51.0	6.0	22.0	0.5
137V 04N5-1.0R	●	137V 04N5-1.0RAL	●	4.0	4.0	3.8	51.0	6.0	22.0	1.0
137V 05N5	●	137V 05N5AL	●	5.0	5.0	4.8	57.0	7.5	27.0	-
137V 05N5-0.2R	●	137V 05N5-0.2RAL	●	5.0	5.0	4.8	57.0	7.5	27.0	0.2
137V 05N5-0.5R	●	137V 05N5-0.5RAL	●	5.0	5.0	4.8	57.0	7.5	27.0	0.5
137V 05N5-1.0R	●	137V 05N5-1.0RAL	●	5.0	5.0	4.8	57.0	7.5	27.0	1.0
137V 06N5	●	137V 06N5AL	●	6.0	6.0	5.8	64.0	9.0	32.0	-
137V 06N5-0.2R	●	137V 06N5-0.2RAL	●	6.0	6.0	5.8	64.0	9.0	32.0	0.2
137V 06N5-0.5R	●	137V 06N5-0.5RAL	●	6.0	6.0	5.8	64.0	9.0	32.0	0.5
137V 06N5-1.0R	●	137V 06N5-1.0RAL	○	6.0	6.0	5.8	64.0	9.0	32.0	1.0
137V 06N5-1.5R	●	137V 06N5-1.5RAL	●	6.0	6.0	5.8	64.0	9.0	32.0	1.5
137V 06N5-2.0R	●	137V 06N5-2.0RAL	●	6.0	6.0	5.8	64.0	9.0	32.0	2.0
137V 08N5	●	137V 08N5AL	●	8.0	8.0	7.8	75.0	12.0	42.0	-
137V 08N5-0.2R	●	137V 08N5-0.2RAL	●	8.0	8.0	7.8	75.0	12.0	42.0	0.2
137V 08N5-0.5R	●	137V 08N5-0.5RAL	●	8.0	8.0	7.8	75.0	12.0	42.0	0.5
137V 08N5-1.0R	●	137V 08N5-1.0RAL	○	8.0	8.0	7.8	75.0	12.0	42.0	1.0
137V 08N5-1.5R	●	137V 08N5-1.5RAL	○	8.0	8.0	7.8	75.0	12.0	42.0	1.5
137V 08N5-2.0R	●	137V 08N5-2.0RAL	●	8.0	8.0	7.8	75.0	12.0	42.0	2.0
137V 08N5-3.0R	●	137V 08N5-3.0RAL	○	8.0	8.0	7.8	75.0	12.0	42.0	3.0
137V 10N5	●	137V 10N5AL	●	10.0	10.0	9.8	90.0	15.0	52.0	-
137V 10N5-0.2R	●	137V 10N5-0.2RAL	●	10.0	10.0	9.8	90.0	15.0	52.0	0.2
137V 10N5-0.5R	●	137V 10N5-0.5RAL	●	10.0	10.0	9.8	90.0	15.0	52.0	0.5
137V 10N5-1.0R	●	137V 10N5-1.0RAL	●	10.0	10.0	9.8	90.0	15.0	52.0	1.0
137V 10N5-1.5R	●	137V 10N5-1.5RAL	●	10.0	10.0	9.8	90.0	15.0	52.0	1.5
137V 10N5-2.0R	●	137V 10N5-2.0RAL	●	10.0	10.0	9.8	90.0	15.0	52.0	2.0
137V 10N5-3.0R	●	137V 10N5-3.0RAL	●	10.0	10.0	9.8	90.0	15.0	52.0	3.0
137V 10N5-4.0R	●	137V 10N5-4.0RAL	○	10.0	10.0	9.8	90.0	15.0	52.0	4.0

● Stock ○ Check Availability



# TuffCut® X-AL Series 137V N5 & 137V N5 AL



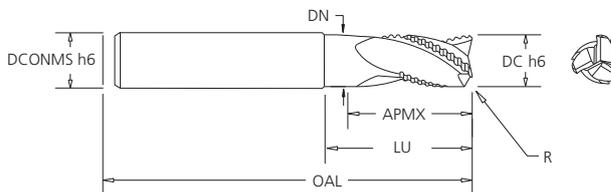
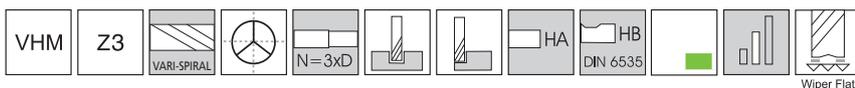
Tool No.				DC	DCONMS	DN	OAL	APMX	LU	RE
Uncoated	Stk	Fordlube Coating	Stk							
137V 12N5	●	137V 12N5AL	●	12.0	12.0	11.8	110.0	18.0	62.0	-
137V 12N5-0.2R	●	137V 12N5-0.2RAL	●	12.0	12.0	11.8	110.0	18.0	62.0	0.2
137V 12N5-0.5R	●	137V 12N5-0.5RAL	●	12.0	12.0	11.8	110.0	18.0	62.0	0.5
137V 12N5-1.0R	●	137V 12N5-1.0RAL	●	12.0	12.0	11.8	110.0	18.0	62.0	1.0
137V 12N5-1.5R	●	137V 12N5-1.5RAL	○	12.0	12.0	11.8	110.0	18.0	62.0	1.5
137V 12N5-2.0R	●	137V 12N5-2.0RAL	●	12.0	12.0	11.8	110.0	18.0	62.0	2.0
137V 12N5-3.0R	●	137V 12N5-3.0RAL	●	12.0	12.0	11.8	110.0	18.0	62.0	3.0
137V 12N5-4.0R	●	137V 12N5-4.0RAL	●	12.0	12.0	11.8	110.0	18.0	62.0	4.0
137V 16N5	●	137V 16N5AL	●	16.0	16.0	15.8	130.0	24.0	82.0	-
137V 16N5-0.2R	●	137V 16N5-0.2RAL	●	16.0	16.0	15.8	130.0	24.0	82.0	0.2
137V 16N5-0.5R	●	137V 16N5-0.5RAL	●	16.0	16.0	15.8	130.0	24.0	82.0	0.5
137V 16N5-1.0R	●	137V 16N5-1.0RAL	●	16.0	16.0	15.8	130.0	24.0	82.0	1.0
137V 16N5-1.5R	●	137V 16N5-1.5RAL	○	16.0	16.0	15.8	130.0	24.0	82.0	1.5
137V 16N5-2.0R	●	137V 16N5-2.0RAL	●	16.0	16.0	15.8	130.0	24.0	82.0	2.0
137V 16N5-3.0R	●	137V 16N5-3.0RAL	●	16.0	16.0	15.8	130.0	24.0	82.0	3.0
137V 16N5-4.0R	●	137V 16N5-4.0RAL	●	16.0	16.0	15.8	130.0	24.0	82.0	4.0
137V 20N5	●	137V 20N5AL	●	20.0	20.0	19.8	150.0	30.0	102.0	-
137V 20N5-0.2R	●	137V 20N5-0.2RAL	●	20.0	20.0	19.8	150.0	30.0	102.0	0.2
137V 20N5-0.5R	●	137V 20N5-0.5RAL	●	20.0	20.0	19.8	150.0	30.0	102.0	0.5
137V 20N5-1.0R	●	137V 20N5-1.0RAL	●	20.0	20.0	19.8	150.0	30.0	102.0	1.0
137V 20N5-1.5R	●	137V 20N5-1.5RAL	○	20.0	20.0	19.8	150.0	30.0	102.0	1.5
137V 20N5-2.0R	●	137V 20N5-2.0RAL	○	20.0	20.0	19.8	150.0	30.0	102.0	2.0
137V 20N5-3.0R	●	137V 20N5-3.0RAL	○	20.0	20.0	19.8	150.0	30.0	102.0	3.0
137V 20N5-4.0R	●	137V 20N5-4.0RAL	○	20.0	20.0	19.8	150.0	30.0	102.0	4.0

● Stock ○ Check Availability



End Mills  
Series 137V N5 & N5 AL

## TuffCut® X-AL Series 137VR N3

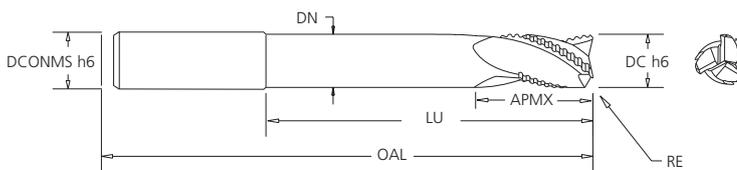
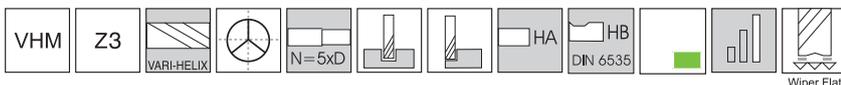


Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Shank
137VR 12N3-1.0R	12.0	12.0	11.8	84.0	26.0	38.0	1.0	HA
137VR 12N3-1.0RW	12.0	12.0	11.8	84.0	26.0	38.0	1.0	HB
137VR 16N3-1.0R	16.0	16.0	15.8	93.0	32.0	50.0	1.0	HA
137VR 16N3-1.0RW	16.0	16.0	15.8	100.0	32.0	50.0	1.0	HB
137VR 20N3-1.0R	20.0	20.0	19.8	105.0	38.0	62.0	1.0	HA
137VR 20N3-1.0RW	20.0	20.0	19.8	112.0	38.0	62.0	1.0	HB



End Mills  
Series 137VR N3 & N5

## TuffCut® X-AL Series 137VR N5



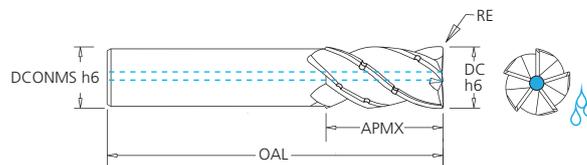
Tool No.	DC	DCONMS	DN	OAL	APMX	LU	RE	Shank
137VR 12N5-1.0R	12.0	12.0	11.8	110.0	18.0	62.0	1.0	HA
137VR 12N5-1.0RW	12.0	12.0	11.8	110.0	18.0	62.0	1.0	HB
137VR 16N5-1.0R	16.0	16.0	15.8	130.0	24.0	82.0	1.0	HA
137VR 16N5-1.0RW	16.0	16.0	15.8	130.0	24.0	82.0	1.0	HB
137VR 20N5-1.0R	20.0	20.0	19.8	150.0	30.0	102.0	1.0	HA
137VR 20N5-1.0RW	20.0	20.0	19.8	155.0	30.0	102.0	1.0	HB



## TuffCut® X-AL Series 137V5



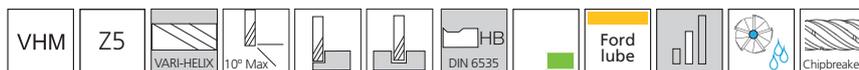
Close up of chipbreaker grind



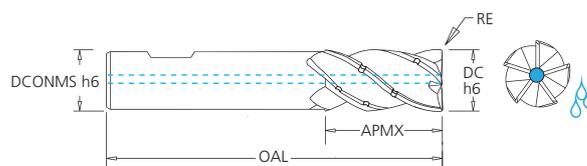
Tool No.	DC	DCONMS	OAL	APMX	RE
137V5 1003-ALCC	10.0	10.0	75.0	32.0	-
137V5 1003-1.0RALCC	10.0	10.0	75.0	32.0	1.0
137V5 1203-ALCC	12.0	12.0	87.0	38.0	-
137V5 1203-1.0RALCC	12.0	12.0	87.0	38.0	1.0
137V5 1203-3.0RALCC	12.0	12.0	87.0	38.0	3.0
137V5 1603-ALCC	16.0	16.0	104.0	50.0	-
137V5 1603-1.0RALCC	16.0	16.0	104.0	50.0	1.0
137V5 1603-3.0RALCC	16.0	16.0	104.0	50.0	3.0
137V5 2003-ALCC	20.0	20.0	120.0	62.0	-
137V5 2003-1.0RALCC	20.0	20.0	120.0	62.0	1.0



## TuffCut® X-AL Series 137V5-W



Close up of chipbreaker grind

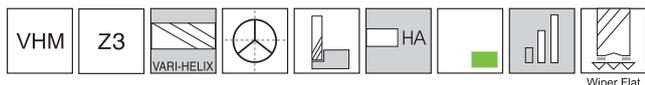


Tool No.	DC	DCONMS	OAL	APMX	RE
137V5 1003-ALCCW	10.0	10.0	75.0	32.0	-
137V5 1003-1.0RALCCW	10.0	10.0	75.0	32.0	1.0
137V5 1203-ALCCW	12.0	12.0	87.0	38.0	-
137V5 1203-1.0RALCCW	12.0	12.0	87.0	38.0	1.0
137V5 1603-ALCCW	16.0	16.0	104.0	50.0	-
137V5 1603-1.0RALCCW	16.0	16.0	104.0	50.0	1.0
137V5 2003-ALCCW	20.0	20.0	120.0	62.0	-
137V5 2003-1.0RALCCW	20.0	20.0	120.0	62.0	1.0

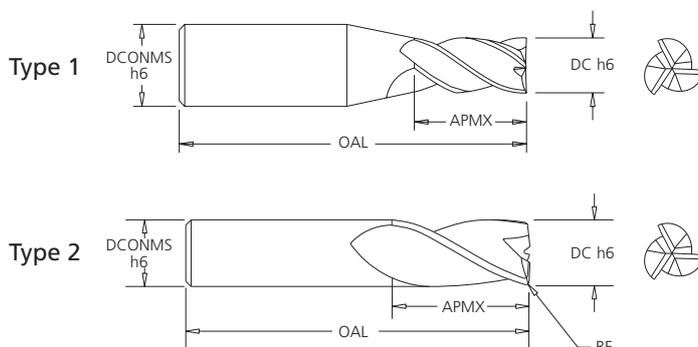


End Mills Series 137V5 & 137V5-W

# TuffCut® X-AL Series 137VF Finishing



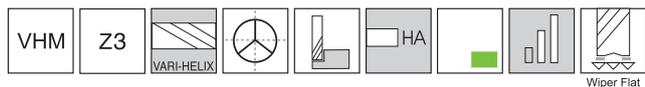
3 x D1 and 5 x D1 Flute Lengths



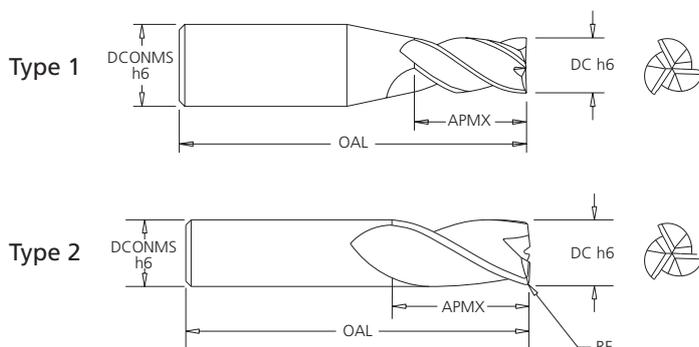
Tool No.	DC	DCONMS	OAL	APMX	RE	Type
137VF 0303	3.0	6.0	75.0	11.0	-	1
137VF 0303-0.2R	3.0	6.0	75.0	11.0	0.2	1
137VF 0305	3.0	6.0	75.0	17.0	-	1
137VF 0305-0.2R	3.0	6.0	75.0	17.0	0.2	1
137VF 0403	4.0	6.0	75.0	14.0	-	1
137VF 0403-0.2R	4.0	6.0	75.0	14.0	0.2	1
137VF 0403-0.5R	4.0	6.0	75.0	14.0	0.5	1
137VF 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

 End Mills  
 Series 137VF Finishing

# TuffCut® X-AL Series 137VF Finishing



3 x D1 and 5 x D1 Flute Lengths

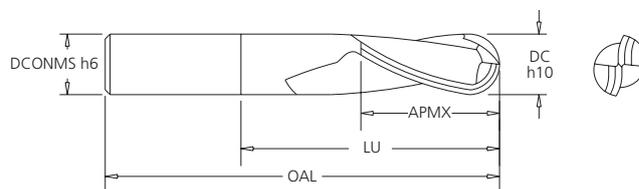
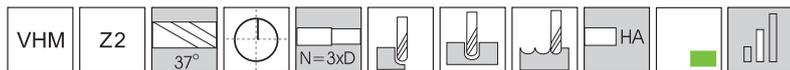


Tool No.	DC	DCONMS	OAL	APMX	RE	Type
137VF 1005-1.0R	10.0	10.0	100.0	52.0	1.0	2
137VF 1005-2.0R	10.0	10.0	100.0	52.0	2.0	2
137VF 1203	12.0	12.0	100.0	38.0	-	2
137VF 1203-0.2R	12.0	12.0	100.0	38.0	0.2	2
137VF 1203-0.5R	12.0	12.0	100.0	38.0	0.5	2
137VF 1203-1.0R	12.0	12.0	100.0	38.0	1.0	2
137VF 1203-2.0R	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

End Mills Series 137VF Finishing



## TuffCut® X-AL Series 135B N3

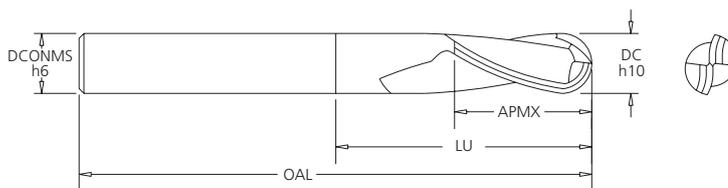
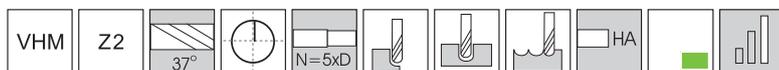


Tool No.	EDP	DC	DCONMS	OAL	APMX	LU
135B 0300N3	13236	3.0	3.0	38.0	5.0	11.0
135B 0400N3	13238	4.0	4.0	51.0	6.0	14.0
135B 0500N3	13240	5.0	5.0	64.0	7.0	17.0
135B 0600N3	13242	6.0	6.0	64.0	8.0	20.0
135B 0800N3	13244	8.0	8.0	64.0	10.0	26.0
135B 1000N3	13246	10.0	10.0	70.0	12.0	32.0
135B 1200N3	13248	12.0	12.0	76.0	16.0	38.0
135B 1600N3	13250	16.0	16.0	89.0	20.0	50.0



End Mills  
Series 135B N3 & N5

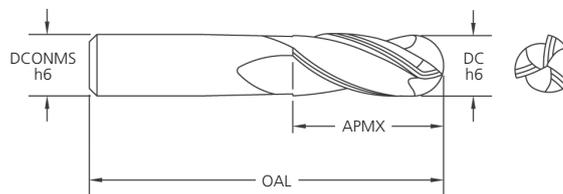
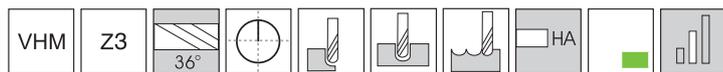
## TuffCut® X-AL Series 135B N5



Tool No.	EDP	DC	DCONMS	OAL	APMX	LU
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



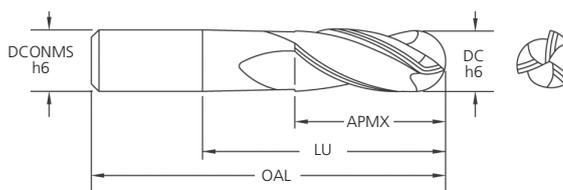
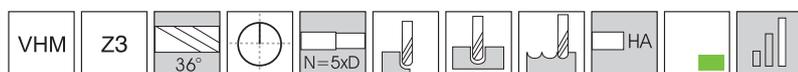
## TuffCut® X-AL Series 138B



Tool No.	EDP	DC	DCONMS	OAL	APMX
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



Tool No.	EDP	DC	DCONMS	OAL	APMX	LU
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



End Mills  
Series 138B & 138B N5

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

● Preferred    ○ Possible    X Not Possible

Workpiece Material Group	Material Type	Tool Diameter									
		1.5mm	3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm	
Steels	P	Low Carbon	0.020	0.027	0.067	0.080	0.093	0.133	0.160	0.187	0.267
		Medium Carbon									
		Alloy Steels									
		Die/Tool Steels									
Stainless Steels	M	Free Machining	0.020	0.027	0.067	0.080	0.093	0.133	0.160	0.187	0.267
		Austenitic									
		Difficult Stainless									
		PH Stainless									
		Cobalt Chrome Alloys									
Special Alloys	S	High Temp Alloys	0.009	0.013	0.033	0.040	0.047	0.067	0.080	0.093	0.133
		Inconel®									
		Titanium Alloys									
Cast Irons	K	Gray Cast Iron	0.019	0.027	0.067	0.080	0.093	0.133	0.160	0.187	0.267
		Ductile Cast Iron									
		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									

### 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

Regular Length - 3MVR Series														
Workpiece Material Group	ISO	Coolant ● Preferred ○ Possible x Not Possible			Application	Depth of Cut Per Application		vc - m/min	End Mill Diameter (mm)					
		Max.	Air	MMS		Axial (Ap)	Radial (Ae)		0.5	1.0	1.5	2.0	2.5	3.0
									fz - mm/tooth by Cutter Diameter					
Moderate Machining & PH Stainless Steels	M	●	X	○	Slotting	0.5 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.2-2.5 x D	0.1 x D	150	0.0033	0.0066	0.0099	0.0132	0.0165	0.0198
High Temp Alloys	S	●	X	X	Slotting	0.5 x D	-	30	0.0010	0.0020	0.0030	0.0040	0.0050	0.0060
					Profiling	0.2-2.5 x D	0.05 x D	45	0.0028	0.0056	0.0084	0.0112	0.0140	0.0168
Titanium Alloys	S	●	X	X	Slotting	0.5 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.2-2.5 x D	0.1 x D	107	0.0020	0.0040	0.0060	0.0080	0.0100	0.0120

Stub Length - 3MVS Series														
Workpiece Material Group	ISO	Coolant ● Preferred ○ Possible x Not Possible			Application	Depth of Cut Per Application		vc - m/min	End Mill Diameter (mm)					
		Max.	Air	MMS		Axial (Ap)	Radial (Ae)		0.5	1.0	1.5	2.0	2.5	3.0
									fz - mm/tooth by Cutter Diameter					
Moderate Machining & PH Stainless Steels	M	●	X	○	Slotting	0.5 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.2-2.5 x D	0.1 x D	150	0.0033	0.0066	0.0099	0.0132	0.0165	0.0198
High Temp Alloys	S	●	X	X	Slotting	0.5 x D	-	30	0.0010	0.0020	0.0030	0.0040	0.0050	0.0060
					Profiling	0.2-2.5 x D	0.05 x D	45	0.0028	0.0056	0.0084	0.0112	0.0140	0.0168
Titanium Alloys	S	●	X	X	Slotting	0.5 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.2-2.5 x D	0.1 x D	107	0.0020	0.0040	0.0060	0.0080	0.0100	0.0120

5 X D Necked Tools (3MVS Series - N5)														
Workpiece Material Group	ISO	Coolant ● Preferred ○ Possible x Not Possible			Application	Depth of Cut Per Application		vc - m/min	End Mill Diameter (mm)					
		Max.	Air	MMS		Axial (Ap)	Radial (Ae)		0.5	1.0	1.5	2.0	2.5	3.0
									fz - mm/tooth by Cutter Diameter					
Moderate Machining & PH Stainless Steels	M	●	X	○	Slotting	0.3 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.1 x D	0.08 x D	150	0.0033	0.0066	0.0099	0.0132	0.0165	0.0198
High Temp Alloys	S	●	X	X	Slotting	0.3 x D	-	30	0.0010	0.0020	0.0030	0.0040	0.0050	0.0060
					Profiling	0.1 x D	0.05 x D	45	0.0028	0.0056	0.0084	0.0112	0.0140	0.0168
Titanium Alloys	S	●	X	X	Slotting	0.3 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.1 x D	0.08 x D	107	0.0020	0.0040	0.0060	0.0080	0.0100	0.0120

8 X D Necked Tools (3MVS Series - N8)														
Workpiece Material Group	ISO	Coolant ● Preferred ○ Possible x Not Possible			Application	Depth of Cut Per Application		vc - m/min	End Mill Diameter (mm)					
		Max.	Air	MMS		Axial (Ap)	Radial (Ae)		0.5	1.0	1.5	2.0	2.5	3.0
									fz - mm/tooth by Cutter Diameter					
Moderate Machining & PH Stainless Steels	M	●	X	○	Slotting	0.2 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.75 x D	0.05 x D	150	0.0033	0.0066	0.0099	0.0132	0.0165	0.0198
High Temp Alloys	S	●	X	X	Slotting	0.2 x D	-	30	0.0010	0.0020	0.0030	0.0040	0.0050	0.0060
					Profiling	0.75 x D	0.05 x D	45	0.0028	0.0056	0.0084	0.0112	0.0140	0.0168
Titanium Alloys	S	●	X	X	Slotting	0.2 x D	-	75	0.0012	0.0024	0.0036	0.0048	0.0060	0.0072
					Profiling	0.75 x D	0.05 x D	107	0.0020	0.0040	0.0060	0.0080	0.0100	0.0120

## 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			1 x D	1 x D	0.05 x D	0.1 x D	0.2 x D	0.3 x D	0.5 x D	
		Max	Air	MMS	0.5 x D	1 x D	2 x D	2 x D	2 x D	1.5 x D	1.5 x D	
Vc-M/Min												
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
		Super Duplex (25%)	●	X	○	50	40	60	55	50	45	40
Special Alloys	S	High Temp Alloys	●	X	X	30	25	50	40	35	30	25
		Titanium Alloys	●	X	X	70	60	120	120	90	75	60
Cast Irons	K	Gray Cast Iron	●	○	○	180	160	360	360	240	190	160
		Ductile Cast Iron	●	○	○	170	150	270	270	190	170	150
		Malleable Iron	●	○	○	130	120	160	150	140	130	120
Hardened Steels	H	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

End Mills - Technical Information Series 177 / 178 / 179

Workpiece Material Group	Material Type	Tool Diameter										
		1.5mm	3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm	25mm	
fz-mm/tooth												
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	S	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

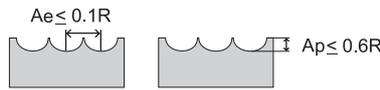
**When using Long Series 178 - 1 Reduce speed by 20%**

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

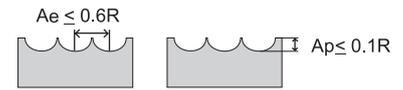
Recommended cutting data :: Conditions de coupe recommandées :: Empfohlene Schnittdaten :: Dati di taglio Raccomandati :: Zalecane Parametry

Semi Roughing / Roughing Steel (25-48 HRC)							Semi Finishing / Finishing Steel (25-48 HRC)			
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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



Cooling Requirements - High Pressure Air Blast



Cooling Requirements - High Pressure Air Blast.



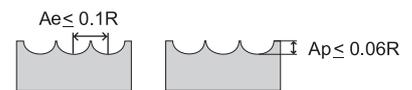
End Mills - Technical Information  
Series 179 / 179L / 279

## 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



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						
		6mm	8mm	10mm	12mm	16mm	20mm	
		fz-mm/tooth						
Steels	P	Low Carbon	0.036	0.048	0.060	0.072	0.096	0.120
		Medium Carbon	0.036	0.048	0.060	0.072	0.096	0.120
		Alloy Steels	0.036	0.048	0.060	0.072	0.096	0.120
		Die/Tool Steels	0.036	0.048	0.060	0.072	0.096	0.120
Stainless Steels	M	Free Machining	0.036	0.048	0.060	0.072	0.096	0.12
		Austenitic	0.029	0.038	0.048	0.058	0.077	0.096
		Difficult Stainless	0.024	0.032	0.040	0.048	0.064	0.080
		PH Stainless	0.029	0.038	0.048	0.058	0.077	0.096
		Cobalt Chrome Alloys	0.018	0.024	0.030	0.036	0.048	0.060
		Duplex (22%)	0.018	0.024	0.030	0.036	0.048	0.060
		Super Duplex (25%)	0.018	0.024	0.030	0.036	0.048	0.060
Special Alloys	S	High Temp Alloys	0.014	0.019	0.024	0.029	0.038	0.048
		Inconel®	0.014	0.019	0.024	0.029	0.038	0.048
		Titanium Alloys	0.024	0.032	0.040	0.048	0.064	0.08
Cast Irons	K	Gray Cast Iron	0.032	0.043	0.054	0.065	0.086	0.108
		Ductile Cast Iron	0.032	0.043	0.054	0.065	0.086	0.108
		Malleable Iron	0.028	0.037	0.046	0.055	0.074	0.092
Hardened Steels	H	Hardened Steels 45 - 50 Rc	0.025	0.034	0.042	0.050	0.067	0.084
		Hardened Steels 50 - 55 Rc	0.022	0.029	0.036	0.043	0.058	0.072

### 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
15%	1.40
13%	1.50
10%	1.67
8%	1.80
7%	2.00
5%	2.30

# TuffCut® XT9 380 & 380CB Series

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

380 & 380CB Series - Profile Milling with 2.5xD APMX											
Workpiece Material Group	ISO	Coolant			RWOC (Ae)		End Mill Diameter (mm)				
		Emulsion	Air	MQL	5%	10%	8	10	12	16	20
					2.3	1.67	← 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.				
					Vc - M/Min	fz - mm/tooth					
Low Carbon Steels	P	o	●	o	380	350	0.048	0.060	0.072	0.096	0.120
Medium Carbon Steels		o	●	o	270	260	0.048	0.060	0.072	0.096	0.120
Alloy Steels		o	●	o	260	240	0.048	0.060	0.072	0.096	0.120
Die / Tool Steels		o	●	o	220	200	0.048	0.060	0.072	0.096	0.120
Free Machining Stainless Steels	M	●	●	o	205	180	0.048	0.060	0.072	0.096	0.120
Austenitic Stainless Steels		●	x	o	160	140	0.040	0.050	0.060	0.080	0.100
Difficult Stainless Steels		●	x	o	110	90	0.032	0.040	0.048	0.064	0.080
PH Stainless Steels		●	●	o	160	140	0.032	0.040	0.048	0.064	0.080
Cobalt Chrome Alloys		●	x	o	120	100	0.032	0.040	0.048	0.064	0.080
Duplex (22%)		●	x	o	75	65	0.032	0.040	0.048	0.064	0.080
Super Duplex (25%)		●	x	o	70	60	0.032	0.040	0.048	0.064	0.080
High Temp Alloys		S	●	x	x	50	40	0.020	0.025	0.030	0.040
Titanium Alloys	●		x	x	120	90	0.032	0.040	0.048	0.064	0.080
Gray Cast Irons	K	●	o	o	360	350	0.048	0.060	0.072	0.096	0.120
Ductile Cast Irons		●	o	o	270	260	0.048	0.060	0.072	0.096	0.120
Hardened Steels 45-50 HRC	H	o	●	o	160	140	0.040	0.050	0.060	0.080	0.100
Hardened Steels 50-55 HRC		o	●	o	150	130	0.028	0.035	0.042	0.056	0.070
Hardened Steels 55-60 HRC		o	●	o	100	-	0.016	0.020	0.024	0.032	0.040

380 & 380CB Series - Profile Milling with 3xD APMX										
Workpiece Material Group	ISO	Coolant			RWOC (Ae)		End Mill Diameter (mm)			
		Emulsion	Air	MQL	5%	10%	10	12	16	20
					2.3	1.67	← 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.			
					Vc - M/Min	fz - mm/tooth				
Low Carbon Steels	P	o	●	o	370	340	0.060	0.072	0.096	0.120
Medium Carbon Steels		o	●	o	260	250	0.060	0.072	0.096	0.120
Alloy Steels		o	●	o	250	230	0.060	0.072	0.096	0.120
Die / Tool Steels		o	●	o	210	190	0.060	0.072	0.096	0.120
Free Machining Stainless Steels	M	●	●	o	195	175	0.060	0.072	0.096	0.120
Austenitic Stainless Steels		●	x	o	155	135	0.050	0.060	0.080	0.100
Difficult Stainless Steels		●	x	o	105	90	0.040	0.048	0.064	0.080
PH Stainless Steels		●	●	o	155	135	0.040	0.048	0.064	0.080
Cobalt Chrome Alloys		●	x	o	115	95	0.040	0.048	0.064	0.080
Duplex (22%)		●	x	o	75	65	0.040	0.048	0.064	0.080
Super Duplex (25%)		●	x	o	70	60	0.040	0.048	0.064	0.080
High Temp Alloys		S	●	x	x	50	40	0.025	0.030	0.040
Titanium Alloys	●		x	x	115	90	0.040	0.048	0.064	0.080
Gray Cast Irons	K	●	o	o	345	335	0.060	0.072	0.096	0.120
Ductile Cast Irons		●	o	o	260	250	0.060	0.072	0.096	0.120
Hardened Steels 45-50 HRC	H	o	●	o	145	125	0.050	0.060	0.080	0.100
Hardened Steels 50-55 HRC		o	●	o	95	-	0.035	0.042	0.056	0.070
Hardened Steels 55-60 HRC		o	●	o	95	-	0.020	0.024	0.032	0.040

● Preferred    ○ Possible    X Not Possible

Notes

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc.
- The 380 & 380CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended.
- For machining materials above 50 HRC, reduce stepover (Ae) to 2-3% of DC for optimal performance



## TuffCut® XT9 380 & 380CB Series

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

### 380 & 380CB Series - Profile Milling with 4xD APMX

Workpiece Material Group	ISO	Coolant			RWOC (Ae)		End Mill Diameter (mm)	
		Emulsion	Air	MQL	3%	5%	12	16
					2.93	2.3	← 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.	
					Vc - M/Min		fz - mm/tooth	
Low Carbon Steels	P	o	•	o	320	300	0.048	0.064
Medium Carbon Steels		o	•	o	250	240	0.048	0.064
Alloy Steels		o	•	o	230	220	0.048	0.064
Die / Tool Steels		o	•	o	210	200	0.048	0.064
Free Machining Stainless Steels	M	•	•	o	200	180	0.048	0.064
Austenitic Stainless Steels		•	x	o	150	140	0.036	0.048
Difficult Stainless Steels		•	x	o	100	90	0.030	0.040
PH Stainless Steels		•	•	o	150	140	0.030	0.040
Cobalt Chrome Alloys		•	x	o	90	80	0.030	0.040
Duplex (22%)		•	x	o	75	65	0.030	0.040
Super Duplex (25%)	S	•	x	o	55	45	0.030	0.040
High Temp Alloys		•	x	x	40	35	0.024	0.032
Titanium Alloys		•	x	x	90	80	0.030	0.040
Gray Cast Irons	K	•	o	o	300	290	0.048	0.064
Ductile Cast Irons		•	o	o	230	215	0.048	0.064
Hardened Steels 45-50 HRC	H	o	•	o	140	130	0.048	0.064
Hardened Steels 50-55 HRC		o	•	o	120	110	0.024	0.032
Hardened Steels 55-60 HRC		o	•	o	100	-	0.024	0.032

● Preferred    ○ Possible    X Not Possible

### 380 & 380CB Series - Profile Milling with 5xD APMX

Workpiece Material Group	ISO	Coolant			RWOC (Ae)		End Mill Diameter (mm)	
		Emulsion	Air	MQL	3%	5%	12	16
					2.93	2.3	← 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.	
					Vc - M/Min		fz - mm/tooth	
Low Carbon Steels	P	o	•	o	285	225	0.042	0.056
Medium Carbon Steels		o	•	o	220	175	0.042	0.056
Alloy Steels		o	•	o	200	165	0.042	0.056
Die / Tool Steels		o	•	o	175	140	0.042	0.056
Free Machining Stainless Steels	M	•	•	o	135	105	0.042	0.056
Austenitic Stainless Steels		•	x	o	105	75	0.030	0.040
Difficult Stainless Steels		•	x	o	80	65	0.024	0.032
PH Stainless Steels		•	•	o	105	85	0.024	0.032
Cobalt Chrome Alloys		•	x	o	80	65	0.024	0.032
Duplex (22%)		•	x	o	65	60	0.024	0.032
Super Duplex (25%)	S	•	x	o	45	40	0.024	0.032
High Temp Alloys		•	x	x	40	-	0.018	0.024
Titanium Alloys		•	x	x	75	65	0.024	0.032
Gray Cast Irons	K	•	o	o	315	250	0.042	0.056
Ductile Cast Irons		•	o	o	190	175	0.042	0.056
Hardened Steels 45-50 HRC	H	o	•	o	120	-	0.042	0.056
Hardened Steels 50-55 HRC		o	•	o	100	-	0.018	0.024
Hardened Steels 55-60 HRC		o	•	o	65	-	0.018	0.024

● Preferred    ○ Possible    X Not Possible

#### Notes

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc.
- The 380 & 380CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended.
- For machining materials above 50 HRC, reduce stepover (Ae) to 2-3% of DC for optimal performance

# TuffCut® XT9 380N & 380N CB Series

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

380N & 380N CB Series - Profile Milling with 4xD Neck									
Workpiece Material Group	I S O	Coolant			RWOC (Ae)		End Mill Diameter (mm)		
		Emulsion	Air	MQL	5%	7%	12	16	
					2.3	1.96	← 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.		
							Vc - M/Min	fz - mm/tooth	
Low Carbon Steels	P	o	●	o	370	340	0.072	0.096	
Medium Carbon Steels		o	●	o	260	250	0.072	0.096	
Alloy Steels		o	●	o	250	230	0.072	0.096	
Die / Tool Steels		o	●	o	210	190	0.072	0.096	
Free Machining Stainless Steels	M	●	●	o	195	175	0.072	0.096	
Austenitic Stainless Steels		●	x	o	155	135	0.060	0.080	
Difficult Stainless Steels		●	x	o	105	90	0.048	0.064	
PH Stainless Steels		●	●	o	155	135	0.048	0.064	
Cobalt Chrome Alloys		●	x	o	115	95	0.048	0.064	
Duplex (22%)		●	x	o	75	65	0.048	0.064	
Super Duplex (25%)	●	x	o	70	60	0.048	0.064		
High Temp Alloys	S	●	x	x	50	40	0.030	0.040	
Titanium Alloys		●	x	x	115	90	0.048	0.064	
Gray Cast Irons	K	●	o	o	345	335	0.072	0.096	
Ductile Cast Irons		●	o	o	260	250	0.072	0.096	
Hardened Steels 45-50 HRC	H	o	●	o	145	125	0.060	0.080	
Hardened Steels 50-55 HRC		o	●	o	95	-	0.042	0.056	
Hardened Steels 55-60 HRC		o	●	o	95	-	0.024	0.032	

● Preferred    ○ Possible    X Not Possible

380N & 380N CB Series - Profile Milling with 5xD Neck									
Workpiece Material Group	I S O	Coolant			RWOC (Ae)		End Mill Diameter (mm)		
		Emulsion	Air	MQL	3%	5%	12	16	
					2.93	2.3	← 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.		
							Vc - M/Min	fz - mm/tooth	
Low Carbon Steels	P	o	●	o	320	300	0.058	0.077	
Medium Carbon Steels		o	●	o	250	240	0.058	0.077	
Alloy Steels		o	●	o	230	220	0.058	0.077	
Die / Tool Steels		o	●	o	210	200	0.058	0.077	
Free Machining Stainless Steels	M	●	●	o	200	180	0.058	0.077	
Austenitic Stainless Steels		●	x	o	150	140	0.048	0.064	
Difficult Stainless Steels		●	x	o	100	90	0.038	0.051	
PH Stainless Steels		●	●	o	150	140	0.038	0.051	
Cobalt Chrome Alloys		●	x	o	90	80	0.038	0.051	
Duplex (22%)		●	x	o	75	65	0.038	0.051	
Super Duplex (25%)	●	x	o	55	45	0.038	0.051		
High Temp Alloys	S	●	x	x	40	35	0.024	0.032	
Titanium Alloys		●	x	x	90	80	0.038	0.051	
Gray Cast Irons	K	●	o	o	300	290	0.058	0.077	
Ductile Cast Irons		●	o	o	230	215	0.058	0.077	
Hardened Steels 45-50 HRC	H	o	●	o	140	130	0.048	0.064	
Hardened Steels 50-55 HRC		o	●	o	120	110	0.034	0.045	
Hardened Steels 55-60 HRC		o	●	o	100	-	0.019	0.026	

● Preferred    ○ Possible    X Not Possible

### Notes

- Cutting data provided should be considered advisory only. Adjustments may be necessary depending on the application, workpiece rigidity, machine tool, etc.
- The 380 & 380CB should only be used in accurate tool holders with high gripping power. ER collet type holders are not recommended.
- For machining materials above 50 HRC, reduce stepover (Ae) to 2-3% of DC for optimal performance

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

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

Workpiece Material Group	Material Type	Coolant			1 x D	1 x D	0.05 x D	0.1 x D	0.2 x D	0.3 x D	0.5 x D	
		Max	Air	MMS	0.5 x D	1 x D	2 x D	2 x D	2 x D	1.5 x D	1.5 x D	
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%) Super Duplex (25%)	●	x	○	75 55	65 45	125 75	100 60	90 55	75 50	65 45
Special Alloys	S	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

End Mills - Technical Information Series 279 / 277, 277R, NR & NR-W / 278 R, 278 N3, N4 & N5

Workpiece Material Group	Material Type	Tool Diameter									
		3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm	25mm	
		fz-mm/tooth									
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	S	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.

**Note:**

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

Radial Cut (Ae)	Chip thickness Compensation factor
30%	1.10
20%	1.20
15%	1.40
10%	1.80
7%	2.00
5%	2.30
1%	5.00

**For N4 & N5 tools profile machining only!**

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

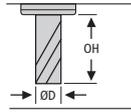
4 x D Cutting Length			Ø 6.0	Ø 8.0	Ø 10.0	Ø 12.0	Ø 16.0
			Maximum Axial Depth Of Cut (ap)				
			≤ 4 x ØD (24.0mm)	≤ 4 x ØD (32.0mm)	≤ 4 x ØD (40.0mm)	≤ 4 x ØD (48.0mm)	≤ 4 x ØD (64.0mm)
Material Group	Vc		Maximum Radial Depth Of Cut (ae)				
			0.05 x ØD (0.3mm)	0.05 x ØD (0.4mm)	0.05 x ØD (0.5mm)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



Workpiece Material Group	Material Type	Coolant		OH	Vc	Tool Diameter and Corner Radius												
		Air	Emulsion			2.0 x R0.5			3.0 x R0.8			4.0 x R1.0						
						Ap	Ae	Fz	Ap	Ae	Fz	Ap	Ae	Fz				
Steel	P	●	○	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
				5D	100	0.09									0.10	0.14	0.16	0.17
				6D	95	0.07									0.10	0.11	0.16	0.14
				8D	85	0.06									0.10	0.10	0.16	0.12
	10D	70	0.05	0.10	0.08	0.16	0.10											
	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
				5D	80	0.07									0.09	0.11	0.14	0.14
				6D	75	0.05									0.09	0.09	0.14	0.11
8D				65	0.05	0.09									0.08	0.14	0.10	
10D	55	0.04	0.09	0.06	0.14	0.08												
Stainless Steel	M	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
				5D	60	0.07									0.09	0.11	0.14	0.14
				6D	55	0.05									0.09	0.09	0.14	0.11
				8D	50	0.05									0.09	0.08	0.14	0.10
10D	40	0.04	0.09	0.06	0.14	0.08												
Special Alloys	S	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
				5D	25	0.02									0.05	0.03	0.08	0.04
				6D	25	0.02									0.05	0.03	0.08	0.03
				8D	20	0.02									0.05	0.02	0.08	0.03
	10D	20	0.01	0.05	0.02	0.08	0.03											
	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
				5D	60	0.05									0.08	0.07	0.12	0.09
				6D	55	0.04									0.08	0.06	0.12	0.07
8D				50	0.03	0.08									0.05	0.12	0.07	
10D	40	0.03	0.08	0.04	0.12	0.06												
Cast Iron	K	●	●	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
				5D	100	0.09									0.10	0.14	0.16	0.17
				6D	95	0.07									0.10	0.11	0.16	0.14
				8D	85	0.06									0.10	0.10	0.16	0.12
10D	70	0.05	0.10	0.08	0.16	0.10												
Hardened Steels	H	●	○	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
				5D	70	0.05									0.07	0.08	0.11	0.10
				6D	65	0.04									0.07	0.07	0.11	0.08
				8D	55	0.04									0.07	0.06	0.11	0.07
	10D	50	0.03	0.07	0.05	0.11	0.06											
	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
				5D	50	0.04									0.05	0.07	0.08	0.09
				6D	50	0.03									0.05	0.05	0.08	0.07
8D				40	0.03	0.05									0.05	0.08	0.06	
10D	35	0.03	0.05	0.04	0.08	0.05												

● Preferred    ○ Possible    x Not Possible

# 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		
0.26		0.30	0.34		0.4	0.34		0.40	0.34		0.40	0.51		
0.20		0.30	0.27		0.4	0.27		0.40	0.27		0.40	0.41		
0.18		0.30	0.24		0.4	0.24		0.40	0.24		0.40	0.36		
0.15		0.30	0.20		0.4	0.20		0.40	0.20		0.40	0.30		
0.24		1.5	0.27		0.32	2.0		0.36	0.32		3.0	0.36		0.32
0.22	0.27		0.29	0.36	0.29		0.36	0.29	0.36	0.43				
0.20	0.27		0.27	0.36	0.27		0.36	0.27	0.36	0.41				
0.16	0.27		0.22	0.36	0.22		0.36	0.22	0.36	0.33				
0.14	0.27		0.19	0.36	0.19		0.36	0.19	0.36	0.29				
0.12	0.27		0.16	0.36	0.16		0.36	0.16	0.36	1.28				
0.24	1.5		0.27	0.32	2.0		0.36	0.32	3.0	0.36		0.32	4.0	0.36
0.22		0.27	0.29	0.36		0.29	0.36	0.29		0.36	0.43			
0.20		0.27	0.27	0.36		0.27	0.36	0.27		0.36	0.41			
0.16		0.27	0.22	0.36		0.22	0.36	0.22		0.36	0.33			
0.14		0.27	0.19	0.36		0.19	0.36	0.19		0.36	0.29			
0.12		0.27	0.16	0.36		0.16	0.36	0.16		0.36	1.28			
0.24		1.5	0.27	0.32		2.0	0.36	0.32		3.0	0.36	0.32		4.0
0.22	0.27		0.29	0.36	0.29		0.36	0.29	0.36		0.43			
0.20	0.27		0.27	0.36	0.27		0.36	0.27	0.36		0.41			
0.16	0.27		0.22	0.36	0.22		0.36	0.22	0.36		0.33			
0.14	0.27		0.19	0.36	0.19		0.36	0.19	0.36		0.29			
0.12	0.27		0.16	0.36	0.16		0.36	0.16	0.36		1.28			
0.08	1.2		0.15	0.10	1.6		0.20	0.10	2.5		0.20	0.10	3.5	
0.07		0.15	0.09	0.20		0.09	0.20	0.09		0.20	0.14			
0.06		0.15	0.09	0.20		0.09	0.20	0.09		0.20	0.13			
0.05		0.15	0.07	0.20		0.07	0.20	0.07		0.20	0.10			
0.05		0.15	0.06	0.20		0.06	0.20	0.06		0.20	0.09			
0.04		0.15	0.05	0.20		0.05	0.20	0.05		0.20	0.08			
0.17		1.2	0.23	0.22		1.6	0.30	0.22		2.5	0.30	0.22		3.5
0.15	0.23		0.20	0.30	0.20		0.30	0.20	0.30		0.30			
0.14	0.23		0.19	0.30	0.19		0.30	0.19	0.30		0.28			
0.11	0.23		0.15	0.30	0.15		0.30	0.15	0.30		0.22			
0.10	0.23		0.13	0.30	0.13		0.30	0.13	0.30		0.20			
0.08	0.23		0.11	0.30	0.11		0.30	0.11	0.30		0.17			
0.30	1.5		0.30	0.40	2.0		0.4	0.40	3.0		0.40	0.40	4.0	
0.27		0.30	0.36	0.4		0.36	0.40	0.36		0.40	0.54			
0.26		0.30	0.34	0.4		0.34	0.40	0.34		0.40	0.51			
0.20		0.30	0.27	0.4		0.27	0.40	0.27		0.40	0.41			
0.18		0.30	0.24	0.4		0.24	0.40	0.24		0.40	0.36			
0.15		0.30	0.20	0.4		0.20	0.40	0.20		0.40	0.30			
0.18		1.5	0.21	0.24		2.0	0.28	0.24		3.0	0.28	0.24		4.0
0.16	0.21		0.22	0.28	0.22		0.28	0.22	0.28		0.32			
0.15	0.21		0.20	0.28	0.20		0.28	0.20	0.28		0.31			
0.12	0.21		0.16	0.28	0.16		0.28	0.16	0.28		0.24			
0.11	0.21		0.14	0.28	0.14		0.28	0.14	0.28		0.22			
0.09	0.21		0.12	0.28	0.12		0.28	0.12	0.28		0.18			
0.15	1.2		0.15	0.20	1.6		0.20	0.20	2.5		0.20	0.20	3.5	
0.14		0.15	0.18	0.20		0.18	0.20	0.18		0.20	0.27			
0.13		0.15	0.17	0.20		0.17	0.20	0.17		0.20	0.26			
0.10		0.15	0.14	0.20		0.14	0.20	0.14		0.20	0.20			
0.09		0.15	0.12	0.20		0.12	0.20	0.12		0.20	0.18			
0.08		0.15	0.10	0.20		0.10	0.20	0.10		0.20	0.15			

End Mills - Technical Information  
 Series 158

## 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					
		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

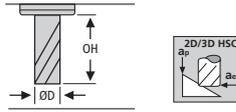
### Feed Per Tooth

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	
			Ap-mm / Ae-mm								
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
	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
	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
	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® XT Series MFB

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

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			
			Max	Air	MMS				
Steels	P	Low Carbon	●	●	●	450	350		
		Medium Carbon	●	●	●	345	275		
		Alloy Steels	●	●	●	315	255		
		Die/Tool Steels	●	●	●	275	220		
Stainless Steels	M	Free Machining	●	X	○	205	165		
		Austenitic	●	X	○	160	130		
		Difficult Stainless	●	X	○	125	100		
		PH Stainless	●	X	○	160	130		
		Cobalt Chrome Alloys	●	X	○	125	100		
		Duplex (22%)	●	X	○	75	60		
		Super Duplex (25%)	●	X	○	75	60		
Special Alloys	S	High Temp Alloys	●	X	X	55	45		
		Titanium Alloys	●	X	X	115	105		
Cast Irons	K	Gray Cast Iron	●	○	○	495	395		
		Ductile Cast Iron	●	○	○	320	280		
		Malleable Iron	●	○	○	205	165		
Hardened Steels	H	Hardened Steels 45 - 50 Rc	●	○	○	150	125		
		Hardened Steels 50 - 55 Rc	●	○	○	100	95		

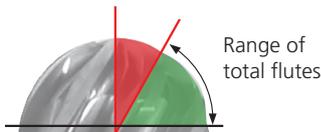
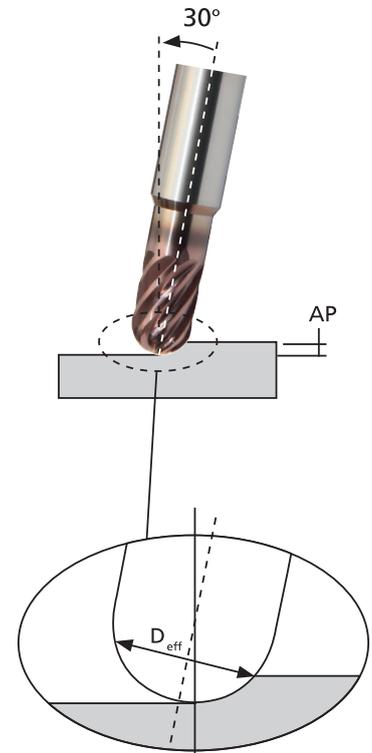
● Preferred    ○ Possible    X Not Possible

Recommended Feeds by Material Group			Tool Diameter & Radius															
Workpiece Material Group	Material Type		4		5		6		8		10		12		16		20	
			2		2.5		3		4		5		6		8		10	
			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
		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
Special Alloys	S	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

Effective Diameter at 30°							
Tool Ø	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
4	+31°	6
5	+33°	6
6	+33°	6
8	+25°	8
10	+22°	8
12	+24°	8
16	+25°	8
20	+25°	10

Effective Teeth			
Tool Ø	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

End Mills - Technical Information  
Series MFB

## TuffCut® 3D Series 250

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

Workpiece Material Group	Material Type	Ap 			Roughing	Finishing	
		Ae 			0.05 - 0.1 x D	0.02 - 0.05 x D	
		Coolant			Vc-m/min		
		Max	Air	MMS			
Steels	P	Low Carbon Steels ≤180HB	○	●	●	250	280
		Med Carbon / Alloy Steels 180-350HB	○	●	●	200	220
		Pre-Hardened Steels 35-45HRC	○	●	●	180	200
Stainless Steels	M	Free Machining Stainless	●	○	○	160	180
		Austenitic Stainless	●	○	○	130	150
		Difficult Stainless	●	○	○	100	110
Special Alloys	S	High Temp Alloys	●	X	X	50	55
		Titanium Alloys	●	X	X	110	120
Cast Irons	K	Grey Cast Iron	○	●	X	220	250
		Ductile Cast Iron	○	●	X	180	200
Hardened Steels	H	Hardened Steels 45 - 50HRC	○	●	○	160	170
Non-Ferrous	N	Aluminium Alloys	●	X	○	300	500
		Brass / Bronze / Copper	●	X	○	250	400

● Preferred ○ Possible X Not Possible

### Recommended Feed per Tooth by Material Group

Workpiece Material Group	Material Type	Tool Diameter & Radius												
		1		1.5		2		3		4		5		
		0.5		0.75		1		1.5		2		2.5		
		Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	
Steels	P	Fz - mm/tooth												
		Low Carbon Steels ≤180HB	0.020	0.015	0.030	0.023	0.040	0.030	0.060	0.045	0.080	0.060	0.100	0.075
		Med Carbon / Alloy Steels 180-350HB	0.020	0.015	0.030	0.023	0.040	0.030	0.060	0.045	0.080	0.060	0.100	0.075
		Pre-Hardened Steels 35-45HRC	0.018	0.015	0.027	0.023	0.036	0.030	0.054	0.045	0.072	0.060	0.090	0.075
Stainless Steels	M	Free Machining Stainless	0.018	0.015	0.027	0.023	0.036	0.030	0.054	0.045	0.072	0.060	0.090	0.075
		Austenitic Stainless	0.015	0.015	0.023	0.023	0.030	0.030	0.045	0.045	0.060	0.060	0.075	0.075
		Difficult Stainless	0.015	0.015	0.023	0.023	0.030	0.030	0.045	0.045	0.060	0.060	0.075	0.075
Special Alloys	S	High Temp Alloys	0.008	0.010	0.012	0.015	0.016	0.020	0.024	0.030	0.032	0.040	0.040	0.050
		Titanium Alloys	0.012	0.010	0.018	0.015	0.024	0.020	0.036	0.030	0.048	0.040	0.060	0.050
Cast Irons	K	Grey Cast Iron	0.020	0.015	0.030	0.023	0.040	0.030	0.060	0.045	0.080	0.060	0.100	0.075
		Ductile Cast Iron	0.018	0.015	0.027	0.023	0.036	0.030	0.054	0.045	0.072	0.060	0.090	0.075
Hardened Steels	H	Hardened Steels 45 - 50HRC	0.013	0.013	0.020	0.019	0.026	0.025	0.039	0.038	0.052	0.050	0.065	0.063
Non-Ferrous	N	Aluminium Alloys	0.025	0.015	0.038	0.023	0.050	0.030	0.075	0.045	0.100	0.060	0.125	0.075
		Brass / Bronze / Copper	0.020	0.015	0.030	0.023	0.040	0.030	0.060	0.045	0.080	0.060	0.100	0.075

Workpiece Material Group	Material Type	Tool Diameter & Radius										
		6		8		10		12		16		
		3		4		5		6		8		
		Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	
Steels	P	Fz - mm/tooth										
		Low Carbon Steels ≤180HB	0.120	0.090	0.160	0.120	0.200	0.150	0.240	0.180	0.320	0.240
		Med Carbon / Alloy Steels 180-350HB	0.120	0.090	0.160	0.120	0.200	0.150	0.240	0.180	0.320	0.240
		Pre-Hardened Steels 35-45HRC	0.108	0.090	0.144	0.120	0.180	0.150	0.216	0.180	0.288	0.240
Stainless Steels	M	Free Machining Stainless	0.108	0.090	0.144	0.120	0.180	0.150	0.216	0.180	0.288	0.240
		Austenitic Stainless	0.090	0.090	0.120	0.120	0.150	0.150	0.180	0.180	0.240	0.240
		Difficult Stainless	0.090	0.090	0.120	0.120	0.150	0.150	0.180	0.180	0.240	0.240
Special Alloys	S	High Temp Alloys	0.048	0.060	0.064	0.080	0.080	0.100	0.096	0.120	0.128	0.160
		Titanium Alloys	0.072	0.060	0.096	0.080	0.120	0.100	0.144	0.120	0.192	0.160
Cast Irons	K	Grey Cast Iron	0.120	0.090	0.160	0.120	0.200	0.150	0.240	0.180	0.320	0.240
		Ductile Cast Iron	0.108	0.090	0.144	0.120	0.180	0.150	0.216	0.180	0.288	0.240
Hardened Steels	H	Hardened Steels 45 - 50HRC	0.078	0.075	0.104	0.100	0.130	0.125	0.156	0.150	0.208	0.200
Non-Ferrous	N	Aluminium Alloys	0.150	0.090	0.200	0.120	0.250	0.150	0.300	0.180	0.400	0.240
		Brass / Bronze / Copper	0.120	0.090	0.160	0.120	0.200	0.150	0.240	0.180	0.320	0.240

## 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 odciążoną szyjką

RPM	Diameter - mm									
	3	4	5	6	8	10	12	16	20	25
	fz 0.035	fz 0.035	fz 0.084	fz 0.12	fz 0.26	fz 0.61	fz 0.77	fz 0.79	fz 0.762	fz 0.76
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	4	5	6	8	10	12	16	20	25
	fz 0.035	fz 0.035	fz 0.084	fz 0.12	fz 0.26	fz 0.61	fz 0.77	fz 0.79	fz 0.762	fz 0.76
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	M/Min	2 - 3	4	5	6	8
						fz	fz	fz	fz	fz
135		300-425	1 x D	0.5 x D	0.035	0.035	0.075-0.1	0.1-0.23	0.175-0.3	
			1 x D	1 x D						250-365
		300-425	0.2 x D	1 x D	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
135B		150	1 x D	0.5 x D	0.05	0.08	0.12	0.16	0.2	
			1 x D	1 x D						250-365
138B		300	0.1 x D	1 x D	0.05	0.08	0.12	0.16	0.2	
			1 x D	1 x D						300

## 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						
			10	12	16	20	25		
			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, N4 & N5, 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						
			ø 3.0	ø 4.0	ø 5.0	ø 6.0	ø 8.0		
			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 <sup>2</sup>	800-1000	0.036	0.054	0.072	0.09	0.126

Series	Type of cut	Vc M/Min	Diameter - mm					
			ø 10.0	ø 12.0	ø 16.0	ø 20.0		
			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 <sup>2</sup>	800-1000	0.162	0.2	0.27	0.342

Series	Type of cut	Vc M/Min	Diameter - mm						
			ø 3.0	ø 4.0	ø 5.0	ø 6.0	ø 8.0		
			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 <sup>2</sup>	800-1000	0.036	0.054	0.072	0.09	0.126

# TuffCut® X-AL Series 137V, 137V N3, N4 & N5, 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		M/Min	∅ 10.0	∅ 12.0	∅ 16.0	∅ 20.0
			fz	fz	fz	fz	fz	fz	fz		
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 <sup>2</sup>	800-1000	0.162	0.20	0.27	0.342				

Series	Type of cut	Vc	Diameter - mm									
			Ae		Ap		M/Min	∅ 3.0	∅ 4.0	∅ 5.0	∅ 6.0	∅ 8.0
			fz	fz	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		M/Min	∅ 10.0	∅ 12.0	∅ 16.0	∅ 20.0
			fz	fz	fz	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			

Notes:

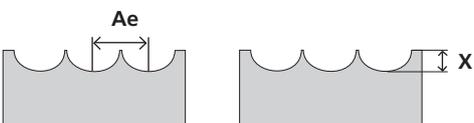
1. Plunging to 1 x D = 20% of Slotting Feed Rate
2. Ramping (15° max) to 2 x D = 33% of Slotting Feed Rate

## Profile Height-X (µm) / Surface finish

Profondeur de profile-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



End Mills - Technical Information  
 Series 137V / 137V N3, N4 & N5 / 137VF

## TuffCut® X-AL Series 137V5

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

Series	Type of cut		Vc	Diameter - mm				
				10.0	12.0	16.0	20.0	
	Ae	Ap	m/min	fz	fz	fz	fz	
137V5 3 x D		0.1 x D	3 x D	300-1000	0.1	0.12	0.16	0.2
		0.15 x D	3 x D	300-1000	0.1	0.12	0.16	0.2
		0.2 x D	3 x D	300-1000	0.1	0.12	0.16	0.2
		0.3 x D	2 x D	300-1000	0.1	0.12	0.16	0.2
		1 x D	1 x D Max	300-1000	0.05	0.06	0.08	0.1

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:**

Ramping (10° max) to 3 x D at slotting feed rates.

To achieve the highest torque when using this tool on low powered machines, the rpm may need to be adjusted.

When using higher Ae please ensure to use an appropriate chuck with sufficient clamping pressure.

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.

**Carbide End Mills**

Fraises Carbure en Bout | Hartmetall-Schaftfräser | Frese in Metallo Duro Integrale | Frezy Palcowe Pełnowęglkowe



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 Universalfräsarbeiten 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.

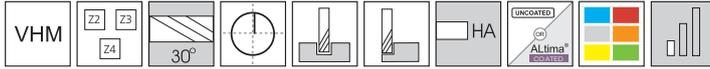
(PL)

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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 End Mills  
**FORDMAX**  
APG

# TuffCut® GP Series 164, 169, 163



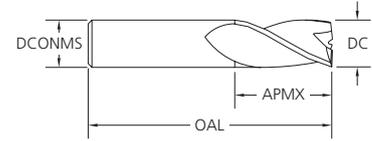
Z2



Z3



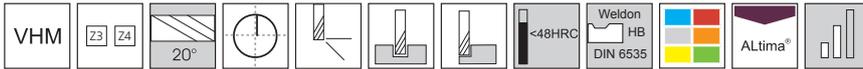
Z4



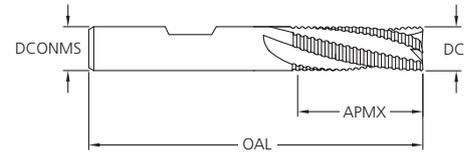
Series 164		Series 169		Series 163		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
Tool No.	Tool No.	Tool No.	Tool No.	Tool No.	Tool No.				
164 0020	-	-	-	-	-	0.2	3.0	38.0	0.4
164 0030	-	-	-	-	-	0.3	3.0	38.0	0.6
164 0040	-	-	-	-	-	0.4	3.0	38.0	0.8
164 0050	-	-	-	-	-	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	169 1800A	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

 End Mills  
 Series 164 / 169 / 163


# TuffCut® GP Series 192



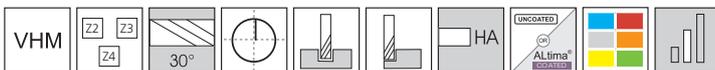
Z3 Z4



Series 192	Tool Dimensions				
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	NOF
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



# TuffCut® GP Series 121, 116, 111



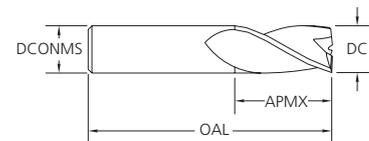
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Z3



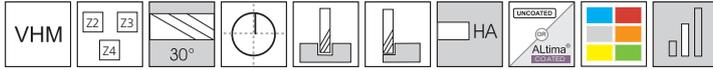
Z4



Series 121		Series 116		Series 111		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
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	121 0050A	-	-	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	121 0090A	-	-	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



# TuffCut® GP Series 121, 116, 111



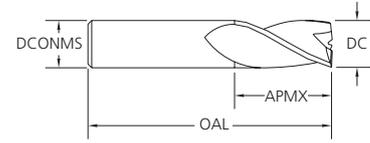
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Z3



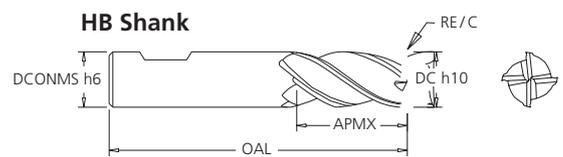
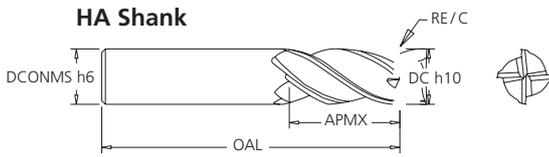
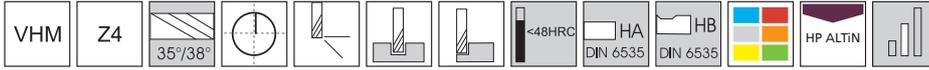
Z4



Series 121		Series 116		Series 111		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
Tool No.	Tool No.	Tool No.	Tool No.	Tool No.	Tool No.				
121 0110	121 0110A	-	-	111 0110	-	1.1	3.0	38.0	3.3
121 0120	121 0120A	-	-	111 0120	111 0120A	1.2	3.0	38.0	3.6
121 0130	121 0130A	-	-	111 0130	-	1.3	3.0	38.0	3.9
121 0140	121 0140A	-	-	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	121 0160A	-	-	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	121 0200-1A	-	-	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	121 0450A	116 0450	-	111 0450	111 0450A	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	111 0550A	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	121 0700A	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	121 0900A	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	121 1100A	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	121 1400A	116 1400	-	111 1400	111 1400A	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	121 1800A	116 1800	-	111 1800	111 1800A	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



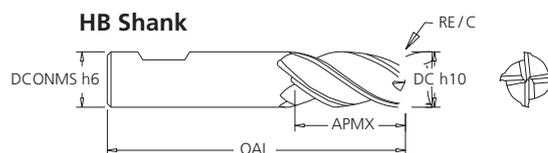
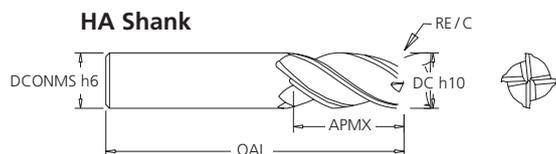
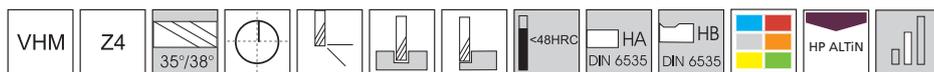
# TuffCut® GP Series MV4 with Corner Chamfer or Corner Radius



Series MV4	Tool Dimensions						
	Tool No.	Ø DC	Ø DCONMS	OAL	APMX	RE	C x 45°
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 0303-12HX	3.0	3.0	50.0	12.0	-	0.1	HA
MV4 0303-12-0.25RHX	3.0	3.0	50.0	12.0	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 05-15HX	5.0	6.0	64.0	15.0	-	0.1	HA
MV4 05-15-0.5RHX	5.0	6.0	64.0	15.0	0.5	-	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 06-19HX	6.0	6.0	64.0	19.0	-	0.1	HA
MV4 06-19-0.25RHX	6.0	6.0	64.0	19.0	0.25	-	HA
MV4 06-19-0.5RHX	6.0	6.0	64.0	19.0	0.5	-	HA
MV4 06-19-1.0RHX	6.0	6.0	64.0	19.0	1.0	-	HA
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
MV4 10HX	10.0	10.0	73.0	22.0	-	0.15	HA
MV4 10HXW	10.0	10.0	73.0	22.0	-	0.15	HB

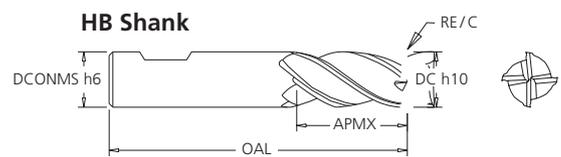
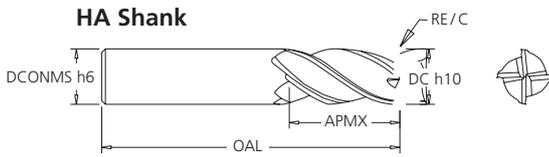
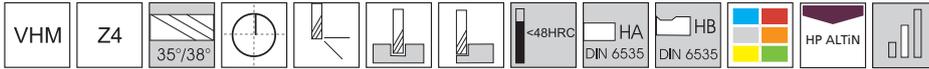


# TuffCut® GP Series MV4 with Corner Chamfer or Corner Radius



Series MV4	Tool Dimensions						
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	RE	C x 45°	Shank
MV4 10-0.5RHX	10.0	10.0	73.0	22.0	0.5	-	HA
MV4 10-0.5RHXW	10.0	10.0	73.0	22.0	0.5	-	HB
MV4 10-1.0RHX	10.0	10.0	73.0	22.0	1.0	-	HA
MV4 10-1.0RHXW	10.0	10.0	73.0	22.0	1.0	-	HB
MV4 10-1.5RHX	10.0	10.0	73.0	22.0	1.5	-	HA
MV4 10-1.5RHXW	10.0	10.0	73.0	22.0	1.5	-	HB
MV4 10-2.0RHX	10.0	10.0	73.0	22.0	2.0	-	HA
MV4 10-2.0RHXW	10.0	10.0	73.0	22.0	2.0	-	HB
MV4 10-2.5RHX	10.0	10.0	73.0	22.0	2.5	-	HA
MV4 10-2.5RHXW	10.0	10.0	73.0	22.0	2.5	-	HB
MV4 10-3.0RHX	10.0	10.0	73.0	22.0	3.0	-	HA
MV4 10-3.0RHXW	10.0	10.0	73.0	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 12-32HX	12.0	12.0	73.0	32.0	-	0.15	HA
MV4 12-32-1.0RHX	12.0	12.0	73.0	32.0	1.0	-	HA
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
MV4 16-2.0RHX	16.0	16.0	92.0	33.0	2.0	-	HA
MV4 16-2.0RHXW	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 16-2.5RHXW	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 16-3.0RHXW	16.0	16.0	92.0	33.0	3.0	-	HB

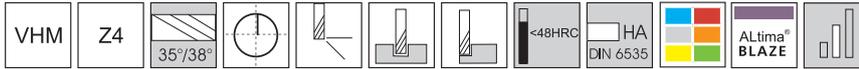
# TuffCut® GP Series MV4 with Corner Chamfer or Corner Radius



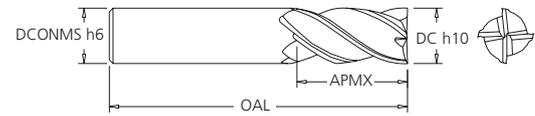
Series MV4	Tool Dimensions						
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	RE	C x 45°	Shank
MV4 20HX	20.0	20.0	104.0	40.0	-	0.3	HA
MV4 20HXW	20.0	20.0	104.0	40.0	-	0.3	HB
MV4 20-1.0RHX	20.0	20.0	104.0	40.0	1.0	-	HA
MV4 20-1.0RHXW	20.0	20.0	104.0	40.0	1.0	-	HB
MV4 20-1.5RHX	20.0	20.0	104.0	40.0	1.5	-	HA
MV4 20-1.5RHXW	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 20-2.0RHXW	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 20-3.0RHXW	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 20-4.0RHXW	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 20-5.0RHXW	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 20-6.0RHXW	20.0	20.0	104.0	40.0	6.0	-	HB



# TuffCut® GP Series ASV4ACM



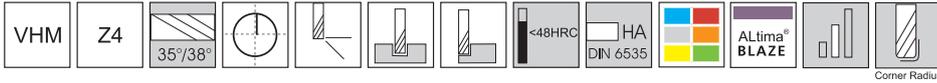
Z4



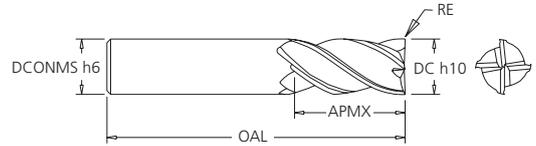
Series ASV4ACM	Tool Dimensions				
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	C x 45°
ASV4ACM0300	3.0	3.0	51.0	6.0	0.1
ASV4ACM0400	4.0	4.0	51.0	11.0	0.1
ASV4ACM0500	5.0	5.0	57.0	12.0	0.1
ASV4ACM0600	6.0	6.0	64.0	15.0	0.1
ASV4ACM0800	8.0	8.0	64.0	22.0	0.15
ASV4ACM1000	10.0	10.0	72.0	22.0	0.15
ASV4ACM1200	12.0	12.0	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



# TuffCut® GP Series ASV4ACM-R



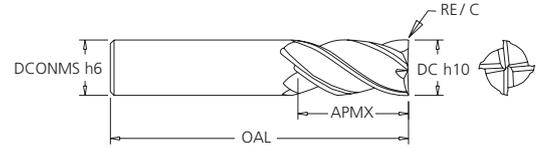
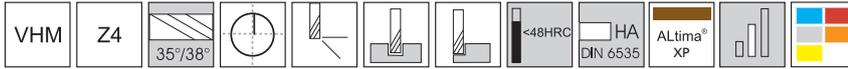
Z4



Series ASV4ACM-R	Tool Dimensions				
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	RE
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

End Mills  
Series ASV4ACM-R

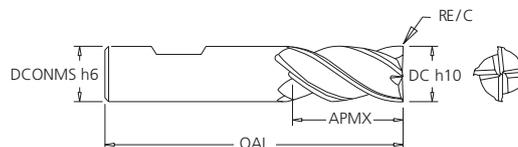
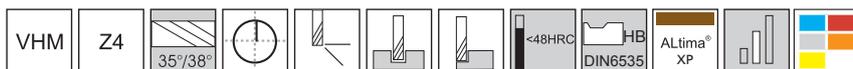


**TuffCut® GP Series VMH**


Series VMH	Tool Dimensions					
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	RE	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 12-0.5R	12.0	12.0	84.0	30.0	1.0	0.5
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



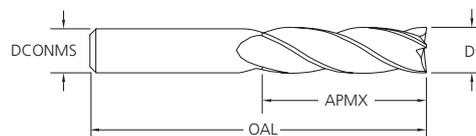
Series VMH	Tool Dimensions					
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	RE	C x 45°
VMH 0300-W	3.0	6.0	64.0	7.5	-	0.15
VMH 0400-W	4.0	6.0	64.0	10.0	-	0.2
VMH 0500-W	5.0	6.0	64.0	12.5	-	0.2
VMH 0600-W	6.0	6.0	64.0	15.0	-	0.2
VMH 06-1.0RW	6.0	6.0	64.0	15.0	1.0	-
VMH 0800-W	8.0	8.0	64.0	20.0	-	0.25
VMH 08-1.0RW	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	-

Please note: Due to manufacturing specification changes, the future OAL dimension of this tool will be subject to modification.



End Mills  
Series VMH-W / V4L

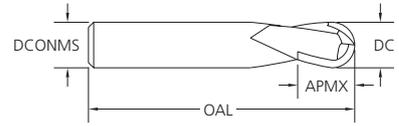
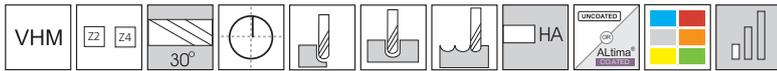
## TuffCut® GP Series V4L



Series V4L		Tool Dimensions			
Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
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



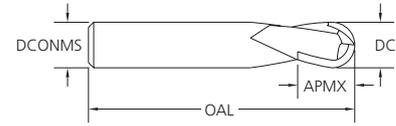
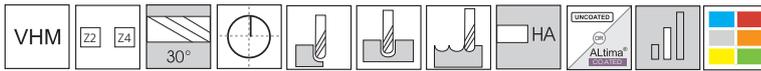
# TuffCut® GP Series 165



Series 165		Tool Dimensions			
Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
165 0100	165 0100A	1.0	3.0	38.0	2.0
165 0150	-	1.5	3.0	38.0	3.0
165 0200	165 0200A	2.0	3.0	38.0	4.0
165 0250	165 0250A	2.5	3.0	38.0	5.0
165 0300	165 0300A	3.0	3.0	38.0	6.0
165 0350	-	3.5	4.0	51.0	7.0
165 0400	165 0400A	4.0	4.0	51.0	8.0
165 0450	-	4.5	5.0	51.0	9.0
165 0500	165 0500A	5.0	5.0	51.0	11.0
165 0550	-	5.5	6.0	51.0	12.0
165 0600	165 0600A	6.0	6.0	51.0	13.0
165 0700	-	7.0	8.0	51.0	13.0
165 0800	165 0800A	8.0	8.0	51.0	13.0
165 0900	-	9.0	9.0	51.0	14.0
165 1000	165 1000A	10.0	10.0	51.0	14.0
165 1100	-	11.0	11.0	64.0	16.0
165 1200	165 1200A	12.0	12.0	64.0	16.0
165 1400	-	14.0	14.0	70.0	18.0
165 1600	165 1600A	16.0	16.0	76.0	20.0
165 1800	-	18.0	18.0	76.0	25.0
165 2000	165 2000A	20.0	20.0	76.0	25.0



# TuffCut® GP Series 150,140

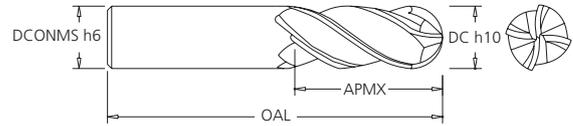
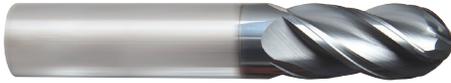
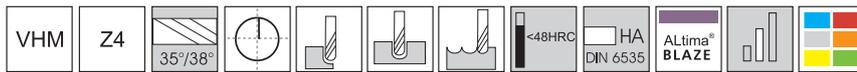


Series 150		Series 140		Tool Dimensions			
Uncoated	Coated	Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
Tool No.	Tool No.	Tool No.	Tool No.				
150 0040	-	-	-	0.4	3.0	38.0	1.2
150 0050	-	-	-	0.5	3.0	38.0	1.5
150 0060	-	-	-	0.6	3.0	38.0	1.8
150 0070	-	-	-	0.7	3.0	38.0	2.1
150 0080	-	-	-	0.8	3.0	38.0	2.4
150 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	150 0700A	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

End Mills  
Series 150 / 140



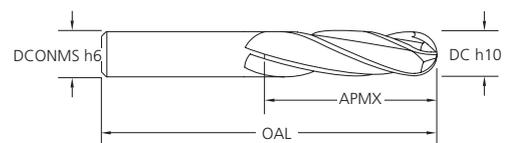
## TuffCut® GP Series ASV4ACB



Series ASV4ACB		Tool Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	
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	


 End Mills  
 Series ASV4ACB / V4LB

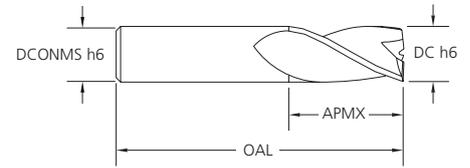
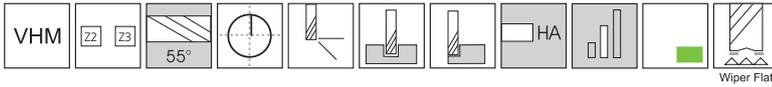
## TuffCut® GP Series V4LB



Series V4LB		Tool Dimensions			
Uncoated	Coated	Ø DC	Ø DCONMS	OAL	APMX
Tool No.	Tool No.				
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



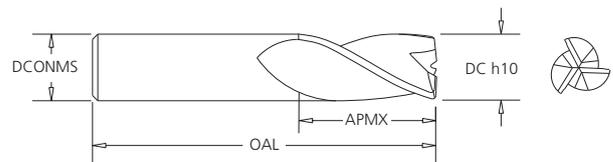
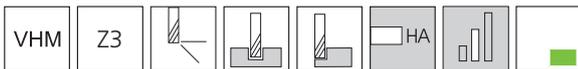
## TuffCut® GP Series GT2, GT3



Series GT2	Series GT3	Tool Dimensions			
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	APMX
GT2 0100	-	1.0	3.0	50.0	5.0
GT2 0150	-	1.5	3.0	50.0	6.0
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 DC	Ø DCONMS	OAL	APMX
ASVSM0300	3.0	3.0	51.0	7.5
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	25.0
ASVSM1200	12.0	12.0	75.0	30.0
ASVSM1400	14.0	14.0	84.0	35.0
ASVSM1600	16.0	16.0	93.0	40.0
ASVSM2000	20.0	20.0	105.0	50.0

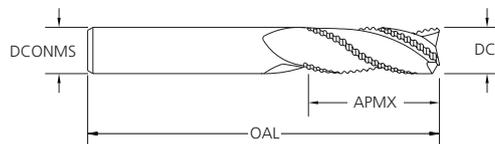


End Mills  
Series GT2 / GT3 / ASVSM

## TuffCut® GP Series 134



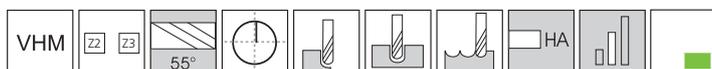
Z3



Series 134		Tool Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	APMX	
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	


 End Mills  
 Series 134 / GT2B / GT3B

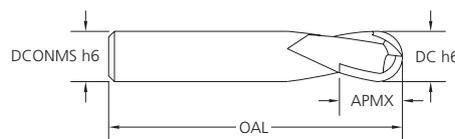
## TuffCut® GP Series GT2B, GT3B



Z2



Z3



Series GT2B	Series GT3B	Tool Dimensions			
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	APMX
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® FORDMAX Carbide Endmills

### Series 164, 169, 163, 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	-	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				
Workpiece Material Group	Material Type	Vc (m/min)	Tool Diameter (mm)					
			3.0	5.0	6.0	8.0	10.0	
			Feed/Tooth (fz - mm)					
Steels	P	Low Carbon	100 - 150	.013 - .020	.025 - .030	.038 - .051	.038 - .051	.053 - .076
		Medium Carbon	90 - 125					
		Mould/Tool Steel	60 - 75					
Stainless Steels	M	Free Machining	70 - 90	.013 - .020	.025 - .030	.038 - .051	.038 - .051	.053 - .076
		Ferritic	60 - 85					
		Austenitic	55 - 70					
		Martensitic	45 - 60					
		PH Stainless	40 - 50					
Cast Irons	K	Grey Cast Iron	120 - 140	.013 - .020	.025 - .030	.038 - .051	.038 - .051	.053 - .076
		Ductile Cast Iron	90 - 120					
		Malleable 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					
Hardened Steels	H	35 - 45 HRC	60 - 75	.008 - .013	.010 - .030	.010 - .030	.025 - .050	.025 - .050
		45 - 55 Rc Steel	45 - 60					
Non-Ferrous	N	Aluminium Alloys	150 - 200	.020 - .040	.040 - .050	.050 - .060	.060 - .070	.070 - .080
		Brass / Bronze	120 - 180					
		Magnesium & Alloys	200 - 300					

RPM Formula For Metric Endmills -  $RPM = (Vc \times 318.0) \div \text{Endmill } \varnothing$   
Feedrate Formula For Metric Endmills -  $\text{Feedrate} = RPM \times fz \times \text{Number Of Cutting Teeth}$

End Mills - Technical Information  
Series 164 / 169 / 163 / 165 / 121 / 116 / 111 / 150 / 140 / V4L / V4LB

# TuffCut® FORDMAX Carbide Endmills

## Series 164, 169, 163, 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			
Workpiece Material Group	Material Type	Vc (m/min)	Tool Diameter (mm)				
			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				
		Mould/Tool Steel	60 - 75				
Stainless Steels	M	Free Machining	70 - 90	.051 - .089	.058 - .102	.056 - .110	.080 - .130
		Ferritic	60 - 85				
		Austenitic	55 - 70				
		Martensitic	45 - 60				
		PH Stainless	40 - 50				
Cast Irons	K	Grey Cast Iron	120 - 140	.051 - .089	.058 - .102	.056 - .109	.081 - .127
		Ductile Cast Iron	90 - 120				
		Malleable Iron	70 - 90				
Special Alloys	S	High Temp Alloys	10 - 20	.020 - .030	.030 - .040	.030 - .045	.045 - .050
		Titanium Alloys	20 - 50				
Hardened Steels	H	35 - 45 Hrc	60 - 75	.030 - .060	.050 - .070	.060 - .080	.070 - .090
		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 -  $RPM = (Vc \times 318.0) \div \text{Endmill } \varnothing$   
 Feedrate Formula For Metric Endmills -  $\text{Feedrate} = RPM \times fz \times \text{Number Of Cutting Teeth}$

## TuffCut® FORDMAX Carbide Endmills

### Series 192

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

Workpiece Material Group	Material Type	Coolant										
		Max	Air	MMS	Vc (m/min)							
Steels	P	Low Carbon	●	●	●	210	210	450	450	350	300	250
		Medium Carbon	●	●	●	180	180	270	270	250	230	200
		Alloy Steels	●	●	●	160	160	250	250	230	210	180
		Die/Tool Steels	●	●	●	130	130	225	225	200	170	130
Stainless Steels	M	Free Machining	●	-	○	110	110	150	150	130	120	105
		Austenitic	●	-	○	100	100	130	130	120	110	100
		Difficult Stainless	●	-	○	70	70	100	100	90	80	70
		PH Stainless	●	-	○	100	100	130	130	120	110	100
		Cobalt Chrome Alloys	●	-	○	70	70	100	100	90	80	70
		Duplex (22%)	●	-	○	70	70	100	100	90	80	70
		Super Duplex (25%)	●	-	○	50	50	60	60	55	50	45
Cast Irons	K	Grey Cast Iron	●	○	○	180	180	360	360	340	240	190
		Ductile Cast Iron	●	○	○	170	170	270	270	240	190	170
		Malleable Iron	●	○	○	130	130	160	160	150	140	130
Special Alloys	S	High Temp Alloys	●	-	-	30	30	50	50	40	35	30
		Inconel	●	-	-	30	30	50	50	40	35	30
		Titanium Alloys	●	-	-	70	70	120	120	110	90	75
Hardened Steels	H	Hardened Steels 45 - 50 Rc	●	○	○	55	55	135	135	125	90	50
		Hardened Steels 50 - 55 Rc	●	○	○	45	45	115	115	105	75	45

● Preferred    ○ Possible    x Not Possible

End Mills - Technical Information  
Series 192

# TuffCut® FORDMAX Carbide Endmills

## Series 192

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

Workpiece Material Group		Type of Machining	Tool Diameter					
			6mm	8mm	10mm	12mm	16mm	20mm
			Feed/Tooth (fz - mm)					
Steels	P	Profiling	0.085	0.100	0.120	0.170	0.200	0.230
		Slotting	0.043	0.050	0.060	0.085	0.100	0.125
Stainless Steels	M	Profiling	0.085	0.100	0.120	0.170	0.200	0.230
		Slotting	0.043	0.050	0.060	0.085	0.100	0.125
		Profiling	0.064	0.076	0.086	0.125	0.150	0.175
		Slotting	0.032	0.038	0.045	0.060	0.075	0.085
Cast Irons	K	Profiling	0.085	0.100	0.120	0.170	0.200	0.230
		Slotting	0.043	0.050	0.060	0.085	0.100	0.125
Special Alloys	S	Profiling	0.043	0.050	0.060	0.085	0.100	0.120
		Slotting	0.022	0.025	0.030	0.045	0.050	0.060
		Profiling	0.085	0.100	0.120	0.170	0.200	0.230
		Slotting	0.022	0.025	0.030	0.045	0.050	0.060
Hardened Steels	H	Profiling	0.076	0.090	0.100	0.150	0.180	0.200
		Slotting	0.035	0.045	0.050	0.075	0.090	0.100
		Profiling	0.053	0.066	0.076	0.100	0.132	0.155
		Slotting	0.025	0.033	0.036	0.050	0.065	0.080

 RPM Formula For Metric Endmills -  $RPM = (Vc \times 318.0) \div \text{Endmill } \varnothing$ 

 Feedrate Formula For Metric Endmills -  $\text{Feedrate} = RPM \times fz \times \text{Number Of Cutting Teeth}$

## TuffCut® FORDMAX Carbide Endmills Series VMH, ASV4, MV4

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

Workpiece Material Group	Material Type	Coolant			1 x D 0.5 x D	1 x 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
		Super Duplex (25%)	●	X	○	55	45	75	60	55	50	45
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
Special Alloys	S	High Temp Alloys	●	X	X	35	28	55	45	40	35	28
		Titanium Alloys	●	X	X	35	28	55	45	40	35	28
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

**End Mills - Technical Information**  
 Series VMH / ASV4 / MV4

# TuffCut® FORDMAX Carbide Endmills

## Series VMH, ASV4, MV4

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

Workpiece Material Group	Type of Machining	Tool Diameter								
		3mm	5mm	6mm	8mm	10mm	12mm	16mm	20mm	
		Feed/Tooth (fz - mm)								
Steels	P	Profiling	0.030	0.050	0.060	0.080	0.100	0.120	0.160	0.200
		Slotting	0.015	0.025	0.030	0.040	0.050	0.060	0.080	0.100
Stainless Steels	M	Profiling	0.030	0.050	0.060	0.080	0.100	0.120	0.160	0.200
		Slotting	0.015	0.025	0.030	0.040	0.050	0.060	0.080	0.100
Cast Irons	K	Profiling	0.030	0.050	0.060	0.080	0.100	0.120	0.160	0.200
		Slotting	0.015	0.025	0.030	0.040	0.050	0.060	0.080	0.100
High Temp Alloys	S	Profiling	0.009	0.013	0.032	0.038	0.044	0.064	0.076	0.089
		Slotting	0.005	0.007	0.016	0.019	0.022	0.032	0.038	0.045
Titanium	S	Profiling	0.030	0.050	0.060	0.080	0.100	0.120	0.160	0.200
		Slotting	0.015	0.025	0.030	0.040	0.050	0.060	0.080	0.100
Hardened Steels	H	Profiling 35 - 45 Rc	0.016	0.023	0.057	0.069	0.080	0.114	0.137	0.160
		Slotting 35 - 45 Rc	0.010	0.015	0.025	0.035	0.045	0.065	0.070	0.075
		Profiling 45 - 55 Rc	0.010	0.015	0.041	0.051	0.058	0.084	0.102	0.119
		Slotting 45 - 55 Rc	0.008	0.011	0.020	0.030	0.040	0.050	0.055	0.080

 RPM Formula For Metric Endmills -  $RPM = (Vc \times 318.0) \div \text{Endmill } \varnothing$ 

 Feedrate Formula For Metric Endmills -  $\text{Feedrate} = RPM \times fz \times \text{Number Of Cutting Teeth}$

## TuffCut® FORDMAX Carbide Endmills Series 134

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

Material Group		
Workpiece Material		Material Type
Non Ferrous	N	Aluminium/Aluminium Alloys ≤ 10% Si

Series	Type Of Cut	ap	ae	Vc (m/min)	Tool Diameter (mm)				
					6.0	8.0	10.0	12.0	16.0
134	 Slotting	0.5 x D	1 x D	300 - 500	0.06	0.08	0.09	0.12	0.17
		1 x D	1 x D	300 - 500	0.05	0.07	0.08	0.10	0.15
	 Profiling	1 x D	0.2 x D	300 - 500	0.07	0.12	0.13	0.15	0.20
		1 x D	0.5 x D	300 - 500	0.06	0.08	0.09	0.12	0.17

Series	Type Of Cut	ap	ae	Vc (m/min)	Tool Diameter (mm)	
					20.0	25.0
134	 Slotting	0.5 x D	1 x D	300 - 500	0.20	0.25
		1 x D	1 x D	300 - 500	0.15	0.20
	 Profiling	1 x D	0.2 x D	300 - 500	0.22	0.28
		1 x D	0.5 x D	300 - 500	0.20	0.25

RPM Formula For Metric Endmills -  $RPM = (Vc \times 318.0) \div \text{Endmill } \varnothing$   
 Feedrate Formula For Metric Endmills -  $\text{Feedrate} = RPM \times fz \times \text{Number Of Cutting Teeth}$ .

  
**End Mills - Technical Information**  
 Series 134

# TuffCut® FORDMAX Carbide Endmills

## Series GT2, GT3, GT2B, GT3B & ASVSM

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

Material Group		
Workpiece Material	Material Type	
Non Ferrous	N	Aluminium/Aluminium Alloys

Series	Type Of Cut	ap	ae	Vc (m/min)	Tool Diameter (mm)				
					3.0	4.0	5.0	6.0	8.0
					Feed/Tooth (fz - mm)				
GT2 & GT3 GT2B & GT3B	 Slotting	0.5 x D	1 x D	300 - 500	0.02	0.03	0.04	0.05	0.07
	 Profiling	1 x D	0.2 x D	300 - 500	0.03	0.045	0.06	0.075	0.105
		1 x D	0.5 x D	300 - 500	0.02	0.03	0.04	0.05	0.07

Series	Type Of Cut	ap	ae	Vc (m/min)	Tool Diameter (mm)				
					10.0	12.0	14.0	16.0	20.0
					Feed/Tooth (fz - mm)				
GT2 & GT3 GT2B & GT3B	 Slotting	0.5 x D	1 x D	300 - 500	0.10	0.12	0.15	0.16	0.20
	 Profiling	1 x D	0.2 x D	300 - 500	0.15	0.18	0.225	0.24	0.30
		1 x D	0.5 x D	300 - 500	0.10	0.12	0.15	0.16	0.20

 RPM Formula For Metric Endmills -  $RPM = (Vc \times 318.0) \div \text{Endmill } \varnothing$ 

 Feedrate Formula For Metric Endmills -  $\text{Feedrate} = RPM \times fz \times \text{Number Of Cutting Teeth}$



# Twister® & CYCLONE

Our high performance Twister® and Cyclone drill ranges deliver extreme performance, penetration rates and outstanding hole finish on a wide range of materials from titanium, stainless steels and high temperature alloys through to aluminium and other non-ferrous metals.

(FR)

Nos gammes de forets haute performance Twister® et Cyclone offrent des résultats exceptionnels, des vitesses d'avance et une qualité de trous remarquables sur un vaste éventail de matériaux comme le titane, les aciers inoxydables et les alliages à haute température ainsi que l'aluminium et les autres métaux non-ferreux.

(DE)

Unser Hochleistungssortiment der Twister®- und Cyclone-Bohrer bieten höchste Leistungsfähigkeit, außergewöhnliche Bohrgeschwindigkeit und hervorragende Oberflächengüte der Bohrungen bei einem breiten Spektrum an Werkstoffen, von Titan, rostfreiem Stahl sowie hochtemperaturfesten Legierungen über Aluminium bis zu anderen, Nichteisenmetallen.

(IT)

Le nostre linee di punte ad alte prestazioni Twister® e Cyclone offrono estremo rendimento, capacità di penetrazione e straordinaria finitura del foro su una vasta gamma di materiali come titanio, acciai inossidabili e leghe ad alta temperatura, alluminio e altri metalli non ferrosi.

(PL)

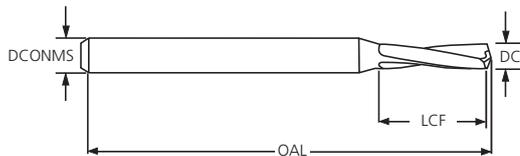
Nasze wysokowydajne wiertła Twister® i Cyclone zapewniają ekstremalne osiągi, prędkość zagłębiania się i doskonałe wykończenie otworów w szerokim zakresie materiałów od tytanu, stali nierdzewnych i stopów wysokotemperaturowych do aluminium i innych metali nieżelaznych.

## High Performance Drills

Foret Haute Performance Hochleistungsbohrer  
Punte ad alte prestazioni Wiertła wysoko wydajne

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# Twister® Micro-Tuff™ Drill Series 305 Uncoated

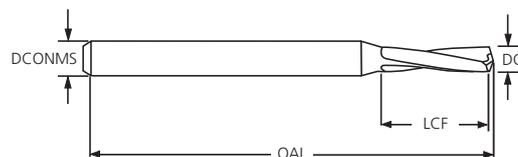


Series 305	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
305 0010	0.10	3.0	38.0	1.7
305 0011	0.11	3.0	38.0	1.7
305 0012	0.12	3.0	38.0	1.7
305 0013	0.13	3.0	38.0	1.7
305 0014	0.14	3.0	38.0	1.7
305 0015	0.15	3.0	38.0	2.5
305 0016	0.16	3.0	38.0	2.5
305 0017	0.17	3.0	38.0	2.5
305 0018	0.18	3.0	38.0	2.5
305 0019	0.19	3.0	38.0	2.5
305 0020	0.20	3.0	38.0	2.5
305 0021	0.21	3.0	38.0	2.5
305 0022	0.22	3.0	38.0	2.5
305 0023	0.23	3.0	38.0	2.5
305 0024	0.24	3.0	38.0	2.5
305 0025	0.25	3.0	38.0	3.2
305 0026	0.26	3.0	38.0	3.2
305 0027	0.27	3.0	38.0	3.2
305 0028	0.28	3.0	38.0	3.2
305 0029	0.29	3.0	38.0	3.2
305 0030	0.30	3.0	38.0	4.8
305 0031	0.31	3.0	38.0	4.8
305 0032	0.32	3.0	38.0	4.8
305 0033	0.33	3.0	38.0	4.8
305 0034	0.34	3.0	38.0	4.8
305 0035	0.35	3.0	38.0	4.8
305 0036	0.36	3.0	38.0	4.8
305 0037	0.37	3.0	38.0	4.8
305 0038	0.38	3.0	38.0	4.8
305 0039	0.39	3.0	38.0	4.8
305 0040	0.40	3.0	38.0	4.8
305 0041	0.41	3.0	38.0	6.4
305 0042	0.42	3.0	38.0	6.4
305 0043	0.43	3.0	38.0	6.4
305 0044	0.44	3.0	38.0	6.4
305 0045	0.45	3.0	38.0	6.4
305 0046	0.46	3.0	38.0	6.4
305 0047	0.47	3.0	38.0	6.4
305 0048	0.48	3.0	38.0	6.4
305 0049	0.49	3.0	38.0	6.4
305 0050	0.50	3.0	38.0	6.4
305 0051	0.51	3.0	38.0	6.4
305 0052	0.52	3.0	38.0	6.4
305 0053	0.53	3.0	38.0	6.4
305 0054	0.54	3.0	38.0	6.4

Series 305	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
305 0055	0.55	3.0	38.0	6.4
305 0056	0.56	3.0	38.0	6.4
305 0057	0.57	3.0	38.0	6.4
305 0058	0.58	3.0	38.0	6.4
305 0059	0.59	3.0	38.0	6.4
305 0060	0.60	3.0	38.0	6.4
305 0061	0.61	3.0	38.0	6.4
305 0062	0.62	3.0	38.0	6.4
305 0063	0.63	3.0	38.0	6.4
305 0064	0.64	3.0	38.0	6.4
305 0065	0.65	3.0	38.0	6.4
305 0066	0.66	3.0	38.0	8.1
305 0067	0.67	3.0	38.0	8.1
305 0068	0.68	3.0	38.0	8.1
305 0069	0.69	3.0	38.0	8.1
305 0070	0.70	3.0	38.0	8.1
305 0071	0.71	3.0	38.0	8.1
305 0072	0.72	3.0	38.0	8.1
305 0073	0.73	3.0	38.0	8.1
305 0074	0.74	3.0	38.0	8.1
305 0075	0.75	3.0	38.0	8.1
305 0076	0.76	3.0	38.0	10.2
305 0077	0.77	3.0	38.0	10.2
305 0078	0.78	3.0	38.0	10.2
305 0079	0.79	3.0	38.0	10.2
305 0080	0.80	3.0	38.0	10.2
305 0081	0.81	3.0	38.0	10.2
305 0082	0.82	3.0	38.0	10.2
305 0083	0.83	3.0	38.0	10.2
305 0084	0.84	3.0	38.0	10.2
305 0085	0.85	3.0	38.0	10.2
305 0086	0.86	3.0	38.0	10.2
305 0087	0.87	3.0	38.0	10.2
305 0088	0.88	3.0	38.0	10.2
305 0089	0.89	3.0	38.0	10.2
305 0090	0.90	3.0	38.0	10.2
305 0091	0.91	3.0	38.0	10.2
305 0092	0.92	3.0	38.0	10.2
305 0093	0.93	3.0	38.0	10.2
305 0094	0.94	3.0	38.0	10.2
305 0095	0.95	3.0	38.0	10.2
305 0096	0.96	3.0	38.0	10.2
305 0097	0.97	3.0	38.0	10.2
305 0098	0.98	3.0	38.0	10.2
305 0099	0.99	3.0	38.0	10.2

 Drills  
 Series 305 Uncoated

# Twister® Micro-Tuff™ Drill Series 305 Uncoated



Series 305	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
305 0100	1.00	3.0	38.0	10.2
305 0105	1.05	3.0	38.0	10.2
305 0110	1.10	3.0	38.0	10.2
305 0115	1.15	3.0	38.0	10.2
305 0120	1.20	3.0	38.0	10.2
305 0125	1.25	3.0	38.0	10.2
305 0130	1.30	3.0	38.0	10.2
305 0135	1.35	3.0	38.0	10.2
305 0140	1.40	3.0	38.0	10.2
305 0145	1.45	3.0	38.0	10.2
305 0150	1.50	3.0	38.0	10.2
305 0155	1.55	3.0	38.0	10.2
305 0160	1.60	3.0	38.0	12.2
305 0165	1.65	3.0	38.0	12.2
305 0170	1.70	3.0	38.0	12.2
305 0175	1.75	3.0	38.0	12.2
305 0180	1.80	3.0	38.0	12.2
305 0185	1.85	3.0	38.0	12.2
305 0190	1.90	3.0	38.0	12.2
305 0195	1.95	3.0	38.0	12.2
305 0200	2.00	3.0	38.0	12.2

Series 305	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
305 0205	2.05	3.0	38.0	12.2
305 0210	2.10	3.0	38.0	12.2
305 0215	2.15	3.0	38.0	12.2
305 0220	2.20	3.0	38.0	12.2
305 0225	2.25	3.0	38.0	12.2
305 0230	2.30	3.0	38.0	12.2
305 0235	2.35	3.0	38.0	12.2
305 0240	2.40	3.0	38.0	12.2
305 0245	2.45	3.0	38.0	12.2
305 0250	2.50	3.0	38.0	12.2
305 0255	2.55	3.0	38.0	12.2
305 0260	2.60	3.0	38.0	12.2
305 0265	2.65	3.0	38.0	12.2
305 0270	2.70	3.0	38.0	12.2
305 0275	2.75	3.0	38.0	12.2
305 0280	2.80	3.0	38.0	12.2
305 0285	2.85	3.0	38.0	12.2
305 0290	2.90	3.0	38.0	12.2
305 0295	2.95	3.0	38.0	12.2
305 0300	3.00	3.0	38.0	12.2



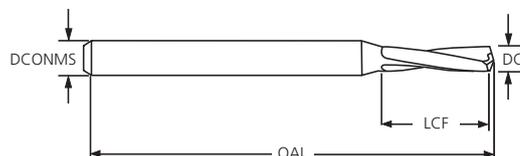
Drills  
Series 305 Uncoated



Metric (mm)	
DC	Tolerance
0.10 - 3.00	+0/-0.008

Metric (mm)	
DCONMS	Tolerance (h6)
3.00	+0/-0.005

# Twister® Micro-Tuff™ Drill Series 305AM Coated



Series 305	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
305 0030AM	0.30	3.0	38.0	4.8
305 0035AM	0.35	3.0	38.0	4.8
305 0040AM	0.40	3.0	38.0	4.8
305 0045AM	0.45	3.0	38.0	6.4
305 0050AM	0.50	3.0	38.0	6.4
305 0055AM	0.55	3.0	38.0	6.4
305 0060AM	0.60	3.0	38.0	6.4
305 0065AM	0.65	3.0	38.0	6.4
305 0070AM	0.70	3.0	38.0	8.1
305 0075AM	0.75	3.0	38.0	8.1
305 0080AM	0.80	3.0	38.0	10.2
305 0085AM	0.85	3.0	38.0	10.2
305 0090AM	0.90	3.0	38.0	10.2
305 0095AM	0.95	3.0	38.0	10.2
305 0100AM	1.00	3.0	38.0	10.2
305 0105AM	1.05	3.0	38.0	10.2
305 0110AM	1.10	3.0	38.0	10.2
305 0115AM	1.15	3.0	38.0	10.2
305 0120AM	1.20	3.0	38.0	10.2
305 0125AM	1.25	3.0	38.0	10.2
305 0130AM	1.30	3.0	38.0	10.2
305 0135AM	1.35	3.0	38.0	10.2
305 0140AM	1.40	3.0	38.0	10.2
305 0145AM	1.45	3.0	38.0	10.2
305 0150AM	1.50	3.0	38.0	10.2
305 0155AM	1.55	3.0	38.0	10.2
305 0160AM	1.60	3.0	38.0	12.2
305 0165AM	1.65	3.0	38.0	12.2

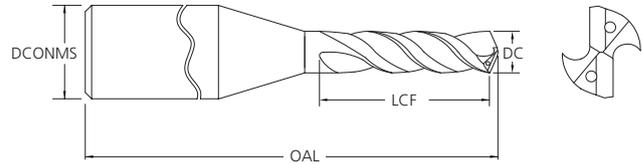
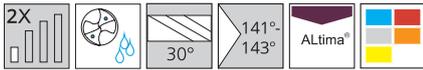
Series 305	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
305 0170AM	1.70	3.0	38.0	12.2
305 0175AM	1.75	3.0	38.0	12.2
305 0180AM	1.80	3.0	38.0	12.2
305 0185AM	1.85	3.0	38.0	12.2
305 0190AM	1.90	3.0	38.0	12.2
305 0195AM	1.95	3.0	38.0	12.2
305 0200AM	2.00	3.0	38.0	12.2
305 0205AM	2.05	3.0	38.0	12.2
305 0210AM	2.10	3.0	38.0	12.2
305 0215AM	2.15	3.0	38.0	12.2
305 0220AM	2.20	3.0	38.0	12.2
305 0225AM	2.25	3.0	38.0	12.2
305 0230AM	2.30	3.0	38.0	12.2
305 0235AM	2.35	3.0	38.0	12.2
305 0240AM	2.40	3.0	38.0	12.2
305 0245AM	2.45	3.0	38.0	12.2
305 0250AM	2.50	3.0	38.0	12.2
305 0255AM	2.55	3.0	38.0	12.2
305 0260AM	2.60	3.0	38.0	12.2
305 0265AM	2.65	3.0	38.0	12.2
305 0270AM	2.70	3.0	38.0	12.2
305 0275AM	2.75	3.0	38.0	12.2
305 0280AM	2.80	3.0	38.0	12.2
305 0285AM	2.85	3.0	38.0	12.2
305 0290AM	2.90	3.0	38.0	12.2
305 0295AM	2.95	3.0	38.0	12.2
305 0300AM	3.00	3.0	38.0	12.2

 Drills  
 Series 305AM Coated


Metric (mm)	
DC	Tolerance
0.10 - 3.00	+0/-0.008

Metric (mm)	
DCONMS	Tolerance (h6)
3.00	+0/-0.005

# Twister® Micro XD Series MPDCS



Series MPDCS	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MPDCSM0100A	1.00	3.0	45.0	4.0
MPDCSM0105A	1.50	3.0	45.0	4.0
MPDCSM0110A	1.10	3.0	45.0	4.0
MPDCSM0115A	1.15	3.0	45.0	5.0
MPDCSM0120A	1.20	3.0	45.0	5.0
MPDCSM0125A	1.25	3.0	45.0	5.0
MPDCSM0130A	1.30	3.0	45.0	5.0
MPDCSM0135A	1.35	3.0	45.0	5.0
MPDCSM0140A	1.40	3.0	45.0	6.0
MPDCSM0145A	1.45	3.0	45.0	6.0
MPDCSM0150A	1.50	3.0	45.0	6.0
MPDCSM0155A	1.55	3.0	45.0	6.0
MPDCSM0160A	1.60	3.0	45.0	6.0
MPDCSM0165A	1.65	3.0	50.0	7.0
MPDCSM0170A	1.70	3.0	50.0	7.0
MPDCSM0175A	1.75	3.0	50.0	7.0
MPDCSM0180A	1.80	3.0	50.0	7.0
MPDCSM0185A	1.85	3.0	50.0	7.0
MPDCSM0190A	1.90	3.0	50.0	8.0
MPDCSM0195A	1.95	3.0	50.0	8.0

Series MPDCS	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MPDCSM0200A	2.0	3.0	50.0	8.0
MPDCSM0205A	2.05	3.0	60.0	8.0
MPDCSM0210A	2.10	3.0	60.0	8.0
MPDCSM0215A	2.15	3.0	60.0	9.0
MPDCSM0220A	2.20	3.0	60.0	9.0
MPDCSM0225A	2.25	3.0	60.0	9.0
MPDCSM0230A	2.30	3.0	60.0	9.0
MPDCSM0235A	2.35	3.0	60.0	9.0
MPDCSM0240A	2.40	3.0	60.0	10.0
MPDCSM0245A	2.45	3.0	60.0	10.0
MPDCSM0250A	2.50	3.0	60.0	10.0
MPDCSM0255A	2.55	3.0	60.0	10.0
MPDCSM0260A	2.60	3.0	60.0	10.0
MPDCSM0265A	2.65	3.0	60.0	11.0
MPDCSM0270A	2.70	3.0	60.0	11.0
MPDCSM0275A	2.75	3.0	60.0	11.0
MPDCSM0280A	2.80	3.0	60.0	11.0
MPDCSM0285A	2.85	3.0	60.0	11.0
MPDCSM0290A	2.90	3.0	60.0	12.0
MPDCSM0295A	2.95	3.0	60.0	12.0

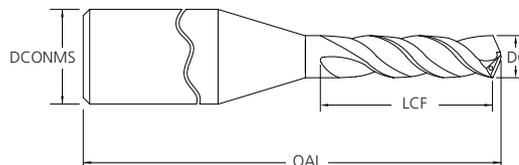


Metric (mm)	
DC	Tolerance
1.00 - 2.95	+0.004/+0.014

Metric (mm)	
DCONMS	Tolerance (h6)
3.00	+0/-0.006



## Twister® Micro XD Series MXDSR



ALtima®	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MXDSRM0050A	0.50	3.0	57.0	4.0
MXDSRM0055A	0.55	3.0	57.0	4.0
MXDSRM0060A	0.60	3.0	57.0	5.0
MXDSRM0065A	0.65	3.0	57.0	5.0
MXDSRM0070A	0.70	3.0	57.0	5.0
MXDSRM0075A	0.75	3.0	57.0	6.0
MXDSRM0080A	0.80	3.0	57.0	6.0
MXDSRM0085A	0.85	3.0	57.0	7.0
MXDSRM0090A	0.90	3.0	57.0	7.0
MXDSRM0095A	0.95	3.0	57.0	7.0
MXDSRM0100A	1.00	3.0	57.0	8.0
MXDSRM0105A	1.05	3.0	57.0	8.0
MXDSRM0110A	1.10	3.0	57.0	8.0
MXDSRM0115A	1.15	3.0	57.0	9.0
MXDSRM0120A	1.20	3.0	57.0	9.0
MXDSRM0125A	1.25	3.0	57.0	9.0
MXDSRM0130A	1.30	3.0	57.0	10.0
MXDSRM0135A	1.35	3.0	57.0	10.0
MXDSRM0140A	1.40	3.0	57.0	10.0
MXDSRM0145A	1.45	3.0	57.0	11.0
MXDSRM0150A	1.50	3.0	57.0	11.0
MXDSRM0155A	1.55	3.0	57.0	12.0
MXDSRM0160A	1.60	3.0	57.0	12.0
MXDSRM0165A	1.65	3.0	57.0	12.0
MXDSRM0170A	1.70	3.0	57.0	13.0

ALtima®	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MXDSRM0175A	1.75	3.0	57.0	13.0
MXDSRM0180A	1.80	3.0	57.0	13.0
MXDSRM0185A	1.85	3.0	57.0	14.0
MXDSRM0190A	1.90	3.0	57.0	14.0
MXDSRM0195A	1.95	3.0	57.0	14.0
MXDSRM0200A	2.00	3.0	57.0	15.0
MXDSRM0205A	2.05	3.0	57.0	15.0
MXDSRM0210A	2.10	3.0	57.0	15.0
MXDSRM0215A	2.15	3.0	57.0	16.0
MXDSRM0220A	2.20	3.0	57.0	16.0
MXDSRM0225A	2.25	3.0	57.0	17.0
MXDSRM0230A	2.30	3.0	57.0	17.0
MXDSRM0235A	2.35	3.0	57.0	17.0
MXDSRM0240A	2.40	3.0	57.0	18.0
MXDSRM0245A	2.45	3.0	57.0	18.0
MXDSRM0250A	2.50	3.0	57.0	18.0
MXDSRM0255A	2.55	3.0	57.0	19.0
MXDSRM0260A	2.60	3.0	57.0	19.0
MXDSRM0265A	2.65	3.0	57.0	19.0
MXDSRM0270A	2.70	3.0	57.0	20.0
MXDSRM0275A	2.75	3.0	57.0	20.0
MXDSRM0280A	2.80	3.0	57.0	20.0
MXDSRM0285A	2.85	3.0	57.0	21.0
MXDSRM0290A	2.90	3.0	57.0	21.0
MXDSRM0295A	2.95	3.0	57.0	22.0

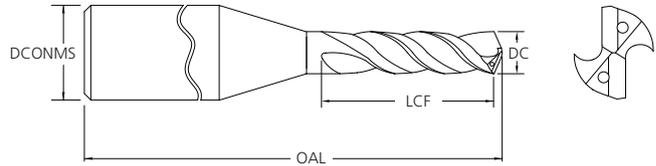
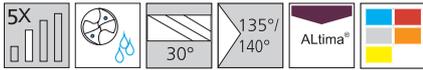
Drills  
Series MXDSR

Metric (mm)	
D1	Tolerance (h7)
0.5 - 2.95	+0/-0.010

Metric (mm)	
D2	Tolerance (h6)
3.0	+0/-0.006



# Twister® Micro XD Series MXDCR



ALtima®	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MXDCRM0100A	1.00	3.0	57.0	8.0
MXDCRM0105A	1.05	3.0	57.0	8.0
MXDCRM0110A	1.10	3.0	57.0	8.0
MXDCRM0115A	1.15	3.0	57.0	9.0
MXDCRM0120A	1.20	3.0	57.0	9.0
MXDCRM0125A	1.25	3.0	57.0	9.0
MXDCRM0130A	1.30	3.0	57.0	10.0
MXDCRM0135A	1.35	3.0	57.0	10.0
MXDCRM0140A	1.40	3.0	57.0	10.0
MXDCRM0145A	1.45	3.0	57.0	11.0
MXDCRM0150A	1.50	3.0	57.0	11.0
MXDCRM0155A	1.55	3.0	57.0	12.0
MXDCRM0160A	1.60	3.0	57.0	12.0
MXDCRM0165A	1.65	3.0	57.0	12.0
MXDCRM0170A	1.70	3.0	57.0	13.0
MXDCRM0175A	1.75	3.0	57.0	13.0
MXDCRM0180A	1.80	3.0	57.0	13.0
MXDCRM0185A	1.85	3.0	57.0	14.0
MXDCRM0190A	1.90	3.0	57.0	14.0
MXDCRM0195A	1.95	3.0	57.0	14.0

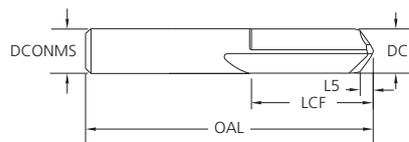
ALtima®	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MXDCRM0200A	2.00	3.0	57.0	15.0
MXDCRM0205A	2.05	3.0	60.0	15.0
MXDCRM0210A	2.10	3.0	60.0	15.0
MXDCRM0215A	2.15	3.0	60.0	16.0
MXDCRM0220A	2.20	3.0	60.0	16.0
MXDCRM0225A	2.25	3.0	60.0	17.0
MXDCRM0230A	2.30	3.0	60.0	17.0
MXDCRM0235A	2.35	3.0	60.0	17.0
MXDCRM0240A	2.40	3.0	60.0	18.0
MXDCRM0245A	2.45	3.0	60.0	18.0
MXDCRM0250A	2.50	3.0	60.0	18.0
MXDCRM0255A	2.55	3.0	60.0	19.0
MXDCRM0260A	2.60	3.0	60.0	19.0
MXDCRM0265A	2.65	3.0	60.0	19.0
MXDCRM0270A	2.70	3.0	60.0	20.0
MXDCRM0275A	2.75	3.0	60.0	20.0
MXDCRM0280A	2.80	3.0	60.0	20.0
MXDCRM0285A	2.85	3.0	60.0	21.0
MXDCRM0290A	2.90	3.0	60.0	21.0
MXDCRM0295A	2.95	3.0	60.0	22.0

Metric (mm)	
DC	Tolerance (h7)
1.00 - 2.95	+0/-0.010

Metric (mm)	
DCONMS	Tolerance (h6)
3.00	+0/-0.006



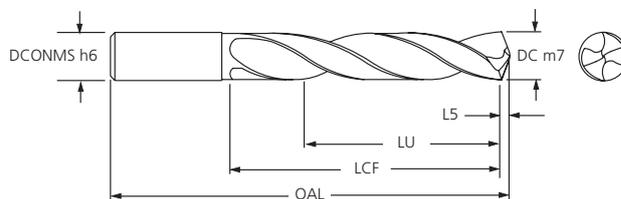
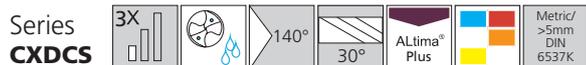
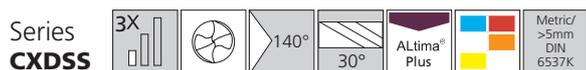
## Twister® XD Spot Drill Series 200S



Series 200S	Drill Dimensions				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	L5
200S 0300A	3.0	3.0	38.0	16.0	0.4
200S 0600A	6.0	6.0	51.0	19.0	0.8
200S 0800A	8.0	8.0	64.0	19.0	1.1
200S 1000A	10.0	10.0	70.0	25.0	1.4
200S 1200A	12.0	12.0	76.0	25.0	1.7
200S 1600A	16.0	16.0	89.0	32.0	2.2

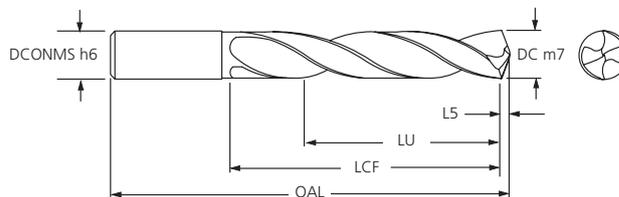
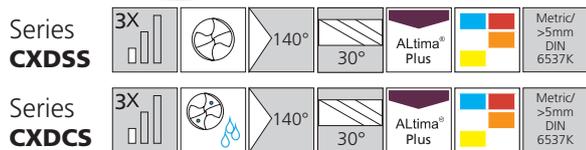


## CYCLONE CXD High Performance Drill - 3xD Series CXDSS & CXDCS



Tool No.		Drill Dimensions (mm)					
CXDSS	CXDCS	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSS 0300AP	CXDCS 0300AP	3.0	3.0	62.0	20.0	14.0	0.46
CXDSS 0310AP	CXDCS 0310AP	3.1	4.0	62.0	20.0	14.0	0.48
CXDSS 0320AP	CXDCS 0320AP	3.2	4.0	62.0	20.0	14.0	0.5
CXDSS 0330AP	CXDCS 0330AP	3.3	4.0	62.0	20.0	14.0	0.51
CXDSS 0340AP	CXDCS 0340AP	3.4	4.0	62.0	20.0	14.0	0.53
CXDSS 0350AP	CXDCS 0350AP	3.5	4.0	62.0	20.0	14.0	0.54
CXDSS 0360AP	CXDCS 0360AP	3.6	4.0	62.0	20.0	14.0	0.56
CXDSS 0370AP	CXDCS 0370AP	3.7	4.0	62.0	20.0	14.0	0.57
CXDSS 0380AP	CXDCS 0380AP	3.8	4.0	66.0	24.0	17.0	0.59
CXDSS 0390AP	CXDCS 0390AP	3.9	4.0	66.0	24.0	17.0	0.6
CXDSS 0400AP	CXDCS 0400AP	4.0	4.0	66.0	24.0	17.0	0.62
CXDSS 0410AP	CXDCS 0410AP	4.1	5.0	66.0	24.0	17.0	0.64
CXDSS 0420AP	CXDCS 0420AP	4.2	5.0	66.0	24.0	17.0	0.65
CXDSS 0430AP	CXDCS 0430AP	4.3	5.0	66.0	24.0	17.0	0.67
CXDSS 0440AP	CXDCS 0440AP	4.4	5.0	66.0	24.0	17.0	0.68
CXDSS 0450AP	CXDCS 0450AP	4.5	5.0	66.0	24.0	17.0	0.7
CXDSS 0460AP	CXDCS 0460AP	4.6	5.0	66.0	24.0	17.0	0.71
CXDSS 0470AP	CXDCS 0470AP	4.7	5.0	66.0	24.0	17.0	0.73

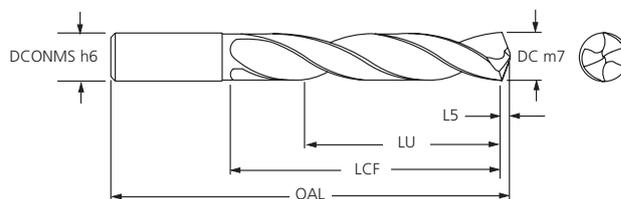
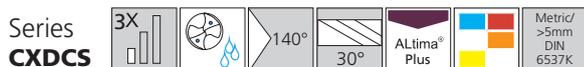
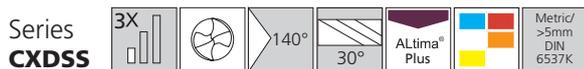
# CYCLONE CXD High Performance Drill - 3xD Series CXDSS & CXDCS



Tool No.		Drill Dimensions (mm)					
CXDSS	CXDCS	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSS 0480AP	CXDCS 0480AP	4.8	5.0	66.0	28.0	20.0	0.74
CXDSS 0490AP	CXDCS 0490AP	4.9	5.0	66.0	28.0	20.0	0.76
CXDSS 0500AP	CXDCS 0500AP	5.0	5.0	66.0	28.0	20.0	0.77
CXDSS 0510AP	CXDCS 0510AP	5.1	6.0	66.0	28.0	20.0	0.79
CXDSS 0520AP	CXDCS 0520AP	5.2	6.0	66.0	28.0	20.0	0.81
CXDSS 0530AP	CXDCS 0530AP	5.3	6.0	66.0	28.0	20.0	0.82
CXDSS 0540AP	CXDCS 0540AP	5.4	6.0	66.0	28.0	20.0	0.84
CXDSS 0550AP	CXDCS 0550AP	5.5	6.0	66.0	28.0	20.0	0.85
CXDSS 0560AP	CXDCS 0560AP	5.6	6.0	66.0	28.0	20.0	0.86
CXDSS 0570AP	CXDCS 0570AP	5.7	6.0	66.0	28.0	20.0	0.88
CXDSS 0580AP	CXDCS 0580AP	5.8	6.0	66.0	28.0	20.0	0.9
CXDSS 0590AP	CXDCS 0590AP	5.9	6.0	66.0	28.0	20.0	0.91
CXDSS 0600AP	CXDCS 0600AP	6.0	6.0	66.0	28.0	20.0	0.93
CXDSS 0610AP	CXDCS 0610AP	6.1	8.0	79.0	34.0	24.0	0.95
CXDSS 0620AP	CXDCS 0620AP	6.2	8.0	79.0	34.0	24.0	0.96
CXDSS 0630AP	CXDCS 0630AP	6.3	8.0	79.0	34.0	24.0	0.98
CXDSS 0640AP	CXDCS 0640AP	6.4	8.0	79.0	34.0	24.0	0.99
CXDSS 0650AP	CXDCS 0650AP	6.5	8.0	79.0	34.0	24.0	1.01
CXDSS 0660AP	CXDCS 0660AP	6.6	8.0	79.0	34.0	24.0	1.03
CXDSS 0670AP	CXDCS 0670AP	6.7	8.0	79.0	34.0	24.0	1.04
CXDSS 0680AP	CXDCS 0680AP	6.8	8.0	79.0	34.0	24.0	1.05
CXDSS 0690AP	CXDCS 0690AP	6.9	8.0	79.0	34.0	24.0	1.07
CXDSS 0700AP	CXDCS 0700AP	7.0	8.0	79.0	34.0	24.0	1.08
CXDSS 0710AP	CXDCS 0710AP	7.1	8.0	79.0	41.0	29.0	1.1
CXDSS 0720AP	CXDCS 0720AP	7.2	8.0	79.0	41.0	29.0	1.12
CXDSS 0730AP	CXDCS 0730AP	7.3	8.0	79.0	41.0	29.0	1.13
CXDSS 0740AP	CXDCS 0740AP	7.4	8.0	79.0	41.0	29.0	1.15
CXDSS 0750AP	CXDCS 0750AP	7.5	8.0	79.0	41.0	29.0	1.16
CXDSS 0760AP	CXDCS 0760AP	7.6	8.0	79.0	41.0	29.0	1.18
CXDSS 0770AP	CXDCS 0770AP	7.7	8.0	79.0	41.0	29.0	1.19
CXDSS 0780AP	CXDCS 0780AP	7.8	8.0	79.0	41.0	29.0	1.21
CXDSS 0790AP	CXDCS 0790AP	7.9	8.0	79.0	41.0	29.0	1.22
CXDSS 0800AP	CXDCS 0800AP	8.0	8.0	79.0	41.0	29.0	1.24
CXDSS 0810AP	CXDCS 0810AP	8.1	10.0	89.0	47.0	35.0	1.26
CXDSS 0820AP	CXDCS 0820AP	8.2	10.0	89.0	47.0	35.0	1.27
CXDSS 0830AP	CXDCS 0830AP	8.3	10.0	89.0	47.0	35.0	1.29
CXDSS 0840AP	CXDCS 0840AP	8.4	10.0	89.0	47.0	35.0	1.31
CXDSS 0850AP	CXDCS 0850AP	8.5	10.0	89.0	47.0	35.0	1.32
CXDSS 0860AP	CXDCS 0860AP	8.6	10.0	89.0	47.0	35.0	1.33
CXDSS 0870AP	CXDCS 0870AP	8.7	10.0	89.0	47.0	35.0	1.35
CXDSS 0880AP	CXDCS 0880AP	8.8	10.0	89.0	47.0	35.0	1.36

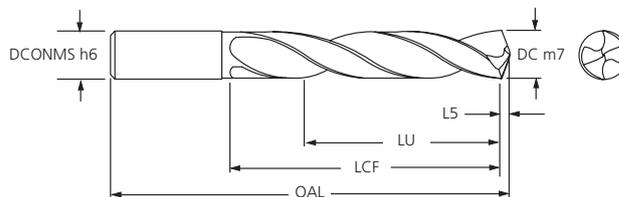
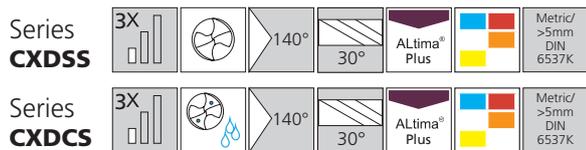
Drills Series CXDSS / CXDCS

# CYCLONE CXD High Performance Drill - 3xD Series CXDSS & CXDCS



Tool No.		Drill Dimensions (mm)					
CXDSS	CXDCS	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSS 0890AP	CXDCS 0890AP	8.9	10.0	89.0	47.0	35.0	1.38
CXDSS 0900AP	CXDCS 0900AP	9.0	10.0	89.0	47.0	35.0	1.39
CXDSS 0910AP	CXDCS 0910AP	9.1	10.0	89.0	47.0	35.0	1.41
CXDSS 0920AP	CXDCS 0920AP	9.2	10.0	89.0	47.0	35.0	1.43
CXDSS 0925AP	CXDCS 0925AP	9.25	10.0	89.0	47.0	35.0	1.43
CXDSS 0930AP	CXDCS 0930AP	9.3	10.0	89.0	47.0	35.0	1.44
CXDSS 0940AP	CXDCS 0940AP	9.4	10.0	89.0	47.0	35.0	1.46
CXDSS 0950AP	CXDCS 0950AP	9.5	10.0	89.0	47.0	35.0	1.47
CXDSS 0960AP	CXDCS 0960AP	9.6	10.0	89.0	47.0	35.0	1.49
CXDSS 0970AP	CXDCS 0970AP	9.7	10.0	89.0	47.0	35.0	1.5
CXDSS 0980AP	CXDCS 0980AP	9.8	10.0	89.0	47.0	35.0	1.52
CXDSS 0990AP	CXDCS 0990AP	9.9	10.0	89.0	47.0	35.0	1.53
CXDSS 1000AP	CXDCS 1000AP	10.0	10.0	89.0	47.0	35.0	1.55
CXDSS 1010AP	CXDCS 1010AP	10.1	12.0	102.0	55.0	40.0	1.56
CXDSS 1020AP	CXDCS 1020AP	10.2	12.0	102.0	55.0	40.0	1.58
CXDSS 1030AP	CXDCS 1030AP	10.3	12.0	102.0	55.0	40.0	1.6
CXDSS 1040AP	CXDCS 1040AP	10.4	12.0	102.0	55.0	40.0	1.61
CXDSS 1050AP	CXDCS 1050AP	10.5	12.0	102.0	55.0	40.0	1.63
CXDSS 1060AP	CXDCS 1060AP	10.6	12.0	102.0	55.0	40.0	1.64
CXDSS 1070AP	CXDCS 1070AP	10.7	12.0	102.0	55.0	40.0	1.66
CXDSS 1080AP	CXDCS 1080AP	10.8	12.0	102.0	55.0	40.0	1.67
CXDSS 1090AP	CXDCS 1090AP	10.9	12.0	102.0	55.0	40.0	1.69
CXDSS 1100AP	CXDCS 1100AP	11.0	12.0	102.0	55.0	40.0	1.7
CXDSS 1110AP	CXDCS 1110AP	11.1	12.0	102.0	55.0	40.0	1.72
CXDSS 1120AP	CXDCS 1120AP	11.2	12.0	102.0	55.0	40.0	1.74
CXDSS 1130AP	CXDCS 1130AP	11.3	12.0	102.0	55.0	40.0	1.75
CXDSS 1140AP	CXDCS 1140AP	11.4	12.0	102.0	55.0	40.0	1.77
CXDSS 1150AP	CXDCS 1150AP	11.5	12.0	102.0	55.0	40.0	1.78
CXDSS 1160AP	CXDCS 1160AP	11.6	12.0	102.0	55.0	40.0	1.8
CXDSS 1170AP	CXDCS 1170AP	11.7	12.0	102.0	55.0	40.0	1.81

# CYCLONE CXD High Performance Drill - 3xD Series CXDSS & CXDCS



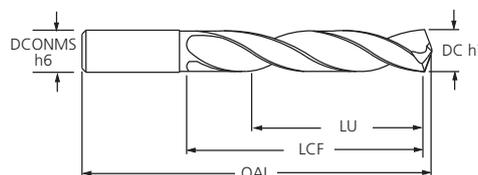
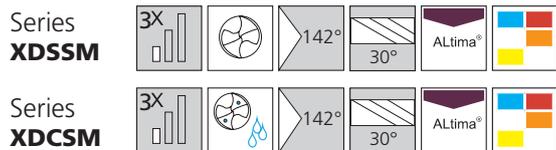
Tool No.		Drill Dimensions (mm)					
CXDSS	CXDCS	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSS 1180AP	CXDCS 1180AP	11.8	12.0	102.0	55.0	40.0	1.83
CXDSS 1190AP	CXDCS 1190AP	11.9	12.0	102.0	55.0	40.0	1.84
CXDSS 1200AP	CXDCS 1200AP	12.0	12.0	102.0	55.0	40.0	1.86
CXDSS 1210AP	CXDCS 1210AP	12.1	14.0	107.0	60.0	43.0	1.87
CXDSS 1250AP	CXDCS 1250AP	12.5	14.0	107.0	60.0	43.0	1.94
CXDSS 1280AP	CXDCS 1280AP	12.8	14.0	107.0	60.0	43.0	1.98
CXDSS 1283AP	CXDCS 1283AP	12.83	14.0	107.0	60.0	43.0	1.99
CXDSS 1290AP	CXDCS 1290AP	12.9	14.0	107.0	60.0	43.0	2.0
CXDSS 1300AP	CXDCS 1300AP	13.0	14.0	107.0	60.0	43.0	2.01
CXDSS 1350AP	CXDCS 1350AP	13.5	14.0	107.0	60.0	43.0	2.09
CXDSS 1370AP	CXDCS 1370AP	13.7	14.0	107.0	60.0	43.0	2.12
CXDSS 1400AP	CXDCS 1400AP	14.0	14.0	107.0	60.0	43.0	2.17
CXDSS 1450AP	CXDCS 1450AP	14.5	16.0	115.0	65.0	45.0	2.25
CXDSS 1470AP	CXDCS 1470AP	14.7	16.0	115.0	65.0	45.0	2.28
CXDSS 1500AP	CXDCS 1500AP	15.0	16.0	115.0	65.0	45.0	2.32
CXDSS 1530AP	CXDCS 1530AP	15.3	16.0	115.0	65.0	45.0	2.37
CXDSS 1550AP	CXDCS 1550AP	15.5	16.0	115.0	65.0	45.0	2.4
CXDSS 1570AP	CXDCS 1570AP	15.7	16.0	115.0	65.0	45.0	2.43
CXDSS 1600AP	CXDCS 1600AP	16.0	16.0	115.0	65.0	45.0	2.48
CXDSS 1608AP	-	16.08	18.0	123.0	73.0	51.0	2.49
CXDSS 1630AP	-	16.3	18.0	123.0	73.0	51.0	2.53
CXDSS 1650AP	-	16.5	18.0	123.0	73.0	51.0	2.56
CXDSS 1700AP	-	17.0	18.0	123.0	73.0	51.0	2.63
CXDSS 1750AP	-	17.5	18.0	123.0	73.0	51.0	2.71
CXDSS 1800AP	-	18.0	18.0	123.0	73.0	51.0	2.79
CXDSS 1850AP	-	18.5	20.0	131.0	79.0	55.0	2.87
CXDSS 1916AP	-	19.16	20.0	131.0	79.0	55.0	2.97
CXDSS 1925AP	-	19.25	20.0	131.0	79.0	55.0	2.98
CXDSS 1930AP	-	19.3	20.0	131.0	79.0	55.0	2.99
CXDSS 1950AP	-	19.5	20.0	131.0	79.0	55.0	3.02
CXDSS 2000AP	-	20.0	20.0	131.0	79.0	55.0	3.1

DC	Tolerance (m7)	DCONMS	Tolerance (h6)
0 - 3.0	+0.002/+0.012	0 - 3.0	+0/-0.006
3.01 - 6.0	+0.004/+0.016	3.01 - 6.0	+0/-0.008
6.01 - 10.0	+0.006/+0.021	6.01 - 10.0	+0/-0.009
10.01 - 18.0	+0.007/+0.025	10.01 - 18.0	+0/-0.011
18.01 - 20.0	+0.008/+0.029	18.01 - 20.0	+0/-0.013



Drills Series CXDSS / CXDCS

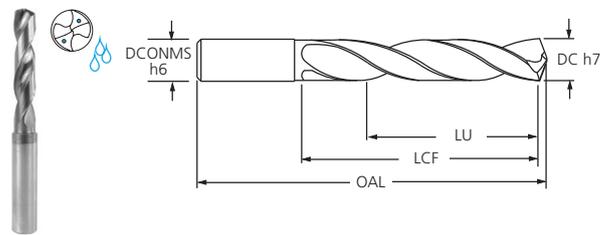
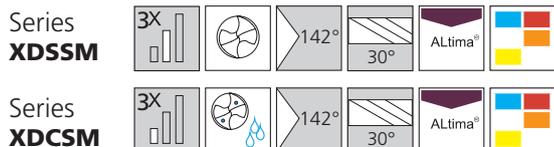
# Twister® XD High Performance Drill - 3xD Series XDSSM & XDSCM



Series 2XDSSM	Drill Dimensions XDSSM					Series 2XDSCM	Drill Dimensions XDSCM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDSSM0250A	2.5	2.5	43.0	14.0	11.0	-	-	-	-	-	-
2XDSSM0290A	2.9	2.9	46.0	16.0	12.0	-	-	-	-	-	-
2XDSSM0300A	3.0	3.0	57.0	16.0	13.0	2XDSCM0300A	3.0	3.0	57.0	16.0	13.0
2XDSSM0310A	3.1	4.0	63.0	22.0	18.0	2XDSCM0310A	3.1	4.0	63.0	22.0	18.0
2XDSSM0320A	3.2	4.0	63.0	22.0	18.0	2XDSCM0320A	3.2	4.0	63.0	22.0	18.0
2XDSSM0330A	3.3	4.0	63.0	22.0	18.0	2XDSCM0330A	3.3	4.0	63.0	22.0	18.0
2XDSSM0340A	3.4	4.0	63.0	22.0	18.0	2XDSCM0340A	3.4	4.0	63.0	22.0	18.0
2XDSSM0350A	3.5	4.0	63.0	22.0	18.0	2XDSCM0350A	3.5	4.0	63.0	22.0	18.0
2XDSSM0360A	3.6	4.0	63.0	22.0	18.0	2XDSCM0360A	3.6	4.0	63.0	22.0	18.0
2XDSSM0370A	3.7	4.0	63.0	22.0	18.0	2XDSCM0370A	3.7	4.0	63.0	22.0	18.0
2XDSSM0380A	3.8	4.0	63.0	22.0	18.0	2XDSCM0380A	3.8	4.0	63.0	22.0	18.0
2XDSSM0390A	3.9	4.0	63.0	22.0	18.0	2XDSCM0390A	3.9	4.0	63.0	22.0	18.0
2XDSSM0400A	4.0	4.0	63.0	22.0	18.0	2XDSCM0400A	4.0	4.0	63.0	22.0	18.0
2XDSSM0410A	4.1	5.0	63.0	26.0	21.0	2XDSCM0410A	4.1	5.0	63.0	26.0	21.0
2XDSSM0420A	4.2	5.0	63.0	26.0	21.0	2XDSCM0420A	4.2	5.0	63.0	26.0	21.0
2XDSSM0430A	4.3	5.0	63.0	26.0	21.0	2XDSCM0430A	4.3	5.0	63.0	26.0	21.0
2XDSSM0440A	4.4	5.0	63.0	26.0	21.0	2XDSCM0440A	4.4	5.0	63.0	26.0	21.0
2XDSSM0450A	4.5	5.0	63.0	26.0	21.0	2XDSCM0450A	4.5	5.0	63.0	26.0	21.0
2XDSSM0460A	4.6	5.0	63.0	26.0	21.0	2XDSCM0460A	4.6	5.0	63.0	26.0	21.0
2XDSSM0470A	4.7	5.0	63.0	26.0	21.0	2XDSCM0470A	4.7	5.0	63.0	26.0	21.0
2XDSSM0480A	4.8	5.0	63.0	26.0	21.0	2XDSCM0480A	4.8	5.0	63.0	26.0	21.0
2XDSSM0490A	4.9	5.0	63.0	26.0	21.0	2XDSCM0490A	4.9	5.0	63.0	26.0	21.0
2XDSSM0500A	5.0	5.0	63.0	26.0	21.0	2XDSCM0500A	5.0	5.0	63.0	26.0	21.0
2XDSSM0510A	5.1	6.0	76.0	30.0	24.0	2XDSCM0510A	5.1	6.0	66.0	28.0	20.0
2XDSSM0520A	5.2	6.0	76.0	30.0	24.0	2XDSCM0520A	5.2	6.0	66.0	28.0	20.0
2XDSSM0530A	5.3	6.0	76.0	30.0	24.0	2XDSCM0530A	5.3	6.0	66.0	28.0	20.0
2XDSSM0540A	5.4	6.0	76.0	30.0	24.0	2XDSCM0540A	5.4	6.0	66.0	28.0	20.0
2XDSSM0550A	5.5	6.0	76.0	30.0	24.0	2XDSCM0550A	5.5	6.0	66.0	28.0	20.0
2XDSSM0570A	5.7	6.0	76.0	30.0	24.0	2XDSCM0570A	5.7	6.0	66.0	28.0	20.0
2XDSSM0580A	5.8	6.0	76.0	30.0	24.0	2XDSCM0580A	5.8	6.0	66.0	28.0	20.0
2XDSSM0590A	5.9	6.0	76.0	30.0	24.0	2XDSCM0590A	5.9	6.0	66.0	28.0	20.0
2XDSSM0600A	6.0	6.0	76.0	30.0	24.0	2XDSCM0600A	6.0	6.0	66.0	28.0	20.0
2XDSSM0610A	6.1	8.0	82.0	35.0	28.0	2XDSCM0610A	6.1	8.0	79.0	34.0	24.0
2XDSSM0620A	6.2	8.0	82.0	35.0	28.0	2XDSCM0620A	6.2	8.0	79.0	34.0	24.0
2XDSSM0630A	6.3	8.0	82.0	35.0	28.0	2XDSCM0630A	6.3	8.0	79.0	34.0	24.0
2XDSSM0640A	6.4	8.0	82.0	35.0	28.0	2XDSCM0640A	6.4	8.0	79.0	34.0	24.0
2XDSSM0650A	6.5	8.0	82.0	35.0	28.0	2XDSCM0650A	6.5	8.0	79.0	34.0	24.0
2XDSSM0660A	6.6	8.0	82.0	35.0	28.0	2XDSCM0660A	6.6	8.0	79.0	34.0	24.0
2XDSSM0670A	6.7	8.0	82.0	35.0	28.0	2XDSCM0670A	6.7	8.0	79.0	34.0	24.0
2XDSSM0680A	6.8	8.0	82.0	35.0	28.0	2XDSCM0680A	6.8	8.0	79.0	34.0	24.0
2XDSSM0690A	6.9	8.0	82.0	35.0	28.0	2XDSCM0690A	6.9	8.0	79.0	34.0	24.0
2XDSSM0700A	7.0	8.0	82.0	35.0	28.0	2XDSCM0700A	7.0	8.0	79.0	34.0	24.0

 Drills  
 Series XDSSM / XDSCM

# Twister® XD High Performance Drill - 3xD Series XDSSM & XDSCSM

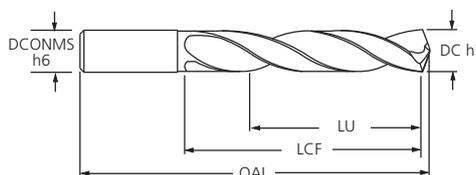
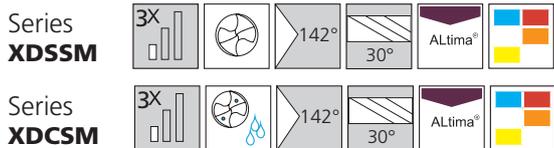


Series 2XDSSM	Drill Dimensions XDSSM					Series 2XDSCSM	Drill Dimensions XDSCSM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDSSM0710A	7.1	8.0	82.0	38.0	31.0	2XDSCSM0710A	7.1	8.0	79.0	41.0	29.0
2XDSSM0720A	7.2	8.0	82.0	38.0	31.0	2XDSCSM0720A	7.2	8.0	79.0	41.0	29.0
2XDSSM0730A	7.3	8.0	82.0	38.0	31.0	2XDSCSM0730A	7.3	8.0	79.0	41.0	29.0
2XDSSM0740A	7.4	8.0	82.0	38.0	31.0	2XDSCSM0740A	7.4	8.0	79.0	41.0	29.0
2XDSSM0750A	7.5	8.0	82.0	38.0	31.0	2XDSCSM0750A	7.5	8.0	79.0	41.0	29.0
2XDSSM0760A	7.6	8.0	82.0	38.0	31.0	2XDSCSM0760A	7.6	8.0	79.0	41.0	29.0
2XDSSM0770A	7.7	8.0	82.0	38.0	31.0	2XDSCSM0770A	7.7	8.0	79.0	41.0	29.0
2XDSSM0780A	7.8	8.0	82.0	38.0	31.0	2XDSCSM0780A	7.8	8.0	79.0	41.0	29.0
2XDSSM0790A	7.9	8.0	82.0	38.0	31.0	2XDSCSM0790A	7.9	8.0	79.0	41.0	29.0
2XDSSM0800A	8.0	8.0	82.0	38.0	31.0	2XDSCSM0800A	8.0	8.0	79.0	41.0	29.0
2XDSSM0810A	8.1	10.0	89.0	43.0	35.0	2XDSCSM0810A	8.1	10.0	89.0	47.0	35.0
2XDSSM0820A	8.2	10.0	89.0	43.0	35.0	2XDSCSM0820A	8.2	10.0	89.0	47.0	35.0
2XDSSM0830A	8.3	10.0	89.0	43.0	35.0	2XDSCSM0830A	8.3	10.0	89.0	47.0	35.0
2XDSSM0840A	8.4	10.0	89.0	43.0	35.0	2XDSCSM0840A	8.4	10.0	89.0	47.0	35.0
2XDSSM0850A	8.5	10.0	89.0	43.0	35.0	2XDSCSM0850A	8.5	10.0	89.0	47.0	35.0
2XDSSM0860A	8.6	10.0	89.0	43.0	35.0	2XDSCSM0860A	8.6	10.0	89.0	47.0	35.0
2XDSSM0870A	8.7	10.0	89.0	43.0	35.0	2XDSCSM0870A	8.7	10.0	89.0	47.0	35.0
2XDSSM0880A	8.8	10.0	89.0	43.0	35.0	2XDSCSM0880A	8.8	10.0	89.0	47.0	35.0
2XDSSM0890A	8.9	10.0	89.0	43.0	35.0	2XDSCSM0890A	8.9	10.0	89.0	47.0	35.0
2XDSSM0900A	9.0	10.0	89.0	43.0	35.0	2XDSCSM0900A	9.0	10.0	89.0	47.0	35.0
2XDSSM0910A	9.1	10.0	89.0	43.0	35.0	2XDSCSM0910A	9.1	10.0	89.0	47.0	35.0
2XDSSM0920A	9.2	10.0	89.0	43.0	35.0	2XDSCSM0920A	9.2	10.0	89.0	47.0	35.0
2XDSSM0925A	9.25	10.0	89.0	43.0	35.0	2XDSCSM0925A	9.25	10.0	89.0	47.0	35.0
2XDSSM0930A	9.3	10.0	89.0	43.0	35.0	2XDSCSM0930A	9.3	10.0	89.0	47.0	35.0
2XDSSM0940A	9.4	10.0	89.0	43.0	35.0	2XDSCSM0940A	9.4	10.0	89.0	47.0	35.0
2XDSSM0950A	9.5	10.0	89.0	43.0	35.0	2XDSCSM0950A	9.5	10.0	89.0	47.0	35.0
2XDSSM0960A	9.6	10.0	89.0	43.0	35.0	2XDSCSM0960A	9.6	10.0	89.0	47.0	35.0
2XDSSM0970A	9.7	10.0	89.0	43.0	35.0	2XDSCSM0970A	9.7	10.0	89.0	47.0	35.0
2XDSSM0980A	9.8	10.0	89.0	43.0	35.0	2XDSCSM0980A	9.8	10.0	89.0	47.0	35.0
2XDSSM0990A	9.9	10.0	89.0	43.0	35.0	2XDSCSM0990A	9.9	10.0	89.0	47.0	35.0
2XDSSM1000A	10.0	10.0	89.0	43.0	35.0	2XDSCSM1000A	10.0	10.0	89.0	47.0	35.0
2XDSSM1010A	10.1	12.0	101.0	51.0	41.0	2XDSCSM1010A	10.1	12.0	102.0	55.0	40.0
2XDSSM1020A	10.2	12.0	101.0	51.0	41.0	2XDSCSM1020A	10.2	12.0	102.0	55.0	40.0
2XDSSM1030A	10.3	12.0	101.0	51.0	41.0	2XDSCSM1030A	10.3	12.0	102.0	55.0	40.0
2XDSSM1040A	10.4	12.0	101.0	51.0	41.0	2XDSCSM1040A	10.4	12.0	102.0	55.0	40.0
2XDSSM1050A	10.5	12.0	101.0	51.0	41.0	2XDSCSM1050A	10.5	12.0	102.0	55.0	40.0
2XDSSM1060A	10.6	12.0	101.0	51.0	41.0	2XDSCSM1060A	10.6	12.0	102.0	55.0	40.0
2XDSSM1070A	10.7	12.0	101.0	51.0	41.0	2XDSCSM1070A	10.7	12.0	102.0	55.0	40.0
2XDSSM1080A	10.8	12.0	101.0	51.0	41.0	2XDSCSM1080A	10.8	12.0	102.0	55.0	40.0
2XDSSM1090A	10.9	12.0	101.0	51.0	41.0	2XDSCSM1090A	10.9	12.0	102.0	55.0	40.0
2XDSSM1100A	11.0	12.0	101.0	51.0	41.0	2XDSCSM1100A	11.0	12.0	102.0	55.0	40.0
2XDSSM1110A	11.1	12.0	101.0	51.0	41.0	2XDSCSM1110A	11.1	12.0	102.0	55.0	40.0



Drills  
Series XDSSM / XDSCSM

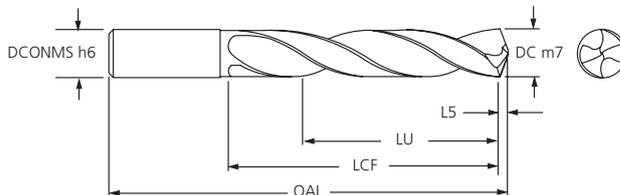
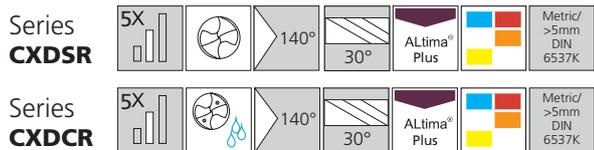
# Twister® XD High Performance Drill - 3xD Series XDSSM & XDSCSM



Series 2XDSSM	Drill Dimensions XDSSM					Series 2XDSCSM	Drill Dimensions XDSCSM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDSSM1120A	11.2	12.0	101.0	51.0	41.0	2XDSCSM1120A	11.2	12.0	102.0	55.0	40.0
2XDSSM1130A	11.3	12.0	101.0	51.0	41.0	2XDSCSM1130A	11.3	12.0	102.0	55.0	40.0
2XDSSM1140A	11.4	12.0	101.0	51.0	41.0	2XDSCSM1140A	11.4	12.0	102.0	55.0	40.0
2XDSSM1150A	11.5	12.0	101.0	51.0	41.0	2XDSCSM1150A	11.5	12.0	102.0	55.0	40.0
2XDSSM1160A	11.6	12.0	101.0	51.0	41.0	2XDSCSM1160A	11.6	12.0	102.0	55.0	40.0
2XDSSM1170A	11.7	12.0	101.0	51.0	41.0	2XDSCSM1170A	11.7	12.0	102.0	55.0	40.0
2XDSSM1180A	11.8	12.0	101.0	51.0	41.0	2XDSCSM1180A	11.8	12.0	102.0	55.0	40.0
2XDSSM1190A	11.9	12.0	101.0	51.0	41.0	2XDSCSM1190A	11.9	12.0	102.0	55.0	40.0
2XDSSM1200A	12.0	12.0	101.0	51.0	41.0	2XDSCSM1200A	12.0	12.0	102.0	55.0	40.0
2XDSSM1210A	12.1	14.0	107.0	54.0	43.0	2XDSCSM1210A	12.1	14.0	107.0	60.0	43.0
2XDSSM1250A	12.5	14.0	107.0	54.0	43.0	2XDSCSM1250A	12.5	14.0	107.0	60.0	43.0
2XDSSM1280A	12.8	14.0	107.0	54.0	43.0	2XDSCSM1280A	12.8	14.0	107.0	60.0	43.0
2XDSSM1283A	12.83	14.0	107.0	54.0	43.0	2XDSCSM1283A	12.83	14.0	107.0	60.0	43.0
2XDSSM1290A	12.9	14.0	107.0	54.0	43.0	2XDSCSM1290A	12.9	14.0	107.0	60.0	43.0
2XDSSM1300A	13.0	14.0	107.0	54.0	43.0	2XDSCSM1300A	13.0	14.0	107.0	60.0	43.0
2XDSSM1350A	13.5	14.0	107.0	54.0	43.0	2XDSCSM1350A	13.5	14.0	107.0	60.0	43.0
2XDSSM1370A	13.7	14.0	107.0	54.0	43.0	2XDSCSM1370A	13.7	14.0	107.0	60.0	43.0
2XDSSM1400A	14.0	14.0	107.0	54.0	43.0	2XDSCSM1400A	14.0	14.0	107.0	60.0	43.0
2XDSSM1450A	14.5	16.0	117.0	60.0	48.0	2XDSCSM1450A	14.5	16.0	115.0	65.0	45.0
2XDSSM1470A	14.7	16.0	117.0	60.0	48.0	2XDSCSM1470A	14.7	16.0	115.0	65.0	45.0
2XDSSM1500A	15.0	16.0	117.0	60.0	48.0	2XDSCSM1500A	15.0	16.0	115.0	65.0	45.0
2XDSSM1530A	15.3	16.0	117.0	60.0	48.0	2XDSCSM1530A	15.3	16.0	115.0	65.0	45.0
2XDSSM1550A	15.5	16.0	117.0	60.0	48.0	2XDSCSM1550A	15.5	16.0	115.0	65.0	45.0
2XDSSM1570A	15.7	16.0	117.0	60.0	48.0	2XDSCSM1570A	15.7	16.0	115.0	65.0	45.0
2XDSSM1600A	16.0	16.0	117.0	60.0	48.0	2XDSCSM1600A	16.0	16.0	115.0	65.0	45.0
2XDSSM1608A	16.08	18.0	122.0	63.0	51.0						
2XDSSM1630A	16.3	18.0	122.0	63.0	51.0						
2XDSSM1650A	16.5	18.0	122.0	63.0	51.0						
2XDSSM1700A	17.0	18.0	122.0	63.0	51.0						
2XDSSM1750A	17.5	18.0	122.0	63.0	51.0						
2XDSSM1800A	18.0	18.0	122.0	63.0	51.0						
2XDSSM1850A	18.5	20.0	133.0	70.0	56.0						
2XDSSM1916A	19.16	20.0	133.0	70.0	56.0						
2XDSSM1925A	19.25	20.0	133.0	70.0	56.0						
2XDSSM1930A	19.3	20.0	133.0	70.0	56.0						
2XDSSM1950A	19.5	20.0	133.0	70.0	56.0						
2XDSSM2000A	20.0	20.0	133.0	70.0	56.0						


 Drills  
 Series XDSSM / XDSCSM

# CYCLONE CXD High Performance Drill - 5xD Series CXDSR & CXDCR

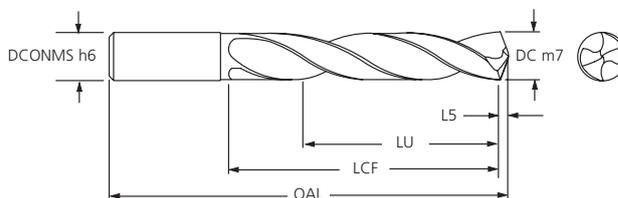
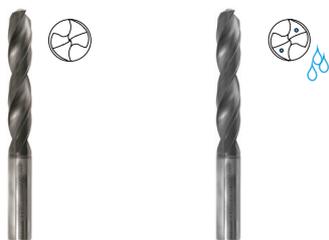
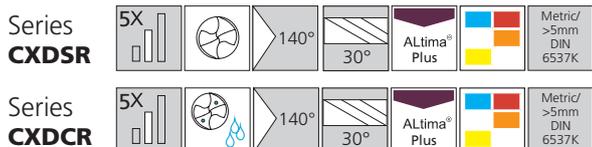


Tool No.		Drill Dimensions (mm)					
CXDSR	CXDCR	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSR 0300AP	CXDCR 0300AP	3.0	3.0	66.0	28.0	23.0	0.46
CXDSR 0310AP	CXDCR 0310AP	3.1	4.0	66.0	28.0	23.0	0.48
CXDSR 0320AP	CXDCR 0320AP	3.2	4.0	66.0	28.0	23.0	0.5
CXDSR 0330AP	CXDCR 0330AP	3.3	4.0	66.0	28.0	23.0	0.51
CXDSR 0340AP	CXDCR 0340AP	3.4	4.0	66.0	28.0	23.0	0.53
CXDSR 0350AP	CXDCR 0350AP	3.5	4.0	66.0	28.0	23.0	0.54
CXDSR 0360AP	CXDCR 0360AP	3.6	4.0	66.0	28.0	23.0	0.56
CXDSR 0370AP	CXDCR 0370AP	3.7	4.0	66.0	28.0	23.0	0.57
CXDSR 0380AP	CXDCR 0380AP	3.8	4.0	74.0	36.0	29.0	0.59
CXDSR 0390AP	CXDCR 0390AP	3.9	4.0	74.0	36.0	29.0	0.6
CXDSR 0400AP	CXDCR 0400AP	4.0	4.0	74.0	36.0	29.0	0.62
CXDSR 0410AP	CXDCR 0410AP	4.1	5.0	74.0	36.0	29.0	0.64
CXDSR 0420AP	CXDCR 0420AP	4.2	5.0	74.0	36.0	29.0	0.65
CXDSR 0430AP	CXDCR 0430AP	4.3	5.0	74.0	36.0	29.0	0.67
CXDSR 0440AP	CXDCR 0440AP	4.4	5.0	74.0	36.0	29.0	0.68
CXDSR 0450AP	CXDCR 0450AP	4.5	5.0	74.0	36.0	29.0	0.7
CXDSR 0460AP	CXDCR 0460AP	4.6	5.0	74.0	36.0	29.0	0.71
CXDSR 0470AP	CXDCR 0470AP	4.7	5.0	74.0	36.0	29.0	0.73
CXDSR 0480AP	CXDCR 0480AP	4.8	5.0	82.0	44.0	35.0	0.74
CXDSR 0490AP	CXDCR 0490AP	4.9	5.0	82.0	44.0	35.0	0.76
CXDSR 0500AP	CXDCR 0500AP	5.0	5.0	82.0	44.0	35.0	0.77
CXDSR 0510AP	CXDCR 0510AP	5.1	6.0	82.0	44.0	35.0	0.79
CXDSR 0520AP	CXDCR 0520AP	5.2	6.0	82.0	44.0	35.0	0.81
CXDSR 0530AP	CXDCR 0530AP	5.3	6.0	82.0	44.0	35.0	0.82
CXDSR 0540AP	CXDCR 0540AP	5.4	6.0	82.0	44.0	35.0	0.84
CXDSR 0550AP	CXDCR 0550AP	5.5	6.0	82.0	44.0	35.0	0.85
CXDSR 0560AP	CXDCR 0560AP	5.6	6.0	82.0	44.0	35.0	0.86
CXDSR 0570AP	CXDCR 0570AP	5.7	6.0	82.0	44.0	35.0	0.88
CXDSR 0580AP	CXDCR 0580AP	5.8	6.0	82.0	44.0	35.0	0.9
CXDSR 0590AP	CXDCR 0590AP	5.9	6.0	82.0	44.0	35.0	0.91
CXDSR 0600AP	CXDCR 0600AP	6.0	6.0	82.0	44.0	35.0	0.93
CXDSR 0610AP	CXDCR 0610AP	6.1	8.0	91.0	53.0	43.0	0.95
CXDSR 0620AP	CXDCR 0620AP	6.2	8.0	91.0	53.0	43.0	0.96
CXDSR 0630AP	CXDCR 0630AP	6.3	8.0	91.0	53.0	43.0	0.98
CXDSR 0640AP	CXDCR 0640AP	6.4	8.0	91.0	53.0	43.0	0.99
CXDSR 0650AP	CXDCR 0650AP	6.5	8.0	91.0	53.0	43.0	1.01
CXDSR 0660AP	CXDCR 0660AP	6.6	8.0	91.0	53.0	43.0	1.03
CXDSR 0670AP	CXDCR 0670AP	6.7	8.0	91.0	53.0	43.0	1.04
CXDSR 0680AP	CXDCR 0680AP	6.8	8.0	91.0	53.0	43.0	1.05
CXDSR 0690AP	CXDCR 0690AP	6.9	8.0	91.0	53.0	43.0	1.07



Drills  
Series CXDSR / CXDCR

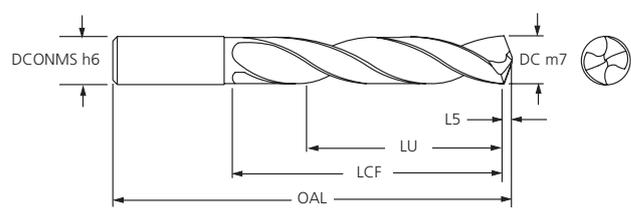
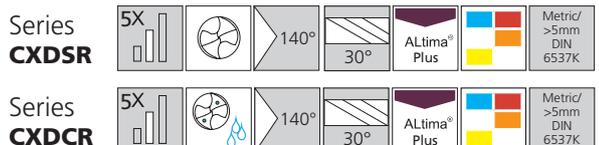
# CYCLONE CXD High Performance Drill - 5xD Series CXDSR & CXDCR



Tool No.		Drill Dimensions (mm)					
CXDSR	CXDCR	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSR 0700AP	CXDCR 0700AP	7.0	8.0	91.0	53.0	43.0	1.08
CXDSR 0710AP	CXDCR 0710AP	7.1	8.0	91.0	53.0	43.0	1.1
CXDSR 0720AP	CXDCR 0720AP	7.2	8.0	91.0	53.0	43.0	1.12
CXDSR 0730AP	CXDCR 0730AP	7.3	8.0	91.0	53.0	43.0	1.13
CXDSR 0740AP	CXDCR 0740AP	7.4	8.0	91.0	53.0	43.0	1.15
CXDSR 0750AP	CXDCR 0750AP	7.5	8.0	91.0	53.0	43.0	1.16
CXDSR 0760AP	CXDCR 0760AP	7.6	8.0	91.0	53.0	43.0	1.18
CXDSR 0770AP	CXDCR 0770AP	7.7	8.0	91.0	53.0	43.0	1.19
CXDSR 0780AP	CXDCR 0780AP	7.8	8.0	91.0	53.0	43.0	1.21
CXDSR 0790AP	CXDCR 0790AP	7.9	8.0	91.0	53.0	43.0	1.22
CXDSR 0800AP	CXDCR 0800AP	8.0	8.0	91.0	53.0	43.0	1.24
CXDSR 0810AP	CXDCR 0810AP	8.1	10.0	103.0	61.0	49.0	1.26
CXDSR 0820AP	CXDCR 0820AP	8.2	10.0	103.0	61.0	49.0	1.27
CXDSR 0830AP	CXDCR 0830AP	8.3	10.0	103.0	61.0	49.0	1.29
CXDSR 0840AP	CXDCR 0840AP	8.4	10.0	103.0	61.0	49.0	1.31
CXDSR 0850AP	CXDCR 0850AP	8.5	10.0	103.0	61.0	49.0	1.32
CXDSR 0860AP	CXDCR 0860AP	8.6	10.0	103.0	61.0	49.0	1.33
CXDSR 0870AP	CXDCR 0870AP	8.7	10.0	103.0	61.0	49.0	1.35
CXDSR 0880AP	CXDCR 0880AP	8.8	10.0	103.0	61.0	49.0	1.36
CXDSR 0890AP	CXDCR 0890AP	8.9	10.0	103.0	61.0	49.0	1.38
CXDSR 0900AP	CXDCR 0900AP	9.0	10.0	103.0	61.0	49.0	1.39
CXDSR 0910AP	CXDCR 0910AP	9.1	10.0	103.0	61.0	49.0	1.41
CXDSR 0920AP	CXDCR 0920AP	9.2	10.0	103.0	61.0	49.0	1.43
CXDSR 0925AP	CXDCR 0925AP	9.3	10.0	103.0	61.0	49.0	1.43
CXDSR 0930AP	CXDCR 0930AP	9.3	10.0	103.0	61.0	49.0	1.44
CXDSR 0940AP	CXDCR 0940AP	9.4	10.0	103.0	61.0	49.0	1.46
CXDSR 0950AP	CXDCR 0950AP	9.5	10.0	103.0	61.0	49.0	1.47
CXDSR 0960AP	CXDCR 0960AP	9.6	10.0	103.0	61.0	49.0	1.49
CXDSR 0970AP	CXDCR 0970AP	9.7	10.0	103.0	61.0	49.0	1.5
CXDSR 0980AP	CXDCR 0980AP	9.8	10.0	103.0	61.0	49.0	1.52
CXDSR 0990AP	CXDCR 0990AP	9.9	10.0	103.0	61.0	49.0	1.53
CXDSR 1000AP	CXDCR 1000AP	10.0	10.0	103.0	61.0	49.0	1.55
CXDSR 1010AP	CXDCR 1010AP	10.1	12.0	118.0	71.0	56.0	1.56
CXDSR 1020AP	CXDCR 1020AP	10.2	12.0	118.0	71.0	56.0	1.58
CXDSR 1030AP	CXDCR 1030AP	10.3	12.0	118.0	71.0	56.0	1.6
CXDSR 1040AP	CXDCR 1040AP	10.4	12.0	118.0	71.0	56.0	1.61
CXDSR 1050AP	CXDCR 1050AP	10.5	12.0	118.0	71.0	56.0	1.63
CXDSR 1060AP	CXDCR 1060AP	10.6	12.0	118.0	71.0	56.0	1.64
CXDSR 1070AP	CXDCR 1070AP	10.7	12.0	118.0	71.0	56.0	1.66
CXDSR 1080AP	CXDCR 1080AP	10.8	12.0	118.0	71.0	56.0	1.67

 Drills  
 Series CXDSR / CXDCR

# CYCLONE CXD High Performance Drill - 5xD Series CXDSR & CXDCR

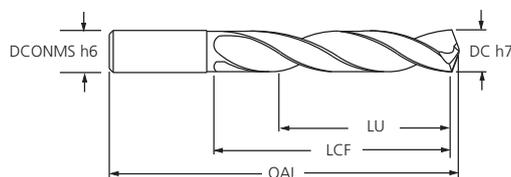


Tool No.		Drill Dimensions (mm)					
CXDSR	CXDCR	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDSR 1090AP	CXDCR 1090AP	10.9	12.0	118.0	71.0	56.0	1.69
CXDSR 1100AP	CXDCR 1100AP	11.0	12.0	118.0	71.0	56.0	1.7
CXDSR 1110AP	CXDCR 1110AP	11.1	12.0	118.0	71.0	56.0	1.72
CXDSR 1120AP	CXDCR 1120AP	11.2	12.0	118.0	71.0	56.0	1.74
CXDSR 1130AP	CXDCR 1130AP	11.3	12.0	118.0	71.0	56.0	1.75
CXDSR 1140AP	CXDCR 1140AP	11.4	12.0	118.0	71.0	56.0	1.77
CXDSR 1150AP	CXDCR 1150AP	11.5	12.0	118.0	71.0	56.0	1.78
CXDSR 1160AP	CXDCR 1160AP	11.6	12.0	118.0	71.0	56.0	1.8
CXDSR 1170AP	CXDCR 1170AP	11.7	12.0	118.0	71.0	56.0	1.81
CXDSR 1180AP	CXDCR 1180AP	11.8	12.0	118.0	71.0	56.0	1.83
CXDSR 1190AP	CXDCR 1190AP	11.9	12.0	118.0	71.0	56.0	1.84
CXDSR 1200AP	CXDCR 1200AP	12.0	12.0	118.0	71.0	56.0	1.86
CXDSR 1210AP	CXDCR 1210AP	12.1	14.0	124.0	77.0	60.0	1.87
CXDSR 1250AP	CXDCR 1250AP	12.5	14.0	124.0	77.0	60.0	1.94
CXDSR 1280AP	CXDCR 1280AP	12.8	14.0	124.0	77.0	60.0	1.98
CXDSR 1283AP	CXDCR 1283AP	12.8	14.0	124.0	77.0	60.0	1.99
CXDSR 1290AP	CXDCR 1290AP	12.9	14.0	124.0	77.0	60.0	2.0
CXDSR 1300AP	CXDCR 1300AP	13.0	14.0	124.0	77.0	60.0	2.01
CXDSR 1350AP	CXDCR 1350AP	13.5	14.0	124.0	77.0	60.0	2.09
CXDSR 1370AP	CXDCR 1370AP	13.7	14.0	124.0	77.0	60.0	2.12
CXDSR 1400AP	CXDCR 1400AP	14.0	14.0	124.0	77.0	60.0	2.17
CXDSR 1450AP	CXDCR 1450AP	14.5	16.0	133.0	83.0	63.0	2.25
CXDSR 1470AP	CXDCR 1470AP	14.7	16.0	133.0	83.0	63.0	2.28
CXDSR 1500AP	CXDCR 1500AP	15.0	16.0	133.0	83.0	63.0	2.32
CXDSR 1530AP	CXDCR 1530AP	15.3	16.0	133.0	83.0	63.0	2.37
CXDSR 1550AP	CXDCR 1550AP	15.5	16.0	133.0	83.0	63.0	2.4
CXDSR 1570AP	CXDCR 1570AP	15.7	16.0	133.0	83.0	63.0	2.43
CXDSR 1600AP	CXDCR 1600AP	16.0	16.0	133.0	83.0	63.0	2.48
-	CXDCR 1608AP	16.08	18.0	143.0	93.0	71.0	2.49
-	CXDCR 1630AP	16.3	18.0	143.0	93.0	71.0	2.53
-	CXDCR 1650AP	16.5	18.0	143.0	93.0	71.0	2.56
-	CXDCR 1700AP	17.0	18.0	143.0	93.0	71.0	2.63
-	CXDCR 1750AP	17.5	18.0	143.0	93.0	71.0	2.71
-	CXDCR 1800AP	18.0	18.0	143.0	93.0	71.0	2.79
-	CXDCR 1850AP	18.5	20.0	153.0	101.0	79.0	2.87
-	CXDCR 1916AP	19.16	20.0	153.0	101.0	79.0	2.97
-	CXDCR 1925AP	19.25	20.0	153.0	101.0	79.0	2.98
-	CXDCR 1930AP	19.3	20.0	153.0	101.0	79.0	2.99
-	CXDCR 1950AP	19.5	20.0	153.0	101.0	79.0	3.02
-	CXDCR 2000AP	20.0	20.0	153.0	101.0	79.0	3.1

Drills Series CXDSR / CXDCR



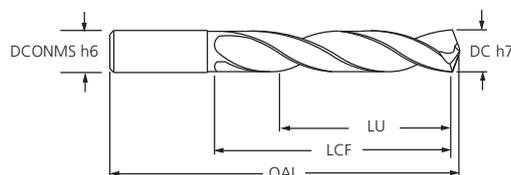
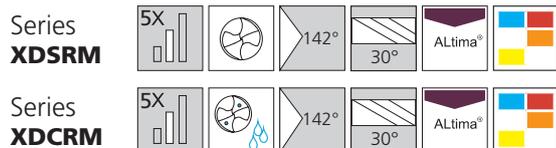
# Twister® XD High Performance Drill - 5xD Series XDSRM & XDCRM



Series 2XDSRM	Drill Dimensions XDSRM					Series 2XDCRM	Drill Dimensions XDCRM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDSRM0050A	0.5	0.5	26.0	6.0	5.0	-	-	-	-	-	-
2XDSRM0060A	0.6	0.6	26.0	7.0	5.0	-	-	-	-	-	-
2XDSRM0065A	0.65	0.65	26.0	8.0	6.0	-	-	-	-	-	-
2XDSRM0095A	0.95	0.95	32.0	11.0	8.0	-	-	-	-	-	-
2XDSRM0100A	1.0	1.0	34.0	12.0	9.0	-	-	-	-	-	-
2XDSRM0105A	1.05	1.05	34.0	12.0	9.0	-	-	-	-	-	-
2XDSRM0125A	1.25	1.25	38.0	16.0	12.0	-	-	-	-	-	-
2XDSRM0150A	1.5	1.5	40.0	18.0	14.0	-	-	-	-	-	-
2XDSRM0160A	1.6	1.6	43.0	20.0	15.0	-	-	-	-	-	-
2XDSRM0180A	1.8	1.8	46.0	22.0	17.0	-	-	-	-	-	-
2XDSRM0190A	1.9	1.9	46.0	22.0	17.0	-	-	-	-	-	-
2XDSRM0200A	2.0	2.0	49.0	24.0	18.0	-	-	-	-	-	-
2XDSRM0205A	2.05	2.05	49.0	24.0	18.0	-	-	-	-	-	-
2XDSRM0230A	2.3	2.3	53.0	27.0	20.0	-	-	-	-	-	-
2XDSRM0240A	2.4	2.4	57.0	30.0	23.0	-	-	-	-	-	-
2XDSRM0250A	2.5	2.5	57.0	30.0	23.0	-	-	-	-	-	-
2XDSRM0290A	2.9	2.9	61.0	33.0	25.0	-	-	-	-	-	-
2XDSRM0300A	3.0	3.0	63.0	24.0	19.0	2XDCRM0300A	3.0	3.0	75.0	24.0	19.0
2XDSRM0310A	3.1	4.0	69.0	32.0	26.0	2XDCRM0310A	3.1	4.0	80.0	32.0	26.0
2XDSRM0320A	3.2	4.0	69.0	32.0	26.0	2XDCRM0320A	3.2	4.0	80.0	32.0	26.0
2XDSRM0330A	3.3	4.0	69.0	32.0	26.0	2XDCRM0330A	3.3	4.0	80.0	32.0	26.0
2XDSRM0340A	3.4	4.0	69.0	32.0	26.0	2XDCRM0340A	3.4	4.0	80.0	32.0	26.0
2XDSRM0350A	3.5	4.0	69.0	32.0	26.0	2XDCRM0350A	3.5	4.0	80.0	32.0	26.0
2XDSRM0360A	3.6	4.0	69.0	32.0	26.0	2XDCRM0360A	3.6	4.0	80.0	32.0	26.0
2XDSRM0370A	3.7	4.0	69.0	32.0	26.0	2XDCRM0370A	3.7	4.0	80.0	32.0	26.0
2XDSRM0380A	3.8	4.0	69.0	32.0	26.0	2XDCRM0380A	3.8	4.0	80.0	32.0	26.0
2XDSRM0390A	3.9	4.0	69.0	32.0	26.0	2XDCRM0390A	3.9	4.0	80.0	32.0	26.0
2XDSRM0400A	4.0	4.0	69.0	32.0	26.0	2XDCRM0400A	4.0	4.0	80.0	32.0	26.0
2XDSRM0410A	4.1	5.0	80.0	38.0	30.0	2XDCRM0410A	4.1	5.0	82.0	38.0	30.0
2XDSRM0420A	4.2	5.0	80.0	38.0	30.0	2XDCRM0420A	4.2	5.0	82.0	38.0	30.0
2XDSRM0430A	4.3	5.0	80.0	38.0	30.0	2XDCRM0430A	4.3	5.0	82.0	38.0	30.0
2XDSRM0440A	4.4	5.0	80.0	38.0	30.0	2XDCRM0440A	4.4	5.0	82.0	38.0	30.0
2XDSRM0450A	4.5	5.0	80.0	38.0	30.0	2XDCRM0450A	4.5	5.0	82.0	38.0	30.0
2XDSRM0460A	4.6	5.0	80.0	38.0	30.0	2XDCRM0460A	4.6	5.0	82.0	38.0	30.0
2XDSRM0470A	4.7	5.0	80.0	38.0	30.0	2XDCRM0470A	4.7	5.0	82.0	38.0	30.0
2XDSRM0480A	4.8	5.0	80.0	38.0	30.0	2XDCRM0480A	4.8	5.0	82.0	38.0	30.0
2XDSRM0490A	4.9	5.0	80.0	38.0	30.0	2XDCRM0490A	4.9	5.0	82.0	38.0	30.0
2XDSRM0500A	5.0	5.0	80.0	38.0	30.0	2XDCRM0500A	5.0	5.0	82.0	38.0	30.0
2XDSRM0510A	5.1	6.0	82.0	40.0	32.0	2XDCRM0510A	5.1	6.0	82.0	40.0	32.0
2XDSRM0520A	5.2	6.0	82.0	40.0	32.0	2XDCRM0520A	5.2	6.0	82.0	40.0	32.0
2XDSRM0530A	5.3	6.0	82.0	40.0	32.0	2XDCRM0530A	5.3	6.0	82.0	40.0	32.0
2XDSRM0540A	5.4	6.0	82.0	40.0	32.0	2XDCRM0540A	5.4	6.0	82.0	40.0	32.0
2XDSRM0550A	5.5	6.0	82.0	40.0	32.0	2XDCRM0550A	5.5	6.0	82.0	40.0	32.0

Drills  
Series XDSRM / XDCRM

# Twister® XD High Performance Drill - 5xD Series XDSRM & XDCRM

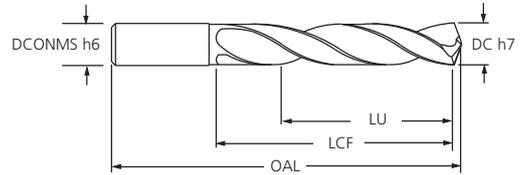


Series 2XDSRM	Drill Dimensions XDSRM					Series 2XDCRM	Drill Dimensions XDCRM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDSRM0570A	5.7	6.0	82.0	40.0	32.0	2XDCRM0570A	5.7	6.0	82.0	40.0	32.0
2XDSRM0580A	5.8	6.0	82.0	40.0	32.0	2XDCRM0580A	5.8	6.0	82.0	40.0	32.0
2XDSRM0590A	5.9	6.0	82.0	40.0	32.0	2XDCRM0590A	5.9	6.0	82.0	40.0	32.0
2XDSRM0600A	6.0	6.0	82.0	40.0	32.0	2XDCRM0600A	6.0	6.0	82.0	40.0	32.0
2XDSRM0610A	6.1	8.0	91.0	48.0	38.0	2XDCRM0610A	6.1	8.0	91.0	48.0	38.0
2XDSRM0620A	6.2	8.0	91.0	48.0	38.0	2XDCRM0620A	6.2	8.0	91.0	48.0	38.0
2XDSRM0630A	6.3	8.0	91.0	48.0	38.0	2XDCRM0630A	6.3	8.0	91.0	48.0	38.0
2XDSRM0640A	6.4	8.0	91.0	48.0	38.0	2XDCRM0640A	6.4	8.0	91.0	48.0	38.0
2XDSRM0650A	6.5	8.0	91.0	48.0	38.0	2XDCRM0650A	6.5	8.0	91.0	48.0	38.0
2XDSRM0660A	6.6	8.0	91.0	48.0	38.0	2XDCRM0660A	6.6	8.0	91.0	48.0	38.0
2XDSRM0670A	6.7	8.0	91.0	48.0	38.0	2XDCRM0670A	6.7	8.0	91.0	48.0	38.0
2XDSRM0680A	6.8	8.0	91.0	48.0	38.0	2XDCRM0680A	6.8	8.0	91.0	48.0	38.0
2XDSRM0690A	6.9	8.0	91.0	48.0	38.0	2XDCRM0690A	6.9	8.0	91.0	48.0	38.0
2XDSRM0700A	7.0	8.0	91.0	48.0	38.0	2XDCRM0700A	7.0	8.0	91.0	48.0	38.0
2XDSRM0710A	7.1	8.0	91.0	48.0	38.0	2XDCRM0710A	7.1	8.0	91.0	48.0	38.0
2XDSRM0720A	7.2	8.0	91.0	48.0	38.0	2XDCRM0720A	7.2	8.0	91.0	48.0	38.0
2XDSRM0730A	7.3	8.0	91.0	48.0	38.0	2XDCRM0730A	7.3	8.0	91.0	48.0	38.0
2XDSRM0740A	7.4	8.0	91.0	48.0	38.0	2XDCRM0740A	7.4	8.0	91.0	48.0	38.0
2XDSRM0750A	7.5	8.0	91.0	48.0	38.0	2XDCRM0750A	7.5	8.0	91.0	48.0	38.0
2XDSRM0760A	7.6	8.0	91.0	48.0	38.0	2XDCRM0760A	7.6	8.0	91.0	48.0	38.0
2XDSRM0770A	7.7	8.0	91.0	48.0	38.0	2XDCRM0770A	7.7	8.0	91.0	48.0	38.0
2XDSRM0780A	7.8	8.0	91.0	48.0	38.0	2XDCRM0780A	7.8	8.0	91.0	48.0	38.0
2XDSRM0790A	7.9	8.0	91.0	48.0	38.0	2XDCRM0790A	7.9	8.0	91.0	48.0	38.0
2XDSRM0800A	8.0	8.0	91.0	48.0	38.0	2XDCRM0800A	8.0	8.0	91.0	48.0	38.0
2XDSRM0810A	8.1	10.0	103.0	55.0	44.0	2XDCRM0810A	8.1	10.0	103.0	55.0	44.0
2XDSRM0820A	8.2	10.0	103.0	55.0	44.0	2XDCRM0820A	8.2	10.0	103.0	55.0	44.0
2XDSRM0830A	8.3	10.0	103.0	55.0	44.0	2XDCRM0830A	8.3	10.0	103.0	55.0	44.0
2XDSRM0840A	8.4	10.0	103.0	55.0	44.0	2XDCRM0840A	8.4	10.0	103.0	55.0	44.0
2XDSRM0850A	8.5	10.0	103.0	55.0	44.0	2XDCRM0850A	8.5	10.0	103.0	55.0	44.0
2XDSRM0860A	8.6	10.0	103.0	55.0	44.0	2XDCRM0860A	8.6	10.0	103.0	55.0	44.0
2XDSRM0870A	8.7	10.0	103.0	55.0	44.0	2XDCRM0870A	8.7	10.0	103.0	55.0	44.0
2XDSRM0880A	8.8	10.0	103.0	55.0	44.0	2XDCRM0880A	8.8	10.0	103.0	55.0	44.0
2XDSRM0890A	8.9	10.0	103.0	55.0	44.0	2XDCRM0890A	8.9	10.0	103.0	55.0	44.0
2XDSRM0900A	9.0	10.0	103.0	55.0	44.0	2XDCRM0900A	9.0	10.0	103.0	55.0	44.0
2XDSRM0910A	9.1	10.0	103.0	55.0	44.0	2XDCRM0910A	9.1	10.0	103.0	55.0	44.0
2XDSRM0920A	9.2	10.0	103.0	55.0	44.0	2XDCRM0920A	9.2	10.0	103.0	55.0	44.0
2XDSRM0925A	9.25	10.0	103.0	55.0	44.0	2XDCRM0925A	9.25	10.0	103.0	55.0	44.0
2XDSRM0930A	9.3	10.0	103.0	55.0	44.0	2XDCRM0930A	9.3	10.0	103.0	55.0	44.0
2XDSRM0940A	9.4	10.0	103.0	55.0	44.0	2XDCRM0940A	9.4	10.0	103.0	55.0	44.0
2XDSRM0950A	9.5	10.0	103.0	55.0	44.0	2XDCRM0950A	9.5	10.0	103.0	55.0	44.0
2XDSRM0960A	9.6	10.0	103.0	55.0	44.0	2XDCRM0960A	9.6	10.0	103.0	55.0	44.0
2XDSRM0970A	9.7	10.0	103.0	55.0	44.0	2XDCRM0970A	9.7	10.0	103.0	55.0	44.0
2XDSRM0980A	9.8	10.0	103.0	55.0	44.0	2XDCRM0980A	9.8	10.0	103.0	55.0	44.0



Drills  
Series XD SRM / XD CRM

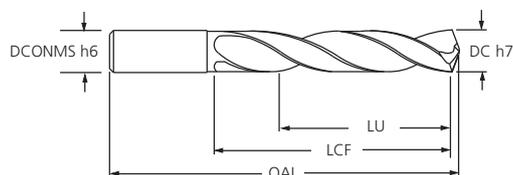
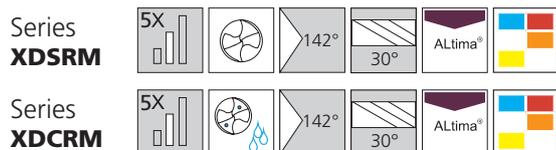
# Twister® XD High Performance Drill - 5xD Series XDSRM & XDCRM



Series 2XDSRM	Drill Dimensions XDSRM					Series 2XDCRM	Drill Dimensions XDCRM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDSRM0990A	9.9	10.0	103.0	55.0	44.0	2XDCRM0990A	9.9	10.0	103.0	55.0	44.0
2XDSRM1000A	10.0	10.0	103.0	55.0	44.0	2XDCRM1000A	10.0	10.0	103.0	55.0	44.0
2XDSRM1010A	10.1	12.0	120.0	60.0	48.0	2XDCRM1010A	10.1	12.0	120.0	60.0	48.0
2XDSRM1020A	10.2	12.0	120.0	60.0	48.0	2XDCRM1020A	10.2	12.0	120.0	60.0	48.0
2XDSRM1030A	10.3	12.0	120.0	60.0	48.0	2XDCRM1030A	10.3	12.0	120.0	60.0	48.0
2XDSRM1040A	10.4	12.0	120.0	60.0	48.0	2XDCRM1040A	10.4	12.0	120.0	60.0	48.0
2XDSRM1050A	10.5	12.0	120.0	60.0	48.0	2XDCRM1050A	10.5	12.0	120.0	60.0	48.0
2XDSRM1060A	10.6	12.0	120.0	60.0	48.0	2XDCRM1060A	10.6	12.0	120.0	60.0	48.0
2XDSRM1070A	10.7	12.0	120.0	60.0	48.0	2XDCRM1070A	10.7	12.0	120.0	60.0	48.0
2XDSRM1080A	10.8	12.0	120.0	60.0	48.0	2XDCRM1080A	10.8	12.0	120.0	60.0	48.0
2XDSRM1090A	10.9	12.0	120.0	60.0	48.0	2XDCRM1090A	10.9	12.0	120.0	60.0	48.0
2XDSRM1100A	11.0	12.0	120.0	60.0	48.0	2XDCRM1100A	11.0	12.0	120.0	60.0	48.0
2XDSRM1110A	11.1	12.0	120.0	60.0	48.0	2XDCRM1110A	11.1	12.0	120.0	66.0	53.0
2XDSRM1120A	11.2	12.0	120.0	60.0	48.0	2XDCRM1120A	11.2	12.0	120.0	66.0	53.0
2XDSRM1130A	11.3	12.0	120.0	60.0	48.0	2XDCRM1130A	11.3	12.0	120.0	66.0	53.0
2XDSRM1140A	11.4	12.0	120.0	60.0	48.0	2XDCRM1140A	11.4	12.0	120.0	66.0	53.0
2XDSRM1150A	11.5	12.0	120.0	60.0	48.0	2XDCRM1150A	11.5	12.0	120.0	66.0	53.0
2XDSRM1160A	11.6	12.0	120.0	60.0	48.0	2XDCRM1160A	11.6	12.0	120.0	66.0	53.0
2XDSRM1170A	11.7	12.0	120.0	60.0	48.0	2XDCRM1170A	11.7	12.0	120.0	66.0	53.0
2XDSRM1180A	11.8	12.0	120.0	60.0	48.0	2XDCRM1180A	11.8	12.0	120.0	66.0	53.0
2XDSRM1190A	11.9	12.0	120.0	60.0	48.0	2XDCRM1190A	11.9	12.0	120.0	66.0	53.0
2XDSRM1200A	12.0	12.0	120.0	66.0	53.0	2XDCRM1200A	12.0	12.0	120.0	66.0	53.0
2XDSRM1210A	12.1	14.0	126.0	72.0	58.0	2XDCRM1210A	12.1	14.0	126.0	72.0	58.0
2XDSRM1250A	12.5	14.0	126.0	72.0	58.0	2XDCRM1250A	12.5	14.0	126.0	72.0	58.0
2XDSRM1280A	12.8	14.0	126.0	72.0	58.0	2XDCRM1280A	12.8	14.0	126.0	72.0	58.0
2XDSRM1290A	12.9	14.0	126.0	72.0	58.0	2XDCRM1290A	12.9	14.0	126.0	72.0	58.0
2XDSRM1300A	13.0	14.0	126.0	72.0	58.0	2XDCRM1300A	13.0	14.0	126.0	72.0	58.0
2XDSRM1350A	13.5	14.0	134.0	77.0	62.0	2XDCRM1350A	13.5	14.0	134.0	77.0	62.0
2XDSRM1370A	13.7	14.0	134.0	77.0	62.0	2XDCRM1370A	13.7	14.0	134.0	77.0	62.0
2XDSRM1400A	14.0	14.0	134.0	77.0	62.0	2XDCRM1400A	14.0	14.0	134.0	77.0	62.0
2XDSRM1450A	14.5	16.0	140.0	80.0	64.0	2XDCRM1450A	14.5	16.0	140.0	80.0	64.0
2XDSRM1470A	14.7	16.0	140.0	80.0	64.0	2XDCRM1470A	14.7	16.0	140.0	80.0	64.0
2XDSRM1500A	15.0	16.0	140.0	80.0	64.0	2XDCRM1500A	15.0	16.0	140.0	80.0	64.0
2XDSRM1530A	15.3	16.0	146.0	82.0	66.0	2XDCRM1530A	15.3	16.0	146.0	82.0	66.0
2XDSRM1550A	15.5	16.0	146.0	82.0	66.0	2XDCRM1550A	15.5	16.0	146.0	82.0	66.0
2XDSRM1570A	15.7	16.0z	146.0	82.0	66.0	2XDCRM1570A	15.7	16.0	146.0	82.0	66.0
2XDSRM1600A	16.0	16.0	146.0	82.0	66.0	2XDCRM1600A	16.0	16.0	146.0	82.0	66.0
-	-	-	-	-	-	2XDCRM1608A	16.08	18.0	158.0	90.0	72.0
-	-	-	-	-	-	2XDCRM1630A	16.3	18.0	158.0	90.0	72.0
-	-	-	-	-	-	2XDCRM1650A	16.5	18.0	158.0	90.0	72.0
-	-	-	-	-	-	2XDCRM1700A	17.0	18.0	158.0	90.0	72.0
-	-	-	-	-	-	2XDCRM1750A	17.5	18.0	158.0	95.0	76.0
-	-	-	-	-	-	2XDCRM1800A	18.0	18.0	158.0	95.0	76.0

Drills  
Series XDSRM / XDCRM

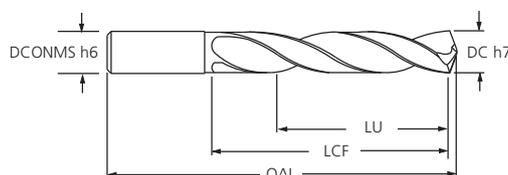
## Twister® XD High Performance Drill - 5xD Series XDSRM & XDCRM



Series 2XDSRM		Drill Dimensions XDSRM				Series 2XDCRM		Drill Dimensions XDCRM			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
-	-	-	-	-	-	2XDCRM1850A	18.5	20.0	160.0	100.0	80.0
-	-	-	-	-	-	2XDCRM1916A	19.16	20.0	160.0	100.0	80.0
-	-	-	-	-	-	2XDCRM1925A	19.25	20.0	160.0	100.0	80.0
-	-	-	-	-	-	2XDCRM1930A	19.3	20.0	160.0	100.0	80.0
-	-	-	-	-	-	2XDCRM1950A	19.5	20.0	160.0	100.0	80.0
-	-	-	-	-	-	2XDCRM2000A	20.0	20.0	160.0	100.0	80.0



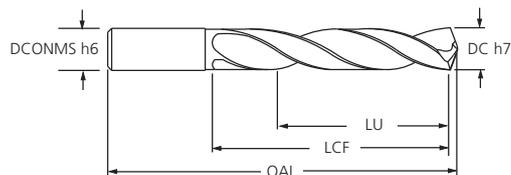
## Twister® XD High Performance Drill - 7+xD Series XDCLM



Series 2XDCLM	Drill Dimensions XDCLM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDCLM0300A	3.0	3.0	81.0	33.0	26.0
2XDCLM0310A	3.1	4.0	92.0	44.0	35.0
2XDCLM0320A	3.2	4.0	92.0	44.0	35.0
2XDCLM0330A	3.3	4.0	92.0	44.0	35.0
2XDCLM0340A	3.4	4.0	92.0	44.0	35.0
2XDCLM0350A	3.5	4.0	92.0	44.0	35.0
2XDCLM0360A	3.6	4.0	92.0	44.0	35.0
2XDCLM0370A	3.7	4.0	92.0	44.0	35.0
2XDCLM0380A	3.8	4.0	92.0	44.0	35.0
2XDCLM0390A	3.9	4.0	92.0	44.0	35.0
2XDCLM0400A	4.0	4.0	92.0	44.0	35.0
2XDCLM0410A	4.1	5.0	100.0	45.0	36.0
2XDCLM0420A	4.2	5.0	100.0	45.0	36.0
2XDCLM0430A	4.3	5.0	100.0	45.0	36.0
2XDCLM0440A	4.4	5.0	100.0	45.0	36.0
2XDCLM0450A	4.5	5.0	100.0	45.0	36.0
2XDCLM0460A	4.6	5.0	100.0	45.0	36.0
2XDCLM0470A	4.7	5.0	100.0	45.0	36.0
2XDCLM0480A	4.8	5.0	100.0	45.0	36.0
2XDCLM0490A	4.9	5.0	100.0	45.0	36.0
2XDCLM0500A	5.0	5.0	100.0	45.0	36.0

Drills Series XDSRM / XDCRM / XDCLM

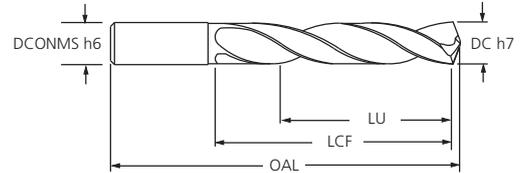
# Twister® XD High Performance Drill - 7<sup>+</sup>xD Series XDCLM



Series 2XDCLM	Drill Dimensions XDCLM				
	Tool No.	Ø DC	Ø CONMS	OAL	LCF
2XDCLM0510A	5.1	6.0	100.0	51.0	41.0
2XDCLM0520A	5.2	6.0	100.0	51.0	41.0
2XDCLM0530A	5.3	6.0	100.0	51.0	41.0
2XDCLM0540A	5.4	6.0	100.0	51.0	41.0
2XDCLM0550A	5.5	6.0	100.0	51.0	41.0
2XDCLM0570A	5.7	6.0	100.0	51.0	41.0
2XDCLM0580A	5.8	6.0	100.0	51.0	41.0
2XDCLM0590A	5.9	6.0	100.0	51.0	41.0
2XDCLM0600A	6.0	6.0	100.0	51.0	41.0
2XDCLM0610A	6.1	8.0	109.0	60.0	48.0
2XDCLM0620A	6.2	8.0	109.0	60.0	48.0
2XDCLM0630A	6.3	8.0	109.0	60.0	48.0
2XDCLM0640A	6.4	8.0	109.0	60.0	48.0
2XDCLM0650A	6.5	8.0	109.0	60.0	48.0
2XDCLM0660A	6.6	8.0	109.0	60.0	48.0
2XDCLM0670A	6.7	8.0	109.0	60.0	48.0
2XDCLM0680A	6.8	8.0	109.0	60.0	48.0
2XDCLM0690A	6.9	8.0	109.0	60.0	48.0
2XDCLM0700A	7.0	8.0	109.0	60.0	48.0
2XDCLM0710A	7.1	8.0	118.0	70.0	56.0
2XDCLM0720A	7.2	8.0	118.0	70.0	56.0
2XDCLM0730A	7.3	8.0	118.0	70.0	56.0
2XDCLM0740A	7.4	8.0	118.0	70.0	56.0
2XDCLM0750A	7.5	8.0	118.0	70.0	56.0
2XDCLM0760A	7.6	8.0	118.0	70.0	56.0
2XDCLM0770A	7.7	8.0	118.0	70.0	56.0
2XDCLM0780A	7.8	8.0	118.0	70.0	56.0
2XDCLM0790A	7.9	8.0	118.0	70.0	56.0
2XDCLM0800A	8.0	8.0	118.0	70.0	56.0
2XDCLM0810A	8.1	10.0	127.0	80.0	64.0
2XDCLM0820A	8.2	10.0	127.0	80.0	64.0
2XDCLM0830A	8.3	10.0	127.0	80.0	64.0
2XDCLM0840A	8.4	10.0	127.0	80.0	64.0
2XDCLM0850A	8.5	10.0	127.0	80.0	64.0
2XDCLM0860A	8.6	10.0	127.0	80.0	64.0
2XDCLM0870A	8.7	10.0	127.0	80.0	64.0
2XDCLM0880A	8.8	10.0	127.0	80.0	64.0
2XDCLM0890A	8.9	10.0	127.0	80.0	64.0
2XDCLM0900A	9.0	10.0	127.0	80.0	64.0
2XDCLM0910A	9.1	10.0	136.0	85.0	68.0
2XDCLM0920A	9.2	10.0	136.0	85.0	68.0
2XDCLM0925A	9.25	10.0	136.0	85.0	68.0
2XDCLM0930A	9.3	10.0	136.0	85.0	68.0
2XDCLM0940A	9.4	10.0	136.0	85.0	68.0
2XDCLM0950A	9.5	10.0	136.0	85.0	68.0
2XDCLM0960A	9.6	10.0	136.0	85.0	68.0
2XDCLM0970A	9.7	10.0	136.0	85.0	68.0
2XDCLM0980A	9.8	10.0	136.0	85.0	68.0
2XDCLM0990A	9.9	10.0	136.0	85.0	68.0
2XDCLM1000A	10.0	10.0	136.0	85.0	68.0
2XDCLM1010A	10.1	12.0	149.0	93.0	74.0
2XDCLM1020A	10.2	12.0	149.0	93.0	74.0
2XDCLM1030A	10.3	12.0	149.0	93.0	74.0
2XDCLM1040A	10.4	12.0	149.0	93.0	74.0
2XDCLM1050A	10.5	12.0	149.0	93.0	74.0

**Drills**  
 Series XDCLM

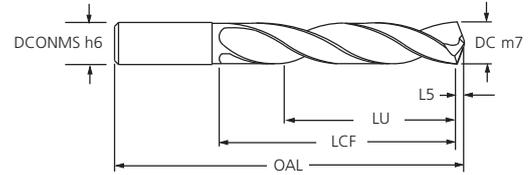
# Twister® XD High Performance Drill - 7<sup>+</sup>xD Series XDCLM



Series 2XDCLM	Drill Dimensions XDCLM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2XDCLM1060A	10.6	12.0	149.0	93.0	74.0
2XDCLM1070A	10.7	12.0	149.0	93.0	74.0
2XDCLM1080A	10.8	12.0	149.0	93.0	74.0
2XDCLM1090A	10.9	12.0	149.0	93.0	74.0
2XDCLM1100A	11.0	12.0	149.0	93.0	74.0
2XDCLM1110A	11.1	12.0	155.0	102.0	82.0
2XDCLM1120A	11.2	12.0	155.0	102.0	82.0
2XDCLM1130A	11.3	12.0	155.0	102.0	82.0
2XDCLM1140A	11.4	12.0	155.0	102.0	82.0
2XDCLM1150A	11.5	12.0	155.0	102.0	82.0
2XDCLM1160A	11.6	12.0	155.0	102.0	82.0
2XDCLM1170A	11.7	12.0	155.0	102.0	82.0
2XDCLM1180A	11.8	12.0	155.0	102.0	82.0
2XDCLM1190A	11.9	12.0	155.0	102.0	82.0
2XDCLM1200A	12.0	12.0	155.0	102.0	82.0



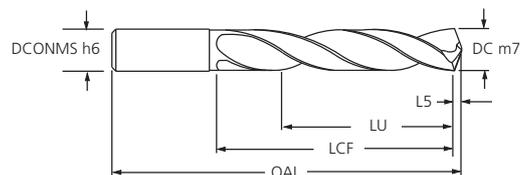
# CYCLONE CXD High Performance Drill - 8xD Series CXDCLM



Tool Number	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDCLM0300AP	3.0	3.0	81.0	33.0	25.0	0.46
CXDCL1200AP	3.05	4.0	92.0	44.0	33.0	0.48
CXDCLM0310AP	3.1	4.0	92.0	44.0	33.0	0.48
CXDCL1250AP	3.18	4.0	92.0	44.0	33.0	0.48
CXDCLM0320AP	3.2	4.0	92.0	44.0	33.0	0.5
CXDCLM0325AP	3.25	4.0	92.0	44.0	33.0	0.51
CXDCL1285AP	3.26	4.0	92.0	44.0	33.0	0.51
CXDCLM0330AP	3.3	4.0	92.0	44.0	33.0	0.51
CXDCLM0340AP	3.4	4.0	92.0	44.0	33.0	0.53
CXDCL1360AP	3.45	4.0	92.0	44.0	33.0	0.53
CXDCLM0350AP	3.5	4.0	92.0	44.0	33.0	0.54
CXDCL1406AP	3.57	4.0	92.0	44.0	33.0	0.56
CXDCLM0360AP	3.6	4.0	92.0	44.0	33.0	0.56
CXDCLM0370AP	3.7	4.0	92.0	44.0	33.0	0.57
CXDCL1496AP	3.8	4.0	92.0	44.0	33.0	0.59
CXDCL1520AP	3.86	4.0	92.0	44.0	33.0	0.6
CXDCLM0390AP	3.9	4.0	92.0	44.0	33.0	0.6
CXDCL1562AP	3.97	4.0	92.0	44.0	33.0	0.61
CXDCLM0400AP	4.0	4.0	92.0	44.0	33.0	0.62
CXDCL1590AP	4.04	5.0	100.0	45.0	34.0	0.63
CXDCLM0410AP	4.1	5.0	100.0	45.0	34.0	0.64
CXDCLM0420AP	4.2	5.0	100.0	45.0	34.0	0.65
CXDCLM0430AP	4.3	5.0	100.0	45.0	34.0	0.67
CXDCL1719AP	4.37	5.0	100.0	45.0	34.0	0.68
CXDCLM0440AP	4.4	5.0	100.0	45.0	34.0	0.68
CXDCLM0450AP	4.5	5.0	100.0	45.0	34.0	0.7
CXDCLM0460AP	4.6	5.0	100.0	45.0	34.0	0.71
CXDCLM0465AP	4.65	5.0	100.0	45.0	34.0	0.72
CXDCLM0470AP	4.7	5.0	100.0	45.0	34.0	0.73
CXDCL1875AP	4.76	5.0	100.0	45.0	34.0	0.74
CXDCLM0480AP	4.8	5.0	100.0	50.0	38.0	0.74
CXDCLM0490AP	4.9	5.0	100.0	50.0	38.0	0.76
CXDCLM0500AP	5.0	5.0	100.0	50.0	38.0	0.77
CXDCLM0510AP	5.1	6.0	100.0	57.0	43.0	0.79
CXDCL2031AP	5.16	6.0	100.0	57.0	43.0	0.79
CXDCLM0520AP	5.2	6.0	100.0	57.0	43.0	0.81
CXDCLM0530AP	5.3	6.0	100.0	57.0	43.0	0.82
CXDCLM0540AP	5.4	6.0	100.0	57.0	43.0	0.84
CXDCLM0550AP	5.5	6.0	100.0	57.0	43.0	0.85
CXDCL2187AP	5.56	6.0	100.0	57.0	43.0	0.86
CXDCLM0560AP	5.6	6.0	100.0	57.0	43.0	0.86
CXDCL2210AP	5.61	6.0	100.0	57.0	43.0	0.86
CXDCLM0570AP	5.7	6.0	100.0	57.0	43.0	0.88
CXDCLM0580AP	5.8	6.0	100.0	57.0	43.0	0.9
CXDCLM0590AP	5.9	6.0	100.0	57.0	43.0	0.91
CXDCL2344AP	5.95	6.0	100.0	57.0	43.0	0.91

 Drills  
Series CXDCLM

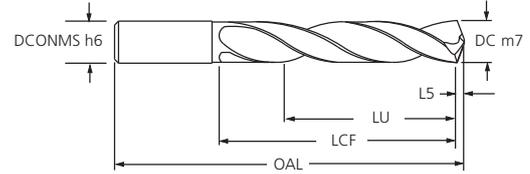
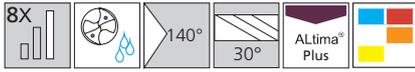
# CYCLONE CXD High Performance Drill - 8xD Series CXDCLM



Tool Number	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDCLM0600AP	6.0	6.0	100.0	57.0	43.0	0.93
CXDCLM0610AP	6.1	8.0	118.0	76.0	57.0	0.95
CXDCL2420AP	6.15	8.0	118.0	76.0	57.0	0.95
CXDCLM0620AP	6.2	8.0	118.0	76.0	57.0	0.96
CXDCL2460AP	6.25	8.0	118.0	76.0	57.0	0.97
CXDCLM0630AP	6.3	8.0	118.0	76.0	57.0	0.98
CXDCL2500AP	6.35	8.0	118.0	76.0	57.0	0.99
CXDCLM0640AP	6.4	8.0	118.0	76.0	57.0	0.99
CXDCLM0650AP	6.5	8.0	118.0	76.0	57.0	1.01
CXDCL2570AP	6.53	8.0	118.0	76.0	57.0	1.03
CXDCLM0660AP	6.6	8.0	118.0	76.0	57.0	1.03
CXDCL2610AP	6.63	8.0	118.0	76.0	57.0	1.03
CXDCLM0670AP	6.7	8.0	118.0	76.0	57.0	1.04
CXDCL2656AP	6.75	8.0	118.0	76.0	57.0	1.04
CXDCLM0680AP	6.8	8.0	118.0	76.0	57.0	1.05
CXDCLM0690AP	6.9	8.0	118.0	76.0	57.0	1.07
CXDCLM0700AP	7.0	8.0	118.0	76.0	57.0	1.08
CXDCLM0710AP	7.1	8.0	118.0	76.0	57.0	1.1
CXDCL2812AP	7.14	8.0	118.0	76.0	57.0	1.12
CXDCLM0720AP	7.2	8.0	118.0	76.0	57.0	1.12
CXDCLM0730AP	7.3	8.0	118.0	76.0	57.0	1.13
CXDCLM0740AP	7.4	8.0	118.0	76.0	57.0	1.15
CXDCLM0750AP	7.5	8.0	118.0	76.0	57.0	1.16
CXDCL2969AP	7.54	8.0	118.0	76.0	57.0	1.17
CXDCLM0760AP	7.6	8.0	118.0	76.0	57.0	1.18
CXDCLM0770AP	7.7	8.0	118.0	76.0	57.0	1.19
CXDCLM0780AP	7.8	8.0	118.0	76.0	57.0	1.21
CXDCLM0790AP	7.9	8.0	118.0	76.0	57.0	1.22
CXDCL3125AP	7.94	8.0	118.0	76.0	57.0	1.22
CXDCLM0800AP	8.0	8.0	118.0	76.0	57.0	1.24
CXDCLM0810AP	8.1	10.0	139.0	87.0	65.0	1.26
CXDCLM0820AP	8.2	10.0	139.0	87.0	65.0	1.27
CXDCLM0830AP	8.3	10.0	139.0	87.0	65.0	1.29
CXDCL3281AP	8.33	10.0	139.0	87.0	65.0	1.3
CXDCLM0840AP	8.4	10.0	139.0	87.0	65.0	1.31
CXDCL3320AP	8.43	10.0	139.0	87.0	65.0	1.31
CXDCLM0850AP	8.5	10.0	139.0	87.0	65.0	1.32
CXDCLM0860AP	8.6	10.0	139.0	87.0	65.0	1.33
CXDCLM0870AP	8.7	10.0	139.0	87.0	65.0	1.35
CXDCL3438AP	8.73	10.0	139.0	87.0	65.0	1.35
CXDCLM0880AP	8.8	10.0	139.0	87.0	65.0	1.36
CXDCLM0890AP	8.9	10.0	139.0	87.0	65.0	1.38
CXDCLM0900AP	9.0	10.0	139.0	87.0	65.0	1.39
CXDCLM0910AP	9.1	10.0	139.0	95.0	71.0	1.41
CXDCL3594AP	9.13	10.0	139.0	95.0	71.0	1.42
CXDCLM0920AP	9.2	10.0	139.0	95.0	71.0	1.43

Drills  
Series CXDCLM

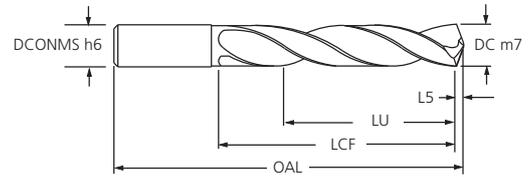
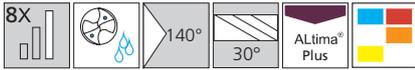
# CYCLONE CXD High Performance Drill - 8xD Series CXDCLM



Tool Number	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDCLM0925AP	9.25	10.0	139.0	95.0	71.0	1.43
CXDCLM0930AP	9.3	10.0	139.0	95.0	71.0	1.44
CXDCL3680AP	9.35	10.0	139.0	95.0	71.0	1.45
CXDCLM0940AP	9.4	10.0	139.0	95.0	71.0	1.46
CXDCLM0950AP	9.5	10.0	139.0	95.0	71.0	1.47
CXDCL3750AP	9.52	10.0	139.0	95.0	71.0	1.47
CXDCLM0960AP	9.6	10.0	139.0	95.0	71.0	1.49
CXDCLM0970AP	9.7	10.0	139.0	95.0	71.0	1.5
CXDCL3858AP	9.8	10.0	139.0	95.0	71.0	1.52
CXDCLM0990AP	9.9	10.0	139.0	95.0	71.0	1.53
CXDCL3906AP	9.92	10.0	139.0	95.0	71.0	1.55
CXDCLM1000AP	10.0	10.0	139.0	95.0	71.0	1.55
CXDCLM1010AP	10.1	12.0	155.0	106.0	80.0	1.56
CXDCLM1020AP	10.2	12.0	155.0	106.0	80.0	1.58
CXDCLM1030AP	10.3	12.0	155.0	106.0	80.0	1.6
CXDCL4062AP	10.32	12.0	155.0	106.0	80.0	1.6
CXDCLM1040AP	10.4	12.0	155.0	106.0	80.0	1.61
CXDCLM1050AP	10.5	12.0	155.0	106.0	80.0	1.63
CXDCLM1060AP	10.6	12.0	155.0	106.0	80.0	1.64
CXDCLM1070AP	10.7	12.0	155.0	106.0	80.0	1.66
CXDCL4219AP	10.72	12.0	155.0	106.0	80.0	1.65
CXDCLM1080AP	10.8	12.0	155.0	106.0	80.0	1.67
CXDCLM1090AP	10.9	12.0	155.0	106.0	80.0	1.69
CXDCLM1100AP	11.0	12.0	155.0	106.0	80.0	1.7
CXDCLM1110AP	11.1	12.0	163.0	114.0	86.0	1.72
CXDCL4375AP	11.11	12.0	163.0	114.0	86.0	1.73
CXDCLM1120AP	11.2	12.0	163.0	114.0	86.0	1.74
CXDCLM1130AP	11.3	12.0	163.0	114.0	86.0	1.75
CXDCLM1140AP	11.4	12.0	163.0	114.0	86.0	1.77
CXDCLM1150AP	11.5	12.0	163.0	114.0	86.0	1.78
CXDCLM1160AP	11.6	12.0	163.0	114.0	86.0	1.8
CXDCLM1170AP	11.7	12.0	163.0	114.0	86.0	1.81
CXDCLM1180AP	11.8	12.0	163.0	114.0	86.0	1.83
CXDCLM1190AP	11.9	12.0	163.0	114.0	86.0	1.84
CXDCL4688AP	11.91	12.0	163.0	114.0	86.0	1.85
CXDCLM1200AP	12.0	12.0	163.0	114.0	86.0	1.86
CXDCLM1210AP	12.1	14.0	182.0	133.0	112.0	1.87
CXDCL4844AP	12.3	14.0	182.0	133.0	100.0	1.91
CXDCLM1250AP	12.5	14.0	182.0	133.0	112.0	1.93
CXDCL5000AP	12.7	14.0	182.0	133.0	100.0	1.95
CXDCLM1280AP	12.8	14.0	182.0	133.0	112.0	1.98
CXDCLM1290AP	12.9	14.0	182.0	133.0	112.0	1.99
CXDCLM1300AP	13.0	14.0	182.0	133.0	112.0	2.01
CXDCL5156AP	13.09	14.0	182.0	133.0	112.0	2.03
CXDCL5312AP	13.49	14.0	182.0	133.0	112.0	2.08
CXDCLM1350AP	13.5	14.0	182.0	133.0	112.0	2.09

Drills  
Series CXDCLM

# CYCLONE CXD High Performance Drill - 8xD Series CXDCLM

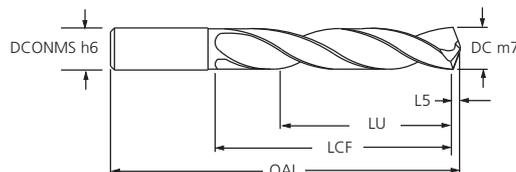
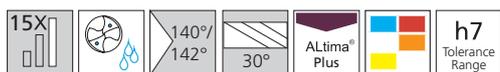


Tool Number	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDCLM1370AP	13.7	14.0	182.0	133.0	112.0	2.12
CXDCL5469AP	13.89	14.0	182.0	133.0	112.0	2.16
CXDCLM1400AP	14.0	14.0	182.0	133.0	112.0	2.16
CXDCL5625AP	14.29	16.0	204.0	152.0	128.0	2.21
CXDCLM1450AP	14.5	16.0	204.0	152.0	128.0	2.24
CXDCLM1470AP	14.7	16.0	204.0	152.0	128.0	2.27
CXDCLM1500AP	15.0	16.0	204.0	152.0	128.0	2.32
CXDCL5938AP	15.08	16.0	204.0	152.0	128.0	2.33
CXDCLM1530AP	15.3	16.0	204.0	152.0	128.0	2.36
CXDCLM1550AP	15.5	16.0	204.0	152.0	128.0	2.39
CXDCLM1570AP	15.7	16.0	204.0	152.0	128.0	2.43
CXDCL6250AP	15.87	16.0	204.0	152.0	128.0	2.46
CXDCLM1600AP	16.0	16.0	204.0	152.0	128.0	2.47



Drills  
Series CXDCLM

# CYCLONE CXD High Performance Drill - 15xD Series CXDCEM

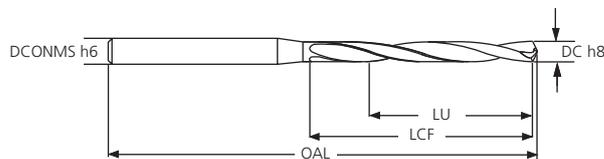


Tool Number	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
CXDCEM0300AP	3.0	3.0	105.0	56.0	45.0	0.46
CXDCEM0350AP	3.5	4.0	120.0	66.0	53.0	0.54
CXDCEM0400AP	4.0	4.0	120.0	75.0	60.0	0.62
CXDCEM0420AP	4.2	5.0	143.0	79.0	63.0	0.65
CXDCEM0430AP	4.3	5.0	143.0	81.0	65.0	0.67
CXDCEM0440AP	4.4	5.0	143.0	83.0	66.0	0.68
CXDCEM0450AP	4.5	5.0	143.0	84.0	68.0	0.7
CXDCEM0480AP	4.8	5.0	143.0	90.0	72.0	0.74
CXDCEM0490AP	4.9	5.0	143.0	92.0	74.0	0.76
CXDCEM0500AP	5.0	5.0	143.0	94.0	75.0	0.77
CXDCEM0520AP	5.2	6.0	162.0	98.0	78.0	0.81
CXDCEM0540AP	5.4	6.0	162.0	101.0	81.0	0.84
CXDCEM0550AP	5.5	6.0	162.0	103.0	83.0	0.85
CXDCEM0560AP	5.6	6.0	162.0	105.0	84.0	0.86
CXDCEM0580AP	5.8	6.0	162.0	109.0	87.0	0.9
CXDCEM0600AP	6.0	6.0	162.0	113.0	90.0	0.93
CXDCEM0610AP	6.1	8.0	200.0	114.0	92.0	0.95
CXDCEM0620AP	6.2	8.0	200.0	116.0	93.0	0.96
CXDCEM0630AP	6.3	8.0	200.0	118.0	95.0	0.98
CXDCEM0650AP	6.5	8.0	200.0	122.0	98.0	1.01
CXDCEM0680AP	6.8	8.0	200.0	128.0	102.0	1.05
CXDCEM0700AP	7.0	8.0	200.0	131.0	105.0	1.08
CXDCEM0740AP	7.4	8.0	200.0	139.0	111.0	1.15
CXDCEM0750AP	7.5	8.0	200.0	141.0	113.0	1.16
CXDCEM0760AP	7.6	8.0	200.0	143.0	114.0	1.18
CXDCEM0780AP	7.8	8.0	200.0	146.0	117.0	1.21
CXDCEM0800AP	8.0	8.0	200.0	150.0	120.0	1.24
CXDCEM0820AP	8.2	10.0	240.0	154.0	123.0	1.27
CXDCEM0830AP	8.3	10.0	240.0	156.0	125.0	1.29
CXDCEM0840AP	8.4	10.0	240.0	158.0	126.0	1.3
CXDCEM0850AP	8.5	10.0	240.0	159.0	128.0	1.32
CXDCEM0870AP	8.7	10.0	240.0	163.0	131.0	1.35
CXDCEM0900AP	9.0	10.0	240.0	169.0	135.0	1.39
CXDCEM0940AP	9.4	10.0	240.0	176.0	141.0	1.46
CXDCEM0980AP	9.8	10.0	240.0	184.0	147.0	1.52
CXDCEM1000AP	10.0	10.0	240.0	188.0	150.0	1.55
CXDCEM1020AP	10.2	12.0	283.0	191.0	153.0	1.58
CXDCEM1030AP	10.3	12.0	283.0	193.0	155.0	1.6
CXDCEM1050AP	10.5	12.0	283.0	197.0	158.0	1.63
CXDCEM1080AP	10.8	12.0	283.0	203.0	162.0	1.67
CXDCEM1100AP	11.0	12.0	283.0	206.0	165.0	1.7
CXDCEM1150AP	11.5	12.0	283.0	216.0	173.0	1.78
CXDCEM1180AP	11.8	12.0	283.0	221.0	177.0	1.83
CXDCEM1200AP	12.0	12.0	283.0	225.0	180.0	1.86

**Drills**  
 Series CXDCEM



# Twister® XD High Performance Micro Drill - 10xD Series MDCLM



Series 2MDCLM	Drill Dimensions MDCLM				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
2MDCLM0200A	2.00	3.0	68.0	24.0	18.0
2MDCLM0205A	2.05	3.0	74.0	28.0	21.0
2MDCLM0210A	2.10	3.0	74.0	28.0	21.0
2MDCLM0215A	2.15	3.0	74.0	28.0	21.0
2MDCLM0220A	2.20	3.0	74.0	28.0	21.0
2MDCLM0225A	2.25	3.0	74.0	28.0	21.0
2MDCLM0230A	2.30	3.0	74.0	28.0	21.0
2MDCLM0235A	2.35	3.0	74.0	28.0	21.0
2MDCLM0240A	2.40	3.0	74.0	28.0	21.0
2MDCLM0245A	2.45	3.0	74.0	28.0	21.0
2MDCLM0250A	2.50	3.0	74.0	28.0	21.0
2MDCLM0255A	2.55	3.0	81.0	34.0	25.5
2MDCLM0260A	2.60	3.0	81.0	34.0	25.5
2MDCLM0265A	2.65	3.0	81.0	34.0	25.5
2MDCLM0270A	2.70	3.0	81.0	34.0	25.5
2MDCLM0275A	2.75	3.0	81.0	34.0	25.5
2MDCLM0280A	2.80	3.0	81.0	34.0	25.5
2MDCLM0285A	2.85	3.0	81.0	34.0	25.5
2MDCLM0290A	2.90	3.0	81.0	34.0	25.5
2MDCLM0295A	2.95	3.0	81.0	34.0	25.5



## Tolerances

Drill Dia. (h8)	Tolerance
2.00 - 2.95	+0/-0.014

Shank Dia. (h6)	Tolerance
3.00	+0/-0.006

## Machine Requirements

High Pressure Pump System (1000 psi)  
Coolant filtration of 10 microns or better  
Machine runout of .0004" (.01mm) Max.

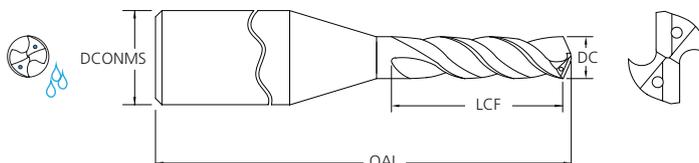
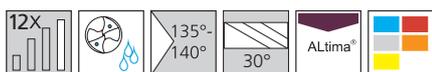
M.A. Ford® does not recommend full retraction of the body of the drill from the hole during the peck cycle. It is recommended to leave the drill point within the hole.

## Estimated Peck Depths

For hole depths up to 6x diameter    No pecks  
For hole depths up to 10x diameter    0-2 pecks  
For hole depths up to 15x diameter    2-4 pecks

For hole depths deeper than 4x the diameter, M.A. Ford® recommends using a "soft start" program that drills to .5x diameter deep at 2/3 of the speed and feed.

# Twister® High Performance Micro Drill - 12xD Series MXDCL



ALtima®	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MXDCLM0100A	1.00	3.0	60.0	16.0
MXDCLM0105A	1.05	3.0	60.0	17.0
MXDCLM0110A	1.10	3.0	60.0	18.0
MXDCLM0115A	1.15	3.0	60.0	19.0
MXDCLM0120A	1.20	3.0	65.0	20.0
MXDCLM0125A	1.25	3.0	65.0	20.0
MXDCLM0130A	1.30	3.0	65.0	21.0
MXDCLM0135A	1.35	3.0	65.0	22.0
MXDCLM0140A	1.40	3.0	65.0	23.0
MXDCLM0145A	1.45	3.0	65.0	24.0
MXDCLM0150A	1.50	3.0	65.0	24.0
MXDCLM0155A	1.55	3.0	65.0	25.0
MXDCLM0160A	1.60	3.0	70.0	26.0
MXDCLM0165A	1.65	3.0	70.0	27.0
MXDCLM0170A	1.70	3.0	70.0	28.0
MXDCLM0175A	1.75	3.0	70.0	28.0
MXDCLM0180A	1.80	3.0	70.0	29.0
MXDCLM0185A	1.85	3.0	70.0	30.0
MXDCLM0190A	1.90	3.0	75.0	31.0
MXDCLM0195A	1.95	3.0	75.0	32.0

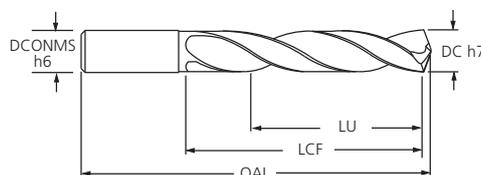
ALtima®	Drill Dimensions			
Tool No.	Ø DC	Ø DCONMS	OAL	LCF
MXDCLM0200A	2.00	3.0	75.0	32.0
MXDCLM0205A	2.05	3.0	75.0	33.0
MXDCLM0210A	2.10	3.0	75.0	34.0
MXDCLM0215A	2.15	3.0	75.0	35.0
MXDCLM0220A	2.20	3.0	75.0	36.0
MXDCLM0225A	2.25	3.0	75.0	36.0
MXDCLM0230A	2.30	3.0	75.0	37.0
MXDCLM0235A	2.35	3.0	75.0	38.0
MXDCLM0240A	2.40	3.0	75.0	39.0
MXDCLM0245A	2.45	3.0	75.0	40.0
MXDCLM0250A	2.50	3.0	75.0	40.0
MXDCLM0255A	2.55	3.0	80.0	41.0
MXDCLM0260A	2.60	3.0	80.0	42.0
MXDCLM0265A	2.65	3.0	80.0	43.0
MXDCLM0270A	2.70	3.0	80.0	44.0
MXDCLM0275A	2.75	3.0	80.0	44.0
MXDCLM0280A	2.80	3.0	80.0	45.0
MXDCLM0285A	2.85	3.0	80.0	46.0
MXDCLM0290A	2.90	3.0	85.0	47.0
MXDCLM0295A	2.95	3.0	85.0	48.0

Metric (mm)	
DC	Tolerance (h7)
1.00 - 2.95	+0/-0.010

Metric (mm)	
DCONMS	Tolerance (h6)
3.0	+0/-0.006


 Drills  
 Series MXDCL

# Twister<sup>®</sup> XD High Performance Drill - 12<sup>+</sup>xD Series XDCEM



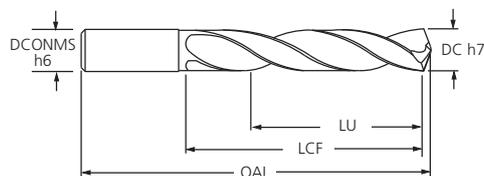
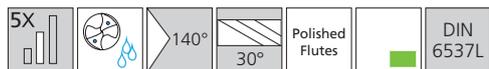
Series 2XDCEM	Drill Dimensions						
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU	LCF / DC (DC x Ø)	LU / DC (DC x Ø)
2XDCEM0400A	4.0	4.0	163.0	100.0	80.0	25.0	20.0
2XDCEM0500A	5.0	5.0	163.0	105.0	84.0	21.0	17.0
2XDCEM0520A	5.2	6.0	163.0	110.0	88.0	21.0	17.0
2XDCEM0540A	5.4	6.0	163.0	110.0	88.0	20.0	16.0
2XDCEM0560A	5.6	6.0	163.0	110.0	88.0	20.0	16.0
2XDCEM0580A	5.8	6.0	163.0	110.0	88.0	19.0	15.0
2XDCEM0600A	6.0	6.0	163.0	110.0	88.0	18.0	15.0
2XDCEM0620A	6.2	8.0	163.0	110.0	88.0	18.0	14.0
2XDCEM0630A	6.3	8.0	163.0	110.0	88.0	17.0	14.0
2XDCEM0635A	6.35	8.0	163.0	110.0	88.0	17.0	14.0
2XDCEM0680A	6.8	8.0	163.0	110.0	88.0	16.0	13.0
2XDCEM0700A	7.0	8.0	163.0	110.0	88.0	16.0	13.0
2XDCEM0760A	7.6	8.0	163.0	120.0	96.0	16.0	13.0
2XDCEM0780A	7.8	8.0	163.0	120.0	96.0	15.0	12.0
2XDCEM0794A	7.94	8.0	163.0	120.0	96.0	15.0	12.0
2XDCEM0800A	8.0	8.0	163.0	120.0	96.0	15.0	12.0
2XDCEM0820A	8.2	10.0	180.0	135.0	108.0	16.0	13.0
2XDCEM0850A	8.5	10.0	180.0	135.0	108.0	16.0	13.0
2XDCEM0870A	8.7	10.0	180.0	135.0	108.0	16.0	12.0
2XDCEM0900A	9.0	10.0	180.0	135.0	108.0	15.0	12.0
2XDCEM0940A	9.4	10.0	195.0	150.0	120.0	16.0	13.0
2XDCEM0953A	9.53	10.0	195.0	150.0	120.0	16.0	13.0
2XDCEM0980A	9.8	10.0	195.0	150.0	120.0	15.0	12.0
2XDCEM1000A	10.0	10.0	195.0	150.0	120.0	15.0	12.0
2XDCEM1030A	10.3	12.0	210.0	160.0	128.0	16.0	12.0
2XDCEM1050A	10.5	12.0	210.0	160.0	128.0	15.0	12.0
2XDCEM1080A	10.8	12.0	210.0	160.0	128.0	15.0	12.0
2XDCEM1100A	11.0	12.0	210.0	160.0	128.0	15.0	12.0
2XDCEM1111A	11.11	12.0	210.0	160.0	128.0	14.0	12.0
2XDCEM1150A	11.5	12.0	210.0	160.0	128.0	14.0	12.0
2XDCEM1180A	11.8	12.0	210.0	160.0	128.0	14.0	12.0
2XDCEM1200A	12.0	12.0	210.0	160.0	128.0	13.0	12.0
2XDCEM1270A	12.7	14.0	230.0	180.0	144.0	14.0	12.0



Drills  
Series XDCEM



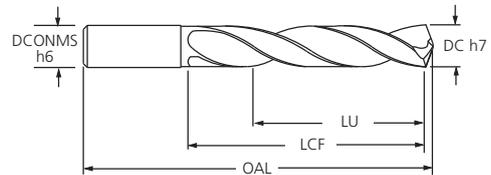
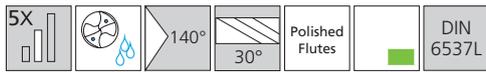
# CYCLONE CDA High Performance Aluminium Drill - 5xD Series CDACRM



Tool Number	Ø DC	Ø DCONMS	OAL	LCF (max)	LU (Ref)
CDACRM0300	3.0	6.0	66.0	28.0	23.0
CDACRM0310	3.1	6.0	66.0	28.0	23.0
CDACRM0320	3.2	6.0	66.0	28.0	23.0
CDACRM0330	3.3	6.0	66.0	28.0	23.0
CDACRM0340	3.4	6.0	66.0	28.0	23.0
CDACRM0350	3.5	6.0	66.0	28.0	23.0
CDACRM0360	3.6	6.0	66.0	28.0	23.0
CDACRM0370	3.7	6.0	66.0	28.0	23.0
CDACRM0380	3.8	6.0	74.0	36.0	29.0
CDACRM0390	3.9	6.0	74.0	36.0	29.0
CDACRM0400	4.0	6.0	74.0	36.0	29.0
CDACRM0410	4.1	6.0	74.0	36.0	29.0
CDACRM0420	4.2	6.0	74.0	36.0	29.0
CDACRM0430	4.3	6.0	74.0	36.0	29.0
CDACRM0440	4.4	6.0	74.0	36.0	29.0
CDACRM0450	4.5	6.0	74.0	36.0	29.0
CDACRM0460	4.6	6.0	74.0	36.0	29.0
CDACRM0470	4.7	6.0	74.0	36.0	29.0
CDACRM0480	4.8	6.0	82.0	44.0	35.0
CDACRM0490	4.9	6.0	82.0	44.0	35.0
CDACRM0500	5.0	6.0	82.0	44.0	35.0
CDACRM0510	5.1	6.0	82.0	44.0	35.0
CDACRM0520	5.2	6.0	82.0	44.0	35.0
CDACRM0530	5.3	6.0	82.0	44.0	35.0
CDACRM0540	5.4	6.0	82.0	44.0	35.0
CDACRM0550	5.5	6.0	82.0	44.0	35.0
CDACRM0560	5.6	6.0	82.0	44.0	35.0
CDACRM0570	5.7	6.0	82.0	44.0	35.0
CDACRM0580	5.8	6.0	82.0	44.0	35.0
CDACRM0590	5.9	6.0	82.0	44.0	35.0
CDACRM0600	6.0	6.0	82.0	44.0	35.0
CDACRM0610	6.1	8.0	91.0	53.0	43.0
CDACRM0620	6.2	8.0	91.0	53.0	43.0
CDACRM0630	6.3	8.0	91.0	53.0	43.0
CDACRM0640	6.4	8.0	91.0	53.0	43.0
CDACRM0650	6.5	8.0	91.0	53.0	43.0
CDACRM0660	6.6	8.0	91.0	53.0	43.0
CDACRM0670	6.7	8.0	91.0	53.0	43.0
CDACRM0680	6.8	8.0	91.0	53.0	43.0
CDACRM0690	6.9	8.0	91.0	53.0	43.0
CDACRM0700	7.0	8.0	91.0	53.0	43.0
CDACRM0710	7.1	8.0	91.0	53.0	43.0
CDACRM0720	7.2	8.0	91.0	53.0	43.0
CDACRM0730	7.3	8.0	91.0	53.0	43.0
CDACRM0740	7.4	8.0	91.0	53.0	43.0
CDACRM0750	7.5	8.0	91.0	53.0	43.0

**Drills**  
 Series CDACRM

# CYCLONE CDA High Performance Aluminium Drill - 5xD Series CDACRM



Tool Number	Ø DC	Ø DCONMS	OAL	LCF (max)	LU (Ref)
CDACRM0760	7.6	8.0	91.0	53.0	43.0
CDACRM0770	7.7	8.0	91.0	53.0	43.0
CDACRM0780	7.8	8.0	91.0	53.0	43.0
CDACRM0790	7.9	8.0	91.0	53.0	43.0
CDACRM0800	8.0	8.0	91.0	53.0	43.0
CDACRM0810	8.1	10.0	103.0	61.0	49.0
CDACRM0820	8.2	10.0	103.0	61.0	49.0
CDACRM0830	8.3	10.0	103.0	61.0	49.0
CDACRM0840	8.4	10.0	103.0	61.0	49.0
CDACRM0850	8.5	10.0	103.0	61.0	49.0
CDACRM0860	8.6	10.0	103.0	61.0	49.0
CDACRM0870	8.7	10.0	103.0	61.0	49.0
CDACRM0880	8.8	10.0	103.0	61.0	49.0
CDACRM0890	8.9	10.0	103.0	61.0	49.0
CDACRM0900	9.0	10.0	103.0	61.0	49.0
CDACRM0910	9.1	10.0	103.0	61.0	49.0
CDACRM0920	9.2	10.0	103.0	61.0	49.0
CDACRM0930	9.3	10.0	103.0	61.0	49.0
CDACRM0940	9.4	10.0	103.0	61.0	49.0
CDACRM0950	9.5	10.0	103.0	61.0	49.0
CDACRM0960	9.6	10.0	103.0	61.0	49.0
CDACRM0970	9.7	10.0	103.0	61.0	49.0
CDACRM0980	9.8	10.0	103.0	61.0	49.0
CDACRM0990	9.9	10.0	103.0	61.0	49.0
CDACRM1000	10.0	10.0	103.0	61.0	49.0
CDACRM1010	10.0	12.0	118.0	71.0	56.0
CDACRM1020	10.2	12.0	118.0	71.0	56.0
CDACRM1030	10.3	12.0	118.0	71.0	56.0
CDACRM1040	10.4	12.0	118.0	71.0	56.0
CDACRM1050	10.5	12.0	118.0	71.0	56.0
CDACRM1060	10.6	12.0	118.0	71.0	56.0
CDACRM1070	10.7	12.0	118.0	71.0	56.0
CDACRM1080	10.8	12.0	118.0	71.0	56.0
CDACRM1090	10.9	12.0	118.0	71.0	56.0
CDACRM1100	11.0	12.0	118.0	71.0	56.0
CDACRM1110	11.1	12.0	118.0	71.0	56.0
CDACRM1120	11.2	12.0	118.0	71.0	56.0
CDACRM1130	11.3	12.0	118.0	71.0	56.0
CDACRM1140	11.4	12.0	118.0	71.0	56.0
CDACRM1150	11.5	12.0	118.0	71.0	56.0
CDACRM1160	11.6	12.0	118.0	71.0	56.0
CDACRM1170	11.7	12.0	118.0	71.0	56.0
CDACRM1180	11.8	12.0	118.0	71.0	56.0
CDACRM1190	11.9	12.0	118.0	71.0	56.0
CDACRM1200	12.0	12.0	118.0	71.0	56.0
CDACRM1250	12.5	14.0	124.0	77.0	60.0

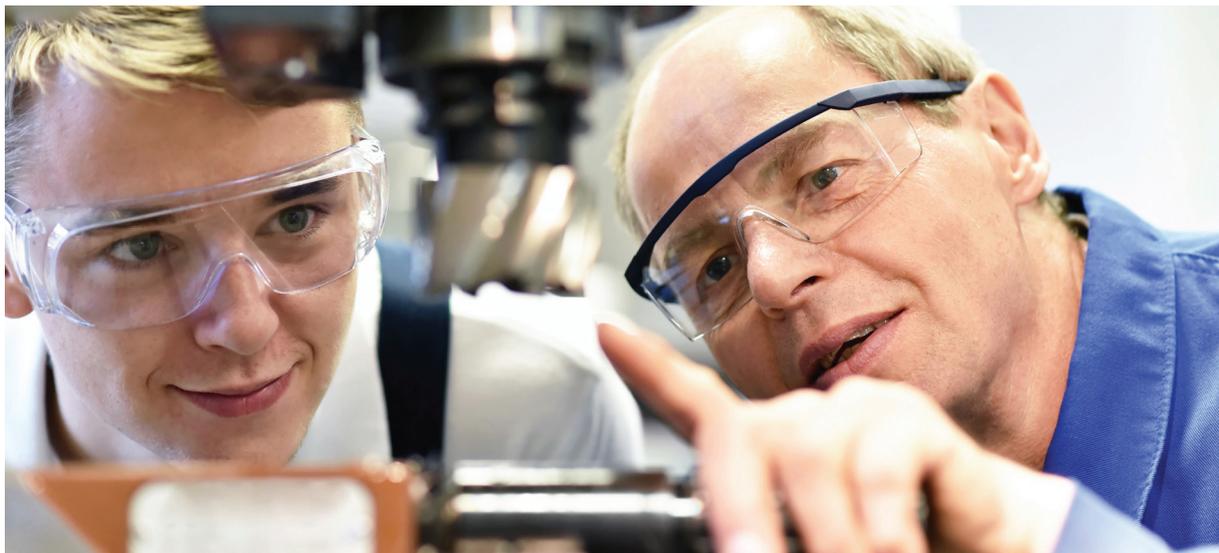


Drills  
Series CDACRM



## ▶ Technical Support & Advice

Like the cutting edge performance offered by our tooling, the high quality standards provided by our technical support team are an integral part of our business and an essential link for our customers.



Whether it's a simple product performance or tool selection query or a complex question about a new tooling application or improving machining performance, our technical support team has the expertise, experience and knowledge to advise and help.

At M.A. Ford Europe, service and technical support is not just a function of our business, it's a fundamental part of what we do and how we work together with customers to deliver the best solutions for their machining and manufacturing operations.

In addition to guidance and advice, our team can also provide training at our Technical Centre or at customers' premises, application & tool testing to verify performance, as well as support for every element within our Integrated Manufacturing Solutions (IMS) programme.

Where a unique cutting solution is required, we also support customers through our own specialist Custom Tools Division, which is dedicated to the design & manufacture of custom tools and innovative solutions to meet individual customer specifications.

For further information please contact our support team on: 01332 267960

# Twister® Micro-Tuff™ Drill

## Series 305M, 305AM Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio raccomandati | Zalecane dane o cięciu (Zalacane parametry skrawania)

Recommended Speeds By Material Group		Vc (m/min)		
Material Groups	Material Type	305M	305AM	
		Uncoated	Altima® Micro Coated	
Steels	P	Low Carbon	30 - 40	40 - 50
		Alloy Steel (≤ 35 Rc)	20 - 30	35 - 45
		Alloy Steel (36-45 Rc)	20 - 30	35 - 45
Stainless Steels	M	Free Machining	30 - 40	40 - 50
		Austenitic	20 - 30	35 - 45
		Ferritic/Martensitic	20 - 30	30 - 40
		PH Stainless	10 - 20	15 - 25
Cast Irons	K	Grey Cast Iron	30 - 40	40 - 50
		Ductile Cast Iron	30 - 40	40 - 50
Special Alloys	S	Titanium Alloys (Ti6AL4v)	10 - 20	15 - 25
		High Temp Alloys (Inconel®, Nimonic, Hastelloy)	10 - 20	15 - 25
Hardened Steels	H	45 - 55 Rc Steel	5 - 15	10 - 20
Non-Ferrous	N	Aluminium Alloys (< 10% Si)	50 - 60	-
		Plastics		

RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$

## Series 305M, 305AM Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio raccomandati | Zalecane dane o cięciu (Zalacane parametry skrawania)

Recommended Feedrates By Material Group		Drill Diameter (mm)					
Material Groups	Material Type	0.5	1.0	1.5	2.0	3.0	
		Feed (mm/rev)					
Steels	P	Low Carbon					
		Alloy Steel (≤ 35 Rc)	0.01	0.02	0.04	0.06	0.075
		Alloy Steel (36-45 Rc)					
Stainless Steels	M	Free Machining					
		Austenitic	0.01	0.02	0.04	0.06	0.075
		Ferritic/Martensitic					
		PH Stainless	0.005	0.01	0.02	0.03	0.035
Cast Irons	K	Grey Cast Iron	0.01	0.02	0.04	0.06	0.075
		Ductile Cast Iron					
Special Alloys	S	Titanium Alloys (Ti6AL4v)	0.01	0.02	0.04	0.06	0.075
		High Temp Alloys (Inconel® Nimonic, Hastelloy)	0.005	0.01	0.02	0.025	0.035
Hardened Steels	H	45 - 55 Rc Steel	0.005	0.01	0.02	0.025	0.035
Non-Ferrous	N	Aluminium Alloys (< 10% Si)	0.015	0.025	0.05	0.075	0.10
		Plastics					

Recommended Pecking Depths By Drill Diameter\* (Ø D<sup>1</sup>)

Diameter Ø D <sup>1</sup>	Pecking Depth
0.50	0.5 x Ø D <sup>1</sup>
1.00	1 x Ø D <sup>1</sup>
1.50	1.5 x Ø D <sup>1</sup>
2.00	2 x Ø D <sup>1</sup>
3.00	3 x Ø D <sup>1</sup>

\* Pecking depths can vary by material type

Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$



Drills - Technical Information  
Series 305 / 305AM

# Twister<sup>®</sup> XD High Performance Drills

## Series MXDSR Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio raccomandati | Zalecane dane o cięciu (Zalecane parametry skrawania)

Material Groups	ISO	Hardness	vc - m/min	Drill Diameter (mm)					
				0.5	1.0	1.5	2.0	2.5	2.95
				Feed (mm/rev)					
Free Machining & Low Carbon Steels	P	up to 28 Rc	45	.010	.020	.030	.040	.060	.075
Medium Carbon & High Carbon Steels, Alloy Steels & Easy to Machine Tool Steels	P	28 to 38 Rc	40	.010	.020	.030	.040	.060	.075
Tool Steels & Die Steel	P	28 to 44 Rc	40	.010	.020	.030	.040	.060	.075
Free Machining Stainless	M	up to 28 Rc	45	.010	.020	.030	.040	.060	.075
Stainless Steel - Austenitic 304 / 316	M	up to 28 Rc	40	.010	.020	.030	.040	.060	.075
Stainless Steel - Ferritic / Martensitic	M	up to 28 Rc	35	.010	.020	.030	.040	.060	.075
Stainless Steel - Moderately Difficult	M	over 28 Rc	20	.010	.020	.030	.040	.060	.075
Cast Iron - Gray CG	K	up to 240 HB	45	.010	.020	.030	.040	.060	.075
Cast Iron - Ductile & Malleable CGI	K	over 240 HB	45	.010	.020	.030	.040	.060	.075
Titanium	S	up to 40 Rc	20	.010	.020	.030	.040	.060	.075
High Temp Alloys Inconel <sup>®</sup> / Hastelloy / Waspeloy / Nickel Based Alloys-Monel	S		20	.005	.010	.015	.020	.025	.075
Hardened Steels	H	55 Rc	15	.005	.010	.015	.020	.025	.035
Aluminum (<10% Si)	N		55	.015	.025	.040	.050	.075	.100
Plastics	N			.015	.025	.040	.050	.075	.100

# Twister<sup>®</sup> XD Spot Drill

## Series 200S Spot Drill Recommended Feed

Avance recommandée | Empfohlener Vorschub | Avanzamento consigliato | Zalecany Posuw

Materials	Vc (m/min)	Drill Diameter (mm)				
		6	8	10	12	16
		Feed (mm/rev)				
Low Carbon Steel <0.3%C	100	0.076	0.1	0.13	0.16	0.16
Medium Carbon Steel	80	0.076	0.1	0.13	0.16	0.16
Alloy Steel ≤ 35hrc	70	0.076	0.1	0.13	0.16	0.16
Alloy Steel 36- 45hrc	45	0.076	0.1	0.13	0.16	0.16
Alloy Steel 45-50hrc	40	0.076	0.1	0.13	0.16	0.16
Grey Cast Iron	110	0.076	0.1	0.13	0.16	0.16
Ductile Cast Iron	80	0.076	0.1	0.13	0.16	0.16
Austenitic Stainless	45	0.076	0.1	0.13	0.16	0.16
Ph Stainless	30	0.076	0.1	0.13	0.16	0.16
High Temp Alloys	20	0.076	0.1	0.13	0.16	0.16
Titanium Alloys	55	0.076	0.1	0.13	0.16	0.16

 RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$ 

 Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$

# Twister<sup>®</sup> XD High Performance Drills

## Recommended Speed - XD/MD Drills

Vitesse Recommandée · Empfohlene Drehzahl · Velocità di taglio raccomandata · Zalecane prędkości

Materials	Vc (m/min)					
	2XDSSM 3 X D SOLID	2XD SRM 5 X D SOLID	2XD CSM 3 X D COOLANT	2XD CRM 5 X D COOLANT	2XD CLM 7 X D COOLANT	2MD CLM 10 X D COOLANT
Low Carbon Steel <0.3%C	80-120	75-100	150-200	150-200	130-145	80-90
Medium Carbon Steel	75-100	65-90	125-175	125-175	100-130	80-90
Alloy Steel ≤ 35hrc	60-75	50-70	75-105	75-105	70-90	80-90
Alloy Steel 36- 45hrc	45-60	40-55	45-70	45-70	40-55	60-80
Alloy Steel 45-50hrc	30-35	25-30	35-50	35-50	35-45	40-60
Grey Cast Iron	100-120	80-100	150-200	150-200	110-140	80-90
Ductile Cast Iron	75-90	65-80	135-150	135-150	130-145	60-80
Austenitic Stainless	30-45	25-40	80-150	80-150	45-65	60-70
Ph Stainless	20-35	15-30	50-80	50-80	30-45	40-50
High Temp Alloys	15-30	10-25	15-35	15-35	20-30	20-25
Titanium Alloys	35-45	30-40	55-70	55-70	50-65	40-50

RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$

## Series XD Drill - Recommended Feed 0.5 - 6mm diameter

Avance recommandée pour un diamètre de 0.5 – 6mm · Empfohlener Vorschub 0,5 – 6 mm Durchmesser  
 Avanzamento raccomandato per diametri 0,5 - 6mm · Zalecany posuw dla średnic 0.5-6mm

Materials	Feed (mm/rev)					
	0.5	1.5	3	4	5	6
Low Carbon Steel <0.3%C	0.025-0.05	0.05-0.075	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2
Medium Carbon Steel	0.025-0.05	0.05-0.075	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2
Alloy Steel ≤ 35hrc	0.025-0.05	0.05-0.075	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2
Alloy Steel 36- 45hrc	0.01-0.025	0.025-0.04	0.05-0.11	0.08-0.13	0.12-0.18	0.14-0.2
Alloy Steel 45-50hrc	0.01-0.02	0.02-0.03	0.035-0.075	0.06-0.1	0.08-0.12	0.09-0.15
Grey Cast Iron	0.025-0.05	0.05-0.075	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2
Ductile Cast Iron	0.025-0.05	0.05-0.075	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2
Austenitic Stainless	0.025-0.05	0.05-0.075	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2
Ph Stainless	0.01-0.03	0.025-0.05	0.05-0.085	0.06-0.09	0.07-0.11	0.08-0.12
High Temp Alloys	0.01-0.03	0.025-0.05	0.035-0.085	0.04-0.09	0.05-0.10	0.06-0.11
Titanium Alloys	0.01-0.03	0.025-0.05	0.075-0.12	0.1-0.15	0.12-0.18	0.14-0.2

Feedrate Formula For Metric Drills -  $\text{Feed} = \text{RPM} \times \text{mm/rev}$

## Twister® XD High Performance Drills

### Series 2MDCL Micro Coolant Drills - Recommended Feed

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio raccomandati | Zalecane dane o cięciu (Zalacane parametry skrawania)

Materials	Feed (mm/rev)		
	Diameter		
	2	2.5	2.9
Low Carbon Steel <0.3%C	0.046	0.051	0.056
Medium Carbon Steel	0.046	0.051	0.056
Alloy Steel ≤ 35hrc	0.046	0.051	0.056
Alloy Steel 36- 45hrc	0.046	0.046	0.051
Alloy Steel 45-50hrc	0.025	0.033	0.046
Grey Cast Iron	0.046	0.051	0.056
Ductile Cast Iron	0.046	0.051	0.056
Austenitic Stainless	0.033	0.038	0.043
Ph Stainless	0.025	0.027	0.038
High Temp Alloys	0.025	0.027	0.036
Titanium Alloys	0.025	0.027	0.036

Feedrate Formula For Metric Drills - Feed = RPM x mm/rev

## Twister® XD High Performance Drills

### Series XD Drill - Recommended Feed 8 - 20mm Diameter

 Avance recommandée 8 - 20mm de diamètre | Produktreihe XD-Bohrer – empfohlener Vorschub 8 – 20 mm Durchmesser  
 Avanzamento raccomandato per diametri 8 - 20mm | Zalecany posuw dla średnic 8 - 20mm

Materials	Feed (mm/rev)						
	8	10	12	14	16	18	20
Low Carbon Steel <0.3%C	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Medium Carbon Steel	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Alloy Steel ≤ 35hrc	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Alloy Steel 36- 45hrc	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Alloy Steel 45-50hrc	0.12-0.2	0.13-0.23	0.13-0.23	0.15-0.26	0.16-0.26	0.18-0.28	0.2-0.3
Grey Cast Iron	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Ductile Cast Iron	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Austenitic Stainless	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4
Ph Stainless	0.1-0.15	0.13-0.23	0.18-0.25	0.2-0.27	0.22-0.3	0.25-0.33	0.28-0.35
High Temp Alloys	0.08-0.13	0.1-0.15	0.12-0.17	0.14-0.19	0.16-0.21	0.18-0.25	0.23-0.28
Titanium Alloys	0.16-0.24	0.18-0.27	0.2-0.3	0.22-0.35	0.25-0.36	0.28-0.38	0.3-0.4

Feedrate Formula For Metric Drills - Feed = RPM x mm/rev

# Twister® Series MPDCS, MXDCR, MXDCL

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

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	vc-m/min.	Drill Diameter (mm)					
							0.5	1.0	1.5	2.0	2.5	2.95
							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	MXDSR		5	45	0.013	0.025	0.038	0.050	0.063	0.076
			MPDCS		2	90	-	0.025	0.038	0.050	0.063	0.076
			MXDCR		5							
			MXDCL		12							
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 38 Rc	MXDSR		5	40	0.013	0.025	0.038	0.050	0.063	0.076
			MPDCS		2	90	-	0.025	0.038	0.050	0.063	0.076
			MXDCR		5							
			MXDCL		12							
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 44 Rc	MXDSR		5	35	0.013	0.025	0.038	0.050	0.063	0.076
			MPDCS		2	75	-	0.025	0.038	0.050	0.063	0.076
			MXDCR		5							
			MXDCL		12							
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	MXDSR		5	40	0.013	0.025	0.038	0.050	0.063	0.076
			MPDCS		2	90	-	0.025	0.038	0.050	0.063	0.076
			MXDCR		5							
			MXDCL		12							
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	MXDSR		5	38	0.013	0.025	0.038	0.050	0.063	0.076
			MPDCS		2	70	-	0.025	0.038	0.050	0.063	0.076
			MXDCR		5							
			MXDCL		12							
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	MXDSR		5	18	0.005	0.010	0.018	0.023	0.028	0.036
			MPDCS		2	18	-	0.010	0.018	0.023	0.028	0.036
			MXDCR		5							
			MXDCL		12							
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 40 Rc	MXDSR		5	20	0.013	0.025	0.038	0.050	0.063	0.076
			MPDCS		2	55	-	0.025	0.038	0.050	0.063	0.076
			MXDCR		5							
			MXDCL		12							
High Temp Alloys Nimonic, Inconel®, Monel, Hastelloy®, Waspeloy	S	up to 40 Rc	MXDSR		5	18	0.005	0.010	0.018	0.023	0.028	0.036
			MPDCS		2	24	-	0.010	0.018	0.023	0.028	0.036
			MXDCR		5							
			MXDCL		12							

Drills - Technical Information  
Series MPDCS / MXDCR / MXDCL

### 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.

# Twister® XD High Performance Drills - 12<sup>+</sup>xD

## Series 2XDCEM Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio raccomandati | Zalecane dane o cięciu (Zalecane parametry skrawania)

Workpiece Material Groups	Vc (m/min)	Tool Diameter (mm)									
		3	4	5	6	7	8	9	10	12	
		Feed (mm/rev)									
Low Carbon Steel <0.3%C	105	0.05	0.075	0.088	0.106	0.127	0.193	0.215	0.238	0.254	
Structural Steel	120	0.05	0.075	0.088	0.106	0.127	0.193	0.215	0.238	0.254	
Medium Carbon Steel	80	0.05	0.075	0.088	0.106	0.127	0.193	0.215	0.238	0.254	
Tool & Die Steel	80	0.05	0.075	0.088	0.106	0.127	0.193	0.215	0.238	0.254	
Alloy Steel	80	0.05	0.075	0.088	0.106	0.127	0.193	0.215	0.238	0.254	
Grey Cast Iron	120	0.06	0.078	0.1	0.12	0.14	0.2	0.215	0.24	0.254	
Ductile Cast Iron	80	0.06	0.078	0.1	0.12	0.14	0.2	0.215	0.24	0.254	
Austenitic Stainless	55	0.05	0.071	0.09	0.105	0.127	0.193	0.215	0.238	0.254	
Ph Stainless	40	0.05	0.071	0.09	0.105	0.127	0.193	0.215	0.238	0.254	
Martensitic Stainless	40	0.05	0.071	0.09	0.105	0.127	0.193	0.215	0.238	0.254	
Ferritic Stainless	75	0.05	0.071	0.09	0.105	0.127	0.193	0.215	0.238	0.254	
High Temp Alloys	20-25	0.017	0.022	0.03	0.035	0.048	0.063	0.071	0.078	0.085	
Titanium Alloys	45	0.03	0.04	0.05	0.06	0.071	0.12	0.127	0.14	0.152	
Hardened Steel (35-45 Hrc)	35	0.012	0.015	0.02	0.022	0.027	0.048	0.053	0.06	0.066	
Hardened Steel (46-55 Hrc)	25	0.012	0.015	0.02	0.022	0.027	0.048	0.053	0.06	0.066	
Non Ferrous-Al<14%Si	150	0.083	0.11	0.14	0.17	0.195	0.28	0.314	0.35	0.378	
Non Ferrous-Al>14%Si	105	0.083	0.11	0.14	0.17	0.195	0.28	0.314	0.35	0.378	
Non Ferrous-Brass	120	0.053	0.071	0.088	0.106	0.127	0.279	0.314	0.35	0.378	
Cu/Cu Alloys/Magnesium	90	0.053	0.071	0.088	0.106	0.127	0.279	0.314	0.35	0.378	

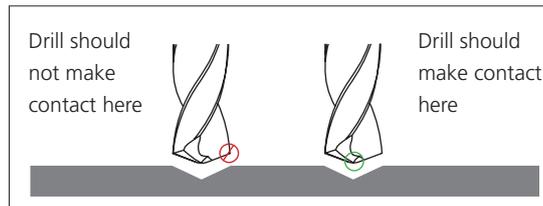
 RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$ 

 Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$

## Twister® 2XDCEM, MXDCL & CXDCLM 15X

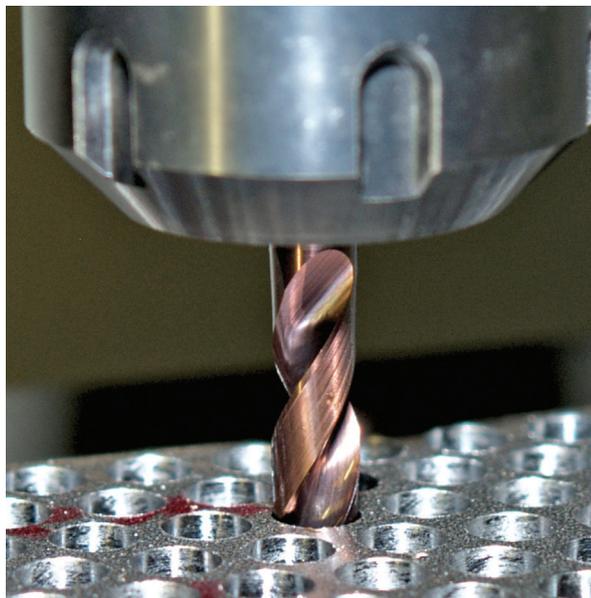
### Process For Successful Deep Hole Drilling:

1. Start by producing a 1.5 x diameter to 3 x diameter pilot hole using a coolant or non-coolant pilot drill. Typically this tool will have a point angle the same as or greater than the deep hole drill. Run this drill at 100% of the final drill speed and 1/2 the normal IPM.
2. Retract and tool change to the final deep hole (2XDCE MA Ford® Series) drill.
3. Rapid to clearance plane and enter the pilot hole at 25% (don't exceed 400 to 500 RPM) of the final speed and 25 - 50 mm/min. This will help with true position by eliminating drill whip. Once into the hole, turn on the coolant and advance to the material start. At this point, you can add a dwell to clear any chips that have been left from the previous drill and let the spindle get to full speed. Increase the speed and feed to final drilling parameters.
4. Drill one shot to the final hole depth or through.
5. Should you experience any squeaking you may need to retract the drill and increase your feed. Chip packing is occurring and will need to be addressed.
6. Once through the material, it may be necessary to reduce the RPM to eliminate breakage of the drill due to drill whip. Then retract to the clearance plane.



### Machine Requirements

High Pressure Pump System (70 Bar)  
Machine runout of 0.008mm Max.



Due to the conditions of equipment, tool holders, and conditions beyond MA Ford®'s control, your results may vary.

Should your application require more in depth discussion or a special tool, please contact M.A. Ford®'s Application Engineering Department at +44(0) 1332 267960.

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

# CYCLONE CDA High Performance Aluminium Drill - 5xD

## Series CDACRM Aluminium Drill Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio raccomandati | Zalecane dane o cięciu (Zalecane parametry skrawania)

Work piece Material Group	ISO	Hardness	vc - m/min			Drill Diameter (mm)						
			Min	Starting Value	Max	3.0	4.0	6.0	8.0	10.0	12.0	
						f - mm/Rev						
Aluminium & Aluminium Wrought Alloys	N	10	60-100 Brinell HB	120	230	450	0.13-0.25	0.14-0.29	0.17-0.35	0.21-0.42	0.27-0.50	0.33-0.57
Cast Aluminium Alloys		20	75-90 Brinell HB	120	220	350	0.14-0.23	0.15-0.28	0.17-0.34	0.22-0.39	0.29-0.46	0.34-0.54
Aluminium Alloys Cast 13-22% Si		30		100	180	400	0.13-0.18	0.14-0.19	0.16-0.25	0.20-0.30	0.28-0.37	0.33-0.24
Copper and Copper Alloys Brass, Bronze, Copper		40	90-110 Brinell HB	100	130	300	0.10-0.16	0.12-0.18	0.14-0.24	0.16-0.28	0.18-0.32	0.20-0.36



# CYCLONE CXD High Performance Drill - Series CXDCEM 15xD

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

Workpiece Material Group	ISO	Hardness	TYPE	DEPTH	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, 12L13, 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		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, S2100, 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		15X	35	.012	.016	.020	.022	.027	.046	.053	.060	.066
Hardened Steels		45-55 Rc			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		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, Nitronics	M	over 28 Rc		15X	40	.053	.070	.090	.105	.127	.193	.215	.238	.254
High Temp Alloys Nimonic, Inconel®, Monel, Hastelloy	S	up to 42 Rc		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-6Cr-4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc		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		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		15X	80	.053	.070	.100	.120	.140	.200	.215	.240	.254



Drills - Technical Information  
Series CXDCEM

### 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.



## Recommended Cutting Data CXD ≤ 6mm - Metric

Conditions de coupe recommandées CXD ≤ 6mm - Métrique

Empfohlene Schnittdaten CXD ≤ 6 mm - metrisch

Dati di taglio raccomandati CXD ≤ 6mm - Metrici

Zalecane dane o cięciu (Zalacane parametry skrawania) CXD ≤ 6 mm - metryczne

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter (mm)				Drill Diameter (mm)			
						3	4	5	6	3	4	5	6
						vc - m/min				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	CXDSS		3	119	116	113	110	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	119	116	113	110				
			CXDSCS		3	201	198	195	192	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSCR		5	201	198	195	192				
			CXDCL		8	181	177	171	165				
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 38 Rc	CXDSS		3	101	98	94	91	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	101	98	94	91				
			CXDSCS		3	175	168	165	152	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSCR		5	175	168	165	152				
			CXDCL		8	131	128	125	122				
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 44 Rc	CXDSS		3	61	58	58	56	.036-.076	.061-.102	.076-.127	.089-.152
			CXDSR		5	61	58	58	56				
			CXDSCS		3	76	73	70	67	.036-.076	.061-.102	.076-.127	.089-.152
			CXDSCR		5	76	73	70	67				
			CXDCL		8	69	67	66	62				
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	CXDSS		3	107	104	101	98	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	107	104	101	98				
			CXDSCS		3	168	152	145	137	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSCR		5	168	152	145	137				
			CXDCL		8	137	130	122	116				
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	CXDSS		3	43	41	40	38	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	43	41	40	38				
			CXDSCS		3	91	88	85	82	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSCR		5	91	88	85	82				
			CXDCL		8	85	82	79	76				
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	CXDSS		3	43	40	37	34	.051-.076	.061-.089	.089-.102	.076-.127
			CXDSR		5	43	40	37	34				
			CXDSCS		3	81	76	73	70	.051-.076	.061-.089	.089-.102	.076-.127
			CXDSCR		5	81	76	73	70				
			CXDCL		8	58	55	52	49				
High Temp Alloys Nimonic, Inconel, Monel, Hastelloy	S	up to 42 Rc	CXDSS		3	26	24	23	21	.036-.089	.036-.089	.051-.102	.061-.127
			CXDSR		5	26	24	23	21				
			CXDSCS		3	35	30	29	27	.036-.089	.036-.089	.051-.102	.061-.127
			CXDSCR		5	35	30	29	27				
			CXDCL		8	30	30	29	29				
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	CXDSS		3	40	38	37	35	.076-.102	.102-.152	.127-.178	.140-.229
			CXDSR		5	40	38	37	35				
			CXDSCS		3	70	67	64	61	.076-.102	.102-.152	.127-.178	.140-.229
			CXDSCR		5	70	67	64	61				
			CXDCL		8	64	58	55	52				
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	CXDSS		3	146	143	140	131	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	146	143	140	131				
			CXDSCS		3	201	195	189	183	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSCR		5	201	195	189	183				
			CXDCL		8	152	149	146	143				
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	CXDSS		3	85	82	79	76	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSR		5	85	82	79	76				
			CXDSCS		3	122	146	140	134	.076-.127	.102-.152	.127-.178	.127-.203
			CXDSCR		5	122	146	140	134				
			CXDCL		8	107	104	101	98				



Recommended Cutting Data CXD ≤ 8mm - Metric

Conditions de coupe recommandées CXD ≤ 8mm - Métrique  
Empfohlene Schnittdaten CXD ≤ 8 mm – metrisch  
Dati di taglio raccomandati CXD ≤ 8mm - Metrici  
Zalecane dane o cięciu (Zalecane parametry skrawania) CXD ≤ 8 mm – metryczne

Workpiece Material Group	ISO	Hardness	Tool Series	TYPE	DEPTH	Drill Diameter (mm)							Drill Diameter (mm)						
						8	10	12	14	16	18	20	8	10	12	14	16	18	20
						vc - m/min							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	CXDSS		3	107	104	98	91	84	81	77	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDSR		5	107	104	98	91	84	81								
			CXDCS		3	189	183	175	168	160	152								
			CXDRC		5	189	183	175	168	160	152	145	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	158	152	146	140	134									
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 38 Rc	CXDSS		3	88	85	82	81	79	79	75	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDSR		5	88	85	82	81	79	79								
			CXDCS		3	145	137	130	122	99	96								
			CXDRC		5	145	137	130	122	99	96	92	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	114	107	99	93	76									
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 44 Rc	CXDSS		3	56	55	55	53	53	52	49	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDSR		5	56	55	55	53	53	52								
			CXDCS		3	64	64	61	61	58	58								
			CXDRC		5	64	64	61	61	58	58	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	61	58	58	58	55									
Stainless Steel - Easy to Machine 430F, 301, 303, 410, 416 Annealed, 420F, 430	M	up to 28 Rc	CXDSS		3	94	91	84	76	69	61	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	94	91	84	76	69	61								
			CXDCS		3	122	119	116	113	101	98								
			CXDRC		5	122	119	116	113	101	98	94	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	114	113	107	104	91									
Stainless Steel - Moderately Difficult 301, 302, 303 High Tensile, 304, 304L, 305, 420, 15-5PH, 17-4PH, 17-7PH	M	up to 28 Rc	CXDSS		3	37	35	34	32	30	29	28	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	37	35	34	32	30	29								
			CXDCS		3	79	76	73	73	70	67								
			CXDRC		5	79	76	73	73	70	67	64	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	73	70	67	67	64									
Stainless Steel - Difficult to Machine 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	M	over 28 Rc	CXDSS		3	34	32	32	30	30	29	27	.11-.15	.13-.23	.18-.25	.21-.27	.22-.31	.25-.33	.30-.37
			CXDSR		5	34	32	32	30	30	29								
			CXDCS		3	67	61	58	55	52	47								
			CXDRC		5	67	61	58	55	52	47	45	.11-.15	.13-.23	.18-.25	.21-.27	.22-.31	.25-.33	.30-.37
			CXDCL		8	46	43	40	38	36									
High Temp Alloys Nimonic, Inconel, Monel, Hastelloy	S	up to 42 Rc	CXDSS		3	20	18	17	15	14	12	11	.08-.13	.11-.15	.12-.17	.14-.19	.16-.21	.18-.25	.17-.24
			CXDSR		5	20	18	17	15	14	12								
			CXDCS		3	26	26	24	24	23	23								
			CXDRC		5	26	26	24	24	23	23	22	.09-.13	.11-.15	.12-.17	.14-.19	.16-.21	.18-.25	.17-.24
			CXDCL		8	24	24	23	23	21									
Titanium Alloys 6Al-4V, 5Al-2.5 Sn, 6Al-2 Sn-4Zr-6Mo, 3Al-8V-6Cr-4Mo-4Zr, 10V-2Fe-3Al, 13V-11Cr-3Al	S	up to 42 Rc	CXDSS		3	34	32	30	30	27	27	25	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	34	32	30	30	27	27								
			CXDCS		3	55	55	52	49	46	46								
			CXDRC		5	55	55	52	49	46	46	44	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDCL		8	49	46	43	40	38									
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	CXDSS		3	125	122	119	113	110	107	102	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	125	122	119	113	110	107								
			CXDCS		3	177	171	168	168	160	152								
			CXDRC		5	177	171	168	168	160	152	145	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	140	137	134	134	128									
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	CXDSS		3	73	70	67	64	61	58	55	.16-.24	.18-.27	.21-.31	.22-.35	.25-.36	.28-.38	.30-.37
			CXDSR		5	73	70	67	64	61	58								
			CXDCS		3	122	114	107	91	84	76								
			CXDRC		5	122	114	107	91	84	76	72	.16-.24	.18-.27	.21-.31	.22-.35	.25-.35	.28-.38	.30-.37
			CXDCL		8	91	82	76	67	61									

Drills - Technical Information  
Series CXD





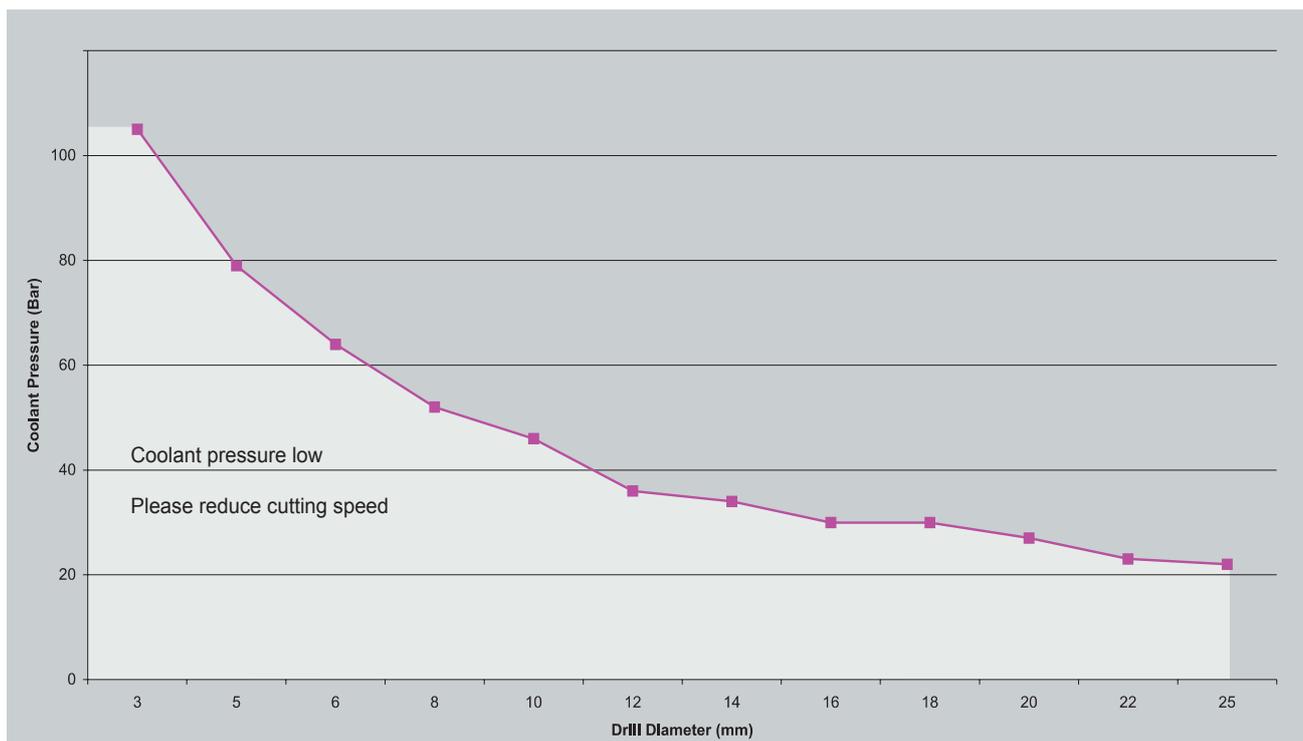
## Drill Troubleshooting

Dépannage Foret | Fehlerbehebung Bohrer | Risoluzione dei problemi relativi alla foratura | Diagnostowanie usterek wiertel

Possible Solutions	Problem																															
	Tool Deterioration										Chip Formation			Tool Life	Workpiece					Process												
	Flank wear	Margin wear	Breakage	Flaking	Creater wear	Chisel edge wear	Corner chipping	Flute chipping	Cutting edge chipping	Cutting edge wear	Point center chipping	Rake face	Scoring on tool body	Long stringy	Varied chip form	Blue/brown chips	Tool Life	Undersized hole	Oversized hole	Poor alignment	Poor surface finish	Heavy burr breakout	Retract marks	Hole location	Hole straightness	Deflection	Point Deflection	Galling	Vibration	Abnormal noise	Chip packing	No drill penetration
Reduce feed or reduce at exit	x		x			x	x	x	x		x	x	x				x	x	x		x	x			x							x
Reduce feed at entrance			x																x		x			x								x
Consistent feed rate			x										x	x															x		x	
Increase feed	x					x							x					x	x													
Reduce speed	x	x			x	x			x								x	x										x		x	x	
Increase speed																					x											
Coolant mix		x	x	x				x				x					x	x		x	x										x	
Coolant increase flow	x	x				x	x	x								x	x	x		x	x										x	
Coolant filter	x	x	x					x									x	x		x	x										x	
Workpiece clamp rigid		x	x			x	x	x				x					x		x	x	x	x	x	x	x						x	
Collet accuracy			x					x											x						x	x				x		
Tool holder fit .0008			x					x											x					x	x					x		
Alignment			x					x											x												x	
Peck drill			x																													
Concentricity		x	x	x				x	x				x							x	x			x	x	x		x		x		
Do not extract tool during peck								x																								

## Recommended Minimum Coolant Pressure

Pression minimale recommandée pour le liquide de coupe | Empfohlener Minstdruck für Kühlmittel  
Pressione minima del refrigerante consigliata | Zalecane minimalne ciśnienia chłodziwa





# Twister®

## Solid Carbide Drills

### General Purpose Drills

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

EN

Our FordMax drills range is one of the most comprehensive available and covering high-precision micro and circuit board drills up to high performance, large diameter drills for machining aluminium, stainless steel and exotic alloys, as well as our HSSCo Platinum drills for steel, stainless steels, copper and aluminium.

FR

Notre gamme de forets FordMax est l'une des plus complètes, disponibles sur le marché, elle couvre depuis les forets de grande précision et forets pour circuit imprimé jusqu'aux forets haute performance, une gamme large de diamètres pour l'usinage de l'aluminium, de l'acier inoxydable et des alliages exotiques, aussi bien que nos forets en Platinum HSSCo pour l'acier, l'acier inoxydable, le cuivre et l'aluminium.

DE

Unser Sortiment der FordMax-Bohrer gehört zu den umfangreichsten, auf dem Markt erhältlichen Produktpaletten. Es umfasst Hochpräzisions-Mikrobohrer und Bohrer für Leiterplatten sowie Hochleistungsbohrer, Bohrer mit großem Durchmesser zur Bearbeitung von Aluminium, Edelstahl und Sonderlegierungen sowie unsere HSSCo-Platinbohrer für Stahl, rostfreien Stahl, Kupfer und Aluminium.

IT

La nostra gamma di punte FordMax è una tra le più complete e comprende, tra l'altro, micropunte ad alta precisione e per circuiti stampati, punte ad elevate prestazioni, punte di grandi diametri per lavorazioni di alluminio, acciaio inossidabile e materiali esotici. La serie Platinum in HSSCo è idonea per acciaio, acciaio inossidabile, rame e alluminio.

PL

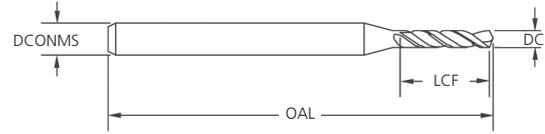
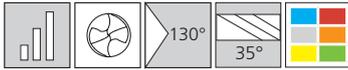
Zakres wiertel FordMax jest jednym z najbardziej wszechstronnych i dostępnych. Obejmuje precyzyjne i wysokowydajne mikro wiertła i wiertła z płytkami lutowanymi o szerokim zakresie średnic do obróbki aluminium, stali nierdzewnej i stopów egzotycznych, a także wiertła HSSCo Platinum do stali, stali nierdzewnych, miedzi i aluminium.

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Drills  
FORDMAX

# Twister® Micro Drill Series 302 Uncoated

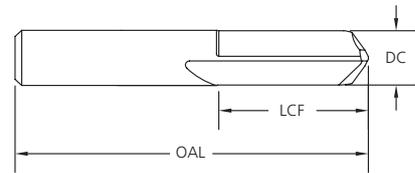
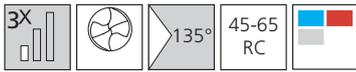


Series 302	Drill Dimensions			
Tool No	Ø DC	Ø DCONMS	OAL	LCF
302 0010	0.1	3.175	38.1	1.7
302 0015	0.15	3.175	38.1	2.5
302 0020	0.2	3.175	38.1	3.2
302 0025	0.25	3.175	38.1	3.8
302 0030	0.3	3.175	38.1	5.0
302 0035	0.35	3.175	38.1	5.0
302 0035-1	0.35	3.175	38.1	6.0
302 0040	0.4	3.175	38.1	5.0
302 0040-1	0.4	3.175	38.1	6.0
302 0045	0.45	3.175	38.1	5.0
302 0045-1	0.45	3.175	38.1	6.0
302 0045-2	0.45	3.175	38.1	8.0
302 0050	0.5	3.175	38.1	5.0
302 0050-1	0.5	3.175	38.1	6.0
302 0050-2	0.5	3.175	38.1	8.0
302 0055	0.55	3.175	38.1	5.0
302 0055-1	0.55	3.175	38.1	6.0
302 0055-2	0.55	3.175	38.1	8.0
302 0060	0.6	3.175	38.1	5.0
302 0060-1	0.6	3.175	38.1	6.0
302 0060-2	0.6	3.175	38.1	8.0
302 0065	0.65	3.175	38.1	5.0
302 0065-1	0.65	3.175	38.1	6.0
302 0065-2	0.65	3.175	38.1	8.0
302 0070	0.7	3.175	38.1	6.0
302 0070-1	0.7	3.175	38.1	8.0
302 0070-2	0.7	3.175	38.1	10.2
302 0075	0.75	3.175	38.1	6.0
302 0075-1	0.75	3.175	38.1	8.0
302 0075-2	0.75	3.175	38.1	10.2
302 0080	0.8	3.175	38.1	6.0
302 0080-1	0.8	3.175	38.1	10.2
302 0085	0.85	3.175	38.1	6.0
302 0085-1	0.85	3.175	38.1	10.2
302 0090	0.9	3.175	38.1	10.2
302 0095	0.95	3.175	38.1	10.2
302 0100	1.0	3.175	38.1	10.2
302 0105	1.05	3.175	38.1	10.2
302 0110	1.1	3.175	38.1	10.2
302 0115	1.15	3.175	38.1	10.2

Series 302	Drill Dimensions			
Tool No	Ø DC	Ø DCONMS	OAL	LCF
302 0120	1.2	3.175	38.1	10.2
302 0125	1.25	3.175	38.1	10.2
302 0130	1.3	3.175	38.1	10.2
302 0135	1.35	3.175	38.1	10.2
302 0140	1.4	3.175	38.1	10.2
302 0145	1.45	3.175	38.1	10.2
302 0150	1.5	3.175	38.1	10.2
302 0155	1.55	3.175	38.1	10.2
302 0160	1.6	3.175	38.1	10.2
302 0165	1.65	3.175	38.1	10.2
302 0170	1.7	3.175	38.1	10.2
302 0175	1.75	3.175	38.1	10.2
302 0180	1.8	3.175	38.1	10.2
302 0185	1.85	3.175	38.1	10.2
302 0190	1.9	3.175	38.1	10.2
302 0195	1.95	3.175	38.1	10.2
302 0200	2.0	3.175	38.1	10.2
302 0205	2.05	3.175	38.1	10.2
302 0210	2.1	3.175	38.1	10.2
302 0215	2.15	3.175	38.1	10.2
302 0220	2.2	3.175	38.1	10.2
302 0225	2.25	3.175	38.1	10.2
302 0230	2.3	3.175	38.1	10.2
302 0235	2.35	3.175	38.1	10.2
302 0240	2.4	3.175	38.1	10.2
302 0245	2.45	3.175	38.1	10.2
302 0250	2.5	3.175	38.1	10.2
302 0255	2.55	3.175	38.1	10.2
302 0260	2.6	3.175	38.1	10.2
302 0265	2.65	3.175	38.1	10.2
302 0270	2.7	3.175	38.1	10.2
302 0275	2.75	3.175	38.1	10.2
302 0280	2.8	3.175	38.1	10.2
302 0285	2.85	3.175	38.1	10.2
302 0290	2.9	3.175	38.1	10.2
302 0295	2.95	3.175	38.1	10.2
302 0300	3.0	3.175	38.1	10.2
302 0305	3.05	3.175	38.1	10.2
302 0310	3.1	3.175	38.1	10.2
302 0315	3.15	3.175	38.1	10.2

 Drills  
 Series 302 Uncoated


# Twister® Hi-Roc® Drill - 3xD Series 200 Uncoated

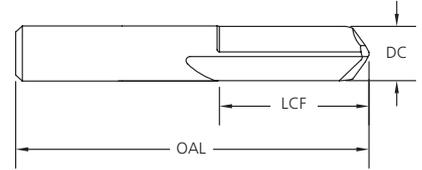
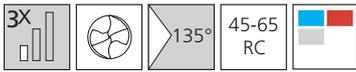


Series 200	Drill Dimensions		
Tool No	Ø DC	OAL	LCF
200 0080	0.8	38.0	5.0
200 0085	0.85	38.0	5.5
200 0090	0.9	38.0	5.5
200 0095	0.95	38.0	6.0
200 0100	1.0	38.0	6.5
200 0105	1.05	38.0	6.5
200 0110	1.1	38.0	6.5
200 0115	1.15	38.0	6.5
200 0120	1.2	38.0	8.0
200 0125	1.25	38.0	8.0
200 0130	1.3	38.0	8.0
200 0135	1.35	38.0	8.0
200 0140	1.4	38.0	8.0
200 0145	1.45	38.0	8.0
200 0150	1.5	38.0	8.0
200 0160	1.6	38.0	8.0
200 0170	1.7	38.0	9.5
200 0180	1.8	38.0	9.5
200 0190	1.9	38.0	9.5
200 0200	2.0	38.0	9.5
200 0210	2.1	38.0	12.5
200 0220	2.2	38.0	12.5
200 0230	2.3	38.0	12.5
200 0240	2.4	38.0	12.5
200 0250	2.5	38.0	12.5
200 0260	2.6	38.0	16.0
200 0270	2.7	38.0	16.0
200 0280	2.8	38.0	16.0
200 0290	2.9	38.0	16.0
200 0300	3.0	38.0	16.0
200 0310	3.1	38.0	16.0
200 0320	3.2	38.0	16.0
200 0330	3.3	38.0	16.0
200 0340	3.4	51.0	16.0
200 0350	3.5	51.0	16.0
200 0360	3.6	51.0	16.0
200 0370	3.7	51.0	16.0
200 0380	3.8	51.0	16.0
200 0390	3.9	51.0	16.0
200 0400	4.0	51.0	16.0
200 0410	4.1	51.0	16.0
200 0420	4.2	51.0	16.0
200 0430	4.3	51.0	16.0
200 0440	4.4	51.0	16.0
200 0450	4.5	51.0	16.0

Series 200	Drill Dimensions		
Tool No	Ø DC	OAL	LCF
200 0460	4.6	51.0	16.0
200 0470	4.7	51.0	16.0
200 0480	4.8	51.0	16.0
200 0490	4.9	51.0	16.0
200 0500	5.0	51.0	19.0
200 0510	5.1	51.0	19.0
200 0520	5.2	51.0	19.0
200 0530	5.3	51.0	19.0
200 0540	5.4	51.0	19.0
200 0550	5.5	51.0	19.0
200 0560	5.6	51.0	19.0
200 0570	5.7	51.0	19.0
200 0580	5.8	51.0	19.0
200 0590	5.9	51.0	19.0
200 0600	6.0	51.0	19.0
200 0610	6.1	51.0	19.0
200 0620	6.2	51.0	19.0
200 0630	6.3	51.0	19.0
200 0640	6.4	51.0	19.0
200 0650	6.5	51.0	19.0
200 0660	6.6	64.0	19.0
200 0670	6.7	64.0	19.0
200 0680	6.8	64.0	19.0
200 0690	6.9	64.0	19.0
200 0700	7.0	64.0	19.0
200 0710	7.1	64.0	19.0
200 0720	7.2	64.0	19.0
200 0730	7.3	64.0	19.0
200 0740	7.4	64.0	19.0
200 0750	7.5	64.0	19.0
200 0760	7.6	64.0	19.0
200 0770	7.7	64.0	19.0
200 0780	7.8	64.0	19.0
200 0790	7.9	64.0	19.0
200 0800	8.0	64.0	19.0
200 0810	8.1	64.0	19.0
200 0820	8.2	64.0	25.5
200 0830	8.3	64.0	25.5
200 0840	8.4	64.0	25.5
200 0850	8.5	64.0	25.5
200 0860	8.6	64.0	25.5
200 0870	8.7	64.0	25.5
200 0880	8.8	64.0	25.5
200 0890	8.9	64.0	25.5
200 0900	9.0	64.0	25.5

Drills  
Series 200 Uncoated

# Twister® Hi-Roc® Drill - 3xD Series 200 Uncoated



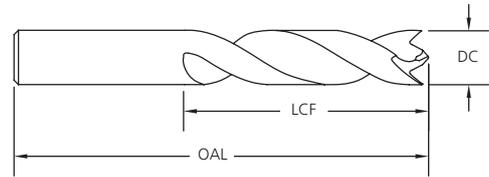
Series 200	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
200 0910	9.1	64.0	25.5
200 0920	9.2	64.0	25.5
200 0930	9.3	64.0	25.5
200 0940	9.4	64.0	25.5
200 0950	9.5	64.0	25.5
200 0960	9.6	64.0	25.5
200 0970	9.7	70.0	25.5
200 0980	9.8	70.0	25.5
200 0990	9.9	70.0	25.5
200 1000	10.0	70.0	25.5
200 1010	10.1	70.0	25.5
200 1020	10.2	70.0	25.5
200 1030	10.3	70.0	25.5
200 1040	10.4	70.0	25.5
200 1050	10.5	70.0	25.5
200 1060	10.6	70.0	25.5
200 1070	10.7	70.0	25.5
200 1080	10.8	70.0	25.5
200 1090	10.9	70.0	25.5
200 1100	11.0	70.0	25.5
200 1110	11.1	70.0	25.5
200 1120	11.2	70.0	25.5
200 1130	11.3	76.0	25.5

Series 200	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
200 1140	11.4	76.0	25.5
200 1150	11.5	76.0	25.5
200 1160	11.6	76.0	25.5
200 1170	11.7	76.0	25.5
200 1180	11.8	76.0	25.5
200 1190	11.9	76.0	25.5
200 1200	12.0	76.0	25.5
200 1250	12.5	76.0	25.5
200 1300	13.0	89.0	28.5
200 1350	13.5	89.0	28.5
200 1400	14.0	89.0	28.5
200 1450	14.5	89.0	32.0
200 1500	15.0	89.0	32.0
200 1550	15.5	89.0	32.0
200 1600	16.0	89.0	32.0
200 1650	16.5	102.0	38.0
200 1700	17.0	102.0	38.0
200 1750	17.5	102.0	38.0
200 1800	18.0	102.0	38.0
200 1850	18.5	102.0	38.0
200 1900	19.0	102.0	38.0
200 2000	20.0	102.0	38.0

**Drills**  
 Series 200 Uncoated



# Twister® Kevlar/Composite Drill - 3xD Series 207 Uncoated



Series 207		Drill Dimensions		
Tool No.	Stk	Ø DC	OAL	LCF
207 0400	○	4.0	54.0	22.0
207 0500	○	5.0	57.0	25.5
207 0600	○	6.0	64.0	32.0
207 0640	○	6.4	64.0	32.0
207 0700	○	7.0	68.0	35.0
207 0800	○	8.0	71.0	38.0

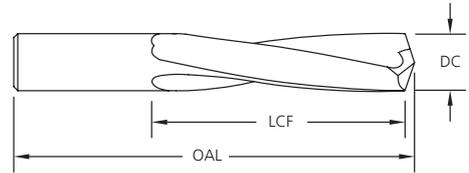
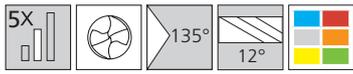
Series 207		Drill Dimensions		
Tool No.	Stk	Ø DC	OAL	LCF
207 0900	○	9.0	78.0	39.5
207 0950	○	9.5	79.0	41.5
207 1050	○	10.5	86.0	46.0
207 1100	○	11.0	87.0	47.5
207 1150	○	11.5	92.0	51.0
207 1200	○	12.0	94.0	54.0

● Stock ○ Check Availability



Drills  
Series 207 Uncoated

# Twister® Hi-Tuff® Drill - 5xD Series 205 Uncoated

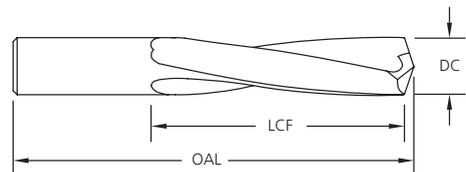


Series 205	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
205 0030	0.3	38.0	5.0
205 0035	0.35	38.0	5.0
205 0040	0.4	38.0	5.0
205 0045	0.45	38.0	5.0
205 0050	0.5	38.0	6.5
205 0055	0.55	38.0	6.5
205 0060	0.6	38.0	6.5
205 0065	0.65	38.0	8.0
205 0070	0.7	38.0	8.0
205 0075	0.75	38.0	8.0
205 0080	0.8	38.0	9.5
205 0085	0.85	38.0	9.5
205 0090	0.9	38.0	11.0
205 0095	0.95	38.0	11.0
205 0100	1.0	38.0	12.5
205 0105	1.05	38.0	12.5
205 0110	1.1	38.0	12.5
205 0115	1.15	38.0	12.5
205 0120	1.2	38.0	12.5
205 0125	1.25	41.0	16.0
205 0130	1.3	41.0	16.0
205 0135	1.35	41.0	16.0
205 0140	1.4	41.0	16.0
205 0145	1.45	41.0	16.0
205 0150	1.5	41.0	16.0
205 0160	1.6	41.0	16.0
205 0170	1.7	43.0	17.5
205 0180	1.8	43.0	17.5
205 0190	1.9	43.0	17.5
205 0200	2.0	44.0	19.0
205 0210	2.1	44.0	19.0
205 0220	2.2	44.0	19.0
205 0230	2.3	44.0	19.0
205 0240	2.4	44.0	19.0
205 0250	2.5	46.0	21.0
205 0260	2.6	46.0	20.5
205 0270	2.7	46.0	20.5
205 0280	2.8	48.0	22.0
205 0290	2.9	48.0	22.0
205 0300	3.0	48.0	22.0
205 0310	3.1	48.0	22.0
205 0320	3.2	48.0	22.0
205 0330	3.3	49.0	24.0
205 0340	3.4	49.0	24.0
205 0350	3.5	49.0	24.0

Series 205	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
205 0360	3.6	49.0	24.0
205 0370	3.7	52.0	25.5
205 0380	3.8	52.0	25.5
205 0390	3.9	52.0	25.5
205 0400	4.0	54.0	27.0
205 0410	4.1	54.0	27.0
205 0420	4.2	54.0	27.0
205 0430	4.3	54.0	27.0
205 0440	4.4	56.0	28.5
205 0450	4.5	56.0	28.5
205 0460	4.6	56.0	28.5
205 0470	4.7	57.0	30.0
205 0480	4.8	57.0	30.0
205 0490	4.9	57.0	30.0
205 0500	5.0	57.0	30.0
205 0510	5.1	57.0	30.0
205 0520	5.2	60.0	32.0
205 0530	5.3	60.0	32.0
205 0540	5.4	60.0	32.0
205 0550	5.5	60.0	32.0
205 0560	5.6	62.0	33.4
205 0570	5.7	62.0	33.4
205 0580	5.8	62.0	33.4
205 0590	5.9	62.0	33.4
205 0600	6.0	64.0	35.0
205 0610	6.1	64.0	35.0
205 0620	6.2	64.0	35.0
205 0630	6.3	64.0	35.0
205 0640	6.4	64.0	35.0
205 0650	6.5	67.0	36.5
205 0660	6.6	67.0	36.5
205 0670	6.7	67.0	38.0
205 0680	6.8	68.0	38.0
205 0690	6.9	68.0	38.0
205 0700	7.0	68.0	38.0
205 0710	7.1	68.0	38.0
205 0720	7.2	68.0	38.0
205 0730	7.3	68.0	38.0
205 0740	7.4	70.0	39.5
205 0750	7.5	70.0	39.5
205 0760	7.6	70.0	39.5
205 0770	7.7	71.0	41.5
205 0780	7.8	71.0	41.5
205 0790	7.9	71.0	41.5
205 0800	8.0	71.0	41.5

Drills  
Series 205 Uncoated

# Twister® Hi-Tuff® Drill - 5xD Series 205 Uncoated



Series 205	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
205 0810	8.1	75.0	43.0
205 0820	8.2	75.0	43.0
205 0830	8.3	75.0	43.0
205 0840	8.4	75.0	43.0
205 0850	8.5	75.0	43.0
205 0860	8.6	75.0	43.0
205 0870	8.7	75.0	43.0
205 0880	8.8	75.0	43.0
205 0890	8.9	78.0	44.5
205 0900	9.0	78.0	44.5
205 0910	9.1	78.0	44.5
205 0920	9.2	78.0	44.5
205 0930	9.3	79.0	46.0
205 0940	9.4	79.0	46.0
205 0950	9.5	79.0	46.0
205 0960	9.6	83.0	47.5
205 0970	9.7	83.0	47.5
205 0980	9.8	83.0	47.5
205 0990	9.9	83.0	47.5
205 1000	10.0	84.0	49.0
205 1010	10.1	84.0	49.0
205 1020	10.2	84.0	49.0
205 1030	10.3	84.0	49.0
205 1040	10.4	84.0	49.0
205 1050	10.5	86.0	51.0
205 1060	10.6	86.0	51.0
205 1070	10.7	86.0	51.0
205 1080	10.8	86.0	51.0

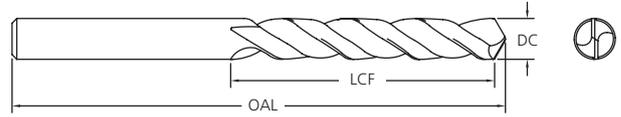
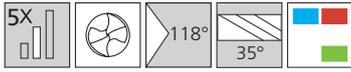
Series 205	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
205 1090	10.9	87.0	52.5
205 1100	11.0	87.0	52.5
205 1110	11.1	87.0	52.5
205 1120	11.2	92.0	54.0
205 1130	11.3	92.0	54.0
205 1140	11.4	92.0	54.0
205 1150	11.5	92.0	54.0
205 1160	11.6	92.0	54.0
205 1170	11.7	92.0	54.0
205 1180	11.8	92.0	54.0
205 1190	11.9	92.0	54.0
205 1200	12.0	94.0	55.5
205 1250	12.5	95.0	57.0
205 1300	13.0	98.0	60.5
205 1350	13.5	102.0	63.5
205 1400	14.0	102.0	63.5
205 1450	14.5	105.0	66.5
205 1500	15.0	105.0	66.5
205 1550	15.5	108.0	70.0
205 1600	16.0	108.0	70.0
205 1650	16.5	114.0	73.0
205 1700	17.0	117.0	73.0
205 1750	17.5	121.0	76.0
205 1800	18.0	121.0	76.0
205 1850	18.5	127.0	79.5
205 1900	19.0	127.0	79.5
205 2000	20.0	133.0	82.5



Drills  
Series 205 Uncoated



# Twister® Micro Drill 5xD Series 300 Uncoated



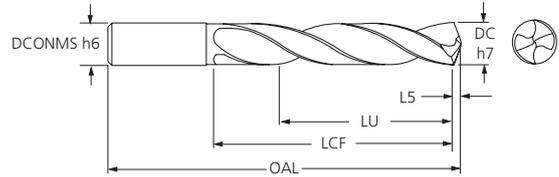
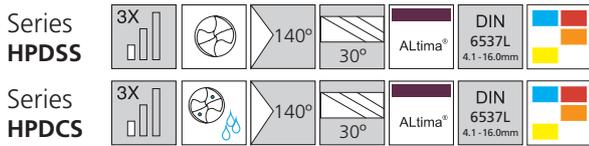
Drill Dimensions			
Tool No.	Ø DC	OAL	LCF
300 0050	0.5	38.0	9.5
300 0055	0.55	38.0	9.5
300 0060	0.6	38.0	9.5
300 0065	0.65	38.0	12.5
300 0070	0.7	38.0	12.5
300 0075	0.75	38.0	12.5
300 0080	0.8	38.0	12.5
300 0085	0.85	38.0	12.5
300 0090	0.9	38.0	16.0
300 0095	0.95	38.0	16.0
300 0100	1.0	38.0	16.0
300 0105	1.05	38.0	16.0
300 0110	1.1	38.0	16.0
300 0115	1.15	38.0	16.0
300 0120	1.2	38.0	16.0
300 0125	1.25	38.0	16.0
300 0130	1.3	38.0	16.0
300 0135	1.35	38.0	16.0
300 0140	1.4	38.0	16.0
300 0145	1.45	38.0	16.0
300 0150	1.5	38.0	16.0
300 0155	1.55	38.0	16.0
300 0160	1.6	38.0	16.0
300 0165	1.65	38.0	16.0
300 0170	1.7	38.0	16.0
300 0175	1.75	38.0	16.0
300 0180	1.8	38.0	16.0

Drill Dimensions			
Tool No.	Ø DC	OAL	LCF
300 0185	1.85	38.0	16.0
300 0190	1.9	38.0	16.0
300 0195	1.95	38.0	16.0
300 0200	2.0	38.0	16.0
300 0205	2.05	38.0	16.0
300 0210	2.1	38.0	16.0
300 0215	2.15	38.0	16.0
300 0220	2.2	38.0	16.0
300 0225	2.25	38.0	16.0
300 0230	2.3	38.0	16.0
300 0235	2.35	38.0	16.0
300 0240	2.4	38.0	16.0
300 0245	2.45	38.0	16.0
300 0250	2.5	38.0	16.0
300 0255	2.55	38.0	16.0
300 0260	2.6	38.0	16.0
300 0265	2.65	38.0	16.0
300 0270	2.7	38.0	16.0
300 0275	2.75	38.0	16.0
300 0280	2.8	38.0	16.0
300 0285	2.85	38.0	16.0
300 0290	2.9	38.0	16.0
300 0295	2.95	38.0	16.0
300 0300	3.0	38.0	16.0
300 0305	3.05	38.0	16.0
300 0310	3.1	38.0	16.0
300 0315	3.15	38.0	16.0

Drills  
Series 300 Uncoated



# Twister® HPD Performance Drills - 3xD Series HPDSS, HPDCS

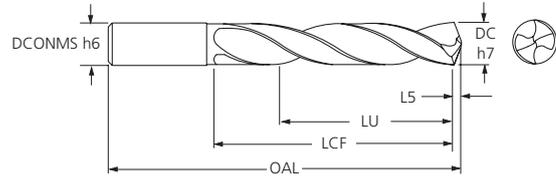
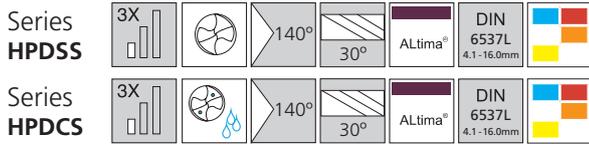


Series HPDSS	Series HPDCS	Tool Dimensions					
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
HPDSS 0300A	HPDCS 0300A	3.0	3.0	62.0	20.0	14.0	0.46
HPDSS 0310A	HPDCS 0310A	3.1	4.0	62.0	20.0	14.0	0.48
HPDSS 0320A	HPDCS 0320A	3.2	4.0	62.0	20.0	14.0	0.49
HPDSS 0330A	HPDCS 0330A	3.3	4.0	62.0	20.0	14.0	0.51
HPDSS 0340A	HPDCS 0340A	3.4	4.0	62.0	20.0	14.0	0.52
HPDSS 0350A	HPDCS 0350A	3.5	4.0	62.0	20.0	14.0	0.54
HPDSS 0360A	HPDCS 0360A	3.6	4.0	62.0	20.0	14.0	0.55
HPDSS 0370A	HPDCS 0370A	3.7	4.0	62.0	20.0	14.0	0.57
HPDSS 0380A	HPDCS 0380A	3.8	4.0	66.0	24.0	17.0	0.58
HPDSS 0390A	HPDCS 0390A	3.9	4.0	66.0	24.0	17.0	0.60
HPDSS 0400A	HPDCS 0400A	4.0	4.0	66.0	24.0	17.0	0.61
HPDSS 0410A	HPDCS 0410A	4.1	6.0	66.0	24.0	17.0	0.64
HPDSS 0420A	HPDCS 0420A	4.2	6.0	66.0	24.0	17.0	0.64
HPDSS 0430A	HPDCS 0430A	4.3	6.0	66.0	24.0	17.0	0.66
HPDSS 0440A	HPDCS 0440A	4.4	6.0	66.0	24.0	17.0	0.67
HPDSS 0450A	HPDCS 0450A	4.5	6.0	66.0	24.0	17.0	0.69
HPDSS 0460A	HPDCS 0460A	4.6	6.0	66.0	24.0	17.0	0.71
HPDSS 0470A	HPDCS 0470A	4.7	6.0	66.0	24.0	17.0	0.72
HPDSS 0480A	HPDCS 0480A	4.8	6.0	66.0	28.0	20.0	0.74
HPDSS 0490A	HPDCS 0490A	4.9	6.0	66.0	28.0	20.0	0.75
HPDSS 0500A	HPDCS 0500A	5.0	6.0	66.0	28.0	20.0	0.77
HPDSS 0510A	HPDCS 0510A	5.1	6.0	66.0	28.0	20.0	0.78
HPDSS 0520A	HPDCS 0520A	5.2	6.0	66.0	28.0	20.0	0.80
HPDSS 0530A	HPDCS 0530A	5.3	6.0	66.0	28.0	20.0	0.81
HPDSS 0540A	HPDCS 0540A	5.4	6.0	66.0	28.0	20.0	0.83
HPDSS 0550A	HPDCS 0550A	5.5	6.0	66.0	28.0	20.0	0.84
HPDSS 0560A	HPDCS 0560A	5.6	6.0	66.0	28.0	20.0	0.86
HPDSS 0570A	HPDCS 0570A	5.7	6.0	66.0	28.0	20.0	0.87
HPDSS 0580A	HPDCS 0580A	5.8	6.0	66.0	28.0	20.0	0.89
HPDSS 0590A	HPDCS 0590A	5.9	6.0	66.0	28.0	20.0	0.90
HPDSS 0600A	HPDCS 0600A	6.0	6.0	66.0	28.0	20.0	0.92
HPDSS 0610A	HPDCS 0610A	6.1	8.0	79.0	34.0	24.0	0.94
HPDSS 0620A	HPDCS 0620A	6.2	8.0	79.0	34.0	24.0	0.95
HPDSS 0630A	HPDCS 0630A	6.3	8.0	79.0	34.0	24.0	0.97
HPDSS 0640A	HPDCS 0640A	6.4	8.0	79.0	34.0	24.0	0.98
HPDSS 0650A	HPDCS 0650A	6.5	8.0	79.0	34.0	24.0	1.00
HPDSS 0660A	HPDCS 0660A	6.6	8.0	79.0	34.0	24.0	1.01
HPDSS 0670A	HPDCS 0670A	6.7	8.0	79.0	34.0	24.0	1.03
HPDSS 0680A	HPDCS 0680A	6.8	8.0	79.0	34.0	24.0	1.04
HPDSS 0690A	HPDCS 0690A	6.9	8.0	79.0	34.0	24.0	1.06
HPDSS 0700A	HPDCS 0700A	7.0	8.0	79.0	34.0	24.0	1.07
HPDSS 0710A	HPDCS 0710A	7.1	8.0	79.0	41.0	29.0	1.09
HPDSS 0720A	HPDCS 0720A	7.2	8.0	79.0	41.0	29.0	1.10
HPDSS 0730A	HPDCS 0730A	7.3	8.0	79.0	41.0	29.0	1.12



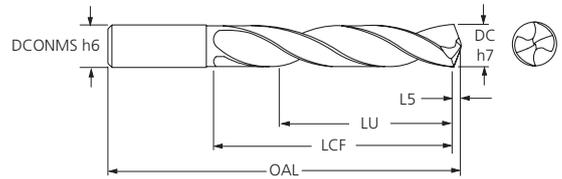
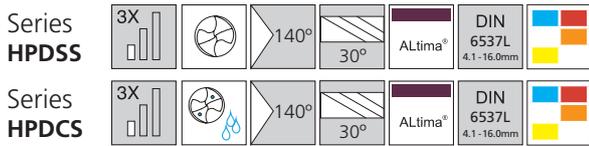
Drills  
Series HPDSS / HPDCS

# Twister® HPD Performance Drills - 3xD Series HPDSS, HPDCS



Series HPDSS	Series HPDCS	Tool Dimensions					
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
HPDSS 0740A	HPDCS 0740A	7.4	8.0	79.0	41.0	29.0	1.13
HPDSS 0750A	HPDCS 0750A	7.5	8.0	79.0	41.0	29.0	1.15
HPDSS 0760A	HPDCS 0760A	7.6	8.0	79.0	41.0	29.0	1.17
HPDSS 0770A	HPDCS 0770A	7.7	8.0	79.0	41.0	29.0	1.18
HPDSS 0780A	HPDCS 0780A	7.8	8.0	79.0	41.0	29.0	1.20
HPDSS 0790A	HPDCS 0790A	7.9	8.0	79.0	41.0	29.0	1.21
HPDSS 0800A	HPDCS 0800A	8.0	8.0	79.0	41.0	29.0	1.23
HPDSS 0810A	HPDCS 0810A	8.1	10.0	89.0	47.0	35.0	1.24
HPDSS 0820A	HPDCS 0820A	8.2	10.0	89.0	47.0	35.0	1.26
HPDSS 0830A	HPDCS 0830A	8.3	10.0	89.0	47.0	35.0	1.27
HPDSS 0840A	HPDCS 0840A	8.4	10.0	89.0	47.0	35.0	1.29
HPDSS 0850A	HPDCS 0850A	8.5	10.0	89.0	47.0	35.0	1.30
HPDSS 0860A	HPDCS 0860A	8.6	10.0	89.0	47.0	35.0	1.32
HPDSS 0870A	HPDCS 0870A	8.7	10.0	89.0	47.0	35.0	1.33
HPDSS 0880A	HPDCS 0880A	8.8	10.0	89.0	47.0	35.0	1.35
HPDSS 0890A	HPDCS 0890A	8.9	10.0	89.0	47.0	35.0	1.36
HPDSS 0900A	HPDCS 0900A	9.0	10.0	89.0	47.0	35.0	1.38
HPDSS 0910A	HPDCS 0910A	9.1	10.0	89.0	47.0	35.0	1.40
HPDSS 0920A	HPDCS 0920A	9.2	10.0	89.0	47.0	35.0	1.41
HPDSS 0930A	HPDCS 0930A	9.3	10.0	89.0	47.0	35.0	1.43
HPDSS 0940A	HPDCS 0940A	9.4	10.0	89.0	47.0	35.0	1.44
HPDSS 0950A	HPDCS 0950A	9.5	10.0	89.0	47.0	35.0	1.46
HPDSS 0960A	HPDCS 0960A	9.6	10.0	89.0	47.0	35.0	1.47
HPDSS 0970A	HPDCS 0970A	9.7	10.0	89.0	47.0	35.0	1.49
HPDSS 0980A	HPDCS 0980A	9.8	10.0	89.0	47.0	35.0	1.50
HPDSS 0990A	HPDCS 0990A	9.9	10.0	89.0	47.0	35.0	1.52
HPDSS 1000A	HPDCS 1000A	10.0	10.0	89.0	47.0	35.0	1.53
HPDSS 1010A	HPDCS 1010A	10.1	12.0	102.0	55.0	40.0	1.55
HPDSS 1020A	HPDCS 1020A	10.2	12.0	102.0	55.0	40.0	1.56
HPDSS 1030A	HPDCS 1030A	10.3	12.0	102.0	55.0	40.0	1.58
HPDSS 1040A	HPDCS 1040A	10.4	12.0	102.0	55.0	40.0	1.59
HPDSS 1050A	HPDCS 1050A	10.5	12.0	102.0	55.0	40.0	1.61
HPDSS 1060A	HPDCS 1060A	10.6	12.0	102.0	55.0	40.0	1.63
HPDSS 1070A	HPDCS 1070A	10.7	12.0	102.0	55.0	40.0	1.64
HPDSS 1080A	HPDCS 1080A	10.8	12.0	102.0	55.0	40.0	1.66
HPDSS 1090A	HPDCS 1090A	10.9	12.0	102.0	55.0	40.0	1.67
HPDSS 1100A	HPDCS 1100A	11.0	12.0	102.0	55.0	40.0	1.69
HPDSS 1110A	HPDCS 1110A	11.1	12.0	102.0	55.0	40.0	1.70
HPDSS 1120A	HPDCS 1120A	11.2	12.0	102.0	55.0	40.0	1.72
HPDSS 1130A	HPDCS 1130A	11.3	12.0	102.0	55.0	40.0	1.73
HPDSS 1140A	HPDCS 1140A	11.4	12.0	102.0	55.0	40.0	1.75
HPDSS 1150A	HPDCS 1150A	11.5	12.0	102.0	55.0	40.0	1.76
HPDSS 1160A	HPDCS 1160A	11.6	12.0	102.0	55.0	40.0	1.78
HPDSS 1170A	HPDCS 1170A	11.7	12.0	102.0	55.0	40.0	1.79

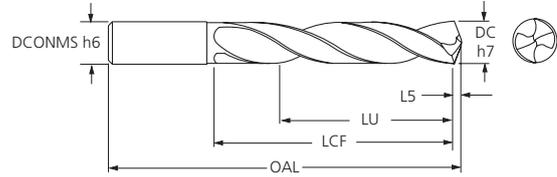
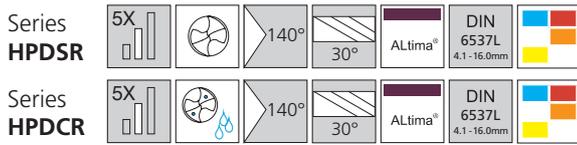
# Twister® HPD Performance Drills - 3xD Series HPDSS, HPDCS



Series HPDSS	Series HPDCS	Tool Dimensions					
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
HPDSS 1180A	HPDCS 1180A	11.8	12.0	102.0	55.0	40.0	1.81
HPDSS 1190A	HPDCS 1190A	11.9	12.0	102.0	55.0	40.0	1.82
HPDSS 1200A	HPDCS 1200A	12.0	12.0	102.0	55.0	40.0	1.84
HPDSS 1210A	HPDCS 1210A	12.1	14.0	107.0	60.0	43.0	1.86
HPDSS 1220A	HPDCS 1220A	12.2	14.0	107.0	60.0	43.0	1.87
HPDSS 1230A	HPDCS 1230A	12.3	14.0	107.0	60.0	43.0	1.89
HPDSS 1240A	HPDCS 1240A	12.4	14.0	107.0	60.0	43.0	1.90
HPDSS 1250A	HPDCS 1250A	12.5	14.0	107.0	60.0	43.0	1.92
HPDSS 1260A	HPDCS 1260A	12.6	14.0	107.0	60.0	43.0	1.93
HPDSS 1270A	HPDCS 1270A	12.7	14.0	107.0	60.0	43.0	1.95
HPDSS 1280A	HPDCS 1280A	12.8	14.0	107.0	60.0	43.0	1.96
HPDSS 1290A	HPDCS 1290A	12.9	14.0	107.0	60.0	43.0	1.99
HPDSS 1300A	HPDCS 1300A	13.0	14.0	107.0	60.0	43.0	1.98
HPDSS 1310A	HPDCS 1310A	13.1	14.0	107.0	60.0	43.0	2.01
HPDSS 1320A	HPDCS 1320A	13.2	14.0	107.0	60.0	43.0	2.02
HPDSS 1330A	HPDCS 1330A	13.3	14.0	107.0	60.0	43.0	2.04
HPDSS 1340A	HPDCS 1340A	13.4	14.0	107.0	60.0	43.0	2.05
HPDSS 1350A	HPDCS 1350A	13.5	14.0	107.0	60.0	43.0	2.07
HPDSS 1360A	HPDCS 1360A	13.6	14.0	107.0	60.0	43.0	2.09
HPDSS 1370A	HPDCS 1370A	13.7	14.0	107.0	60.0	43.0	2.10
HPDSS 1380A	HPDCS 1380A	13.8	14.0	107.0	60.0	43.0	2.12
HPDSS 1390A	HPDCS 1390A	13.9	14.0	107.0	60.0	43.0	2.13
HPDSS 1400A	HPDCS 1400A	14.0	14.0	107.0	60.0	43.0	2.15
HPDSS 1410A	HPDCS 1410A	14.1	16.0	115.0	65.0	45.0	2.16
HPDSS 1420A	HPDCS 1420A	14.2	16.0	115.0	65.0	45.0	2.18
HPDSS 1430A	HPDCS 1430A	14.3	16.0	115.0	65.0	45.0	2.19
HPDSS 1440A	HPDCS 1440A	14.4	16.0	115.0	65.0	45.0	2.21
HPDSS 1450A	HPDCS 1450A	14.5	16.0	115.0	65.0	45.0	2.22
HPDSS 1460A	HPDCS 1460A	14.6	16.0	115.0	65.0	45.0	2.24
HPDSS 1470A	HPDCS 1470A	14.7	16.0	115.0	65.0	45.0	2.25
HPDSS 1480A	HPDCS 1480A	14.8	16.0	115.0	65.0	45.0	2.27
HPDSS 1490A	HPDCS 1490A	14.9	16.0	115.0	65.0	45.0	2.28
HPDSS 1500A	HPDCS 1500A	15.0	16.0	115.0	65.0	45.0	2.30
HPDSS 1510A	HPDCS 1510A	15.1	16.0	115.0	65.0	45.0	2.32
HPDSS 1520A	HPDCS 1520A	15.2	16.0	115.0	65.0	45.0	2.33
HPDSS 1530A	HPDCS 1530A	15.3	16.0	115.0	65.0	45.0	2.35
HPDSS 1540A	HPDCS 1540A	15.4	16.0	115.0	65.0	45.0	2.36
HPDSS 1550A	HPDCS 1550A	15.5	16.0	115.0	65.0	45.0	2.38
HPDSS 1560A	HPDCS 1560A	15.6	16.0	115.0	65.0	45.0	2.39
HPDSS 1570A	HPDCS 1570A	15.7	16.0	115.0	65.0	45.0	2.41
HPDSS 1580A	HPDCS 1580A	15.8	16.0	115.0	65.0	45.0	2.42
HPDSS 1590A	HPDCS 1590A	15.9	16.0	115.0	65.0	45.0	2.44
HPDSS 1600A	HPDCS 1600A	16.0	16.0	115.0	65.0	45.0	2.45

Drills  
Series HPDSS / HPDCS

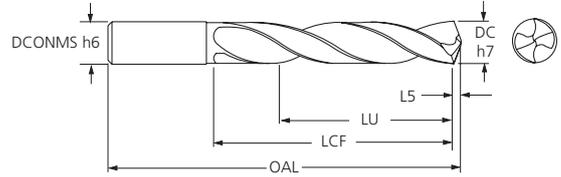
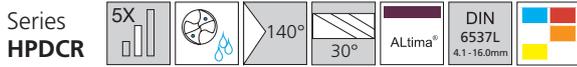
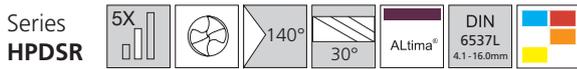
# Twister® HPD Performance Drills - 5xD Series HPDSR, HPDCR



Series HPDSR	Series HPDCR	Tool Dimensions					
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
HPDSR 0300A	HPDCR 0300A	3.0	3.0	66.0	28.0	23.0	0.46
HPDSR 0310A	HPDCR 0310A	3.1	4.0	66.0	28.0	23.0	0.48
HPDSR 0320A	HPDCR 0320A	3.2	4.0	66.0	28.0	23.0	0.49
HPDSR 0330A	HPDCR 0330A	3.3	4.0	66.0	28.0	23.0	0.51
HPDSR 0340A	HPDCR 0340A	3.4	4.0	66.0	28.0	23.0	0.52
HPDSR 0350A	HPDCR 0350A	3.5	4.0	66.0	28.0	23.0	0.54
HPDSR 0360A	HPDCR 0360A	3.6	4.0	66.0	28.0	23.0	0.55
HPDSR 0370A	HPDCR 0370A	3.7	4.0	66.0	28.0	23.0	0.57
HPDSR 0380A	HPDCR 0380A	3.8	4.0	74.0	36.0	29.0	0.58
HPDSR 0390A	HPDCR 0390A	3.9	4.0	74.0	36.0	29.0	0.60
HPDSR 0400A	HPDCR 0400A	4.0	4.0	74.0	36.0	29.0	0.61
HPDSR 0410A	HPDCR 0410A	4.1	6.0	74.0	36.0	29.0	0.64
HPDSR 0420A	HPDCR 0420A	4.2	6.0	74.0	36.0	29.0	0.64
HPDSR 0430A	HPDCR 0430A	4.3	6.0	74.0	36.0	29.0	0.66
HPDSR 0440A	HPDCR 0440A	4.4	6.0	74.0	36.0	29.0	0.67
HPDSR 0450A	HPDCR 0450A	4.5	6.0	74.0	36.0	29.0	0.69
HPDSR 0460A	HPDCR 0460A	4.6	6.0	74.0	36.0	29.0	0.71
HPDSR 0470A	HPDCR 0470A	4.7	6.0	74.0	36.0	29.0	0.72
HPDSR 0480A	HPDCR 0480A	4.8	6.0	82.0	44.0	35.0	0.74
HPDSR 0490A	HPDCR 0490A	4.9	6.0	82.0	44.0	35.0	0.75
HPDSR 0500A	HPDCR 0500A	5.0	6.0	82.0	44.0	35.0	0.77
HPDSR 0510A	HPDCR 0510A	5.1	6.0	82.0	44.0	35.0	0.78
HPDSR 0520A	HPDCR 0520A	5.2	6.0	82.0	44.0	35.0	0.80
HPDSR 0530A	HPDCR 0530A	5.3	6.0	82.0	44.0	35.0	0.81
HPDSR 0540A	HPDCR 0540A	5.4	6.0	82.0	44.0	35.0	0.83
HPDSR 0550A	HPDCR 0550A	5.5	6.0	82.0	44.0	35.0	0.84
HPDSR 0560A	HPDCR 0560A	5.6	6.0	82.0	44.0	35.0	0.86
HPDSR 0570A	HPDCR 0570A	5.7	6.0	82.0	44.0	35.0	0.87
HPDSR 0580A	HPDCR 0580A	5.8	6.0	82.0	44.0	35.0	0.89
HPDSR 0590A	HPDCR 0590A	5.9	6.0	82.0	44.0	35.0	0.90
HPDSR 0600A	HPDCR 0600A	6.0	6.0	82.0	44.0	35.0	0.92
HPDSR 0610A	HPDCR 0610A	6.1	8.0	91.0	53.0	43.0	0.94
HPDSR 0620A	HPDCR 0620A	6.2	8.0	91.0	53.0	43.0	0.95
HPDSR 0630A	HPDCR 0630A	6.3	8.0	91.0	53.0	43.0	0.97
HPDSR 0640A	HPDCR 0640A	6.4	8.0	91.0	53.0	43.0	0.98
HPDSR 0650A	HPDCR 0650A	6.5	8.0	91.0	53.0	43.0	1.00
HPDSR 0660A	HPDCR 0660A	6.6	8.0	91.0	53.0	43.0	1.01
HPDSR 0670A	HPDCR 0670A	6.7	8.0	91.0	53.0	43.0	1.03
HPDSR 0680A	HPDCR 0680A	6.8	8.0	91.0	53.0	43.0	1.04
HPDSR 0690A	HPDCR 0690A	6.9	8.0	91.0	53.0	43.0	1.06
HPDSR 0700A	HPDCR 0700A	7.0	8.0	91.0	53.0	43.0	1.07
HPDSR 0710A	HPDCR 0710A	7.1	8.0	91.0	53.0	43.0	1.09
HPDSR 0720A	HPDCR 0720A	7.2	8.0	91.0	53.0	43.0	1.10

 Drills  
Series HPDSR / HPDCR

# Twister® HPD Performance Drills - 5xD Series HPDSR, HPDCR

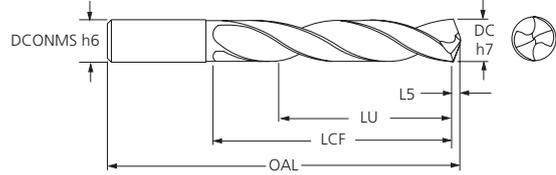
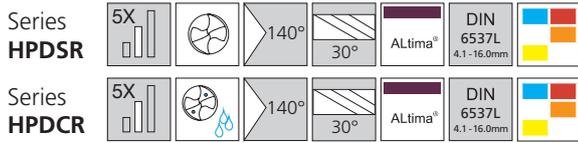


Series HPDSR	Series HPDCR	Tool Dimensions					
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
HPDSR 0730A	HPDCR 0730A	7.3	8.0	91.0	53.0	43.0	1.12
HPDSR 0740A	HPDCR 0740A	7.4	8.0	91.0	53.0	43.0	1.13
HPDSR 0750A	HPDCR 0750A	7.5	8.0	91.0	53.0	43.0	1.15
HPDSR 0760A	HPDCR 0760A	7.6	8.0	91.0	53.0	43.0	1.17
HPDSR 0770A	HPDCR 0770A	7.7	8.0	91.0	53.0	43.0	1.18
HPDSR 0780A	HPDCR 0780A	7.8	8.0	91.0	53.0	43.0	1.20
HPDSR 0790A	HPDCR 0790A	7.9	8.0	91.0	53.0	43.0	1.21
HPDSR 0800A	HPDCR 0800A	8.0	8.0	91.0	53.0	43.0	1.23
HPDSR 0810A	HPDCR 0810A	8.1	10.0	103.0	61.0	49.0	1.24
HPDSR 0820A	HPDCR 0820A	8.2	10.0	103.0	61.0	49.0	1.26
HPDSR 0830A	HPDCR 0830A	8.3	10.0	103.0	61.0	49.0	1.27
HPDSR 0840A	HPDCR 0840A	8.4	10.0	103.0	61.0	49.0	1.29
HPDSR 0850A	HPDCR 0850A	8.5	10.0	103.0	61.0	49.0	1.30
HPDSR 0860A	HPDCR 0860A	8.6	10.0	103.0	61.0	49.0	1.32
HPDSR 0870A	HPDCR 0870A	8.7	10.0	103.0	61.0	49.0	1.33
HPDSR 0880A	HPDCR 0880A	8.8	10.0	103.0	61.0	49.0	1.35
HPDSR 0890A	HPDCR 0890A	8.9	10.0	103.0	61.0	49.0	1.36
HPDSR 0900A	HPDCR 0900A	9.0	10.0	103.0	61.0	49.0	1.38
HPDSR 0910A	HPDCR 0910A	9.1	10.0	103.0	61.0	49.0	1.40
HPDSR 0920A	HPDCR 0920A	9.2	10.0	103.0	61.0	49.0	1.41
HPDSR 0930A	HPDCR 0930A	9.3	10.0	103.0	61.0	49.0	1.43
HPDSR 0940A	HPDCR 0940A	9.4	10.0	103.0	61.0	49.0	1.44
HPDSR 0950A	HPDCR 0950A	9.5	10.0	103.0	61.0	49.0	1.46
HPDSR 0960A	HPDCR 0960A	9.6	10.0	103.0	61.0	49.0	1.47
HPDSR 0970A	HPDCR 0970A	9.7	10.0	103.0	61.0	49.0	1.49
HPDSR 0980A	HPDCR 0980A	9.8	10.0	103.0	61.0	49.0	1.50
HPDSR 0990A	HPDCR 0990A	9.9	10.0	103.0	61.0	49.0	1.52
HPDSR 1000A	HPDCR 1000A	10.0	10.0	103.0	61.0	49.0	1.53
HPDSR 1010A	HPDCR 1010A	10.1	12.0	118.0	71.0	56.0	1.55
HPDSR 1020A	HPDCR 1020A	10.2	12.0	118.0	71.0	56.0	1.56
HPDSR 1030A	HPDCR 1030A	10.3	12.0	118.0	71.0	56.0	1.58
HPDSR 1040A	HPDCR 1040A	10.4	12.0	118.0	71.0	56.0	1.59
HPDSR 1050A	HPDCR 1050A	10.5	12.0	118.0	71.0	56.0	1.61
HPDSR 1060A	HPDCR 1060A	10.6	12.0	118.0	71.0	56.0	1.63
HPDSR 1070A	HPDCR 1070A	10.7	12.0	118.0	71.0	56.0	1.64
HPDSR 1080A	HPDCR 1080A	10.8	12.0	118.0	71.0	56.0	1.66
HPDSR 1090A	HPDCR 1090A	10.9	12.0	118.0	71.0	56.0	1.67
HPDSR 1100A	HPDCR 1100A	11.0	12.0	118.0	71.0	56.0	1.69
HPDSR 1110A	HPDCR 1110A	11.1	12.0	118.0	71.0	56.0	1.70
HPDSR 1120A	HPDCR 1120A	11.2	12.0	118.0	71.0	56.0	1.72
HPDSR 1130A	HPDCR 1130A	11.3	12.0	118.0	71.0	56.0	1.73
HPDSR 1140A	HPDCR 1140A	11.4	12.0	118.0	71.0	56.0	1.75
HPDSR 1150A	HPDCR 1150A	11.5	12.0	118.0	71.0	56.0	1.76
HPDSR 1160A	HPDCR 1160A	11.6	12.0	118.0	71.0	56.0	1.78



Drills  
Series HPDSR / HPDCR

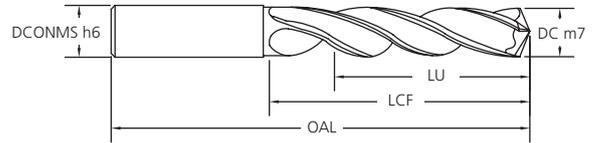
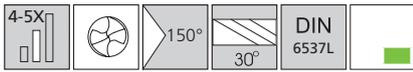
# Twister® HPD Performance Drills - 5xD Series HPDSR, HPDCR



Series HPDSR	Series HPDCR	Tool Dimensions					
Tool No.	Tool No.	Ø DC	Ø DCONMS	OAL	LCF (Max.)	LU	L5
HPDSR 1170A	HPDCR 1170A	11.7	12.0	118.0	71.0	56.0	1.79
HPDSR 1180A	HPDCR 1180A	11.8	12.0	118.0	71.0	56.0	1.81
HPDSR 1190A	HPDCR 1190A	11.9	12.0	118.0	71.0	56.0	1.82
HPDSR 1200A	HPDCR 1200A	12.0	12.0	118.0	71.0	56.0	1.84
HPDSR 1210A	HPDCR 1210A	12.1	14.0	124.0	77.0	60.0	1.86
HPDSR 1220A	HPDCR 1220A	12.2	14.0	124.0	77.0	60.0	1.87
HPDSR 1230A	HPDCR 1230A	12.3	14.0	124.0	77.0	60.0	1.89
HPDSR 1240A	HPDCR 1240A	12.4	14.0	124.0	77.0	60.0	1.90
HPDSR 1250A	HPDCR 1250A	12.5	14.0	124.0	77.0	60.0	1.92
HPDSR 1260A	HPDCR 1260A	12.6	14.0	124.0	77.0	60.0	1.93
HPDSR 1270A	HPDCR 1270A	12.7	14.0	124.0	77.0	60.0	1.95
HPDSR 1280A	HPDCR 1280A	12.8	14.0	124.0	77.0	60.0	1.96
HPDSR 1290A	HPDCR 1290A	12.9	14.0	124.0	77.0	60.0	1.99
HPDSR 1300A	HPDCR 1300A	13.0	14.0	124.0	77.0	60.0	1.98
HPDSR 1310A	HPDCR 1310A	13.1	14.0	124.0	77.0	60.0	2.01
HPDSR 1320A	HPDCR 1320A	13.2	14.0	124.0	77.0	60.0	2.02
HPDSR 1330A	HPDCR 1330A	13.3	14.0	124.0	77.0	60.0	2.04
HPDSR 1340A	HPDCR 1340A	13.4	14.0	124.0	77.0	60.0	2.05
HPDSR 1350A	HPDCR 1350A	13.5	14.0	124.0	77.0	60.0	2.07
HPDSR 1360A	HPDCR 1360A	13.6	14.0	124.0	77.0	60.0	2.09
HPDSR 1370A	HPDCR 1370A	13.7	14.0	124.0	77.0	60.0	2.10
HPDSR 1380A	HPDCR 1380A	13.8	14.0	124.0	77.0	60.0	2.12
HPDSR 1390A	HPDCR 1390A	13.9	14.0	124.0	77.0	60.0	2.13
HPDSR 1400A	HPDCR 1400A	14.0	14.0	124.0	77.0	60.0	2.15
HPDSR 1410A	HPDCR 1410A	14.1	16.0	133.0	83.0	63.0	2.16
HPDSR 1420A	HPDCR 1420A	14.2	16.0	133.0	83.0	63.0	2.18
HPDSR 1430A	HPDCR 1430A	14.3	16.0	133.0	83.0	63.0	2.19
HPDSR 1440A	HPDCR 1440A	14.4	16.0	133.0	83.0	63.0	2.21
HPDSR 1450A	HPDCR 1450A	14.5	16.0	133.0	83.0	63.0	2.22
HPDSR 1460A	HPDCR 1460A	14.6	16.0	133.0	83.0	63.0	2.24
HPDSR 1470A	HPDCR 1470A	14.7	16.0	133.0	83.0	63.0	2.25
HPDSR 1480A	HPDCR 1480A	14.8	16.0	133.0	83.0	63.0	2.27
HPDSR 1490A	HPDCR 1490A	14.9	16.0	133.0	83.0	63.0	2.28
HPDSR 1500A	HPDCR 1500A	15.0	16.0	133.0	83.0	63.0	2.30
HPDSR 1510A	HPDCR 1510A	15.1	16.0	133.0	83.0	63.0	2.32
HPDSR 1520A	HPDCR 1520A	15.2	16.0	133.0	83.0	63.0	2.33
HPDSR 1530A	HPDCR 1530A	15.3	16.0	133.0	83.0	63.0	2.35
HPDSR 1540A	HPDCR 1540A	15.4	16.0	133.0	83.0	63.0	2.36
HPDSR 1550A	HPDCR 1550A	15.5	16.0	133.0	83.0	63.0	2.38
HPDSR 1560A	HPDCR 1560A	15.6	16.0	133.0	83.0	63.0	2.39
HPDSR 1570A	HPDCR 1570A	15.7	16.0	133.0	83.0	63.0	2.41
HPDSR 1580A	HPDCR 1580A	15.8	16.0	133.0	83.0	63.0	2.42
HPDSR 1590A	HPDCR 1590A	15.9	16.0	133.0	83.0	63.0	2.44
HPDSR 1600A	HPDCR 1600A	16.0	16.0	133.0	83.0	63.0	2.45

 Drills  
Series HPDSR / HPDCR


# Twister® X-AL 3 Flute Performance Aluminium Drill - 4-5xD Series 229

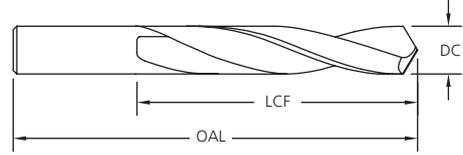


Series 229	Drill Dimensions				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
229 0200	2.0	2.0	38.0	16.0	12.0
229 0230	2.3	2.3	43.0	20.0	15.0
229 0250	2.5	2.5	43.0	20.0	15.0
229 0290	2.9	2.9	46.0	25.0	19.0
229 0300	3.0	6.0	66.0	28.0	23.0
229 0310	3.1	6.0	66.0	28.0	23.0
229 0320	3.2	6.0	66.0	28.0	23.0
229 0330	3.3	6.0	66.0	28.0	23.0
229 0340	3.4	6.0	66.0	28.0	23.0
229 0350	3.5	6.0	66.0	28.0	23.0
229 0360	3.6	6.0	66.0	28.0	23.0
229 0370	3.7	6.0	66.0	28.0	23.0
229 0380	3.8	6.0	74.0	36.0	29.0
229 0390	3.9	6.0	74.0	36.0	29.0
229 0400	4.0	6.0	74.0	36.0	29.0
229 0410	4.1	6.0	74.0	36.0	29.0
229 0420	4.2	6.0	74.0	36.0	29.0
229 0440	4.4	6.0	74.0	36.0	29.0
229 0450	4.5	6.0	74.0	36.0	29.0
229 0460	4.6	6.0	74.0	36.0	29.0
229 0480	4.8	6.0	82.0	44.0	35.0
229 0490	4.9	6.0	82.0	44.0	35.0
229 0500	5.0	6.0	82.0	44.0	35.0
229 0520	5.2	6.0	82.0	44.0	35.0
229 0550	5.5	6.0	82.0	44.0	35.0
229 0560	5.6	6.0	82.0	44.0	35.0
229 0600	6.0	6.0	82.0	44.0	35.0
229 0620	6.2	8.0	91.0	53.0	43.0
229 0650	6.5	8.0	91.0	53.0	43.0
229 0670	6.7	8.0	91.0	53.0	43.0
229 0680	6.8	8.0	91.0	53.0	43.0

Series 229	Drill Dimensions				
Tool No.	Ø DC	Ø DCONMS	OAL	LCF	LU
229 0700	7.0	8.0	91.0	53.0	43.0
229 0720	7.2	8.0	91.0	53.0	43.0
229 0730	7.3	8.0	91.0	53.0	43.0
229 0740	7.4	8.0	91.0	53.0	43.0
229 0750	7.5	8.0	91.0	53.0	43.0
229 0780	7.8	8.0	91.0	53.0	43.0
229 0800	8.0	8.0	91.0	53.0	43.0
229 0810	8.1	10.0	103.0	61.0	49.0
229 0840	8.4	10.0	103.0	61.0	49.0
229 0850	8.5	10.0	103.0	61.0	49.0
229 0900	9.0	10.0	103.0	61.0	49.0
229 0950	9.5	10.0	103.0	61.0	49.0
229 0970	9.7	10.0	103.0	61.0	49.0
229 1000	10.0	10.0	103.0	61.0	49.0
229 1020	10.2	12.0	118.0	71.0	56.0
229 1040	10.4	12.0	118.0	71.0	56.0
229 1050	10.5	12.0	118.0	71.0	56.0
229 1060	10.6	12.0	118.0	71.0	56.0
229 1100	11.0	12.0	118.0	71.0	56.0
229 1150	11.5	12.0	118.0	71.0	56.0
229 1200	12.0	12.0	118.0	71.0	56.0
229 1250	12.5	14.0	124.0	77.0	60.0
229 1270	12.7	14.0	124.0	77.0	60.0
229 1300	13.0	14.0	124.0	77.0	60.0
229 1350	13.5	14.0	124.0	77.0	60.0
229 1400	14.0	14.0	124.0	77.0	60.0
229 1450	14.5	16.0	133.0	83.0	63.0
229 1500	15.0	16.0	133.0	83.0	63.0
229 1550	15.5	16.0	133.0	83.0	63.0
229 1580	15.8	16.0	133.0	83.0	63.0
229 1600	16.0	16.0	133.0	83.0	63.0



# Twister® Hi-Tuff® Jobbers Drill - 5xD Series 224 Uncoated

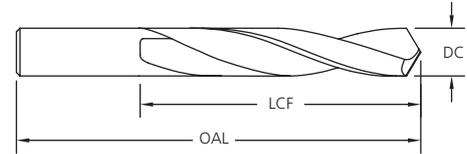
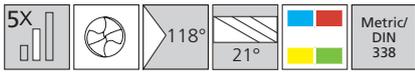


Series 224	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
224 0030	0.3	26.0	3.0
224 0035	0.35	26.0	4.0
224 0040	0.4	26.0	5.0
224 0045	0.45	26.0	5.0
224 0050	0.5	26.0	6.0
224 0055	0.55	26.0	7.0
224 0060	0.6	26.0	7.0
224 0065	0.65	26.0	8.0
224 0070	0.7	28.0	9.0
224 0075	0.75	28.0	9.0
224 0080	0.8	30.0	10.0
224 0085	0.85	30.0	10.0
224 0090	0.9	32.0	11.0
224 0095	0.95	32.0	11.0
224 0100	1.0	34.0	12.0
224 0105	1.05	34.0	12.0
224 0110	1.1	36.0	14.0
224 0115	1.15	36.0	14.0
224 0120	1.2	38.0	16.0
224 0125	1.25	38.0	16.0
224 0130	1.3	38.0	16.0
224 0135	1.35	40.0	18.0
224 0140	1.4	40.0	18.0
224 0145	1.45	40.0	18.0
224 0150	1.5	40.0	18.0
224 0160	1.6	43.0	20.0
224 0170	1.7	43.0	20.0
224 0180	1.8	46.0	22.0
224 0190	1.9	46.0	22.0
224 0200	2.0	49.0	24.0
224 0210	2.1	49.0	24.0
224 0220	2.2	53.0	27.0
224 0230	2.3	53.0	27.0
224 0240	2.4	57.0	30.0
224 0250	2.5	57.0	30.0
224 0260	2.6	57.0	30.0
224 0270	2.7	61.0	33.0
224 0280	2.8	61.0	33.0
224 0290	2.9	61.0	33.0
224 0300	3.0	61.0	33.0
224 0310	3.1	65.0	36.0
224 0320	3.2	65.0	36.0
224 0330	3.3	65.0	36.0
224 0340	3.4	70.0	39.0
224 0350	3.5	70.0	39.0

Series 224	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
224 0360	3.6	70.0	39.0
224 0370	3.7	70.0	39.0
224 0380	3.8	75.0	43.0
224 0390	3.9	75.0	43.0
224 0400	4.0	75.0	43.0
224 0410	4.1	75.0	43.0
224 0420	4.2	75.0	43.0
224 0430	4.3	80.0	47.0
224 0440	4.4	80.0	47.0
224 0450	4.5	80.0	47.0
224 0460	4.6	80.0	47.0
224 0470	4.7	80.0	47.0
224 0480	4.8	86.0	52.0
224 0490	4.9	86.0	52.0
224 0500	5.0	86.0	52.0
224 0510	5.1	86.0	52.0
224 0520	5.2	86.0	52.0
224 0530	5.3	86.0	52.0
224 0540	5.4	93.0	57.0
224 0550	5.5	93.0	57.0
224 0560	5.6	93.0	57.0
224 0570	5.7	93.0	57.0
224 0580	5.8	93.0	57.0
224 0590	5.9	93.0	57.0
224 0600	6.0	93.0	57.0
224 0610	6.1	101.0	63.0
224 0620	6.2	101.0	63.0
224 0630	6.3	101.0	63.0
224 0640	6.4	101.0	63.0
224 0650	6.5	101.0	63.0
224 0660	6.6	101.0	63.0
224 0670	6.7	101.0	63.0
224 0680	6.8	109.0	69.0
224 0690	6.9	109.0	69.0
224 0700	7.0	109.0	69.0
224 0710	7.1	109.0	69.0
224 0720	7.2	109.0	69.0
224 0730	7.3	109.0	69.0
224 0740	7.4	109.0	69.0
224 0750	7.5	109.0	69.0
224 0760	7.6	117.0	75.0
224 0770	7.7	117.0	75.0
224 0780	7.8	117.0	75.0
224 0790	7.9	117.0	75.0
224 0800	8.0	117.0	75.0

 Drills  
 Series 224 Uncoated

# Twister® Hi-Tuff® Jobbers Drill - 5xD Series 224 Uncoated



Series 224	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
224 0810	8.1	117.0	75.0
224 0820	8.2	117.0	75.0
224 0830	8.3	117.0	75.0
224 0840	8.4	117.0	75.0
224 0850	8.5	117.0	75.0
224 0860	8.6	125.0	81.0
224 0870	8.7	125.0	81.0
224 0880	8.8	125.0	81.0
224 0890	8.9	125.0	81.0
224 0900	9.0	125.0	81.0
224 0910	9.1	125.0	81.0
224 0920	9.2	125.0	81.0
224 0930	9.3	125.0	81.0
224 0940	9.4	125.0	81.0
224 0950	9.5	125.0	81.0
224 0960	9.6	133.0	87.0
224 0970	9.7	133.0	87.0
224 0980	9.8	133.0	87.0
224 0990	9.9	133.0	87.0
224 1000	10.0	133.0	87.0
224 1010	10.1	133.0	87.0
224 1020	10.2	133.0	87.0

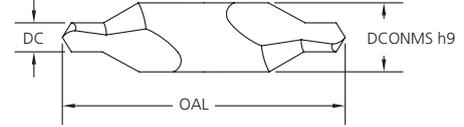
Series 224	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
224 1030	10.3	133.0	87.0
224 1040	10.4	133.0	87.0
224 1050	10.5	133.0	87.0
224 1060	10.6	133.0	87.0
224 1070	10.7	142.0	94.0
224 1080	10.8	142.0	94.0
224 1090	10.9	142.0	94.0
224 1100	11.0	142.0	94.0
224 1110	11.1	142.0	94.0
224 1120	11.2	142.0	94.0
224 1130	11.3	142.0	94.0
224 1140	11.4	142.0	94.0
224 1150	11.5	142.0	94.0
224 1160	11.6	142.0	94.0
224 1170	11.7	142.0	94.0
224 1180	11.8	142.0	94.0
224 1190	11.9	151.0	101.0
224 1200	12.0	151.0	101.0
224 1250	12.5	151.0	101.0
224 1300	13.0	151.0	101.0
224 1350	13.5	160.0	108.0
224 1400	14.0	160.0	108.0



Drills  
Series 224 Uncoated



# Twister® Centre Drill Series 402 Uncoated



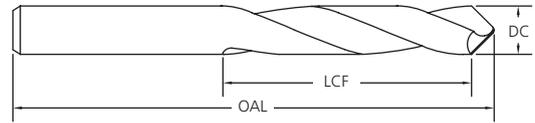
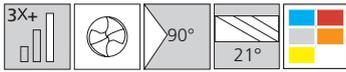
Series 402	Drill Dimensions		
Tool No	Ø DC	Ø DCONMS	OAL
402 0050	0.5	3.15	31.5*
402 0080	0.8	3.15	31.5*
402 0100	1.0	3.15	31.5
402 0125	1.25	3.15	31.5
402 0160	1.6	4.0	35.5
402 0200	2.0	5.0	40.0
402 0250	2.5	6.3	45.0
402 0315	3.15	8.0	50.0
402 0400	4.0	10.0	56.0
402 0500	5.0	12.5	63.0

\* Overall Length (OAL) Not To DIN Specification



Drills  
Series 402 Uncoated

# Twister® 90° NC Spot Drill Series 404 Uncoated

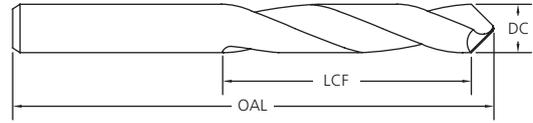
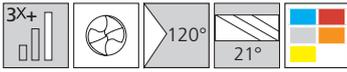


Series 404	Drill Dimensions		
Tool No	Ø DC	OAL	LCF
404 0500	5.0	51.0	26.0
404 0600	6.0	51.0	26.0
404 0800	8.0	64.0	26.0
404 1000	10.0	70.0	30.0
404 1200	12.0	76.0	40.0



**Drills**  
Series 404 Uncoated

# Twister® 120° NC Spot Drill Series 403 Uncoated



Series 403	Drill Dimensions		
Tool No.	Ø DC	OAL	LCF
403 0500	5.0	51.0	26.0
403 0600	6.0	51.0	26.0
403 0800	8.0	64.0	26.0
403 1000	10.0	70.0	30.0
403 1200	12.0	76.0	40.0



**Drills**  
 Series 403 Uncoated

# Twister® High Performance GP Drills

## Series HPDSS & HPDCS 3xD, Series HPDSR & HPDCR 5xD Recommended cutting data

Conditions de coupe recommandées : Empfohlene Schnittdaten : Dati di taglio raccomandati : Zalecane dane o cięciu (Zalacane parametry skrawania)

Workpiece Material Group	Material Type	HPDSS			HPDCS			
		3xD			3xD - Through Coolant			
		Low	Mid	High	Low	Mid	High	
		Vc-m/min			Vc-m/min			
Steels	P	Low Carbon Steels ≤180HB	140	160	180	170	190	210
		Med Carbon / Alloy Steels 180-350HB	80	90	100	90	110	130
		Pre-Hardened Steels 35-45HRC	40	50	60	60	70	80
Stainless Steels	M	Martensitic Stainless - 400 Series	90	100	110	100	120	140
		Austenitic Stainless - 300 Series	40	50	60	60	70	80
Cast Irons	K	Grey Cast Iron	100	120	140	130	150	170
		Ductile Cast Iron	50	60	70	70	80	90

RPM Formula For Metric Drills -  $RPM = (Vc \times 318) / \text{Drill } \varnothing D1$

Workpiece Material Group	Material Type	HPDSR			HPDCR			
		5xD			5xD - Through Coolant			
		Low	Mid	High	Low	Mid	High	
		Vc-m/min			Vc-m/min			
Steels	P	Low Carbon Steels ≤180HB	130	150	170	160	180	200
		Med Carbon / Alloy Steels 180-350HB	70	80	90	90	100	110
		Pre-Hardened Steels 35-45HRC	40	50	60	50	60	70
Stainless Steels	M	Martensitic Stainless - 400 Series	80	90	100	90	110	130
		Austenitic Stainless - 300 Series	40	50	60	50	60	70
Cast Irons	K	Grey Cast Iron	90	110	130	120	140	160
		Ductile Cast Iron	40	50	60	60	70	80

RPM Formula For Metric Drills -  $RPM = (Vc \times 318) / \text{Drill } \varnothing D1$

Workpiece Material Group	Material Type	Drill Diameter (mm)								
		3.0	4.0	5.0	6.0	8.0	10.0	12.0	16.0	
		Feed (mm/rev)								
Steels	P	Low Carbon Steels ≤180HB								
		Med Carbon / Alloy Steels 180-350HB	0.145	0.181	0.181	0.226	0.285	0.362	0.3632	0.453
		Pre-Hardened Steels 35-45HRC								
Stainless Steels	M	Martensitic Stainless - 400 Series	0.07	0.09	0.09	0.11	0.14	0.18	0.18	0.225
		Austenitic Stainless - 300 Series								
Cast Irons	K	Grey Cast Iron	0.155	0.193	0.217	0.305	0.305	0.386	0.435	0.532
		Ductile Cast Iron								

Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$

# Twister® X-AL High Performance 3 Flute - 4-5xD

## Series 229 Recommended cutting data

Conditions de coupe recommandées : Empfohlene Schnittdaten : Dati di taglio raccomandati : Zalecane dane o cięciu (Zalacane parametry skrawania)

Workpiece Material Groups	Example Materials	Vc (m/min)	Tool Diameter (mm)					
			1.5	3	6	12	20	25
			Feed (mm/rev)					
Titanium Alloys	Ti6Al4V	30	0.013	0.05	0.11	0.15	0.2	0.25
Aluminium < 10% Si	6061/7075	215	0.08	0.20	0.31	0.45	0.61	0.76
Aluminium > 10% Si	-	155	0.05	0.08	0.15	0.25	0.31	0.35
Brass/Copper	-	120	0.05	0.08	0.15	0.25	0.31	0.35
Plastics	-	90	0.05	0.08	0.15	0.25	0.31	0.35

RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D1$

Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$



Drills - Technical Information  
Series HPDSS / HPDCS / HPDSR / HPDCR / 229



## Twister® Micro Drill

### Series 300 Recommended cutting data

Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio raccomandati · Zalecane dane o cięciu (Zalecane parametry skrawania)

Workpiece Material Groups	Examples	Vc (m/min)	Tool Diameter(mm)				
			0.5	1.0	2.0	3.0	
			Feed (mm/rev)				
Steels	P	Low Carbon Steels 1018	55	.0170	.0250	.0500	.0760
		Alloy Steels (up to 35 Rc) 4140	45	0170	.0250	.0500	.0760
Cast Irons	K	Gray Cast Iron A48 Class 20/G4000	85	0170	.0250	.0500	.0760
		Ductile Cast Iron A536/60-40-18	55	0170	.0250	.0500	.0760
Non-Ferrous	N	Aluminum (<10% Si) 6061-T6/7075-T6	120	0170	.0250	.0500	.0760
		Aluminum (>10% Si) Copper/Brass	75	0170	.0250	.0500	.0760
		Plastic	90	0170	.0250	.0500	.0760

 RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$ 

 Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$ 

### Series 302 Recommended cutting data

Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio raccomandati · Zalecane dane o cięciu (Zalecane parametry skrawania)

Workpiece Material Groups	Examples	Vc (m/min)	Tool Diameter(mm)					
			< .76	.77-.92	.93-1.02	1.03-1.30	> 1.31	
			Feed (mm/rev)					
Steels	P	Low Carbon Steels 1018	90	.005-.015	0.02	0.025	0.036	0.038
		Alloy Steels (up to 35 Rc) 4140	70	.005-.015	0.02	0.025	0.036	0.038
		Alloy Steels (36-45 Rc) 4140	60	.005-.015	0.02	0.025	0.036	0.038
Austenitic	304/316	60	.005-.010	0.015	0.02	0.025	0.03	
Stainless Steels	M	Free Machining	55	.005-.010	0.015	0.02	0.025	0.03
		Ferritic Martensitic	30	.005-.015	0.02	0.025	0.036	0.038
Precipitation Hardened Stainless Steels	17-4 PH	25	.005-.015	0.02	0.025	0.036	0.038	
Cast Irons	K	Gray Cast Iron A48 Class 20/G4000	120	.005-.015	0.02	0.025	0.036	0.038
		Ductile Cast Iron A536/60-40-18	110	.005-.015	0.02	0.025	0.036	0.038
Special Alloys	S	Titanium 6AL-4V	20	.005-.010	0.015	0.02	0.025	0.03
		High Temp Alloys Inconel®/Hastelloy/Waspelloy	15	.005-.010	0.015	0.02	0.025	0.03
Hardened Steels	H	>45 Rc A2/52100	55	.005-.015	0.02	0.025	0.036	0.038
Non-Ferrous	N	Aluminum (<10% Si)	140	.005-.015	0.02	0.025	0.036	0.038
		Aluminum (>10% Si)	100	.005-.015	0.02	0.025	0.036	0.038
		Plastics	170	.005-.015	0.02	0.025	0.036	0.038
		Composites/Fiber Reinforced Materials/ Circuit Boards	200	.013-.038	0.051	0.076	0.102	0.127

 RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$ 

 Feedrate Formula For Metric Drills -  $\text{Feed} = RPM \times \text{mm/rev}$

# Twister® Hi-Roc® Drill - 3xD

## Series 200 Metric Recommended cutting data

Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio raccomandati · Zalecane dane o cięciu (Zalacane parametry skrawania)

Workpiece Material Groups	Examples	Vc (m/min)	Tool Diameter (mm)								
			1.0	1.5	3.0	6.0	10.0	12.0	16.0	20.0	
			Feed (mm/rev)								
Steels	P	Low Carbon Steels 1018	55	.0060	.0130	.0510	.1020	.1270	.1520	.1750	.2030
		Alloy Steels (up to 35 Rc) 4140	45	.0060	.0130	.0510	.1020	.1270	.1520	.1750	.2030
		Alloy Steels (36-45 Rc) 4140	30	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
Austenitic	M	304/316	40	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
Precipitation Hardened Stainless Steels	M	17-4 PH	20	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
Special Alloys	S	Titanium 6AL-4V	25	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
		High Temp Alloys Inconel®/Hastelloy/Waspelloy	25	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
Hardened Steels	H	>45 Rc A2/52100	20	.0130	.0250	.0250	.0250	.0500	.0500	.0500	.0760
Non-Ferrous	N	Plastic	90	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
		Kevlar/Graphite	115	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250
		Glass/Ceramic	25	.0130	.0250	.0250	.0250	.0500	.0500	.0500	.0760

# Twister® Series 205, 207, 224 Metric

Workpiece Material Groups	Examples	Series			
		205	207	224	
		Vc (m/min)			
Steels	P	Low Carbon Steels 1018	55	-	55
		Alloy Steels (up to 35 Rc) 4140	45	-	50
		Alloy Steels (36-45 Rc) 4140	35	-	45
Austenitic	M	304/316	45	-	40
Precipitation Hardened Stainless Steels	M	17-4 PH	20	-	-
Cast Irons	K	Gray Cast Iron A48 Class 20/G4000	55	-	85
		Ductile Cast Iron A536/60-40-18	55	-	55
Special Alloys	S	Titanium 6AL-4V	25	-	-
		High Temp Alloys Inconel®/Hastelloy/Waspelloy	20	-	-
Hardened Steels	H	>45 Rc A2/52100	15	-	-
Non-Ferrous	N	Plastic	90	90	120
		Kevlar/Graphite	-	115	120

RPM Formula For Metric Drills Only -  $RPM = (Vc \times 318.0) \div \text{Drill } \varnothing D^1$



Drills - Technical Information  
Series 200 / 205 / 207 / 224



## Twister® Series 205, 207, 224 Metric

Recommended cutting data · Conditions de coupe recommandées · Empfohlene Schnittdaten · Dati di taglio raccomandati

· Zalecane dane o cięciu (Zalecane parametry skrawania)

Workpiece Material Groups	Examples	Tool Diameter (mm)									
		1.0	1.5	3.0	6.0	10.0	12.0	16.0	20.0	26.0	
		Feed (mm/rev)									
Steels	P	Low Carbon Steels 1018	.0250	.0500	.0760	.1520	.2030	.2540	.2750	.3050	.3560
		Alloy Steels (up to 35 Rc) 4140	.0250	.0500	.0760	.1520	.2030	.2540	.2750	.3050	.3560
		Alloy Steels (36-45 Rc) 4140	.0250	.0500	.0760	.1520	.2030	.2540	.2750	.3050	.3560
Austenitic	M	304/316	.0250	.0500	.0760	.1520	.2030	.2540	.2750	.3050	.3560
Precipitation Hardened Stainless Steels		17-4 PH	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250	.2540
Cast Irons	K	Gray Cast Iron A48 Class 20/G4000	.0250	.0500	.0760	.1520	.2030	.2540	.2750	.3050	.3560
		Ductile Cast Iron A536/60-40-18	.0250	.0500	.0760	.1520	.2030	.2540	.2750	.3050	.3560
Special Alloys	S	Titanium 6AL-4V	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250	.2540
		High Temp Alloys Inconel®/Hastelloy/Waspelloy	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250	.2540
Hardened Steels	H	>45 Rc A2/52100	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250	.2540
Non-Ferrous	N	Plastic	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250	.2540
		Kevlar/Graphite	.0060	.0127	.0500	.0760	.1010	.1520	.2030	.2250	.2540

Feedrate Formula For Metric Drills - Feed = RPM x mm/rev

## Twister® Series 402, 403, 404 Metric

Workpiece Material Groups	Examples	Vc (m/min)	Tool Diameter (mm)						
			1.0	1.5	3.0	6.0	10.0	12.0	
			Feed (mm/rev)						
Steels	P	Low Carbon Steels 1018	55	.0125	.0250	.0380	.0760	.1020	.1270
		Alloy Steels (up to 35 Rc) 4140	50	.0125	.0250	.0380	.0760	.1020	.1270
		Alloy Steels (36-45 Rc) 4140	45	.0125	.0250	.0380	.0760	.1020	.1270
Stainless Steels	M	304/316	40	.0125	.0250	.0380	.0760	.1020	.1270
		17-4 PH	20	.0125	.0250	.0380	.0760	.1020	.1270
Cast Irons	K	Gray Cast Iron A48 Class 20/G4000	85	.0125	.0250	.0380	.0760	.1020	.1270
		Ductile Cast Iron A536/60-40-18	55	.0125	.0250	.0380	.0760	.1020	.1270
Special Alloys	S	Titanium 6AL-4V	25	.0125	.0250	.0380	.0760	.1020	.1270
		High Temp Alloys Inconel®/Hastelloy/Waspelloy	10	.0125	.0250	.0380	.0760	.1020	.1270
Hardened Steels	H	>45 Rc A2/52100	15	.0125	.0250	.0380	.0760	.1020	.1270

 RPM Formula For Metric Drills Only - RPM = (Vc x 318.0) ÷ Drill Ø D<sup>1</sup>

Feedrate Formula For Metric Drills - Feed = RPM x mm/rev



In applications demanding precision hole tolerances, tighter diameter control and quality bore finishes, our TrueSize® reamers provide a high quality and highly cost-effective solution. Our reamers are available in a wide range of sizes and can be used to machine virtually any material, including cast iron, aluminium, stainless steel, exotic alloys, plastics and other non-ferrous materials.

(FR)

Pour les applications exigeant de la précision et une bonne tolérance de trous, un contrôle de diamètre plus strict et une finition de qualité dans le perçage, nos alésoirs TrueSize® fournissent des solutions de grande qualité et hautement rentables. Nos alésoirs sont disponibles dans une grande variété de tailles et peuvent être utilisés pour usiner pratiquement n'importe quel matériau, y compris la fonte, l'aluminium, l'acier inoxydable, les alliages exotiques, le plastique et d'autres matériaux non-ferreux.

(DE)

Für Anwendungen, bei denen Präzisionsbohrungen mit geringen Toleranzen, eine strengere Durchmesserkontrolle und eine hochwertige Oberflächengüte der Bohrungen erforderlich sind, bieten unsere TrueSize®-Reibahlen eine Lösung von hoher Qualität und zu einem sehr guten Preis-Leistungs-Verhältnis. Unsere Reibahlen sind in diversen Größen erhältlich und können zur Bearbeitung nahezu jeden Materials verwendet werden, einschließlich Gusseisen, Aluminium, rostfreiem Stahl, Sonderlegierungen, Kunststoffen und sonstigen eisenfreien Materialien.

(IT)

Nelle applicazioni che richiedono tolleranze di precisione per i fori, controllo più stretto del diametro e finiture di qualità, i nostri alesatori TrueSize® offrono una soluzione di alta qualità e altamente efficiente. I nostri alesatori sono disponibili in una vasta gamma di misure e possono essere utilizzati per la lavorazione di qualsiasi materiale, tra cui ghisa, alluminio, acciaio inossidabile, leghe esotiche, materie plastiche e altri materiali non ferrosi.

(PL)

W zastosowaniach wymagających precyzyjnych tolerancji otworów, ściślejszej kontroli średnicy i wysokiej jakości wykończenia otworów, nasze rozwiertaki TrueSize® zapewniają wysoką jakość i wysoce opłacalne rozwiązanie. Nasze rozwiertaki są dostępne w szerokiej gamie rozmiarów i można je stosować do obróbki praktycznie każdego materiału, w tym żeliwa, aluminium, stali nierdzewnej, stopów egzotycznych, tworzyw sztucznych i innych materiałów nieżelaznych.

# TrueSize®

## Reamers

Alésoirs Reibahlen Alesatori Rozwiertaki

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<b>TrueSize® Straight Flute Carbide Reamers</b> Series 272	188 - 196
<b>Technical Information</b>	197 - 198



# TrueSize® Solid Carbide Reamers

## Recommended Stock Allowance For Truesize® Solid Carbide Metric Reamers

Surépaisseur recommandée pour les aléssoirs métriques en carbure monoblocs Truesize® · Empfohlenes Aufmaß für Truesize®-Vollhartmetall-Reibahlen  
 Sovrametallo raccomandato per alesatori metrici in metallo duro Truesize® · Zalecany naddatek dla rozwiertaków węglkowych Truesize®

Workpiece Material Group	Material Type	Reamer Diameter (mm)										
		0.35	1.00	2.00	3.00	4.00	5.00	6.00	8.00	10.00	12.00	16.00
		Drill Diameter (mm)										
		0.30	0.90	1.80	2.70	3.70	4.70	5.70	7.60	9.60	11.60	15.50
Stock Allowance (mm)												
<b>P</b>	Low Carbon	0.03	0.09	0.17	0.24	0.26	0.27	0.28	0.31	0.33	0.35	0.41
	Medium Carbon	0.03	0.08	0.15	0.21	0.23	0.24	0.25	0.28	0.31	0.32	0.38
	Tool Steel	0.03	0.08	0.15	0.21	0.23	0.24	0.25	0.28	0.31	0.32	0.38
<b>M</b>	Stainless	0.03	0.08	0.15	0.21	0.23	0.24	0.25	0.28	0.31	0.32	0.38
<b>S</b>	High Temp Alloys	0.03	0.07	0.14	0.20	0.21	0.22	0.23	0.24	0.26	0.29	0.33
	Titanium Alloys	0.03	0.09	0.17	0.24	0.26	0.27	0.28	0.31	0.33	0.35	0.41
<b>K</b>	Grey Cast Iron	0.03	0.09	0.17	0.24	0.26	0.27	0.28	0.31	0.33	0.35	0.41
	Ductile Cast Iron	0.03	0.09	0.17	0.24	0.26	0.27	0.28	0.31	0.33	0.35	0.41
<b>H</b>	Hardened Steel	0.02	0.06	0.12	0.17	0.19	0.19	0.20	0.23	0.26	0.27	0.33
<b>N</b>	Aluminium Alloys	0.04	0.09	0.19	0.27	0.29	0.29	0.30	0.32	0.34	0.37	0.41
	Copper & Hard Bronze	0.04	0.09	0.19	0.27	0.29	0.29	0.30	0.33	0.36	0.38	0.43
	Brass & Soft Bronze	0.04	0.09	0.19	0.27	0.29	0.29	0.30	0.32	0.34	0.37	0.41

 Reamers  
 Recommended Stock Allowance

## Dowel Pin Chart - Metric Dowels

Tableau des goupilles - goupilles métriques · Tabelle der Spannstifte - metrische Spannstifte · Tabella spine calibrate - Spine metriche · Tabela kołków - kołki metryczne

Dowel Pin	Strong Press Fit	Reamer Required	Tight Press Fit	Reamer Required	Loose Press Fit	Reamer Required	Tight Slip Fit	Reamer Required	Loose Slip Fit	Reamer Required
Size (mm)	Reamer Ø	Tool No.	Reamer Ø	Tool No.	Reamer Ø	Tool No.	Reamer Ø	Tool No.	Reamer Ø	Tool No.
2.0	1.95	27207670	1.98	27207810	1.99	27207850	2.01	27207900	2.02	27207950
3.0	2.95	27211610	2.98	27211750	3.00	27211800	3.01	27211850	3.02	27211900
4.0	3.95	27215550	3.99	27215700	4.00	27215750	4.01	27215800	4.03	27215850
5.0	4.95	27219490	4.99	27219650	5.00	27219690	5.02	27219750	5.03	27219800
6.0	5.95	27223430	5.98	27223550	5.99	27223600	6.01	27223650	6.02	27223700
8.0	7.95	27231300	7.98	27231400	8.00	27231500	8.00	27231500	8.03	27231600
10.0	9.96	27239200	9.98	27239300	10.00	27239370	10.01	27239400	10.03	27239500
12.0	11.96	27247100	11.99	27247200	12.00	27247240	12.01	27247300	12.01	27247300

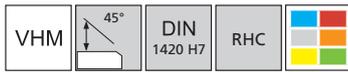
Truesize® Reamer Tolerance - DIN 1420 H7

Dowels are to nominal size +0.0025 / -0.0025mm

### ISO 9001:2008 Certified

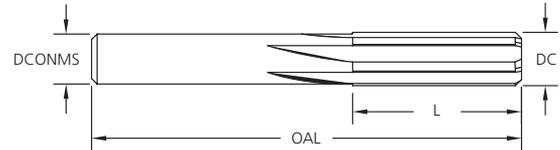
ISO 9001:2008 Certifié  
 Nach ISO 9001:2008 zertifiziert  
 Certificato ISO 9001: 2008  
 Certyfikat ISO 9001:2008

# TrueSize® Straight Flute Carbide Reamers Series 272



DIN 1420 H7

D' (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27201300	0.330	0.33	38.0	5.0	4
27201350	0.343	0.34	38.0	5.0	4
27201380	0.351	0.35	38.0	5.0	4
27201400	0.356	0.36	38.0	5.0	4
27201450	0.368	0.37	38.0	5.0	4
27201500	0.381	0.38	38.0	5.0	4
27201550	0.394	0.39	38.0	5.0	4
27201570	0.400	0.40	38.0	5.0	4
27201600	0.406	0.41	38.0	5.0	4
27201650	0.419	0.42	38.0	5.0	4
27201700	0.432	0.43	38.0	5.0	4
27201750	0.445	0.45	38.0	5.0	4
27201770	0.450	0.45	38.0	5.0	4
27201800	0.457	0.46	38.0	5.0	4
27201850	0.470	0.47	38.0	5.0	4
27201900	0.483	0.48	38.0	5.0	4
27201950	0.495	0.49	38.0	5.0	4
27201970	0.500	0.50	38.0	5.0	4
27202000	0.508	0.51	38.0	5.0	4
27202050	0.521	0.52	38.0	6.5	4
27202100	0.533	0.53	38.0	6.5	4
27202150	0.546	0.55	38.0	6.5	4
27202170	0.551	0.55	38.0	6.5	4
27202200	0.559	0.56	38.0	6.5	4
27202250	0.572	0.57	38.0	6.5	4
27202300	0.584	0.58	38.0	6.5	4
27202350	0.597	0.59	38.0	6.5	4
27202360	0.600	0.60	38.0	6.5	4
27202400	0.610	0.61	38.0	6.5	4
27202450	0.622	0.62	38.0	6.5	4
27202500	0.635	0.64	38.0	6.5	4
27202550	0.648	0.65	38.0	6.5	4
27202560	0.650	0.65	38.0	6.5	4
27202600	0.660	0.66	38.0	6.5	4
27202650	0.673	0.67	38.0	6.5	4
27202700	0.686	0.69	38.0	6.5	4
27202750	0.700	0.70	38.0	6.5	4
27202800	0.711	0.71	38.0	6.5	4
27202850	0.724	0.72	38.0	6.5	4
27202900	0.737	0.73	38.0	6.5	4
27202920	0.742	0.74	38.0	6.5	4
27202951	0.750	0.75	38.0	6.5	4
27203000	0.762	0.76	38.0	6.5	4
27203050	0.775	0.78	38.0	6.5	4
27203100	0.787	0.79	38.0	6.5	4
27203120	0.792	0.79	38.0	6.5	4
27203150	0.800	0.80	38.0	6.5	4

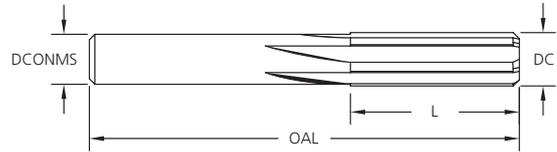
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27203200	0.813	0.81	38.0	6.5	4
27203250	0.826	0.83	38.0	6.5	4
27203300	0.838	0.84	38.0	6.5	4
27203350	0.850	0.85	38.0	6.5	4
27203400	0.864	0.86	38.0	6.5	4
27203450	0.876	0.88	38.0	6.5	4
27203500	0.889	0.89	38.0	6.5	4
27203540	0.900	0.90	38.0	6.5	4
27203600	0.914	0.91	38.0	6.5	4
27203650	0.927	0.93	38.0	6.5	4
27203700	0.940	0.94	38.0	6.5	4
27203740	0.950	0.95	38.0	6.5	4
27203800	0.965	0.97	38.0	6.5	4
27203850	0.978	0.98	38.0	6.5	4
27203900	0.991	0.99	38.0	6.5	4
27203940	1.000	1.00	38.0	6.5	4
27204000	1.016	1.02	38.0	6.5	4
27204050	1.029	1.03	38.0	9.5	4
27204100	1.041	1.04	38.0	9.5	4
27204130	1.049	1.05	38.0	9.5	4
27204150	1.054	1.06	38.0	9.5	4
27204200	1.067	1.07	38.0	9.5	4
27204250	1.080	1.08	38.0	9.5	4
27204300	1.092	1.09	38.0	9.5	4
27204330	1.100	1.10	38.0	9.5	4
27204350	1.105	1.09	38.0	9.5	4
27204400	1.118	1.09	38.0	9.5	4
27204450	1.130	1.09	38.0	9.5	4
27204500	1.143	1.09	38.0	9.5	4
27204520	1.148	1.09	38.0	9.5	4
27204550	1.156	1.09	38.0	9.5	4
27204600	1.168	1.09	38.0	9.5	4
27204650	1.181	1.09	38.0	9.5	4
27204680	1.189	1.09	38.0	9.5	4
27204700	1.194	1.09	38.0	9.5	4
27204720	1.200	1.09	38.0	9.5	4
27204750	1.207	1.09	38.0	9.5	4
27204800	1.219	1.09	38.0	9.5	4
27204850	1.232	1.09	38.0	9.5	4
27204900	1.245	1.09	38.0	9.5	4
27204920	1.250	1.09	38.0	9.5	4
27204950	1.257	1.09	38.0	9.5	4
27205000	1.270	1.09	38.0	9.5	4
27205050	1.283	1.09	38.0	9.5	4
27205100	1.295	1.09	38.0	9.5	4
27205110	1.298	1.09	38.0	9.5	4
27205150	1.308	1.09	38.0	9.5	4



# TrueSize® Straight Flute Carbide Reamers Series 272


**DIN 1420 H7**

D' (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27205200	1.321	1.17	38.0	9.5	4
27205250	1.334	1.17	38.0	9.5	4
27205300	1.346	1.17	38.0	9.5	4
27205310	1.349	1.17	38.0	9.5	4
27205350	1.359	1.17	38.0	9.5	4
27205400	1.372	1.17	38.0	9.5	4
27205450	1.384	1.17	38.0	9.5	4
27205500	1.397	1.17	38.0	9.5	4
27205510	1.400	1.17	38.0	9.5	4
27205550	1.410	1.17	38.0	9.5	4
27205600	1.422	1.17	38.0	9.5	4
27205650	1.435	1.17	38.0	9.5	4
27205700	1.448	1.17	38.0	9.5	4
27205710	1.450	1.17	38.0	9.5	4
27205750	1.461	1.17	38.0	9.5	4
27205800	1.473	1.17	38.0	9.5	4
27205850	1.486	1.17	38.0	9.5	4
27205901	1.500	1.17	38.0	9.5	4
27205950	1.511	1.47	38.0	9.5	4
27206000	1.524	1.47	38.0	9.5	4
27206050	1.537	1.47	38.0	9.5	4
27206101	1.550	1.47	38.0	9.5	4
27206150	1.562	1.47	38.0	9.5	4
27206200	1.575	1.47	38.0	9.5	4
27206250	1.588	1.47	38.0	9.5	4
27206300	1.600	1.47	38.0	9.5	4
27206350	1.613	1.47	38.0	9.5	4
27206400	1.626	1.47	38.0	9.5	4
27206450	1.638	1.47	38.0	9.5	4
27206500	1.650	1.47	38.0	9.5	4
27206550	1.664	1.47	38.0	9.5	4
27206600	1.676	1.47	38.0	9.5	4
27206650	1.689	1.65	44.0	12.5	4
27206690	1.700	1.65	44.0	12.5	4
27206750	1.715	1.65	44.0	12.5	4
27206800	1.727	1.65	44.0	12.5	4
27206850	1.740	1.65	44.0	12.5	4
27206890	1.750	1.65	44.0	12.5	4
27206900	1.753	1.65	44.0	12.5	4
27206950	1.765	1.65	44.0	12.5	4
27207000	1.778	1.65	44.0	12.5	4
27207050	1.791	1.65	44.0	12.5	4
27207080	1.798	1.65	44.0	12.5	4
27207100	1.803	1.65	44.0	12.5	4
27207150	1.816	1.65	44.0	12.5	4
27207200	1.829	1.65	44.0	12.5	4
27207250	1.842	1.65	44.0	12.5	4

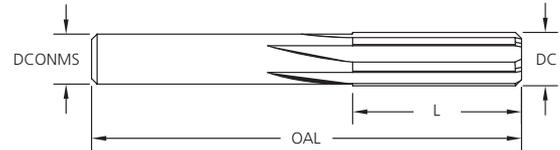
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27207280	1.850	1.65	44.0	12.5	4
27207300	1.854	1.65	44.0	12.5	4
27207350	1.867	1.65	44.0	12.5	4
27207400	1.880	1.65	44.0	12.5	4
27207450	1.892	1.85	44.0	12.5	4
27207480	1.900	1.85	44.0	12.5	4
27207500	1.905	1.85	44.0	12.5	4
27207550	1.918	1.85	44.0	12.5	4
27207600	1.930	1.85	44.0	12.5	4
27207650	1.943	1.85	44.0	12.5	4
27207670	1.948	1.85	44.0	12.5	4
27207700	1.956	1.85	44.0	12.5	4
27207750	1.969	1.85	44.0	12.5	4
27207800	1.981	1.85	44.0	12.5	4
27207810	1.984	1.85	44.0	12.5	4
27207850	1.994	1.85	44.0	12.5	4
27207870	2.000	1.85	44.0	12.5	4
27207900	2.007	1.85	44.0	12.5	4
27207950	2.019	1.85	44.0	12.5	4
27208000	2.032	1.85	44.0	12.5	4
27208050	2.045	1.85	44.0	12.5	4
27208070	2.050	1.85	44.0	12.5	4
27208100	2.057	1.85	44.0	12.5	4
27208150	2.070	2.03	51.0	12.5	4
27208200	2.083	2.03	51.0	12.5	4
27208250	2.096	2.03	51.0	12.5	4
27208270	2.101	2.03	51.0	12.5	4
27208300	2.108	2.03	51.0	12.5	4
27208350	2.121	2.03	51.0	12.5	4
27208400	2.134	2.03	51.0	12.5	4
27208450	2.146	2.03	51.0	12.5	4
27208460	2.149	2.03	51.0	12.5	4
27208500	2.159	2.03	51.0	12.5	4
27208550	2.172	2.03	51.0	12.5	4
27208600	2.184	2.03	51.0	12.5	4
27208650	2.197	2.03	51.0	12.5	4
27208660	2.200	2.03	51.0	12.5	4
27208700	2.210	2.03	51.0	12.5	4
27208750	2.223	2.03	51.0	12.5	4
27208800	2.235	2.03	51.0	12.5	4
27208850	2.248	2.03	51.0	12.5	4
27208860	2.250	2.03	51.0	12.5	4
27208900	2.261	2.03	51.0	12.5	4
27208950	2.273	2.24	51.0	12.5	4
27209000	2.286	2.24	51.0	12.5	4
27209050	2.300	2.24	51.0	12.5	4
27209100	2.311	2.24	51.0	12.5	4

# TrueSize® Straight Flute Carbide Reamers Series 272



DIN 1420 H7

D <sup>1</sup> (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27209150	2.324	2.24	51.0	12.5	4
27209200	2.337	2.24	51.0	12.5	4
27209251	2.350	2.24	51.0	12.5	4
27209300	2.362	2.24	51.0	12.5	4
27209350	2.375	2.24	51.0	12.5	4
27209370	2.380	2.24	51.0	12.5	4
27209400	2.388	2.24	51.0	12.5	4
27209450	2.400	2.24	51.0	12.5	4
27209500	2.413	2.24	51.0	12.5	4
27209550	2.426	2.24	51.0	12.5	4
27209600	2.438	2.24	51.0	12.5	4
27209650	2.451	2.24	51.0	12.5	4
27209700	2.464	2.24	51.0	12.5	4
27209750	2.477	2.44	57.0	16.0	4
27209800	2.489	2.44	57.0	16.0	4
27209840	2.500	2.44	57.0	16.0	4
27209900	2.515	2.44	57.0	16.0	4
27209950	2.527	2.44	57.0	16.0	4
27210000	2.540	2.44	57.0	16.0	4
27210040	2.550	2.44	57.0	16.0	4
27210100	2.565	2.44	57.0	16.0	4
27210150	2.578	2.44	57.0	16.0	4
27210200	2.591	2.44	57.0	16.0	4
27210240	2.601	2.44	57.0	16.0	4
27210300	2.616	2.44	57.0	16.0	4
27210350	2.629	2.44	57.0	16.0	4
27210400	2.642	2.44	57.0	16.0	4
27210430	2.649	2.44	57.0	16.0	4
27210500	2.667	2.44	57.0	16.0	4
27210550	2.680	2.64	57.0	16.0	4
27210600	2.692	2.64	57.0	16.0	4
27210630	2.700	2.64	57.0	16.0	4
27210650	2.705	2.64	57.0	16.0	4
27210700	2.718	2.64	57.0	16.0	4
27210750	2.731	2.64	57.0	16.0	4
27210800	2.743	2.64	57.0	16.0	4
27210830	2.751	2.64	57.0	16.0	4
27210850	2.756	2.64	57.0	16.0	4
27210900	2.769	2.64	57.0	16.0	4
27210940	2.779	2.64	57.0	16.0	4
27210950	2.781	2.64	57.0	16.0	4
27211000	2.794	2.64	57.0	16.0	4
27211020	2.800	2.64	57.0	16.0	4
27211050	2.807	2.64	57.0	16.0	4
27211100	2.819	2.64	57.0	16.0	4
27211150	2.832	2.64	57.0	16.0	4
27211200	2.845	2.64	57.0	16.0	4

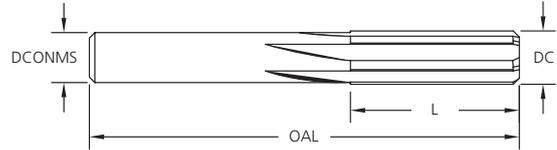
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27211220	2.850	2.64	57.0	16.0	4
27211250	2.858	2.64	57.0	16.0	4
27211300	2.870	2.64	57.0	16.0	4
27211350	2.883	2.84	57.0	16.0	4
27211400	2.896	2.84	57.0	16.0	4
27211420	2.900	2.84	57.0	16.0	4
27211450	2.908	2.84	57.0	16.0	4
27211500	2.921	2.84	57.0	16.0	4
27211550	2.934	2.84	57.0	16.0	4
27211600	2.946	2.84	57.0	16.0	4
27211610	2.949	2.84	57.0	16.0	4
27211650	2.959	2.84	57.0	16.0	4
27211700	2.972	2.84	57.0	16.0	4
27211750	2.985	2.84	57.0	16.0	4
27211800	2.997	2.84	57.0	16.0	4
27211810	3.000	2.84	57.0	16.0	4
27211850	3.010	2.84	57.0	16.0	4
27211900	3.023	2.84	57.0	16.0	4
27211950	3.035	2.84	57.0	16.0	4
27212000	3.048	2.84	57.0	16.0	4
27212010	3.051	2.84	57.0	16.0	4
27212050	3.061	2.84	57.0	16.0	4
27212100	3.073	2.84	57.0	16.0	4
27212150	3.086	3.05	57.0	16.0	4
27212200	3.099	3.05	57.0	16.0	4
27212250	3.112	3.05	57.0	16.0	4
27212300	3.124	3.05	57.0	16.0	4
27212350	3.137	3.05	57.0	16.0	4
27212401	3.150	3.05	57.0	16.0	4
27212450	3.162	3.05	57.0	16.0	4
27212480	3.170	3.05	57.0	16.0	4
27212500	3.175	3.05	57.0	16.0	4
27212550	3.188	3.05	57.0	16.0	4
27212600	3.200	3.05	57.0	16.0	4
27212650	3.213	3.05	57.0	16.0	4
27212700	3.226	3.05	57.0	16.0	4
27212750	3.239	3.05	57.0	16.0	4
27212800	3.251	3.05	57.0	16.0	4
27212850	3.264	3.23	63.0	19.0	4
27212900	3.277	3.23	63.0	19.0	4
27212950	3.289	3.23	63.0	19.0	4
27212990	3.300	3.23	63.0	19.0	4
27213050	3.315	3.23	63.0	19.0	4
27213100	3.327	3.23	63.0	19.0	4
27213150	3.340	3.23	63.0	19.0	4
27213190	3.350	3.23	63.0	19.0	4
27213250	3.366	3.23	63.0	19.0	4
27213300	3.378	3.23	63.0	19.0	4



# TrueSize® Straight Flute Carbide Reamers Series 272


**DIN 1420 H7**

D' (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27213350	3.391	3.23	63.0	19.0	4
27213390	3.401	3.23	63.0	19.0	4
27213450	3.416	3.23	63.0	19.0	4
27213500	3.429	3.23	63.0	19.0	4
27213550	3.442	3.23	63.0	19.0	4
27213580	3.449	3.23	63.0	19.0	4
27213600	3.454	3.23	63.0	19.0	4
27213650	3.467	3.43	63.0	19.0	4
27213700	3.480	3.43	63.0	19.0	4
27213750	3.493	3.43	63.0	19.0	4
27213780	3.500	3.43	63.0	19.0	4
27213800	3.505	3.43	63.0	19.0	4
27213850	3.518	3.43	63.0	19.0	4
27213900	3.531	3.43	63.0	19.0	4
27213950	3.543	3.43	63.0	19.0	4
27213980	3.551	3.43	63.0	19.0	4
27214000	3.556	3.43	63.0	19.0	4
27214060	3.571	3.43	63.0	19.0	4
27214100	3.581	3.43	63.0	19.0	4
27214150	3.594	3.43	63.0	19.0	4
27214170	3.599	3.43	63.0	19.0	4
27214200	3.607	3.43	63.0	19.0	4
27214250	3.620	3.43	63.0	19.0	4
27214300	3.632	3.43	63.0	19.0	4
27214350	3.645	3.43	63.0	19.0	4
27214370	3.650	3.43	63.0	19.0	4
27214400	3.658	3.43	63.0	19.0	4
27214450	3.670	3.63	63.0	19.0	4
27214500	3.683	3.63	63.0	19.0	4
27214550	3.696	3.63	63.0	19.0	4
27214570	3.701	3.63	63.0	19.0	4
27214600	3.708	3.63	63.0	19.0	4
27214650	3.721	3.63	63.0	19.0	4
27214700	3.734	3.63	63.0	19.0	4
27214750	3.747	3.63	63.0	19.0	4
27214760	3.750	3.63	63.0	19.0	4
27214800	3.759	3.63	63.0	19.0	4
27214850	3.772	3.63	63.0	19.0	4
27214900	3.785	3.63	63.0	19.0	4
27214960	3.800	3.63	63.0	19.0	4
27215000	3.810	3.63	63.0	19.0	4
27215050	3.823	3.63	63.0	19.0	4
27215100	3.835	3.63	63.0	19.0	4
27215160	3.851	3.63	63.0	19.0	4
27215200	3.861	3.63	63.0	19.0	4
27215250	3.874	3.84	63.0	19.0	4
27215300	3.886	3.84	63.0	19.0	4

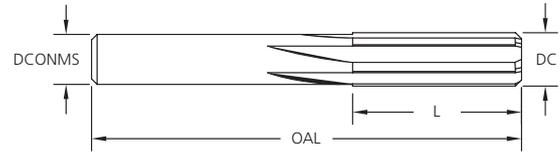
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27215351	3.900	3.84	63.0	19.0	4
27215400	3.912	3.84	63.0	19.0	4
27215450	3.924	3.84	63.0	19.0	4
27215500	3.937	3.84	63.0	19.0	4
27215550	3.950	3.84	63.0	19.0	4
27215600	3.962	3.84	63.0	19.0	4
27215620	3.967	3.84	63.0	19.0	4
27215650	3.975	3.84	63.0	19.0	4
27215700	3.988	3.84	63.0	19.0	4
27215750	4.000	3.84	63.0	19.0	4
27215800	4.013	3.84	63.0	19.0	4
27215850	4.026	3.84	63.0	19.0	4
27215900	4.039	3.84	63.0	19.0	4
27215940	4.049	4.01	70.0	22.0	4
27216000	4.064	4.01	70.0	22.0	4
27216050	4.077	4.01	70.0	22.0	4
27216100	4.089	4.01	70.0	22.0	4
27216140	4.100	4.01	70.0	22.0	4
27216200	4.115	4.01	70.0	22.0	4
27216250	4.128	4.01	70.0	22.0	4
27216300	4.140	4.01	70.0	22.0	4
27216340	4.150	4.01	70.0	22.0	4
27216400	4.166	4.01	70.0	22.0	4
27216450	4.178	4.01	70.0	22.0	4
27216500	4.191	4.01	70.0	22.0	4
27216540	4.201	4.01	70.0	22.0	4
27216600	4.216	4.01	70.0	22.0	4
27216650	4.229	4.01	70.0	22.0	4
27216700	4.242	4.01	70.0	22.0	4
27216730	4.249	4.22	70.0	22.0	4
27216800	4.267	4.22	70.0	22.0	4
27216850	4.280	4.22	70.0	22.0	4
27216900	4.293	4.22	70.0	22.0	4
27216930	4.300	4.22	70.0	22.0	4
27216950	4.305	4.22	70.0	22.0	4
27217000	4.318	4.22	70.0	22.0	4
27217050	4.331	4.22	70.0	22.0	4
27217100	4.343	4.22	70.0	22.0	4
27217130	4.351	4.22	70.0	22.0	4
27217150	4.356	4.22	70.0	22.0	4
27217190	4.366	4.22	70.0	22.0	4
27217200	4.369	4.22	70.0	22.0	4
27217250	4.382	4.22	70.0	22.0	4
27217300	4.394	4.22	70.0	22.0	4
27217320	4.399	4.22	70.0	22.0	4
27217350	4.407	4.22	70.0	22.0	4
27217400	4.420	4.22	70.0	22.0	4

# TrueSize® Straight Flute Carbide Reamers Series 272



DIN 1420 H7

D <sup>1</sup> (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27217450	4.432	4.22	70.0	22.0	4
27217500	4.445	4.22	70.0	22.0	4
27217520	4.450	4.42	70.0	22.0	4
27217550	4.458	4.42	70.0	22.0	4
27217600	4.470	4.42	70.0	22.0	4
27217650	4.483	4.42	70.0	22.0	4
27217700	4.496	4.42	70.0	22.0	4
27217720	4.501	4.42	70.0	22.0	4
27217750	4.509	4.42	70.0	22.0	4
27217800	4.521	4.42	70.0	22.0	4
27217850	4.534	4.42	70.0	22.0	4
27217900	4.547	4.42	70.0	22.0	4
27217910	4.549	4.42	70.0	22.0	4
27217950	4.559	4.42	70.0	22.0	4
27218000	4.572	4.42	70.0	22.0	4
27218050	4.585	4.42	70.0	22.0	4
27218100	4.597	4.42	70.0	22.0	4
27218110	4.600	4.42	70.0	22.0	4
27218150	4.610	4.42	70.0	22.0	4
27218200	4.623	4.42	70.0	22.0	4
27218250	4.636	4.42	70.0	22.0	4
27218300	4.648	4.42	70.0	22.0	4
27218310	4.651	4.62	70.0	22.0	4
27218350	4.661	4.62	70.0	22.0	4
27218400	4.674	4.62	70.0	22.0	4
27218450	4.686	4.62	70.0	22.0	4
27218500	4.700	4.62	70.0	22.0	4
27218550	4.712	4.62	70.0	22.0	4
27218600	4.724	4.62	70.0	22.0	4
27218650	4.737	4.62	70.0	22.0	4
27218701	4.750	4.62	70.0	22.0	4
27218740	4.760	4.62	70.0	22.0	4
27218800	4.775	4.62	70.0	22.0	4
27218850	4.788	4.62	70.0	22.0	4
27218890	4.798	4.62	70.0	22.0	4
27218900	4.800	4.62	70.0	22.0	4
27218950	4.813	4.62	70.0	22.0	4
27219000	4.826	4.62	70.0	22.0	4
27219050	4.839	4.62	70.0	22.0	4
27219090	4.849	4.62	70.0	22.0	4
27219150	4.864	4.83	76.0	25.0	4
27219200	4.877	4.83	76.0	25.0	4
27219250	4.890	4.83	76.0	25.0	4
27219290	4.900	4.83	76.0	25.0	4
27219350	4.915	4.83	76.0	25.0	4
27219400	4.928	4.83	76.0	25.0	4
27219450	4.940	4.83	76.0	25.0	4

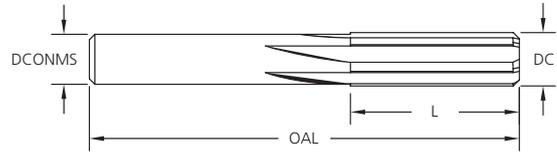
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27219490	4.950	4.83	76.0	25.0	4
27219550	4.966	4.83	76.0	25.0	4
27219600	4.978	4.83	76.0	25.0	4
27219650	4.991	4.83	76.0	25.0	4
27219690	5.001	4.83	76.0	25.0	4
27219750	5.017	4.83	76.0	25.0	4
27219800	5.029	4.83	76.0	25.0	4
27219850	5.042	4.83	76.0	25.0	4
27219880	5.050	4.83	76.0	25.0	4
27219950	5.067	5.03	76.0	25.0	4
27220000	5.080	5.03	76.0	25.0	4
27220050	5.093	5.03	76.0	25.0	4
27220080	5.100	5.03	76.0	25.0	4
27220100	5.105	5.03	76.0	25.0	4
27220150	5.118	5.03	76.0	25.0	4
27220200	5.131	5.03	76.0	25.0	4
27220250	5.144	5.03	76.0	25.0	4
27220280	5.151	5.03	76.0	25.0	4
27220310	5.159	5.03	76.0	25.0	4
27220350	5.169	5.03	76.0	25.0	4
27220400	5.182	5.03	76.0	25.0	4
27220450	5.194	5.03	76.0	25.0	4
27220470	5.199	5.03	76.0	25.0	4
27220500	5.207	5.03	76.0	25.0	4
27220550	5.220	5.03	76.0	25.0	4
27220600	5.232	5.03	76.0	25.0	4
27220650	5.245	5.21	76.0	25.0	4
27220670	5.250	5.21	76.0	25.0	4
27220700	5.258	5.21	76.0	25.0	4
27220750	5.271	5.21	76.0	25.0	4
27220800	5.283	5.21	76.0	25.0	4
27220850	5.296	5.21	76.0	25.0	4
27220870	5.301	5.21	76.0	25.0	4
27220900	5.309	5.21	76.0	25.0	4
27220950	5.321	5.21	76.0	25.0	4
27221000	5.334	5.21	76.0	25.0	4
27221050	5.347	5.21	76.0	25.0	4
27221060	5.349	5.21	76.0	25.0	4
27221100	5.359	5.21	76.0	25.0	4
27221150	5.372	5.21	76.0	25.0	4
27221200	5.385	5.21	76.0	25.0	4
27221250	5.398	5.21	76.0	25.0	4
27221260	5.400	5.21	76.0	25.0	4
27221300	5.410	5.21	76.0	25.0	4
27221350	5.423	5.21	76.0	25.0	4
27221400	5.436	5.21	76.0	25.0	4
27221450	5.448	5.21	76.0	25.0	4



# TrueSize® Straight Flute Carbide Reamers Series 272


**DIN 1420 H7**

D' (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27221460	5.451	5.41	76.0	25.0	4
27221500	5.461	5.41	76.0	25.0	4
27221550	5.474	5.41	76.0	25.0	4
27221600	5.486	5.41	76.0	25.0	4
27221651	5.500	5.41	76.0	25.0	4
27221700	5.512	5.41	76.0	25.0	4
27221750	5.525	5.41	76.0	25.0	4
27221800	5.537	5.41	76.0	25.0	4
27221851	5.550	5.41	76.0	25.0	4
27221900	5.563	5.41	76.0	25.0	4
27221950	5.575	5.41	76.0	25.0	4
27222000	5.588	5.41	76.0	25.0	4
27222050	5.601	5.41	76.0	25.0	4
27222100	5.613	5.41	76.0	25.0	4
27222150	5.626	5.41	76.0	25.0	4
27222200	5.639	5.41	76.0	25.0	4
27222240	5.649	5.61	76.0	25.0	4
27222250	5.652	5.61	76.0	25.0	4
27222300	5.664	5.61	76.0	25.0	4
27222350	5.677	5.61	76.0	25.0	4
27222400	5.690	5.61	76.0	25.0	4
27222440	5.700	5.61	76.0	25.0	4
27222500	5.715	5.61	76.0	25.0	4
27222550	5.728	5.61	76.0	25.0	4
27222600	5.740	5.61	76.0	25.0	4
27222640	5.751	5.61	76.0	25.0	4
27222700	5.766	5.61	76.0	25.0	4
27222750	5.779	5.61	76.0	25.0	4
27222800	5.791	5.61	76.0	25.0	4
27222830	5.799	5.61	76.0	25.0	4
27222850	5.804	5.61	76.0	25.0	4
27222900	5.817	5.61	76.0	25.0	4
27222950	5.829	5.61	76.0	25.0	4
27223000	5.842	5.61	76.0	25.0	4
27223030	5.850	5.82	76.0	25.0	4
27223050	5.855	5.82	76.0	25.0	4
27223100	5.867	5.82	76.0	25.0	4
27223150	5.880	5.82	76.0	25.0	4
27223200	5.893	5.82	76.0	25.0	4
27223230	5.900	5.82	76.0	25.0	4
27223250	5.906	5.82	76.0	25.0	4
27223300	5.918	5.82	76.0	25.0	4
27223350	5.931	5.82	76.0	25.0	4
27223400	5.944	5.82	76.0	25.0	4
27223430	5.951	5.82	76.0	25.0	4
27223450	5.956	5.82	76.0	25.0	4
27223500	5.969	5.82	76.0	25.0	4

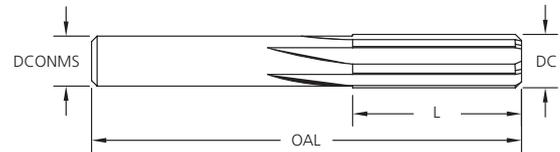
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27223550	5.982	5.82	76.0	25.0	4
27223600	5.994	5.82	76.0	25.0	4
27223620	5.999	5.82	76.0	25.0	4
27223650	6.007	5.82	76.0	25.0	4
27223700	6.020	5.82	76.0	25.0	4
27223750	6.033	5.99	76.0	25.0	4
27223800	6.045	5.99	76.0	25.0	4
27223820	6.050	5.99	76.0	25.0	4
27223850	6.058	5.99	76.0	25.0	4
27223900	6.071	5.99	76.0	25.0	4
27223950	6.083	5.99	76.0	25.0	4
27224000	6.096	5.99	76.0	25.0	4
27224020	6.101	5.99	76.0	25.0	4
27224050	6.109	5.99	76.0	25.0	4
27224100	6.121	5.99	76.0	25.0	4
27224150	6.134	5.99	76.0	25.0	4
27224210	6.149	5.99	76.0	25.0	4
27224250	6.160	5.99	76.0	25.0	4
27224300	6.172	5.99	76.0	25.0	4
27224350	6.185	5.99	76.0	25.0	4
27224410	6.200	5.99	76.0	25.0	4
27224450	6.210	5.99	76.0	25.0	4
27224500	6.223	5.99	76.0	25.0	4
27224550	6.236	6.20	76.0	25.0	4
27224610	6.251	6.20	76.0	25.0	4
27224650	6.261	6.20	76.0	25.0	4
27224700	6.274	6.20	76.0	25.0	4
27224750	6.287	6.20	76.0	25.0	4
27224801	6.300	6.20	76.0	25.0	4
27224850	6.312	6.20	76.0	25.0	4
27224900	6.325	6.20	76.0	25.0	4
27224950	6.337	6.20	76.0	25.0	4
27224980	6.345	6.20	76.0	25.0	4
27225001	6.350	6.20	76.0	25.0	4
27225050	6.363	6.20	76.0	25.0	4
27225100	6.375	6.20	76.0	25.0	4
27225150	6.388	6.20	76.0	25.0	4
27225190	6.398	6.20	76.0	25.0	4
27225200	6.401	6.20	76.0	25.0	4
27225250	6.414	6.20	76.0	25.0	4
27225300	6.426	6.20	76.0	25.0	4
27225390	6.449	6.40	83.0	28.0	6
27225500	6.477	6.40	83.0	28.0	6
27225590	6.500	6.40	83.0	28.0	6
27225700	6.528	6.40	83.0	28.0	6
27225800	6.553	6.40	83.0	28.0	6
27225900	6.579	6.40	83.0	28.0	6

# TrueSize® Straight Flute Carbide Reamers Series 272



DIN 1420 H7

D <sup>1</sup> (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27226000	6.604	6.40	83.0	28.0	6
27226100	6.629	6.40	83.0	28.0	6
27226200	6.655	6.40	83.0	28.0	6
27226300	6.680	6.40	83.0	28.0	6
27226400	6.706	6.40	83.0	28.0	6
27226500	6.731	6.40	83.0	28.0	6
27226560	6.746	6.40	83.0	28.0	6
27226600	6.756	6.40	83.0	28.0	6
27226700	6.782	6.40	83.0	28.0	6
27226800	6.807	6.40	83.0	28.0	6
27226900	6.833	6.40	83.0	28.0	6
27227000	6.858	6.40	83.0	28.0	6
27227100	6.883	6.40	83.0	28.0	6
27227200	6.909	6.86	83.0	28.0	6
27227300	6.934	6.86	83.0	28.0	6
27227400	6.960	6.86	83.0	28.0	6
27227500	6.985	6.86	83.0	28.0	6
27227560	7.000	6.86	83.0	28.0	6
27227600	7.010	6.86	83.0	28.0	6
27227700	7.036	6.86	83.0	28.0	6
27227800	7.061	6.86	83.0	28.0	6
27227900	7.087	6.86	83.0	28.0	6
27228000	7.112	6.86	83.0	28.0	6
27228100	7.137	6.86	83.0	28.0	6
27228120	7.142	6.86	83.0	28.0	6
27228200	7.163	6.86	83.0	28.0	6
27228300	7.188	6.86	83.0	28.0	6
27228400	7.214	6.86	83.0	28.0	6
27228500	7.239	6.86	83.0	28.0	6
27228600	7.264	6.86	83.0	28.0	6
27228700	7.290	7.24	83.0	28.0	6
27228800	7.315	7.24	83.0	28.0	6
27228900	7.341	7.24	83.0	28.0	6
27229000	7.366	7.24	83.0	28.0	6
27229100	7.391	7.24	83.0	28.0	6
27229200	7.417	7.24	83.0	28.0	6
27229300	7.442	7.24	83.0	28.0	6
27229400	7.468	7.24	83.0	28.0	6
27229500	7.493	7.24	83.0	28.0	6
27229530	7.501	7.24	83.0	28.0	6
27229600	7.518	7.24	83.0	28.0	6
27229680	7.539	7.24	83.0	28.0	6
27229700	7.544	7.24	83.0	28.0	6
27229800	7.569	7.24	83.0	28.0	6
27229900	7.595	7.24	83.0	28.0	6
27230000	7.620	7.24	83.0	28.0	6
27230100	7.645	7.24	83.0	28.0	6

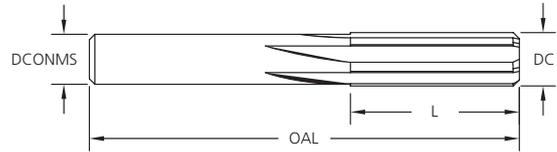
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27230200	7.671	7.24	83.0	28.0	6
27230300	7.696	7.65	83.0	28.0	6
27230400	7.722	7.65	83.0	28.0	6
27230500	7.747	7.65	83.0	28.0	6
27230600	7.772	7.65	83.0	28.0	6
27230700	7.798	7.65	83.0	28.0	6
27230800	7.823	7.65	83.0	28.0	6
27230900	7.849	7.65	83.0	28.0	6
27231000	7.874	7.65	83.0	28.0	6
27231050	7.887	7.65	83.0	28.0	6
27231100	7.899	7.65	83.0	28.0	6
27231150	7.912	7.65	83.0	28.0	6
27231200	7.925	7.65	83.0	28.0	6
27231230	7.932	7.65	83.0	28.0	6
27231250	7.938	7.65	83.0	28.0	6
27231300	7.950	7.65	83.0	28.0	6
27231350	7.963	7.65	83.0	28.0	6
27231400	7.976	7.65	83.0	28.0	6
27231500	8.000	7.65	83.0	28.0	6
27231600	8.026	7.65	83.0	28.0	6
27231700	8.052	7.65	83.0	28.0	6
27231800	8.077	7.65	83.0	28.0	6
27231900	8.103	8.05	89.0	32.0	6
27232000	8.128	8.05	89.0	32.0	6
27232100	8.153	8.05	89.0	32.0	6
27232200	8.179	8.05	89.0	32.0	6
27232300	8.204	8.05	89.0	32.0	6
27232400	8.230	8.05	89.0	32.0	6
27232500	8.255	8.05	89.0	32.0	6
27232600	8.280	8.05	89.0	32.0	6
27232700	8.306	8.05	89.0	32.0	6
27232800	8.331	8.05	89.0	32.0	6
27232900	8.357	8.05	89.0	32.0	6
27233000	8.382	8.05	89.0	32.0	6
27233100	8.407	8.05	89.0	32.0	6
27233200	8.433	8.05	89.0	32.0	6
27233300	8.458	8.05	89.0	32.0	6
27233400	8.484	8.43	89.0	32.0	6
27233460	8.499	8.43	89.0	32.0	6
27233500	8.509	8.43	89.0	32.0	6
27233600	8.534	8.43	89.0	32.0	6
27233700	8.560	8.43	89.0	32.0	6
27233800	8.585	8.43	89.0	32.0	6
27233900	8.611	8.43	89.0	32.0	6
27234000	8.636	8.43	89.0	32.0	6
27234100	8.661	8.43	89.0	32.0	6
27234200	8.687	8.43	89.0	32.0	6



# TrueSize® Straight Flute Carbide Reamers Series 272


**DIN 1420 H7**

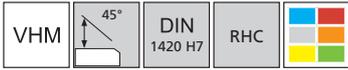
D' (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27234300	8.712	8.43	89.0	32.0	6
27234370	8.730	8.43	89.0	32.0	6
27234400	8.738	8.43	89.0	32.0	6
27234500	8.763	8.43	89.0	32.0	6
27234600	8.788	8.43	89.0	32.0	6
27234700	8.814	8.43	89.0	32.0	6
27234800	8.839	8.43	89.0	32.0	6
27234900	8.865	8.43	89.0	32.0	6
27235000	8.890	8.84	89.0	32.0	6
27235100	8.915	8.84	89.0	32.0	6
27235200	8.941	8.84	89.0	32.0	6
27235300	8.966	8.84	89.0	32.0	6
27235400	8.992	8.84	89.0	32.0	6
27235430	8.999	8.84	89.0	32.0	6
27235500	9.017	8.84	89.0	32.0	6
27235600	9.042	8.84	89.0	32.0	6
27235700	9.068	8.84	89.0	32.0	6
27235800	9.093	8.84	89.0	32.0	6
27235900	9.119	8.84	89.0	32.0	6
27235940	9.129	8.84	89.0	32.0	6
27236000	9.144	8.84	89.0	32.0	6
27236100	9.169	8.84	89.0	32.0	6
27236200	9.195	8.84	89.0	32.0	6
27236300	9.220	8.84	89.0	32.0	6
27236400	9.246	8.84	89.0	32.0	6
27236500	9.271	9.22	89.0	32.0	6
27236600	9.296	9.22	89.0	32.0	6
27236700	9.322	9.22	89.0	32.0	6
27236800	9.347	9.22	89.0	32.0	6
27236900	9.373	9.22	89.0	32.0	6
27237000	9.398	9.22	89.0	32.0	6
27237100	9.423	9.22	89.0	32.0	6
27237200	9.449	9.22	89.0	32.0	6
27237300	9.474	9.22	89.0	32.0	6
27237400	9.500	9.22	89.0	32.0	6
27237450	9.512	9.22	89.0	32.0	6
27237480	9.520	9.22	89.0	32.0	6
27237500	9.525	9.22	89.0	32.0	6
27237600	9.550	9.22	89.0	32.0	6
27237700	9.576	9.22	89.0	32.0	6
27237800	9.601	9.22	89.0	32.0	6
27237900	9.627	9.22	89.0	32.0	6
27238000	9.652	9.22	89.0	32.0	6
27238100	9.677	9.22	89.0	32.0	6
27238200	9.703	9.22	89.0	32.0	6
27238300	9.728	9.22	89.0	32.0	6
27238400	9.754	9.22	89.0	32.0	6

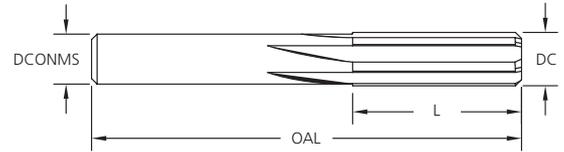
Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27238500	9.779	9.22	89.0	32.0	6
27238600	9.804	9.22	89.0	32.0	6
27238700	9.830	9.65	89.0	32.0	6
27238800	9.855	9.65	89.0	32.0	6
27238900	9.881	9.65	89.0	32.0	6
27239000	9.906	9.65	89.0	32.0	6
27239060	9.921	9.65	89.0	32.0	6
27239100	9.931	9.65	89.0	32.0	6
27239200	9.957	9.65	89.0	32.0	6
27239300	9.982	9.65	89.0	32.0	6
27239370	10.000	9.65	89.0	32.0	6
27239400	10.008	9.65	89.0	32.0	6
27239500	10.033	9.65	89.0	32.0	6
27239600	10.058	9.65	89.0	32.0	6
27239700	10.084	9.65	89.0	32.0	6
27239800	10.109	9.65	89.0	32.0	6
27239900	10.135	9.65	89.0	32.0	6
27240000	10.160	9.65	89.0	32.0	6
27240100	10.185	9.65	89.0	32.0	6
27240200	10.211	9.65	89.0	32.0	6
27240300	10.236	9.65	89.0	32.0	6
27240400	10.262	9.65	89.0	32.0	6
27240500	10.287	9.65	89.0	32.0	6
27240600	10.312	9.65	89.0	32.0	6
27240620	10.317	9.65	89.0	32.0	6
27240700	10.338	9.65	89.0	32.0	6
27240800	10.363	9.65	89.0	32.0	6
27240900	10.389	9.65	89.0	32.0	6
27241000	10.414	9.65	89.0	32.0	6
27241100	10.439	9.65	89.0	32.0	6
27241200	10.465	9.65	89.0	32.0	6
27241300	10.490	9.65	89.0	32.0	6
27241340	10.500	9.65	89.0	32.0	6
27241400	10.516	9.65	89.0	32.0	6
27241500	10.541	9.65	89.0	32.0	6
27241600	10.566	10.41	95.0	35.0	6
27241700	10.592	10.41	95.0	35.0	6
27241800	10.617	10.41	95.0	35.0	6
27241900	10.643	10.41	95.0	35.0	6
27242000	10.668	10.41	95.0	35.0	6
27242100	10.693	10.41	95.0	35.0	6
27242200	10.719	10.41	95.0	35.0	6
27242300	10.744	10.41	95.0	35.0	6
27242400	10.770	10.41	95.0	35.0	6
27242500	10.795	10.41	95.0	35.0	6
27242600	10.820	10.41	95.0	35.0	6
27242700	10.846	10.41	95.0	35.0	6

# TrueSize® Straight Flute Carbide Reamers Series 272



DIN 1420 H7

D <sup>1</sup> (mm)	Tolerance (mm)
≤ 3.00	+ 0.004 / + 0.008
> 3.00 - 6.00	+ 0.005 / + 0.010
> 6.00 - 10.00	+ 0.006 / + 0.012
> 10.00 - 16.00	+ 0.008 / + 0.015



Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27242800	10.871	10.41	95.0	35.0	6
27242900	10.897	10.41	95.0	35.0	6
27243000	10.922	10.41	95.0	35.0	6
27243100	10.947	10.41	95.0	35.0	6
27243200	10.973	10.41	95.0	35.0	6
27243310	11.000	10.41	95.0	35.0	6
27243400	11.024	10.41	95.0	35.0	6
27243500	11.049	10.41	95.0	35.0	6
27243600	11.074	10.41	95.0	35.0	6
27243700	11.100	10.41	95.0	35.0	6
27243740	11.110	10.41	95.0	35.0	6
27243800	11.125	10.41	95.0	35.0	6
27243850	11.138	10.41	95.0	35.0	6
27243900	11.151	10.41	95.0	35.0	6
27244000	11.176	10.41	95.0	35.0	6
27244100	11.201	10.41	95.0	35.0	6
27244200	11.227	10.41	95.0	35.0	6
27244300	11.252	10.41	95.0	35.0	6
27244400	11.278	10.41	95.0	35.0	6
27244500	11.303	10.41	95.0	35.0	6
27244600	11.328	11.18	95.0	35.0	6
27244700	11.354	11.18	95.0	35.0	6
27244800	11.379	11.18	95.0	35.0	6
27244900	11.405	11.18	95.0	35.0	6
27245000	11.430	11.18	95.0	35.0	6
27245100	11.455	11.18	95.0	35.0	6
27245200	11.481	11.18	95.0	35.0	6
27245270	11.499	11.18	95.0	35.0	6
27245310	11.509	11.18	95.0	35.0	6
27245400	11.532	11.18	95.0	35.0	6
27245500	11.557	11.18	95.0	35.0	6
27245600	11.582	11.18	95.0	35.0	6
27245700	11.608	11.18	95.0	35.0	6
27245800	11.633	11.18	95.0	35.0	6
27245900	11.659	11.18	95.0	35.0	6
27246000	11.684	11.18	95.0	35.0	6
27246100	11.709	11.18	95.0	35.0	6
27246200	11.735	11.18	95.0	35.0	6
27246300	11.760	11.18	95.0	35.0	6
27246400	11.786	11.18	95.0	35.0	6
27246500	11.811	11.18	95.0	35.0	6
27246600	11.836	11.18	95.0	35.0	6
27246700	11.862	11.18	95.0	35.0	6
27246800	11.887	11.18	95.0	35.0	6
27246880	11.908	11.18	95.0	35.0	6
27246900	11.913	11.18	95.0	35.0	6
27247000	11.938	11.18	95.0	35.0	6

Tool No.	Tool Dimensions				
	Ø DC	Ø DCONMS	OAL	L	NOF
27247100	11.963	11.18	95.0	35.0	6
27247200	11.989	11.18	95.0	35.0	6
27247240	11.999	11.18	95.0	35.0	6
27247300	12.014	11.18	95.0	35.0	6
27247400	12.040	11.18	95.0	35.0	6
27247500	12.065	11.18	95.0	35.0	6
27247600	12.090	11.94	102.0	38.0	6
27247700	12.116	11.94	102.0	38.0	6
27247800	12.141	11.94	102.0	38.0	6
27247900	12.167	11.94	102.0	38.0	6
27248000	12.192	11.94	102.0	38.0	6
27248100	12.217	11.94	102.0	38.0	6
27248200	12.243	11.94	102.0	38.0	6
27248300	12.268	11.94	102.0	38.0	6
27248400	12.294	11.94	102.0	38.0	6
27248440	12.304	11.94	102.0	38.0	6
27248500	12.319	11.94	102.0	38.0	6
27248600	12.344	11.94	102.0	38.0	6
27248700	12.370	11.94	102.0	38.0	6
27248800	12.395	11.94	102.0	38.0	6
27248900	12.421	11.94	102.0	38.0	6
27249000	12.446	11.94	102.0	38.0	6
27249100	12.471	11.94	102.0	38.0	6
27249200	12.497	11.94	102.0	38.0	6
27249300	12.522	11.94	102.0	38.0	6
27249400	12.548	11.94	102.0	38.0	6
27249500	12.573	11.94	102.0	38.0	6
27249600	12.598	11.94	102.0	38.0	6
27249700	12.624	11.94	102.0	38.0	6
27249800	12.649	11.94	102.0	38.0	6
27249900	12.675	11.94	102.0	38.0	6
27249950	12.687	11.94	102.0	38.0	6
27249990	12.697	11.94	102.0	38.0	6
27250000	12.700	11.94	102.0	38.0	6
27250100	12.725	11.94	102.0	38.0	6
27251180	13.000	12.83	102.0	38.0	6
27251560	13.096	12.83	102.0	38.0	6
27253120	13.492	12.83	102.0	38.0	6
27254690	13.891	13.59	102.0	38.0	6
27255120	14.000	13.59	102.0	38.0	6
27256250	14.288	13.59	102.0	38.0	6
27257810	14.684	14.35	102.0	44.0	6
27259050	14.999	14.35	102.0	44.0	6
27259380	15.083	14.35	102.0	44.0	6
27260940	15.479	15.11	102.0	44.0	6
27262500	15.875	15.11	102.0	44.0	6
27262990	15.999	15.11	102.0	44.0	6



## TrueSize® Solid Carbide Reamers Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane dane o Cięciu (Zalecane parametry skrawania)

Workpiece Material Group		Material Type	Vc (m/min)	Feed Type (Refer To Chart)
Steels	P	Low Carbon	60 - 90	M - H
		Medium Carbon	40 - 60	M
		Alloy Steels	20 - 40	L
		Mould/Tool Steel	20 - 40	L
Stainless Steels	M	Free Machining	45 - 75	M
		Austenitic	45 - 75	M
		Ferritic	25 - 40	M
		Martensitic	25 - 40	M
		PH Stainless	20 - 30	L - M
Special Alloys	S	High Temp Alloys (Ni)	15 - 20	L
		High Temp Alloys (Co)	10 - 15	L
		Titanium Alloys	10 - 15	L - M
Cast Irons	K	Grey Cast Iron	25 - 45	L - M
		Ductile Cast Iron	40 - 60	M
		Malleable Iron	40 - 60	M
Hardened Steels	H	< 25 HRc	60 - 90	M - H
		25 - 32 HRc	40 - 60	M
		32 - 43 HRc	15 - 40	L
		43 - 52 HRc	10 - 15	L
		> 52 HRc	5 - 10	L
Non Ferrous	N	Aluminium Alloys	150 - 300	M - H
		Copper & Hard Bronze	30 - 45	L
		Brass & Soft Bronze	50 - 80	M

$$\text{RPM} = \text{Vc (m/min)} \times 318.0 \div \text{Reamer } \varnothing$$

### Series 272 - Recommended cutting data

Conditions de coupe recommandées | Empfohlene Schnittdaten | Dati di taglio Raccomandati | Zalecane dane o Cięciu (Zalecane parametry skrawania)

Nominal Reamer Diameter $\varnothing D^1$	Feed (mm/rev)		
	L	M	H
0.3mm - 1.6mm	0.01 - 0.03	0.02 - 0.05	0.03 - 0.08
1.6mm - 3.0mm	0.03 - 0.05	0.05 - 0.10	0.08 - 0.15
3.0mm - 6.0mm	0.05 - 0.10	0.10 - 0.15	0.15 - 0.25
6.0mm - 12.0mm	0.10 - 0.15	0.15 - 0.25	0.25 - 0.35
12.0mm - 16.0mm	0.15 - 0.25	0.25 - 0.50	0.35 - 0.75

Feedrate Formula For Metric Reamers - Feed = RPM x mm/rev

### TrueSize® Reamer Tolerances

Résistances des alésoirs | Reibahlen - Toleranzen | Tolleranze degli alesatori | Tolerancja rozwiertaków

Tool Dimensions	Diameter (mm)	Tolerance (mm)
DC	0.330 - 16.000	DIN 1420 H7 (See Below)
DCONMS	0.330 - 16.000	+ 0.00 / - 0.03
OAL	0.330 - 16.000	+/- 1.5
L	0.330 - 16.000	+/- 1.5

# TrueSize® Solid Carbide Reamers

## Troubleshooting Chart

Problem	Possible Solution																		
	Speed & Feed						Tool Geometry						Coolant & Stock Removal						
	Reduce Feed	Increase Feed	Reduce Speed	Increase Speed	Use Larger Reamer	Use Smaller Reamer	Bad Speed & Feed	Worn Tool Margin	Worn Cutting Edge	Uneven Lip Height	Chip Capacity of Reamer	Too Much Clearance	Grind Larger Back Taper	Bent Reamer	Insufficient Stock	Too Much Stock	Use Coolant	Run Dry	Poor Hole Prep
Burnishing		X									X				X				
Reamer Wear	X		X				X									X	X		X
Hole Quality	X		X				X	X	X						X	X	X		X
Hole Undersize	X		X		X			X	X						X	X	X		
Hole Oversize		X		X		X		X	X				X		X	X		X	X
Accuracy	X					X				X							X		
Chatter		X	X						X	X	X				X		X		
Out of Round Hole					X		X	X	X	X					X	X	X		
Hole Taper						X	X	X	X			X			X	X			
Bell Mouth		X					X	X		X		X	X				X		
Reamer Life		X	X				X			X		X					X		
Scoring in Bore							X	X	X						X	X	X		X
Deflection																			

Problem	Possible Solution													
	Set Up								Cutting Errors					
	Alignment	Holder Accuracy	Concentricity	Use Adjustable Holder	Use Floating Holder	Lack of Rigidity in Set-Up	Work Holding Error	Spindle Bearings	Tool Extended Too Far	Poor Regrind	Poor Machinability	Built Up Edge	Wrong Tool	Poor Chip Removal
Burnishing	X						X			X				
Reamer Wear	X	X					X			X	X		X	
Hole Quality	X		X				X			X	X	X	X	
Hole Undersize	X										X			
Hole Oversize	X		X				X			X	X	X	X	
Accuracy							X			X				
Chatter	X	X				X	X	X	X	X				
Out of Round Hole	X						X			X				
Hole Taper	X	X	X	X	X		X			X	X	X		
Bell Mouth	X	X	X	X	X		X			X	X			
Reamer Life	X	X	X			X	X	X	X	X				
Scoring in Bore			X								X	X		X
Deflection	X													



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

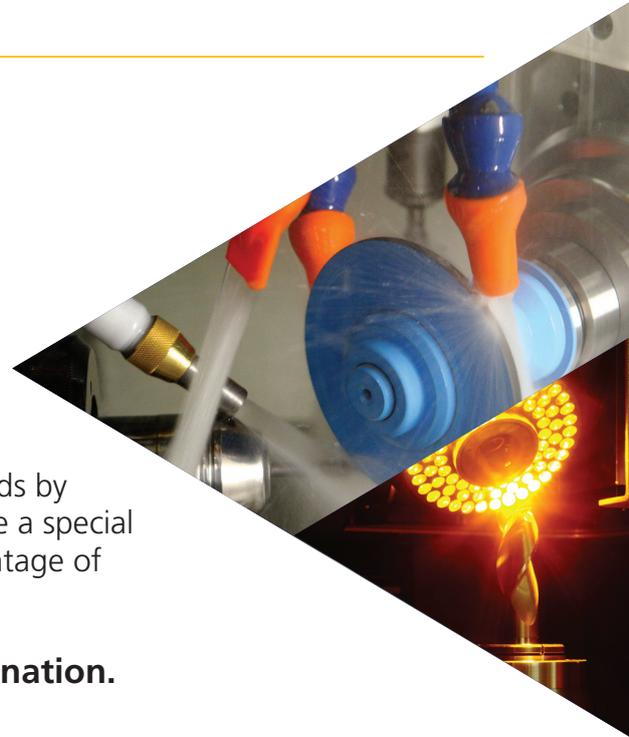


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Our extensive range of high-performance solid carbide milling tools is engineered for chamfering, deburring, back chamfering, and profiling across a broad spectrum of materials. At the forefront of our offering is the 5HC Helical Chamfer Mill, renowned for its smooth cutting action and exceptional surface finish, guaranteeing optimal results with every application. Designed for both tough metals and delicate materials, our chamfer and profile tools deliver unmatched precision, durability, and efficiency, ensuring superior performance in every job.

(FR)

Notre large gamme d'outils de fraisage en carbure solide haute performance est conçue pour le chanfreinage, le déburrage, le chanfreinage arrière et le profilage de divers matériaux. En tête de notre offre se trouve la Fraise Hélicoïdale 5HC, reconnue pour son action de coupe douce et sa finition de surface exceptionnelle, garantissant des résultats optimaux à chaque application. Conçus pour les métaux les plus durs comme pour les matériaux délicats, nos outils de chanfreinage et de profilage offrent une précision, une durabilité et une efficacité inégalées, assurant des performances supérieures dans toutes les applications.

(DE)

Unsere umfangreiche Auswahl an hochleistungsfähigen Fräswerkzeugen aus Vollhartmetall ist für das Fasen, Entgraten, Rückfasen und Profilieren einer Vielzahl von Materialien entwickelt. Unser Spitzenprodukt ist der 5HC Helix-Fasenfräser, bekannt für seine gleichmäßige Schnittbewegung und außergewöhnliche Oberflächenqualität, die bei jeder Anwendung optimale Ergebnisse gewährleistet. Ob bei der Bearbeitung von hochfesten Metallen oder empfindlichen Materialien – unsere Fasen- und Profilfräser bieten unvergleichliche Präzision, Haltbarkeit und Effizienz für herausragende Leistung in jeder Anwendung.

(IT)

La nostra vasta gamma di utensili per fresatura in metallo duro integrale ad alte prestazioni è progettata per smussatura, sbavatura, smussatura posteriore e profilatura su un ampio spettro di materiali. In prima linea nella nostra offerta c'è la Fresa per Smussatura Elicoidale 5HC, rinomata per la sua azione di taglio uniforme e l'eccezionale finitura superficiale, che garantisce risultati ottimali con ogni applicazione. Progettati sia per metalli tenaci che per materiali delicati, i nostri utensili per smussatura e profilatura offrono precisione, durata ed efficienza senza pari, garantendo prestazioni superiori in ogni lavoro.

(PL)

Nasza szeroka gama narzędzi skrawających z węgla spiekanego wysokiej wydajności została zaprojektowana do fazowania, usuwania zadziorów, fazowania tylnych i profilowania różnych materiałów. Naszym flagowym produktem jest Freza Helikalna 5HC, znana z gładkiej pracy skrawającej oraz doskonałej jakości wykończenia powierzchni, zapewniająca optymalne wyniki przy każdej aplikacji. Niezależnie od tego, czy pracujesz z twardymi metalami, czy delikatnymi materiałami, nasze frezy do fazowania i profilowania oferują niezrównaną precyzję, trwałość i wydajność, zapewniając doskonałą jakość pracy w każdej aplikacji.

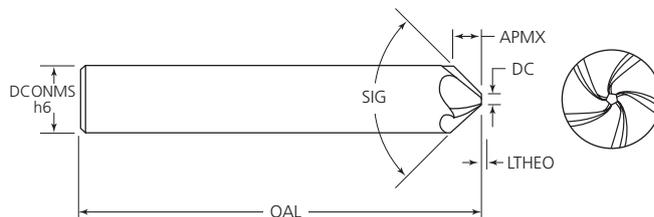
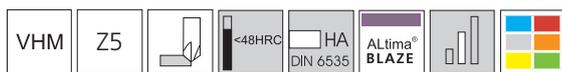
## Chamfer and Profile Mills

Fraises à Chanfreiner et à Profiler | Fasen- und Profilfräser | Frese per Smussi e Profili | Frezy do Fazowania i Profilowania

	Page
<b>TuffCut® Chamfer Mills</b> Series 5HC 90°, 5HC 60°	201
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## TuffCut® Series 5HC 90°

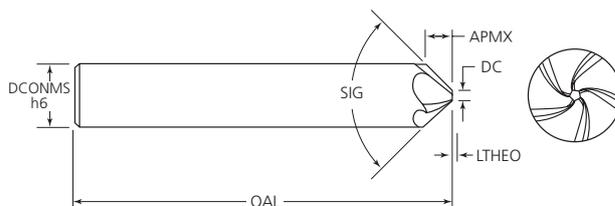
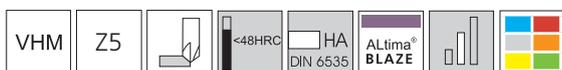


Tool No.	DCONMS	DC	SIG	OAL	APMX	LTSEO
5HCM06003B	6.0	1.5	90°	57.0	2.25	0.75
5HCM08003B	8.0	1.75	90°	63.0	3.125	0.875
5HCM10003B	10.0	1.75	90°	72.0	4.125	0.875
5HCM12003B	12.0	2.0	90°	83.0	5.0	1.0
5HCM16003B	16.0	2.25	90°	92.0	6.875	1.125



Chamfer and Profile Mills  
Series 5HC 90° / 60°

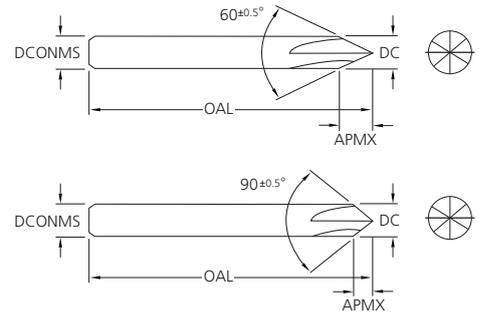
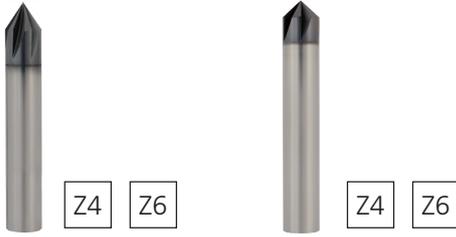
## TuffCut® Series 5HC 60°



Tool Number	DCONMS	DC	SIG	OAL	APMX	LTSEO
5HCM06001B	6.0	1.5	60°	57.0	3.9	1.3
5HCM08001B	8.0	1.75	60°	63.0	5.4	1.5
5HCM10001B	10.0	1.75	60°	72.0	7.1	1.5
5HCM12001B	12.0	2.0	60°	83.0	8.7	1.7
5HCM16001B	16.0	2.25	60°	92.0	13.9	2.0

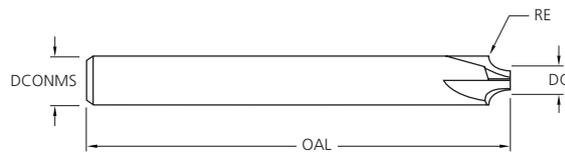


## TuffCut® GP Chamfer Mills Series VCM 60°, VCM 90°



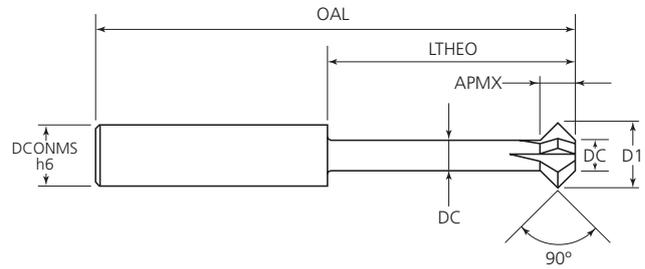
Series VCM 60°		Series VCM 90°		Tool Dimensions					
Uncoated	Coated	Uncoated	Coated	Ø DC	Ø DCONMS	SIG	OAL	APMX	NOF
VCM60 0400	VCM60 0400A	-	-	4.0	4.0	60°	51.0	3.3	4
-	-	VCM90 0400	VCM90 0400A	4.0	4.0	90°	51.0	1.8	4
VCM60 0600	VCM60 0600A	-	-	6.0	6.0	60°	64.0	5.0	4
-	-	VCM90 0600	VCM90 0600A	6.0	6.0	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



Series ACR	Tool Dimensions			
Tool No.	Ø DC	DCONMS	OAL	RE
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

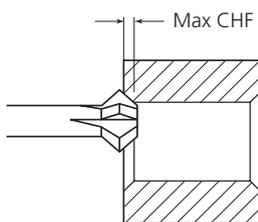
Chamfer and Profile Mills  
Series VCM 60° / VCM 90° / ACR

**TuffCut® GP** Series FBCM


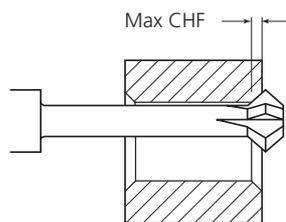
Tool No.	D1	DCONMS	DC	OAL	APMX	LTHEO	NOF	Max CHF
FBCM 03N3H	3.0	4.0	1.5	50.0	1.5	11.5	3	0.6
FBCM 04N3H	4.0	4.0	2.0	50.0	2.0	15.0	3	0.9
FBCM 05N3H	5.0	6.0	2.5	57.0	2.5	18.5	3	1.1
FBCM 06N3H	6.0	6.0	3.0	64.0	3.0	22.0	3	1.4
FBCM 08N3H	8.0	8.0	4.0	63.0	4.0	29.0	4	1.8
FBCM 10N3H	10.0	10.0	5.0	72.0	5.0	36.0	5	2.3
FBCM 12N3H	12.0	12.0	6.0	83.0	6.0	43.0	5	2.8


 Chamfer and Profile Mills  
 Series FBCM

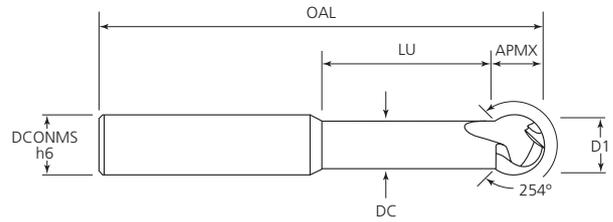
Front chamfer



Back chamfer



## TuffCut® GP Series FBPM



Tool No.	D1	DCONMS	DC	OAL	APMX	LU	RE
FBPM 03N3H	3.0	4.0	2.4	50.0	2.5	9.0	R1.5
FBPM 04N3H	4.0	4.0	3.2	50.0	3.5	11.5	R2.0
FBPM 05N3H	5.0	6.0	4.0	57.0	4.5	14.0	R2.5
FBPM 06N3H	6.0	6.0	4.8	64.0	5.4	16.6	R3.0
FBPM 08N3H	8.0	8.0	6.4	63.0	7.4	21.6	R4.0
FBPM 10N3H	10.0	10.0	8.0	72.0	9.4	26.6	R5.0
FBPM 12N3H	12.0	12.0	9.6	83.0	11.4	31.6	R6.0



Chamfer and Profile Mills  
Series FBPM

## TuffCut® Series 5HC

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

Workpiece Material Group	Material Type	Coolant			Vc-m/min	Tool Diameter					
		Max	Air	MMS		6mm	8mm	10mm	12mm	16mm	
						fz-mm/tooth					
Steels	P	Low Carbon Steels	●	●	●	350	0.072	0.096	0.120	0.144	0.192
		Medium Carbon Steels	●	●	●	270	0.048	0.064	0.080	0.096	0.128
		Alloy Tool Steels	●	●	●	250	0.048	0.064	0.080	0.096	0.128
		Die/Tool Steels	●	●	●	220	0.042	0.056	0.070	0.084	0.112
Stainless Steels	M	Free Machining Stainless	●	X	○	180	0.042	0.056	0.070	0.084	0.112
		Austenitic Stainless	●	X	○	130	0.036	0.048	0.060	0.072	0.096
		Difficult Stainless	●	X	○	75	0.030	0.040	0.050	0.060	0.080
		PH Stainless	●	X	○	130	0.036	0.048	0.060	0.072	0.096
		Cobalt Chrome Alloys	●	X	○	75	0.030	0.040	0.050	0.060	0.080
		Duplex (22%)	●	X	○	75	0.030	0.040	0.050	0.060	0.080
		Super Duplex (25%)	●	X	○	55	0.030	0.040	0.050	0.060	0.080
Special Alloys	S	High Temp Alloys	●	X	X	45	0.030	0.040	0.050	0.060	0.080
		Titanium Alloys	●	X	X	100	0.036	0.048	0.060	0.072	0.096
Cast Irons	K	Grey Cast Iron	●	○	○	300	0.084	0.112	0.140	0.168	0.224
		Ductile Cast Iron	●	○	○	190	0.060	0.080	0.100	0.120	0.160
Hardened Steels	H	Hardened Steels 45 - 50HRC	○	●	○	80	0.030	0.040	0.050	0.060	0.080
		Hardened Steels 50 - 55HRC	○	●	○	60	0.036	0.048	0.060	0.072	0.096
Non Ferrous	N	Aluminium Alloys	●	X	○	600	0.072	0.096	0.120	0.144	0.192
		Brass / Bronze / Copper	●	X	○	350	0.054	0.072	0.090	0.108	0.144

● Preferred ○ Possible X Not Possible

### Please note:

Technical data provided should be considered as advisory only and alterations may be necessary depending on the specific application.

Decreased feeds and/or a finish pass may be required to reach the desired surface finish requirements.

Decreased speeds and feeds may be required for heavy duty cutting.

Cutting speed (Vc) should be calculated from the effective cutting diameter using the following formula:

$(\text{Major diameter } D2 + \text{minor diameter } D3) / 2$ .

Alternatively, estimate the actual diameter that is in contact with the workpiece.

## TuffCut® GP Series FBCM

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

### Recommended Speeds by Material Group

Workpiece Material Group	Material Type	Coolant			Deburr	Chamfer	
		Max	Air	MMS	Vc-m/min		
Steels	P	Low Carbon Steels	●	●	●	230	220
		Medium Carbon Steels	●	●	●	200	185
		Alloy Tool Steels	●	●	●	175	165
		Die/Tool Steels	●	●	●	145	130
Stainless Steels	M	Free Machining Stainless	●	X	○	120	110
		Austenitic Stainless	●	X	○	110	100
		Difficult Stainless	●	X	○	75	65
		PH Stainless	●	X	○	110	100
		Cobalt Chrome Alloys	●	X	○	75	65
		Duplex (22%)	●	X	○	75	65
		Super Duplex (25%)	●	X	○	55	45
Special Alloys	S	High Temp Alloys	●	X	X	35	28
		Titanium Alloys	●	X	X	75	66
Cast Irons	K	Grey Cast Iron	●	○	○	200	175
		Ductile Cast Iron	●	○	○	185	165
Hardened Steels	H	Hardened Steels 45 - 50HRC	○	●	○	60	50
		Hardened Steels 50 - 55HRC	○	●	○	50	45
Non Ferrous	N	Aluminium Alloys	●	X	○	300	250
		Brass / Bronze / Copper	●	X	○	180	170

Please note:

Use the following formula to calculate the effective cutting diameter:  
(Major diameter D1 + minor diameter D3) / 2.

Alternatively, estimate the actual diameter that is in contact with the workpiece.

● Preferred ○ Possible X Not Possible

### Recommended Feed per Tooth by Material Group

Workpiece Material Group	Type of Machining	Tool Diameter							
		3mm	4mm	5mm	6mm	8mm	10mm	12mm	
		fz-mm/tooth							
Steels	P	Deburr	0.015	0.020	0.025	0.030	0.040	0.050	0.060
		Chamfer	0.008	0.010	0.013	0.015	0.020	0.025	0.030
Stainless Steels	M	Deburr	0.015	0.020	0.025	0.030	0.040	0.050	0.060
		Chamfer	0.008	0.010	0.013	0.015	0.020	0.025	0.030
High Temp Alloys	S	Deburr	0.004	0.006	0.007	0.016	0.019	0.022	0.026
		Chamfer	0.002	0.003	0.004	0.008	0.010	0.011	0.013
Titanium	S	Deburr	0.015	0.020	0.025	0.030	0.040	0.050	0.060
		Chamfer	0.008	0.010	0.013	0.015	0.020	0.025	0.030
Cast Irons	K	Deburr	0.015	0.020	0.025	0.030	0.040	0.050	0.060
		Chamfer	0.008	0.010	0.013	0.015	0.020	0.025	0.030
Hardened Steels 45 - 50HRC	H	Deburr	0.010	0.013	0.015	0.025	0.035	0.045	0.054
		Chamfer	0.005	0.007	0.008	0.013	0.018	0.023	0.027
Hardened Steels 50 - 55HRC	H	Deburr	0.008	0.010	0.011	0.020	0.030	0.040	0.050
		Chamfer	0.004	0.005	0.006	0.010	0.015	0.020	0.025
Non Ferrous	N	Deburr	0.015	0.020	0.025	0.030	0.040	0.050	0.050
		Chamfer	0.008	0.010	0.013	0.015	0.020	0.025	0.025

Please note: These are recommended starting conditions. However, please adjust the feed to suit the surface finish requirements.

# TuffCut® GP Series FBPM

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

## Recommended Speeds and Depths of Cut by Material Group

Workpiece Material Group	Material Type	Ap			Roughing		Finishing	
		Ae			0.05 - 0.1 x D		0.02 - 0.05 x D	
		Coolant			Vc-m/min			
		Max	Air	MMS				
Steels	P	Low Carbon Steels ≤180HB	○	●	●	250	280	
		Med Carbon / Alloy Steels 180-350HB	○	●	●	200	220	
		Pre-Hardened Steels 35-45HRC	○	●	●	180	200	
Stainless Steels	M	Free Machining Stainless	●	○	○	160	180	
		Austenitic Stainless	●	○	○	130	150	
		Difficult Stainless	●	○	○	100	110	
Special Alloys	S	High Temp Alloys	●	X	X	50	55	
		Titanium Alloys	●	X	X	110	120	
Cast Irons	K	Grey Cast Iron	○	●	X	220	250	
		Ductile Cast Iron	○	●	X	180	200	
Hardened Steels	H	Hardened Steels 45 - 50HRC	○	●	○	160	170	
Non-Ferrous	N	Aluminium Alloys	●	X	○	300	500	
		Brass / Bronze / Copper	●	X	○	250	400	

● Preferred ○ Possible X Not Possible

## Recommended Feed per Tooth by Material Group

Workpiece Material Group	Material Type	Tool Diameter & Radius (mm)								
		3		4		5		6		
		1.5		2		2.5		3		
		Rough	Finish	Rough	Finish	Rough	Finish	Rough	Finish	
Steels	P	Low Carbon Steels ≤180HB	0.060	0.045	0.080	0.060	0.100	0.075	0.120	0.090
		Med Carbon / Alloy Steels 180-350HB	0.060	0.045	0.080	0.060	0.100	0.075	0.120	0.090
		Pre-Hardened Steels 35-45HRC	0.054	0.045	0.072	0.060	0.090	0.075	0.108	0.090
Stainless Steels	M	Free Machining Stainless	0.054	0.045	0.072	0.060	0.090	0.075	0.108	0.090
		Austenitic Stainless	0.045	0.045	0.060	0.060	0.075	0.075	0.090	0.090
		Difficult Stainless	0.045	0.045	0.060	0.060	0.075	0.075	0.090	0.090
Special Alloys	S	High Temp Alloys	0.024	0.030	0.032	0.040	0.040	0.050	0.048	0.060
		Titanium Alloys	0.036	0.030	0.048	0.040	0.060	0.050	0.072	0.060
Cast Irons	K	Grey Cast Iron	0.060	0.045	0.080	0.060	0.100	0.075	0.120	0.090
		Ductile Cast Iron	0.054	0.045	0.072	0.060	0.090	0.075	0.108	0.090
Hardened Steels	H	Hardened Steels 45 - 50HRC	0.039	0.038	0.052	0.050	0.065	0.063	0.078	0.075
Non-Ferrous	N	Aluminium Alloys	0.075	0.045	0.100	0.060	0.125	0.075	0.150	0.090
		Brass / Bronze / Copper	0.060	0.045	0.080	0.060	0.100	0.075	0.120	0.090

Workpiece Material Group	Material Type	Tool Diameter & Radius (mm)						
		8		10		12		
		4		5		6		
		Rough	Finish	Rough	Finish	Rough	Finish	
Steels	P	Low Carbon Steels ≤180HB	0.160	0.120	0.200	0.150	0.240	0.180
		Med Carbon / Alloy Steels 180-350HB	0.160	0.120	0.200	0.150	0.240	0.180
		Pre-Hardened Steels 35-45HRC	0.144	0.120	0.180	0.150	0.216	0.180
Stainless Steels	M	Free Machining Stainless	0.144	0.120	0.180	0.150	0.216	0.180
		Austenitic Stainless	0.120	0.120	0.150	0.150	0.180	0.180
		Difficult Stainless	0.120	0.120	0.150	0.150	0.180	0.180
Special Alloys	S	High Temp Alloys	0.064	0.080	0.080	0.100	0.096	0.120
		Titanium Alloys	0.096	0.080	0.120	0.100	0.144	0.120
Cast Irons	K	Grey Cast Iron	0.160	0.120	0.200	0.150	0.240	0.180
		Ductile Cast Iron	0.144	0.120	0.180	0.150	0.216	0.180
Hardened Steels	H	Hardened Steels 45 - 50HRC	0.104	0.100	0.130	0.125	0.156	0.150
Non-Ferrous	N	Aluminium Alloys	0.200	0.120	0.250	0.150	0.300	0.180
		Brass / Bronze / Copper	0.160	0.120	0.200	0.150	0.240	0.180

# Material cross reference chart

Tableau de correspondance des matières : Tabelle mit Materialbezeichnungen  
 Tabella di comparazione dei materiali : Tabela materiałóv

	 UK	 German	 DIN	 French	 Swedish	 Spanish	 USA
<b>FREE MACHINING STEEL</b>	1.0718	9SMnPb28	S250Pb	1914	F.2112 - 11SMnPb28	12L13	
	210M15	1.0721	10S20	10F1		F.2121 - 10 S 20	1108
	210A15	1.0723	15S20		1922	F.210F	
	240M07	1.0736	9SMn36	S300		F.2113 - 12 SMn 35	1215
		1.0737	9MnPb36	S300Pb	1926	F.2114 - 12 SMnPb 35	12L14
	1.7022	10SPb20	10PbF2		F.2122 - 10 SPb 20	11L08	
<b>LOW CARBON STEEL</b>	045M10	1.0301	C10	AF34C10/XC10			1010
	080M15;040A15	1.0401	C15	AF37C12/XC18	1350	F.111	1015
	050A20/055M15	1.0402	C22	AF42C20/XC25	1450	F.112	1020
	070M26	1.0406	C25	AF50C30		F.221	1025
	220M07	1.0711	9S20				1212
	230M07	1.0715	9SMn28	S250	1912	F.2111 - 11SMn28	1213
	040A10	1.1121	Ck10	XC10	1265	F.1510 - C 10 k	1010
	120M19	1.1133	20Mn5	20M5		F.1515 - 20 Mn 6	1022/1518
	080M15	1.1141	Ck15	XC15 / C15E	1370	F.1511 - C 16 k	1015
	050A20	1.1151	Ck22	XC25 / C22E		F.1120 - C 25 k	1020/1023
	070M26	1.1158	Ck25	XC25 / C25E		F.1120 - C 25 k	1025
		1.5419	22Mo4				4419
		1.5622	14Ni6	15N6 / 15Ni6		F.2641 - 15 Ni 6	A350-LF5
	655M13/A12	1.5752	14NiCr14	12NC15			3310/9314
	523M15	1.7015	15Cr3	12C3			5015
<b>STRUCTURAL STEEL</b>	4360-40C	1.0038	RSt37-2	E24-2NE / S235JRG2	1312		A570 (36)
	4360-43B	1.0044	St44-2	E28-2 / S275JR	1412	A 430B	A570 (40)
	4360-50B	1.005	St50-2	A50-2 / E295	2172		A570 (50)
	4360-55E	1.006	St60-2	A60-2 / E335			
	4360-40C/D-1449-37C	1.0116	St37-3	E24-3;-4 / S235J2G3	1313	A360 C;D	A284/A573/A611
	1449 -2/3/4CR	1.033	St12	DC01		AP 00	A366/1012/A619
	1449 2CR; 3CR	1.0333	St13			AP 02	1008
	1449 1CR; 2CR	1.0338	St14	DC04		AP 04	A620
	1501Gr.161-360/400	1.0345	H I	A37CP;AP / P235GH	1330	A 37 RC I;RA II	A516Gr.65;-55;
	3CR	1.0347	RRSt13	DC03			A619
	161-400;	1.0425	H II	A42CP;AP / P265GH	1430	A42 RC I	
		1.0473	19Mn6	A52CP;AP / P335GH	2101/2102	A 47 RB II	A537
		1.0481	17Mn4	A48CP;AP / P295GH		A 47 RC I; RA II	A516 (70)
		1.0562	StE355	E355R/FP / S355N	2132	AE 355 KG; DD	A633 (C)
	4360-50B;50C;50D	1.057	St52-3	E36-3;E36-4 / S355J2G3	2132	A 510 C;D	
	1501-240	1.5415	15Mo3	15D3 / 15Mo3	2912	F.2601 - 16 Mo 3	A204 (A)
	1503-245-420	1.5423	16Mo5			F.2602 - 16 Mo 5	4520
	1501-503-690	1.5637	10Ni14	12N14 / 12Ni14		F.152	A350-LF3
		1.5713	13NiCr6	10NC6			3115
		1.5732	14NiCr10	14NC11		F.1540 - 15 NiCr 11	3415
	620Gr.27;31	1.7335	13CrMo44	15CD3.05	2216	F.2631 - 14 CrMo 4 5	A182-F11;F12
	4360-55E	1.8902	StE420	E420RIFP / S420N		AE 420 KG	A633Gr.E
	1.8905	StE460	E460RIFP / S460N		AE 460 KG	A633Gr.E	
	1.007	St70-2	A70-2 / E360				
620Gr.27	1.7337	16CrMo44	15CD4.5	2216		A387 (12)	
622Gr.31;45	1.738	10CrMo910	12CD9.10 / 10CrMo9-10	2218		A182F22	
660/440	1.7715	14MoV63			TU.H		
					F.2621 - 13 MoCrV6		
<b>MEDIUM CARBON STEEL</b>	060A35	1.0501	C35	AF55C35 /XC38	1550	F.113	1035
	212M36	1.0726	35S20	35MF6	1957	F.210G.	1140
	120M36/150M28	1.1165	30Mn5	35M5 / 30Mn5		F.1203 - 36 Mn5	1330
		1.1166	34Mn5	35M5 / 34Mn5		F.8211 - 30 Mn5	1536
	150M36	1.1167	36Mn5	40M5 / 36Mn5	2120	F.1203 - 36 Mn5	1335
	150M28	1.117	28Mn6	20M5 / 28Mn6			1330
	080M36	1.118	Cm35	XC32 / C35R	1572	F.1135 - C 35 k-1	1035
	080M36	1.1181	Ck35	XC38H1 / C35E	1572	F.1130 - C 35 k	1035
	060A35	1.1183	Cf35	XC38H1TS	1572		1035
	080M46	1.0503	C45	AF65C45 /C45	1650	F.114	1045
	070M55	1.0535	C55	C55	1655		1055
	080A62	1.0601	C60	AF70C55 / C60		F.115	1060
	070A72	1.0605	C75	C75			
	212M44	1.0727	45S20	45MF4	1973		1146
	250A53	1.0903	51Si7	51S7	2090	F.1450 - 50 Si 7	9255
	250A53	1.0904	55Si7	55S7	2085	F.1440- 56 Si 7	9255
	150M36	1.1157	40Mn4	35M5			1039
	060A40/080A40	1.1186	Ck40	XC42H1 / C40E			1040
	080M46/060A47	1.1191	Ck45	XC42H1 / C45/XC45	1672	F.1140 - C 45 k	1045
	060A47	1.1193	Cf45	XC42H1TS	1672		1045
	080M46	1.1201	Cm45	XC42H1 /C45R	1660	F.1145 - C 45 k	1045
	060A57/070M55	1.1203	Ck55	XC55H1 / C55E		F.1150 - C 55 k	1055
	080M50	1.1206	Ck50	XC48H1 / C50E			1050
	070M55	1.1209	Cm55	XC55H1 / C55R / 3C55		F.1150 - C 55 k	1055
	060A52	1.1213	Cf53	XC48H1TS	1674		1050
	060A62	1.1221	Ck60	XC60 / C60E/2C60	1665/1678	F.511/F.512	1060
	060A67	1.1231	Ck67	XC68	1770		1070
	250A58	1.0909	60Si7	60S7		F.1441 - 60 Si 7	9260
	250A61	1.0961	60SiCr7	60SC7		F.1442 - 60 SiCr 8	9262

# Material cross reference chart

Tableau de correspondance des matières : Tabelle mit Materialbezeichnungen  
 Tabella di comparazione dei materiali : Tabela materiałów

	UK	German DIN	French	Swedish	Spanish	USA	
<b>ALLOY STEEL</b>	805M20	1.6523	21NiCrMo2	20NCD2	2506	F.1522 - 20 NiCrMo 2	8620
	805A20	1.6543	21NiCrMo22			F.1534 - 20 NiCrMo 3	8720
	060A78	1.1248	Ck75	XC75 / C75E	1774/1778	F.513/514/515	1080/1078
	640A35	1.571	36NiCr6	35NC6			3135
	640M40	1.5711	40NiCr6				3140
	311-Type7	1.6546	40NiCrMo22	40NCD2		F.1204 - 40 NiCrMo2	8740
	820A16	1.6587	17CrNiMo8	18NCD6		F.1560 - 14 NiCrMo13	
	832M13	1.6657	14NiCrMo134	16NCD13		F.1569 - 14 NiCrMo 131	
		1.7006	46Cr2	42C2 / 46Cr2			5045/5046
	530A32	1.7033	34Cr4	32C4 / 34Cr4		F.8221 - 35 Cr 4/F.224	5132
	530A36	1.7034	37Cr4	38C4 / 37Cr4		F.1201 - 38 Cr 4	5135
	527M17	1.7131	16MnCr5	16MC5	2511	F.1515 - 16 MnCr 5	5115
		1.7147	20MnCr5	20MC5		F.150.D	5120
	1717CDS110	1.7218	25CrMo4	25CD4 / 25CrMo4	2225	F.8330 - AM 25 CrMo4	4130
	905M31	1.8507	34CrAlMo5	30CAD6.12		F.1741 - 34 CrAlMo5	A355Cl.D
	905M39	1.8509	41CrAlMo7	40CAD6.12	2940	F.1740 - 41 CrAlMo7	A355Cl.A
	708A37	1.233	35CrMo4	34CD4 / 35CrMo4	2234		4135
	708M40	1.2332	47CrMo4	42CD4	2244		4142
	530M40/530A40	1.7035	41Cr4	42C4 / 41Cr4		F.1202 -42 Cr4	5140
	530A40	1.7045	42Cr4	42C4TS	2245	F.1202 - 42 Cr 4	5140
	527A60	1.7176	55Cr3	55C3	2253	F.1431 - 55 Cr3	5155
	708A37	1.722	34CrMo4	35CD4 / 34CrMo4	2234	F.8231 - AM 34 CrMo4	4135/4137
	708M40	1.7223	41CrMo4	42CD4TS	2244	F.8232 - 42 CrMo4	4142/4140
	708M40	1.7225	42CrMo4	42CD4 / 42CrMo4	2244	F.8232 - 42 CrMo4	4140
708A47	1.7228	50CrMo4	50CrMo4			4150	
735A50	1.8159	50CrV4	50CV4 / 51CrV4	2230	F.1430 - 51 CrV4	6150	
060A96	1.1274	Ck101	XC100	1870		1095	
<b>HIGH STRENGTH ALLOY STEEL</b>	816M40	1.6511	36CrNiMo4	40NCD3 / 36CrNiMo4		F.1280 - 35 NiCrMo4	9840
	817M40	1.6562	40NiCrMo73				4340
	311-Type6	1.6565	40NiCrMo6			F.1272 - 40 NiCrMo 7	4340
	823M30	1.658	30CrNiMo8	30CND8 / 30CrNiMo8			
	817M40	1.6582	34CrNiMo8	35NCD6 / 34CrNiMo6	2541	F.1272 - 40 NiCrMo 7	4340
	830M31	1.6746	32NiCrMo145	35NCD14		F.1262 - 32 NiCrMo 12	
	835M30	1.6747	30NiCrMo166	35NCD16		F.1260 - 32 NiCrMo16	
	722M24	1.8515	31CrMoV139	30CD12	2240	F.1712 - 31 CrMo 12	
	722M24	1.7361	32CrMo12	30CD12	2240	F.124.A	
	<b>TOOL STEELS</b>		1.1525	C80W1	Y190;Y180		
		1.1545	C105W1	Y1105	1880		W110
BW1B		1.1625	C80W2			F.1507 C80	W1
		1.1663	C125W	Y2120		F.5123 C120	W112
BW1A		1.175	C75W				W1
BL3		1.2067	100Cr6	Y100C6		F.5230 100 Cr6	L3
		1.221	115CrV3				L2
BO1		1.251	100MnCrW4		2140	F.5220 95 MnCrW5	O1
BS1		1.2542	45WCrV7		2710	F.5241 45 WCrSi 8	S1
BW2		1.2833	100V1	Y1105V			W210
BO2		1.2842	90MnCrV8	90MV8			2
534A99		1.3505	100Cr6	100C6	2258	F.1310 - 100 Cr 6	52100
		1.2713	55NiCrMoV6	55NCDV7		F.528	L6
Grade2A		0.962	G-X260NiCr42				A532IBNiCr-LC
Grade2B		0.9625	G-X330NiCr42				A532IANiCr-HC
Grade2C;D;E		0.963	G-X300CrNiSi952				A532IDNi-HiCr
Grade3A;B		0.964	G-X300CrMoNi1521				
Grade3C		0.9645	G-X260CrMoNi2021				A532IID20%CrMo-LC
Grade3D		0.965	G-X260Cr27				A532IIIA25%Cr
Grade3E		0.9655	G-X300CrMo271				A532IIIA25%Cr
BD3		1.208	X210Cr12	Z200C12		F.5212 X210 Cr12	D3
BH11		1.2343	X38CrMoV51	Z38CDV5		F.5317 X37 CrMoV5	H11
BH13		1.2344	X40CrMoV51	Z40CDV5	2242	F.5318 X40 CrMoV5	H13
BA2		1.2363	X100CrMoV51	Z100CDV5	2260	F.5227 X100 CrMoV5	A2
BH10		1.2365	X32CrMoV33	32DCV28		F.5313 CrMoV 12	H10
BD2		1.2379	X155CrVMo121	Z160CDV12			D2
		1.2436	X210CrW12		2312	F.5213 X210 CrW12	
		1.2567	X30WCrV53	Z32WCV5			
BH21		1.2581	X30WCrV93	Z30WCV9		F.5323 X30 WCrV9	H21
		1.2601	X165CrMoV12		2310	F.5211 X160 CrMoV12	
BH12		1.2606	X37CrMoW51	Z35CWDV5			H12
BT15		1.3202	S12-1-4-5			F.5563 12-1-5-5	T15
		1.3207	S10-4-3-10	Z130WKCDV10-10-04-03		F.553 10-4-3-10	
		1.3243	S6-5-2-5	Z85WDKCV06-05-05-04-02	2723	F.5613 6-5-2-5	
		1.3246	S7-4-2-5	Z110WKCDV07-05-04-04-02		F.5613 6-5-2-5	M41
BT42		1.3247	S2-10-1-8	Z110DKCWW09-08-04-02-01		F.5615 7-4-2-5	M42
BM34		1.3249	S2-9-2-8			F.5611 2-9-2-8	M33/M34
BT4		1.3255	S18-1-2-5	Z80WKCV18-05-04-01		F.5530 18-1-1-5	T4
BT5	1.3265	S18-1-2-10			F.5540 18-0-2-10	T5	
	1.3342	SC6-5-2	Z90WDCV06-05-04-03			M3	
BM2	1.3343	S6-5-2	Z85WDCV06-05-04-02	2722	F.5603 6-5-2	M2	



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	UK	German DIN	French	Swedish	Spanish	USA
<b>TOOL STEELS</b>	BM1	1.3344 S6-5-3 1.3346 S2-9-1	Z130WDCV06-05-04-04 Z85DCWV08-04-02-01		F.5605 6-5-3	M3Class2 H41/M1
	BT1	1.3348 S2-9-2 1.3355 S18-0-1	Z100DCWV09-04-02-02 Z80WCV18-04-01	2782	F.5607 2-9-2 F.5520 18-0-1	M7 T1
		1.3401 X120Mn12	Z120M12 / Z120Mn12		F.82551-AM-X 120 Mn 12	A128(A)
	443S65	1.4747 X80CrNiSi20	Z80CSN20.02		F.3222-X 80CrSiNi20-02	HNv6
403S17	1.4 X6Cr13	Z6013 / Z6Cr13	2301	F.3110-X6 Cr 13	403	
403S17	1.4001 X7Cr14	Z3014	2301	F.8401-AM-X12 Cr 13	410S	
405S17	1.4002 X6CrAl13	Z6CA13 / Z6CrAl13	2302	F.3111-X6 CrAl13	405	
416S21	1.4005 X12CrS13	Z12CF13 / Z12CrS13	2380	F.3411-X12 CrS13	416	
410S21	1.4006 X10Cr13	Z12C13 / Z12Cr13	2302	F.3401-X12 Cr 13	410/CA-15	
410C21	1.4008 G-X8Cr14	Z12CN13M			410	
430S15	1.4016 X6Cr17	Z8C17 / Z6Cr17	2320	F.3113-X8 Cr17	430	
420S37	1.4021 X20Cr13	Z20C13 / Z20Cr13	2303	F.3402-X20 Cr 13	420	
420S45	1.4028 X30Cr13	Z20C13 / Z20Cr13	2304	F.3403-X30 Cr 13	420	
	1.4031 X38Cr13	Z40C14 / Z40Cr14	2304	F.3404-X40 Cr 13		
420S45	1.4034 X46Cr13	Z40C14 / Z40Cr14		F.3405-X46 Cr 13	420	
431S29	1.4057 X20CrNi172	Z15CN16.02	2321	F.3427-X15 CrNi16	431	
	1.4104 X12CrMoS17	Z10CF17	2383	F.3117-X10 CrS17	430F	
434S17	1.4113 X6CrMo17	Z8CD17.01	2325		434	
	1.4125 X105CrMo17	Z100CD17			440C	
	1.451 X6CrTi17	Z8CT17		F.3114-X8CrTi17	XM8/430Ti	
409S19	1.4512 X5CrTi12	Z6CT12			409	
	1.4534				13-8 PH Mo	
	1.4545				15-5 PH	
					15-7 PH Mo	
	1.4504				17-4 PH	
	1.4548		Z7CNU17-04		17-4 PH ,CH900	
401S45	1.4718 X45CrSi93	Z45CS9		F.3220-X 4 ScrSi 09-03	HNv3	
403S17	1.4724 X10CrAl13	Z10C13		F.13152-X 10 CrAl13		
	1.4731 X40CrSiMo102	Z40CSD10		F.3221-X 40 CrSiMo 10-02		
430S15	1.4742 X10CrAl18	Z10CAS18		F.3153-X 10 CrAl 18	430	
	1.4762 X10CrAl24	Z10CAS24		F.3154-X 10 CrAl24	446	
303S21	1.4305 X10CrNiS189	Z10CNF18.09	2346	F.3508-X10CrNiS18-09	303	
304S15	1.4301 X5CrNi1810	Z6CN18.09	2332	F.3451-X5 CrNi18-10	304/304H	
305S19	1.4303 X5CrNi1812	Z8CN18.12		F.3513-X8CrNi18-12	308; 305	
304S12/S11/C12	1.4306 G-X2CrNi189/1911	Z2CN18.10/Z3CN19.10M	2333/52	F.3503-X 2CrNi19-10	304L	
304C15	1.4308 G-X6CrNi189	Z6CN18.10M	2333		CF-8	
301S21	1.431 X12CrNi177	Z12CN17.07		F.3517-X12CrNi17 07	301	
304S62	1.4311 X2CrNiN1810	Z2CN18.10Az	2371		304LN	
425C11	1.4313 G-X5CrNi134	Z4CND13.4M	2385		CA6-NM	
316S16/S31	1.4401 X5CrNiMo17122	Z6CND17.11	2347	F.3543-X5CrNiMo17-12/-03	316/316L	
316S11/S12	1.4404 X2CrNiMo17132	Z2CND 18.13	2348	F.3533-X 2CrNiMo17 12-03	316L	
316S61	1.4406 ZCrNiMoN17122	Z2CND 17.12Az			316LN	
316C16	1.4408 G-X6CrNiMo1810		2343	F.8414-AM-X7 CrNiMo20 10	CF-8M	
316S62	1.4429 X2CrNiMo17133	Z2CND17.13Az	2375		316LN	
316S11/S12	1.4435 X2CrNiMo18143	Z2CND17.13	2353	F.3533-X 2 CrNiMo 17-12-03	316L	
316S16	1.4436 X5CrNiMo17133	Z6CND17.12	2343	F.3534-X 6 CrNiMo 17-12-03	316	
317S12	1.4438 X2CrNiMo18164	Z2CND19.15	2367		317L	
317S16	1.4449 X5CrNiMo1713				317	
347C17	1.4452 G-X5CrNiNb189	Z6NNb18.10M				
	1.446 X8CrNiMo275		2324	F.3309-X 8CrNiMo27-05	329	
321S12S31	1.4541 X6CrNiTi1810	Z6CNT18.10	2337	F.3553-X 7 CrNiTi 18-11	321	
	1.4542 X5CrNiCuNb1714	Z6CNU17.04			630	
347S17/S18	1.4546 X5CrNiNb1810				348	
347S17/S31	1.455 X6CrNiNb1810	Z6CNNb18.10	2338	F.3552-X 7 CrNiNb 18-11	347	
320S31/S17	1.4571 X6CrNiMoTi17122	Z6CNDT17.12	2350	F.3552-X 6 CrNiMoTi17-12-03	316Ti	
318S17	1.458 X6CrNiMoNb17122	Z6CNDNb17.12/19.13			316Cb	
318C17	1.4581 G-X5CrNiMiNb1810	Z4CNDNb18.12M				
309S24	1.4828 X15CrNiSi2012	Z15CNS20.12			309	
309S24	1.4833 X7CrNi2314	Z15CN24.13			309S	
309C30	1.4837 G-X40CrNiSi2520					
	1.4841 X15CrNiSi2520	Z15CNS25.20		F.3310-X15 CrNiSi 25-20	314/310	
310S24	1.4845 X12CrNi2521	Z12CN25.20	2361	F.331	310S	
310C40	1.4848 G-X40CrNiSi2520			F.8452-AM-X 40 CrNi25 20	HK	
349S54	1.4871 X53CrMnNiN219	Z52CMN21.09		F.3217-X 53 CrMnNiN 21-09	EV8	
331S40	1.4873 X45CrNiW189	Z35CNWS14.14		F.3211-X45 CrNiSiW 28-09		
321S20	1.4878 X12CrNiTi189	T6CNT18.12(B)	2337	F.3523-X 6CrNiTi 18 11	321	
1501-509;510	1.5662 X8Ni9	Z8N9		F.2645 - X 8 Ni 09	A353	
	1.568 I2Ni19	Z18N5			2515	
<b>HIGH TEMPERATURE ALLOYS</b>	NA 18	2.4375 NiCu30 Al	NU 30 AT			Monel k-500
		2.4685 G-NiMo28				Hastelloy B
		2.481 G-NiMo30				Hastelloy C
		2.461 NiMo16Cr16Ti				Hastelloy C-4
	NA 16/3072-76	2.4858 NiCr21Mo	NC 21 Fe DU			Incoloy 825
		2.4694 NiCr16Fe7TiAl				Inconel
NA 21	2.4856 NiCr22Mo9Nb	NC 22 FeDNb			Inconel 625	

# Material cross reference chart

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	UK	German	DIN	French	Swedish	Spanish	USA
<b>HIGH TEMPERATURE ALLOYS</b>		2.4856					Inconel 625
		2.4642	NiC29Fe	Nnc 30 Fe			Inconel 690
		2.4668	NiCr19FeNbMo	NC 19 Fe Nb			Inconel 718
		2.4669	NiCr15Fe7TiAl	NC 15 TNb A			Inconel X-750
							Invar 36-36 Alloy
							Invar Super 32-5
							Invar Super 32-5
	NA 13	2.436	NiCu30Fe	NU 30			Monel 400
	X5NiCrTi26 15					HR650	A286
			Co28Cr6Mo	Z6CNU15-5			Co Chrome ASTM F-75
	NA17	1.4864	X12NiCrSi3616	Z12NCS37.18			330
	NA15(H)	1.4876	X10NiCrAlTi3320	Z8NC3221			F.3313-X 12 CrNi 36-16
	3072-76/NA13	2.436	NiCu30Fe	NU30			F.3545-X 9NiCr 33-21
	3072-76/NA18/3146	2.4375	NiCu30Al				4544/SB127/164
		2.4602	NiCr17Mo17FeW	NC 17 DWY			4676
	HR5/203-4/703-B	2.463	Ni-Cr20Ti	NC 20 T		MH-05	5388 C
	HR 10	2.465	NiCr20Co19MoTi	NCK 20 D			Nimonic 75
		2.4662	NiCr15MoTi	Z8 NCDT 42		MH-16	5660C
	HR 6/204	2.4665	NiCr22Fe18Mo	Nc 22 FeD		MH-03	5536E
	HC 203	2.467	G-NiCr13Al6MoNb	NC 13 AD		MH-31	5391A
	HC 204	2.4674	NiCo15Cr10MoAlTi	NK 15 CAT			
	3072-76	2.4816	NiCr15Fe	NC 15 Fe			5540
		2.4856	NiCr22Mo9Nb	NC 22 FeDNB			5581
	3072-76	2.4858	NiCr21Mo	NC 21 FeDU			
	HR 207/5047		NiFe33Cr17Mo	NW 11 AC			
			NiCo32Cr26Mo	KC 20 WN			
			NiCo28Cr15MoAlTi	NK 27 CADT			
	HR 3/5007	2.4634	NiCo20Cr15MoAlTi	NCKD 20 ATV		MH-14	
		2.4654	NiCr20Co14MoTi	NC 20 K 14			
	HR 505	2.4669	NiCr16FeTi	NC 15 Fe TNb			5542G
	2.4676	NiCo10W10Cr9AlTi					
		NiCr20Co16MoTi	NC 19 KDU/V				
		NiW13Co10Cr9AlTi	NKW 10 CAT aHf				
		NiCr16Co10WAlTi					
HR 401HR601/736B	2.4631	NiCr20TiAl	NC 20 TA		MH-07		
	2.4636	NiCo15Cr15MoAlTi	NCKD 20 AT			687	
	2.4662	NiFe35Cr14MoTi	Z8 NCDT 42				
HR 8	2.4668	NiCr19Fe19NbMo	NC 19 FeNb		MH-06		
	2.4916	NiCr19Co11MoTi					
	2.4983	NiCr18Co18MoAlTi	NCK 19 DAT			684	
		NiCo22Cr16WAlTi	NC 14 K8				
<b>TITANIUM</b>	TA.1	3.7024/25	Ti 99,8	T-35		Ti-PO1	
	TA.2/3/4/5	3.7034/35	Ti 99,7	T-40		Ti-PO2	4941/42/51/4902
	TA.6/7/8/9	3.7064/65	Ti99,5	T-60		Ti-PO4	4901/21
	TA.21-24/52-55/58	3.7124	TiCu2	T-U2		Ti-P11	
	DTD 5023/5273/5283			T-50			4900
		3.7114	TiAl5Sn2 5553				Ti-5Al-2.5Sn Ti-5Al-5V-5Mo-3Cr
	TA.43/44	3.7154	TiAl6Zr5Mo0,5Si0,2	T-A6ZD		Ti-P67	
	TA.10-13/28/56	3.7164/65	TiAl6V4	T-A6V		Ti-P63	491128/35/54/65/67
	TA.45-51/57	3.7184	TiAl4Mo4Sn2Si0,5	T-A4DE		Ti-P68	
<b>NODULAR CAST IRON</b>	420/12	0.704	GGG-40	FGS-400-12	0717-02		60-40-18
	370/17	0.7043	GGG-40.3	FGS370-17	0717-15		
	500/7	0.705	GGG-50	FGS500-7	0727-02		65-45-12
	600/3	0.706	GGG-60	FGS 600-3	0732-03		80-55-06
	700/2	0.707	GGG-70	FGS 700-2	0737-01		100-70-03
	800/2	0.708	GGG-80	FGS 800-2			120-90-02
	W 340/3	0.8035	GTW-35-04	MB 35-7			
	W 410/4	0.804	GTW-40-05	MB 40-10			
	B 340/12	0.8135	GTS-35-10	MN 35-10	SIS 08 15-00		32 510
	P 440/7	0.8145	GTS-45-06	MP 50-5	SIS 08 54-00		
	P 540/5	0.8155	GTS-55-04	MP 60-3	SIS 08 56-00		
	P 690/2	0.817	GTS 70-02	MP 70-2	SIS 08 62-03		70 003
B 290/6			MN 32-8/38-18	SIS 08 14-00			
<b>GREY CAST IRON</b>		0.601	GG10	Ft10D / FGL100	0110-00	FG 10	A48-20B
	Grade 150	0.6015	GG15	Ft15D / FGL150	0115-00	FG 15	A48-25B
	Grade 220	0.602	GG20	Ft20D / FGL200	0120-00	FG20	A48-30B
	Grade 260	0.0625	GG25	Ft25D / FGL250	0125-00	FG 25	A48-40B
	Grade 300	0.603	GG30	Ft30D / FGL300	0130-00	FG 30	A48-45B
	Grade 350	0.6035	GG35	Ft35D / FGL350	0135-00	FG35	A48-50B
	Grade 400	0.604	GG40	Ft40D / FGL400	0140-00		A48-60B
<b>ALUMINIUM ALLOYS</b>	LM4/LM22	3.2151	G-ALSi6Cu4	A-S5U	4230	L-2660	319,2
	2L99/LM25	3.2371	G-ALSi7Mg	A-S7G0,3	4244		A356.2
	LM24	3.2161	G-ALSi8Cu3	A-S9U3	4252	L-2630	380,1
	LM9	3.2381	G-ALSi10Mg	A-S10G	4253	L-2560	A360
	LM20	3.2583	G-ALSi12Cu	A-S12U	4260	L-2530	413,1
	LM6	3.3581	G-ALSi12	A-S13	4261	L-2520	A413

# Material cross reference chart

Tableau de correspondance des matières : Tabelle mit Materialbezeichnungen  
 Tabella di comparazione dei materiali : Tabela materiałóv

	 UK	 German	 DIN	 French	 Swedish	 Spanish	 USA	
<b>ALUMINIUM ALLOYS</b>	LM28/LM29		AlSi18-25CuNiMg				393	
	1C	3.0205	Al99	A4	144010	L-3001	1200	
	1B	3.0255	Al99,5	A5	144007	L-3051	1050A	
	1E	3.0257	E-Al	A5/L	144008	L-3052	1350A	
	1A	3.0285	Al99,8	A8	144004	L-3081	1080A	
	1	3.0385	Al99,98R	A99			1199	
	N31	3.0505	AlMn0,5Mg0,5				3105	
	N3	3.0515	AlMn			144054	L-3810	3103
		3.0525	AlMn1Mg0,5	A-M1G0,5				3005
	N4	3.0526	AlMnMg1	A-M1G			L-3820	3004
		3.0915	AlFeSi	A-FeS				8011A
	H15	3.1255	AlCuSiMn	A-U4SG	144338		L-3130	2014
		3.1303	AlCu2Mg0,5					2036
	3L86/HR13	3.1305	AlCu2,5Mg0,5	A-U2G			L-3180	2117
	H14	3.1325	AlCuMg1	A-U4G			L-3120	2017A
	2L98	3.1355	AlCuMg2	A-U4G1			L3140	2024
		3.1645	AlCuMgPb	A-U4Pb	144335		L-3121	2003
	FC1	3.1655	AlCuBiPb	A-U5PbBi	144355		L-3182	2011
	2L91/92	3.1841	G-AlCu4Ti					295.1/2
	91E	3.2305	E-AlMgSi				L-3431	6101B
	BTR6	3.2307	Al99,85MgSi	A85-GS				6463
	H30	3.2315	Al-Si1 Mg	A-SGMO,7	144212		L-3451	6181
	H9	3.3206	AlMgSi0,5		144103		L-3441	6060
	BTR6	3.3207	E-AlMgSi0,5	A-GS/L	144102			6101C
		3.3241	G-AlMg3Si	A-G3T				F/B514.0
	N41	3.3315	AlMg1	A-G0,6	144106		L-3350	5005A
	3L44	3.3316	AlMg1,5	A-G1,5			L-3380	5050B
	BTR2	3.3317	Al99,85Mg1	A85-G1				
		3.3326	AlMg1,8					5051A
		3.3345	AlMg4,5					5082
	N5Mg3,5	3.3523	AlMg2,5	A-G2,5C	144120		L-3360	5052
	N4	3.3525	AlMg2Mn0,3	A-G2M				5251
		3.3527	AlMg2Mn0,8					5049
		3.3535	AlMg3	A-G3M	144133		L-3390	5754
	N51	3.3537	AlMg2,7Mn	A-G2,5MC				5454
		3.3541	G-AlMg3	A-G3T			L-2341	514
		3.3545	AlMg4Mn	A-G4MC			L-3322	5086
	N8	3.3547	AlMg4,5Mn	5083	144140		L-3321	5083
	N6	3.3555	AlMg5		144146		L-3320	5056A
	LM5	3.3561	G-AlMg5	A-G6				514.1
	LM10	3.3591	G-AlMg10	A-G10-Y4			L-2310	520
	H17	3.4335	AlZn4,5Mg1	A-Z5G	144425		L-3741	7020
		3.4345	AlZnMgCu0,5	A-Z5GU0,6				7022
	2L95	3.4365	AlZnMgCu1,5	A-Z5GU			L-3710	7075
		3.4415	AlZn1				L-3721	7072
<b>COPPER ALLOYS</b>	Pb2	2.1052	G-CuSn12	CuSn12			C 90800	
	CT2	2.106	G-CuSn12Ni				C 91700	
	CT1	2.1086	G-CuSn10				C 90250	
		2.109	G-CuSn7ZnPb	CuSn7Pb6Zn4			C 93200	
	LG4	2.1093	G-CuSn6ZnNi				C 92410	
	LG2	2.1096	G-CuSn5ZnPb/RG5	CuPb5Sn5Zn5			C 83600	
	LG1	2.1098	G-CuSn2ZnPb				C 83810	
	LB2	2.1176	G-CuPb10Sn	CuPb10Sn10			C 93700	
	LB1	2.1182	G-CuPb15Sn				C 93800	
	LB5	2.1188	G-CuPb20Sn	CuPb20Sn5			C 94100	
		2.0918	CuAl5As	CuAl6			C 60 800	
		2.092	CuAl8	CuAl8			C 61 000	
	CA 106	2.0932	CuAl8Fe3	CuAl7Fe2			C 61 400	
	CA 105	2.0936	CuAl10Fe3Mn2	CuAl9Fe3Mn2			C 62 300	
	AB 1	2.094	CuAl10Fe	CuAl9Fe3			C 95 200	
	CA 104	2.0966	CuAl10Ni5Fe4	CuAl9Ni5Fe3Mn			C 63 200	
	AB 2	2.097	G-NiAlBzF50	CuAl9Ni5Fe			C 95 800	
	CC 102	2.1293	CuCrZr				C 18100	
	C 112	2.1285	CuCo2Be				C 17500	
	CB 101	2.1245	CuBe1,7	CuBe1,7			C 17000	

# Coatings

## ALtima®

Aluminium Titanium Nitride (AlTiN). ALtima® is the original high performance coating. This coating allows tools to be run at higher speeds and feeds in a wide array of materials. Also, it allows the option of running tools dry due to the high oxidation temperature of the coating.

## ALtima® Plus

This Aluminium Titanium Nitride (AlTiN) multi-layer coating has optimised coating structure, with pre and post treatment of the coating for optimized high performance drilling in any ferrous material.

## ALtima® 52

Aluminium Titanium Nitride (AlTiN). ALtima® 52 is specially designed for milling hardened steels 52 Rc and above. It has very high hardness and the oxidation temperature of the coating makes this the absolute best choice for hardened steel milling. ALtima® 52 is designed to allow for dry machining.

## ALtima® Blaze

ALtima® Blaze is designed to allow higher material removal rates. This coating has a higher oxidation temperature than a typical TiAlN coating. It has shown very good results in nickel alloys, titanium, and other difficult to machine materials. Tools coated with ALtima® Blaze can be used in dry machining.

## Special Coatings

Upon request, M.A.Ford® can provide any commercially available coating. Any standard M.A.Ford® cutting tool can be provided with coating if requested.

## Gem+

Recommended for aluminium and aluminium alloys up to 12% Si, non-ferrous metals and composites. Gem+ provides excellent wear resistance and maintains sharp cutting edges.

**CERAedge® combines the heat resistance of conventional AlTiN coatings with the hardness and smoothness of amorphous diamond coatings.**

- Hardness that makes it the 3<sup>rd</sup> hardest material when compared to industrial diamonds
- Toughness that is comparable to Titanium
- Lubricity that approaches Teflon

## Applications-

- **Only CERAedge® has properties allowing for ideal drilling and milling of Titanium clad composites**
- **Ideal for machining Titanium, Aluminium Alloys and High Silicon Aluminium materials.**

## Coating Properties

M.A. Ford Coating	M.A. Ford Tool Number Designation	Microhardness (HV)	Maximum Service Temp.	Friction Coefficient
ALtima®	A	3100	1100°C / 2012°F	0.42
ALtima® Plus	AP	3200	1100°C / 2012°F	0.25
ALtima® 52	A	3600	1200°C / 2192°F	0.4
ALtima® Blaze	B	3200	1100°C / 2012°F	0.35
Gem+	GP	4710	500°C / 932°F	0.3
Fordlube	F	4000	700°C / 1292°F	0.3
TiN	T	2300	600°C / 1112°F	0.4
TiCN	C	3000	400°C / 752°F	0.4
ALtima® Xtreme	AX	3800	1100°C / 2012°F	0.3 - 0.5
ALtima® Nano	AN	3875	1100°C / 2012°F	0.3
ALtima® Q	AQ	4500	1100°C / 2012°F	0.4
CERAedge®	CE	3400	1100°C / 2012°F	0.25

## Fordlube

Titanium DiBoride (TiB<sub>2</sub>) is a unique coating with low Aluminium affinity, smooth surface finish and high hardness. It is ideal for Aluminium and Magnesium alloys as it prevents build-up on cutting edge, provides superior chip flow along with extended wear resistance.

## TiN

Titanium Nitride (TiN). TiN coating has shown good results in low carbon steels and many iron-based applications. It is a very popular coating used in the industry today.

## TiCN

Titanium Carbonitride (TiCN). TiCN is a multi-layer coating because of the multi-layer composition, TiCN is tougher than TiN, even though TiCN is harder. The added toughness of the TiCN coating makes it a good choice for mechanically stressed edges like in end mill applications. The higher hardness makes TiCN a good choice for abrasive applications where higher wear resistance is required.

## ALtima® Xtreme

ALtima® Xtreme is a high heat resistant coating with smooth surface to reduce chip rewelding. First choice in Hardened Steels, Stainless Steels and Heat Resistant Alloys like Inconel® 718.

## ALtima® Nano

ALtima® Nano is a high performance coating providing excellent heat resistance in high temperature machining, especially in Titanium and Stainless Steel. It provides improved adhesion, shock resistance and excellent coating smoothness.

## ALtima® Q

A proprietary coating designed to allow for extreme metal removal rates in a broad range of materials such as steels, stainless steels, titanium, & exotic alloys.



# Integrated Manufacturing Solutions



**M.A.Ford®** World Class Cutting Tools



**REGO-FIX powRgrip®** Precision Toolholding



**HSM Tool Path Optimisation**



**REGO-FIX toolVibe®**

**REGO-FIX toolVibe®** Monitoring and Optimisation



**TMS Tool Management System**



**Technical Support & Advice**

## Take control of your machining processes with IMS

Integrated Manufacturing Solutions, IMS for short, combines a range of complementary technologies from M.A. Ford, including our high-performance tooling, which combine to help optimise machining and enhance productivity.

Recently extended with the addition of REGO-FIX toolVibe® monitoring and

optimisation and TMS automated tool management, IMS also incorporates HSM tool path optimisation software and REGO-FIX® precision toolholding, as well as our extensive cutting tool range and unrivalled technical support.

***IMS – Providing solutions for manufacturing challenges.***

For further information please contact our support team on: 01332 267960

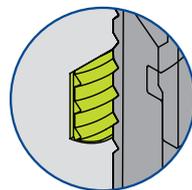
# ▶ REGO-FIX powRgrip®

As an authorised UK REGO-FIX distributor, we can offer you the ultimate combination in high performance cutting tools and tool holding solutions.

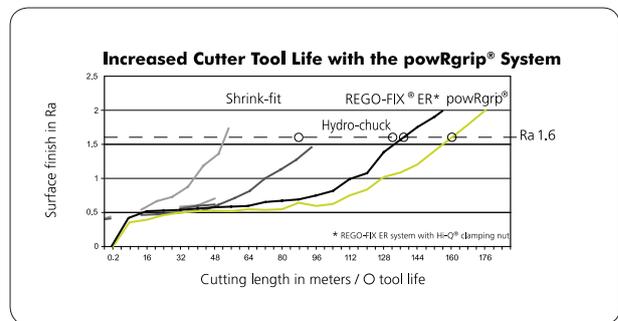
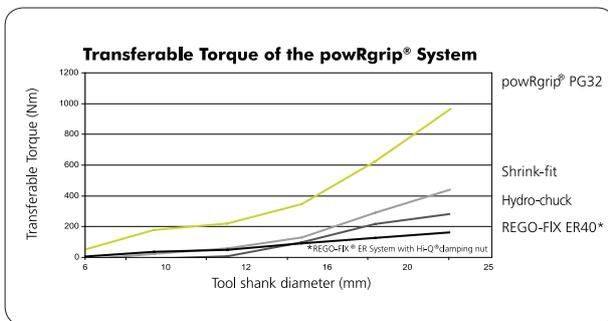
## The figures speak for themselves:

REGO-FIX powRgrip® tool holding system with secuRgrip® option for 100% security against tool pull-out

- ▶ Holders guaranteed for life under normal usage of 20,000 insertion/extraction cycles of collet without deterioration in clamping force
- ▶ ≤ 3µm run-out
- ▶ Designed for roughing and finishing operations
- ▶ Anti-vibration effect over standard shrink-fit allowing increased tool life and cutting parameters



Perfect for HA & HB shanks



For further information please contact our support team on: 01332 267960

# Optimised Cutting

## High Speed Machining (HSM)

Since producing our first cutting tools in 1919, M.A. Ford has always striven to improve customer productivity and reduce costs.

The TuffCut® XR-XT range of end mills is the latest step in this process, offering unique Heli-pitch geometry, proprietary substrates and state of the art ALtima® coatings.

HSM uses cutting speeds that are typically more than double those of standard or conventional techniques. In conjunction with the increase in surface speed, by controlling the cutting tool engagement angle during the milling process, and the use of chip thickness compensation, increased cutting data can be achieved.

Before using these techniques there are several requirements to consider:

- Rigid machine tools with modern control systems with a HSM function.
- High performance, high technology cutting tools.
- High gripping strength, rigid tool holders.
- Air or powerful coolant delivery system-according to material being machined.
- CAD/CAM software to control the engagement angle of the tool.

### We can show you how!

M.A. Ford utilises class leading CAD/CAM software which allows for exact control of the radial depth engagement, which is crucial to the high speed machining process.

A step over of 10% of the cutter diameter requires a chip thickness compensation factor of 1.8 to be applied. 20% radial engagement requires a compensation of 1.2 times. However, care must be taken when using these rates for tight corner internal machining.

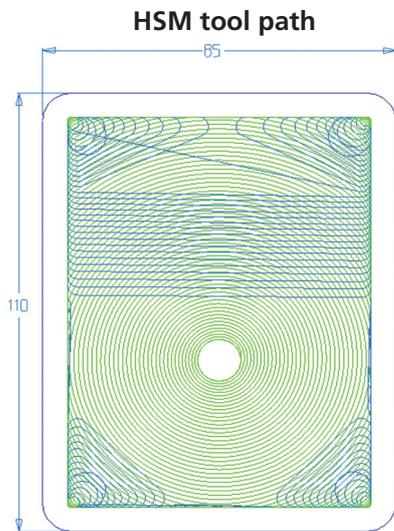
Due to the small radial cuts, large axial cuts – typically 2 times the tool diameter can be used. The combination of these factors enables most steels up to 40HRC to be machined at feeds of up to 13 m/min. An example of this HSM cutting data can be seen on the next page in a direct comparison with conventional programming techniques.

### Benefits of HSM:

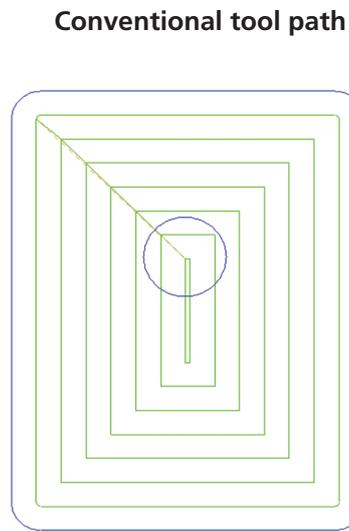
- Decreased cycle time
- Reduced costs
- Potentially reduced cutting tool diameter and hence cost
- Improved process reliability
- Improved cutting tool life
- Reduced coolant consumption

For further information please contact our support team on: 01332 267960

## Benefits of Enhanced Cutting Parameters with HSM Toolpaths



Tool diameter-12 mm      177 1200-0.5RA  
 Entry-Helical ramp-2 degrees  
 Axial depth  $A_p$ -24 mm-1cut  
 Radial step over  $A_e$ -10%-1.2 mm



Tool diameter-12 mm      177 1200-0.5RA  
 Entry-Via drilled hole.  
 Axial depth  $A_p$ -24 mm-2 cuts of 12 mm  
 Radial step over  $A_e$ -50%-6 mm

### Cutting data and cycle time by material

Steel		
RPM	8000	3200
Feed mm/min	6700	765
Cycle time	1 min-40 secs	4 mins
Metal removal rate	193 cm <sup>3</sup>	55 cm <sup>3</sup>
Expected tool life	2 - 3hrs	1 - 2hrs

Stainless Steel		
RPM	4000	1855
Feed mm/min	3400	450
Cycle time	3 min-20 secs	7 mins
Metal removal rate	98 cm <sup>3</sup>	32 cm <sup>3</sup>
Expected tool life	2 - 3hrs	1 - 2hrs

Titanium		
RPM	2600	1600
Feed mm/min	2100	380
Cycle time	5 min-15 secs	8 mins
Metal removal rate	61 cm <sup>3</sup>	27 cm <sup>3</sup>
Expected tool life	2 - 3hrs	1 - 2hrs

Inconel® 625		
RPM	930	660
Feed mm/min	470	80
Cycle time	21 mins	37 mins
Metal removal rate	14 cm <sup>3</sup>	6 cm <sup>3</sup>
Expected tool life	30 mins - 1 hr	15 - 30 mins

# REGO-FIX toolVibe® Monitoring and Optimisation

As part of our Integrated Manufacturing Solutions (IMS) programme, the versatile toolVibe® cutting force monitoring system, from REGO-FIX®, enables us to provide customers with detailed data, derived from their own machining applications, to manage vibration and optimise machining performance.



By monitoring all key cutting forces experienced by the tool in machining applications, in real time, toolVibe® allows the effects of changes in parameters, such as speed, feed and depth of cut to be instantly viewed and analysed by the software.

The results are then displayed as graphic and numerical data, which enables tooling to be optimised to specific machining conditions or requirements. In addition, alarms can be set and automatic recordings created, that enable comprehensive trend analyses to be conducted, allowing continuous process improvement.

Where issues, such as vibration, tool wear and finish quality are present, toolVibe® allows the causes to be identified and addressed effectively by optimising cutting performance and potentially influencing machining strategy.

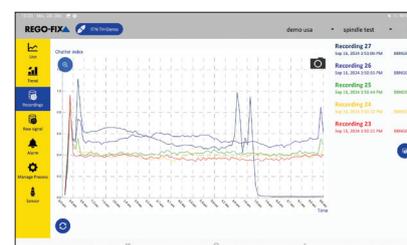
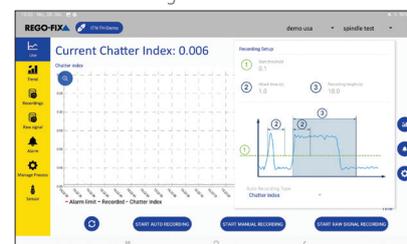
At M.A. Ford Europe, we also use the system as an integral part of our tool development programme to analyse the effects that edge geometry, carbide and coating variations have on tool performance in any material, allowing us to deliver a high-performance solution backed up by robust data.

For further information please contact our support team on: 01332 267960

Trend Analysis



Vibration Monitoring



# TMS - Automated Tool Management Systems

Tooling and inventory management at the push of a button

**Our versatile TMS range of tool management and inventory control machines provide M.A. Ford customers with a fully automated and cost effective-stock control solution on-site at the point of use.**

TMS is easy to use and provides a simple method of managing tool usage and consumption while controlling stock and manufacturing costs, all at the push of a button.

All TMS machines are linked to an online portal, allowing customers to generate a wide range of inventory and usage reports to help manage cutting tool expenditure and monitor costs in detail.

The system automatically generates purchase orders for replenishment stock, or new products, direct to M.A. Ford Europe.

## TMS options

### TMS-CS

This range uses multi-tier stacked carousels, which are segmented into different 'cells' that can be configured for different sized items. They are loaded with single tools or multiple items, if required, each with their own location code. When the correct code is entered the carousel rotates and the access door automatically unlocks when the tool is available for collection.

### TMS-DS

Our TMS-DS models are configured as stacked drawers. Each drawer contains a number of compartments, which can be configured to meet the specific needs of each customer. Once the unique location code is entered on the keypad, the appropriate drawer will open and the individual item will be available for use.



## Why TMS?

### Greater control

Control tooling costs, production and inventory easily while accessing a range of dedicated and detailed usage reports online, as well as automated replenishment.

### Easy to configure

The divider system allows items to be added or removed in minutes, giving great flexibility and time savings.

### Software and flexible system integration

Our powerful software can manage a single TMS unit or banks of machines, giving the flexibility of assigning them as a master or 'slave' unit.

### Small footprint and easy location

The small footprint allows TMS solutions to be located close to the point of use in production areas as well as specialised dedicated manufacturing cells.

### Secure access at any time

Round the clock traceable access using keypad log-in, proximity or biometric methods for authorised users.

### No spirals - No drop

TMS carousel and drawer options do not use rotating spirals so there's no drop and items can easily be returned, if required.

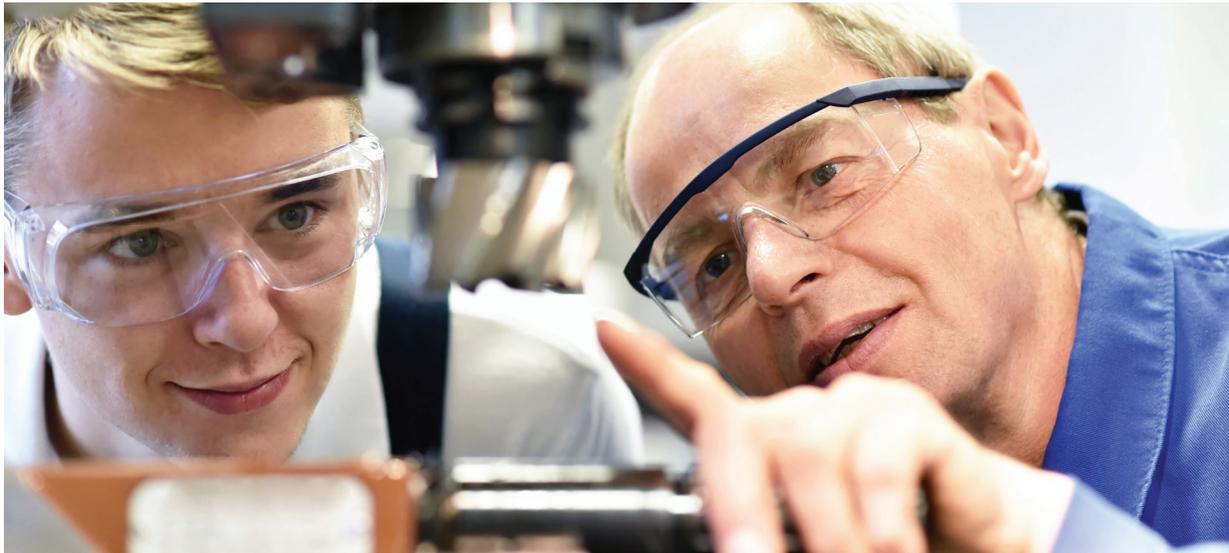
### High capacity

More than 800 individual SKUs can be stocked in a single TMS machine.

For further information please contact our support team on: 01332 267960

## ▶ Technical Support & Advice

Like the cutting edge performance offered by our tooling, the high quality standards provided by our technical support team are an integral part of our business and an essential link for our customers.



Whether it's a simple product performance or tool selection query or a complex question about a new tooling application or improving machining performance, our technical support team has the expertise, experience and knowledge to advise and help.

At M.A. Ford Europe, service and technical support is not just a function of our business, it's a fundamental part of what we do and how we work together with customers to deliver the best solutions for their machining and manufacturing operations.

In addition to guidance and advice, our team can also provide training at our Technical Centre or at customers' premises, application & tool testing to verify performance, as well as support for every element within our Integrated Manufacturing Solutions (IMS) programme.

Where a unique cutting solution is required, we also support customers through our own specialist Custom Tools Division, which is dedicated to the design & manufacture of custom tools and innovative solutions to meet individual customer specifications.

For further information please contact our support team on: 01332 267960

## FordGrip Power Chuck

FordGrip Power Chuck range of collet chucks provides manufacturers with a high precision and cost-effective tool holding solution that allows optimum tool performance to be achieved

- High gripping force ensures tool security
- Accurate tool runout (0.005mm at 3xØ) increases tool-life and improves surface finish
- Suitable for plain, Weldon and whistle notch shank end-mills and drills (Weldon and whistle notch must be used with reduction sleeves)
- Simple mechanism allows easy opening and closing with no maintenance
- Reduced length and external dimensions for improved balancing (G2.5 to 25,000rpm)
- Suitable for through coolant tools



**M.A. FORD GRIP**  
POWER CHUCK

**M.A. FORD GRIP**  
HYDRAULIC MILLING CHUCK

For further information please contact our support team on: 01332 267960

# Custom tools with customised service

There are some applications where only a dedicated, special purpose tool is the best solution.

Our Custom Tools Division gives you the best of both worlds by providing you with the facilities to design and manufacture a special tool to your exact requirements, but with the added advantage of being precision manufactured by M.A. Ford Europe.

**Performance and peace of mind. A perfect combination.**



Contact us now: 01332 267960 or  
Email: [customtools@mafordeurope.com](mailto:customtools@mafordeurope.com)

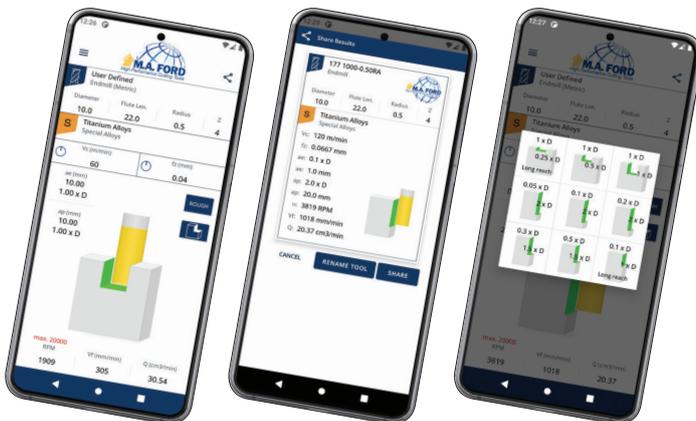
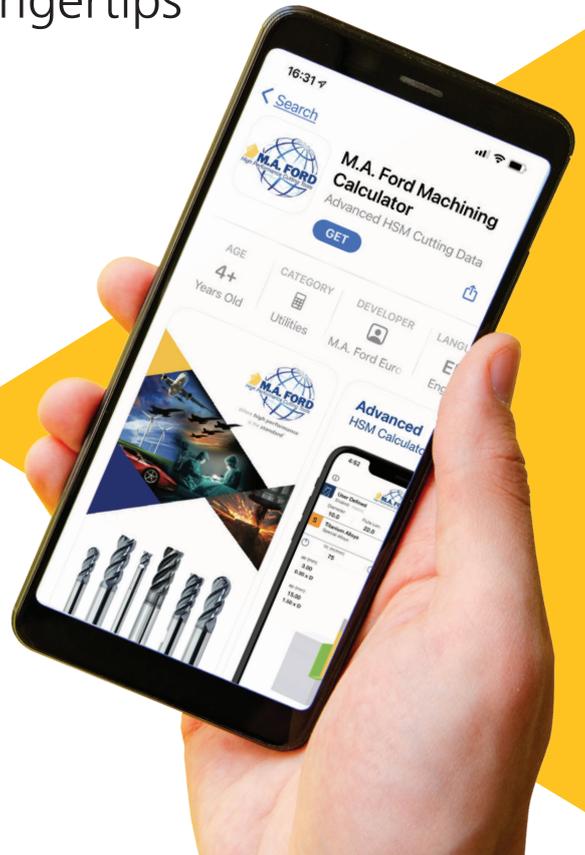
# The M.A. Ford interactive cutting data app

- Everything you need at your fingertips

Our interactive app for iOS and Android devices makes tool cutting data calculations simpler and faster by minimising text input and using 3D graphics that respond instantly to changing cutting parameters, using smart-phone or tablet touch screens.

Developed around our proven cutting data, the app supports a wide range of ISO materials including steel, aluminium alloys, stainless steel and titanium, as well as cast iron, hardened steels and exotic alloys.

Once basic information has been selected from 'drop down' menus, such as tool type, diameter and material, the app allows you to 'drag' the tool graphic display to change the radial engagement and depth of cut, which instantly calculates speeds and feeds.



Colour coded feedback guides you toward the recommended cutting conditions based on the chosen input parameters. User over-ride controls allow cutting data to be fine-tuned for individual applications, as well as enabling calculations to be made that compare multiple scenarios instantly.

Proven cutting data can be stored via the 'Save' feature for future reference or shared with other app users. A hyperlink to M.A. Ford Europe's website also allows immediate access to online information and downloads.

Radial chip thinning data is also calculated for use with high-speed machining (HSM) strategies, which can significantly reduce cycle times and improve tool life.



For further information please contact our support team on: 01332 267960



Where **high performance**  
is the **standard**<sup>®</sup>



**TuffCut**<sup>®</sup> Endmills

**CYCLONE** Drills

**TrueSize**<sup>®</sup> Reamers

**Twister**<sup>®</sup> Drills

**Chamfer & Profile Mills**

**Diamond Grind** Routers

**Edgehog**<sup>®</sup> Burrs

**Countersinks**

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