

Metric

Aluminium

Al

(<12.2% Si)

(>12.2% Si)

TuffCut® End Mills

Twister® Drills



M.A.FORD
High Performance Cutting Tools

ISO 9001:2000 Certified

TuffCut® X-AL

Designed for Extreme Productivity

Conçu pour Rendements Extrêmes



At M.A.Ford®, we pride ourselves on being one of the world's premier manufacturers of high performance cutting tools. That's as true today as it was back in 1919 when Matthew A. Ford produced the first hand cut HSS rotary files made in America.

Whether it's engineering the exacting tolerances of the first circuit board drills, or developing the intricate geometries for application specific high performance cutting tools, such as Aero engine casings in Inconel 718, or Aluminium wing spars at 40 M/Min feed, our commitment to innovation, quality and professional service put us a cut above.

M.A.Ford has two modern solid carbide and HSS cutting tool manufacturing facilities located in Davenport, Iowa and Vero Beach, Florida, USA. Both plants employ a team concept that strives for improved response times, the highest quality tools, innovative ideas and cost reduction & control.

European markets are covered from our stock and distribution headquarters located in Derby, England, supported by factory trained technical field sales personnel.

M.A.Ford strives to keep ahead of market requirements for unique tooling technology and speciality coatings, by creating partnerships and joint ventures with worldwide market leaders.

M.A.Ford's ALTima® coating is produced by Miracle Tools America, an M.A.Ford subsidiary established with Mitsubishi Carbide and MMC Kobelco Tool. MMC Kobelco Tool licences the PVD technology to Miracle Tools America.

Nous sommes fiers chez M.A.Ford® d'être parmi les meilleurs fabricants d'outils coupants à haute performance sur le plan mondial. Ceci est aussi vrai aujourd'hui que ce l'était en 1919 quand Matthew A. Ford a fabriqué les premières limes rotatives en HSS taillées à la main en Amérique.

Que ce soit les tolérances exigeantes dans l'ingénierie de forets pour les premiers circuits imprimés, ou le développement de géométries très élaborées pour des outils coupants à haute performance dans des applications particulières telles que carters de réacteurs dans de l'Inconel, ou des envergures d'aile en Aluminium avec des avances de 40M/Min, notre engagement en matière d'innovation, de qualité et d'un service professionnel nous place dans une catégorie supérieure.

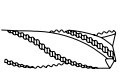
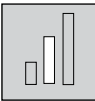
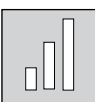
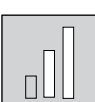
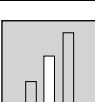
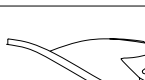
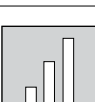
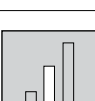
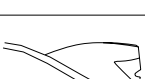
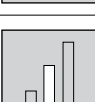
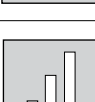
M.A.Ford possède deux installations modernes de fabrication d'outils de coupe en carbure et en HSS situées à Davenport, Iowa et Vero Beach, Floride, aux E-U. Les deux usines sont encadrées dans un concept d'équipe s'efforçant d'améliorer continuellement les temps de réponses, la meilleure qualité possible, des idées innovatrices, ainsi que la diminution et la maîtrise des coûts.

Les marchés européens, pour le stock et la distribution, sont gérés à partir de notre quartier général situé à Derby en Angleterre, avec l'appui d'un personnel technico-commercial formé en usine et sur le terrain.

M.A.Ford's efforte de rester à l'avant-garde des exigences du marché en matière de technologie d'outillage unique et de revêtements spécialisés en créant des partenariats et des coentreprises avec des leaders du marché mondial.

Le revêtement ALTiMa de M.A.Ford est fabriqué par Miracle Tools America, une succursale d' M.A.Ford établie conjointement avec Mitsubishi Carbide et MMC Kobelco Tool. La technologie PVD de Miracle Tools America provient sous licence de MMC Kobelco Tool.

Contents Vue d'Ensemble

	Series Séries	Form Forme	No. of Teeth Nbre.Dents	Lengths Longueurs	Corner Prep Prép.Bec	Application Area Secteur d'Application	Page
	134		Z=3		Chamfer 45 deg Chanfrein 45°	Older-Lower KW machine, long DOC (Ae) M/c anciennes, < KW, long DOC (Ae)	3
	135		Z=2		0-5.0mm radius Rayon 0-5.0 mm	High feed machine -1> mm tooth loading possible Fortes avances -1> mm à la dent	4
	135B		Z=2		N/A	Rough & finish profile milling Ebauche & Fraisage finition profil	10
	136		Z=2		Sharp corner radius to order Coin carré Rayon à la cde.	Finishing Al alloys Wiper flats for surface finish Finition Aciers Alliés Al Arêtes de raclage	11
	137		Z=3		0.25-0.75mm radius Rayon 0.25-0.75 mm	3 fluted for smoother roughing cutting action. High tooth loads possible 3 Dents pour coupe plus douce. Fortes charges.	12
	138		Z=3		Sharp corner Coin carré	High performance finish machining. Wiper flats for surface finish Finition HP Arêtes de raclage	14
	138R		Z=3		0-5.0mm radius Rayon 0-5.0 mm	High performance finish machining. Wiper flats for surface finish Finition HP Arêtes de raclage	15
	138B		Z=3		N/A	Finish profile milling Finition profil	16
	229		Z=3		N/A	High performance drill for use in Ti/Al alloys, plastics, brass and copper alloys HP pour aciers alliés Ti/Al, plastiques, alliages laiton, cuivre.	17
Technical Section - Recommended cutting data							19

Available Coatings - Delivery 3 - 4 weeks Revêtements Disponibles - Livraison 3 - 4 semaines					
	Micro Hardness (HV)	Max Work Temp. °C	Colour	Coef. of Friction	Application Area
	Dureté Micro (HV)	Max. Fonctionnement °C	Couleur	Coef. friction	
F - Fordlube	4000	850	Light Grey Gris clair	<0.45	Al-Si Alloys / Ti Alloys / Mg Alloys / Copper Alloys Alliages Al-Si/Alliages Ti/ Alliages Mg/Alliages Cuivre

TuffCut® X-AL

Designed for Extreme Productivity

Features / Caractéristique

Benefit / Avantage

134 Series / Série 134

- Chipbreaker design
- Sinusoidal Flute Form
- Conception brise-copeaux
- Goujure à forme sinusoïdale

Reduced power consumption on low power/torque machines
Produces small manageable chips for ease of evacuation.
Chips not thrown clear on unguarded machines.
Diminution de la puissance absorbée sur les machines à faible puissance/couple.
Produit des petits copeaux facilitant leur évacuation
Les copeaux ne sont pas rejetés de machines non protégées.

135 series / Série 135

- Unique double grind geometry
- Variety of lengths from stock with neck relief as standard.
- Industry standard radii from stock.
- Géométrie unique à double rectification.
- Choix de longueurs en stock avec fraises détalonnées en standard.
- Rayons industriels stockés en standard

Controlled chip form for easy evacuation.
Highest tooth loading capability (1 mm/tooth/rev during 1 x D slotting)
Enabling the use of best practice tool length.
3 x D and 5 x D neck relieved shanks available.
Tool availability reduces forward planning required for short lead time components.
Forme du copeau maîtrisée pour en faciliter l'évacuation
Capacité de charge à la dent la plus élevée (1 mm/dent/tour lors de rainurage 1 x D).
Permettant l'utilisation d'une longueur d'outil optimale.
3 x D et 5 x D disponibles avec queues détalonnée.
Moins de planification nécessaire, diminuant le délai d'approvisionnement.

137 series / Série 137

- 3 Flute geometry
- Géométrie à 3 Dents

Roughing endmill for a smoother cutting action on less stable machines/workpieces.
Fraise d'ébauche pour une coupe plus douce pour machines/pièces moins stables.

138 series / Série 138

- 3 Flute geometry
- Circular land
- Wiper flats
- Géométrie à 3 Dents
- Face de dépouille circulaire
- Arêtes de Raclage

HS finishing endmill for smoother cutting and higher feed rates.
Improved surface finishes and reduced chatter on walls/ribs.
Best possible web/rib surface finishes.
Fraise finition HV pour coupes plus douces et avances plus élevées.
Etats de surface améliorées et broutage diminué sur les parois.
Meilleures états de surface possibles pour les parois/fonds.

229 series drill / Forets Série 229

- Parabolic flutes
- 150 Deg self centring point
- Goujures paraboliques
- Pointe auto-centreuse 150°

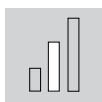
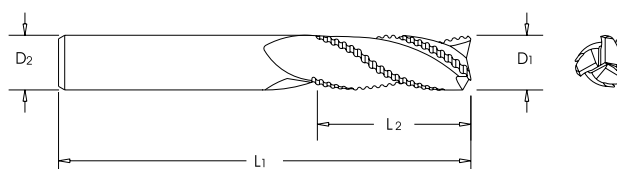
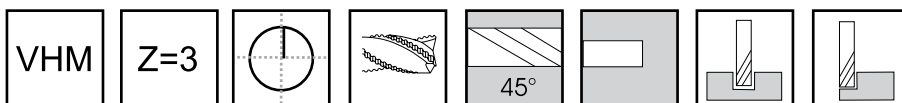
Improved chip evacuation even when drilling 5 x D depth without pecking.
No spot drill required, easily regrindable.
Meilleur dégagement de copeaux, même en perçage 5 x D de profondeur sans temporisation.
Pas besoin de lamer (spot drill), facilement ré-affûtable.

General Features / Caractéristiques Générales

- Unique carbide substrates
- Fordlube coating
- Substrats en carbure exceptionnels
- Revêtement Fordlube

Application specific grades for optimum tool performance.
To prevent chip adhesion and extend tool life during Ultra high speed machining or applications involving the use of minimal coolant.
Nuances pour applications particulières afin d'assurer une performance optimale.
Pour éviter l'adhérence de copeaux et prolonger la durée de vie lors d'usinages à très hautes vitesses ou pour des applications utilisant un minimum d'arrosage.

TuffCut® X-AL Series 134

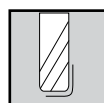
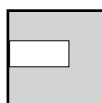
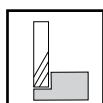
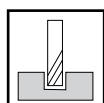
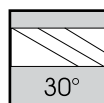
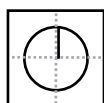
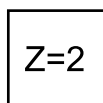


Tool No.	EDP	D1	D2	L1	L2
134 0600	13409	6.0	6.0	64	20.0
134 0800	13414	8.0	8.0	64	20.0
134 1000	13419	10.0	10.0	70	25.0
134 1200	13423	12.0	12.0	76	25.0
134 1400	95321	14.0	14.0	89	30.0
134 1600	13429	16.0	16.0	89	30.0
134 1800	13430	18.0	18.0	102	35.0
134 2000	13433	20.0	20.0	102	38.0
134 2500	13435	25.0	25.0	102	50.0

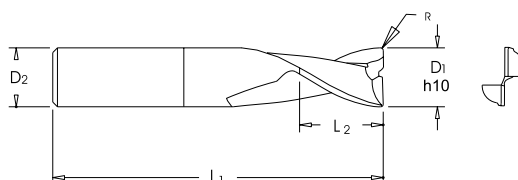
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

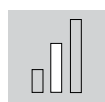
TuffCut® X-AL Series 135



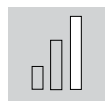
Corner Radius
Eckenradius
Avec Rayons



Tool No.	EDP	D1 Tol h10	D2	L1	L2	R
135 0300	13523	3.0	3.0	38	3.5	.20
135 0400	13533	4.0	4.0	51	4.8	.20
135 0500	13502	5.0	5.0	51	6.0	.25
135 0600	13504	6.0	6.0	64	7.0	.30
135 0800	13508	8.0	8.0	64	9.5	.35
135 1000	13515	10.0	10.0	70	12.0	.50
135 1200	13525	12.0	12.0	76	14.0	.50
135 1400	13552	14.0	14.0	89	16.0	.50
135 1600	13535	16.0	16.0	89	18.0	.75
135 1800	13563	18.0	18.0	102	20.0	.75
135 2000	13545	20.0	20.0	102	22.0	.75
135 2500	13555	25.0	25.0	102	25.0	.75



Tool No.	EDP	D1 Tol h10	D2	L1	L2	R
135 1001	13516	10.0	10.0	76	12.0	.50
135 1201	13526	12.0	12.0	102	14.0	.50
135 1401	13554	14.0	14.0	102	16.0	.50
135 1601	13536	16.0	16.0	117	18.0	.75
135 1801	13568	18.0	18.0	127	20.0	.75
135 2001	13546	20.0	20.0	127	22.0	.75
135 2501	13556	25.0	25.0	127	25.0	.75

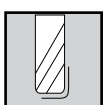
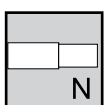
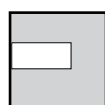
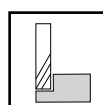
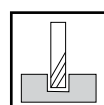
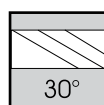
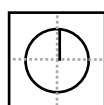
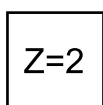


Tool No.	EDP	D1 Tol h10	D2	L1	L2	R
135 1002	13517	10.0	10.0	89	12.0	.50
135 1202	13527	12.0	12.0	127	14.0	.50
135 1402	13573	14.0	14.0	127	16.0	.50
135 1602	13537	16.0	16.0	133	18.0	.75
135 1802	13574	18.0	18.0	152	20.0	.75
135 2002	13547	20.0	20.0	152	22.0	.75
135 2502	13557	25.0	25.0	152	25.0	.75

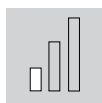
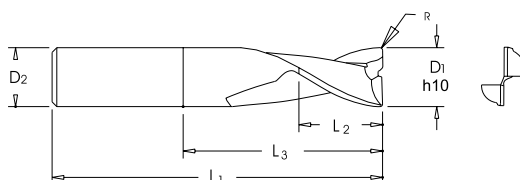
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

TuffCut® X-AL Series 135



Corner Radius
Eckenradius
Avec Rayons



Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 0300N	13524	3.0	3.0	38	3.5	11	.20
135 0400N	13534	4.0	4.0	51	4.8	22	.20
135 0500N	13503	5.0	5.0	51	6.0	22	.25
135 0600N	13505	6.0	6.0	64	7.0	26	.30
135 0800N	13509	8.0	8.0	64	9.5	26	.35
135 1000N	13565	10.0	10.0	70	12.0	28	.50
135 1200N	13575	12.0	12.0	76	14.0	28	.50
135 1400N	13553	14.0	14.0	89	16.0	42	.50
135 1600N	13585	16.0	16.0	89	18.0	39	.75
135 1800N	13564	18.0	18.0	102	20.0	52	.75
135 2000N	13594	20.0	20.0	102	22.0	50	.75
135 2500N	13597	25.0	25.0	102	25.0	36	.75



Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 1001N	13566	10.0	10.0	76	12.0	34	.50
135 1201N	13576	12.0	12.0	102	14.0	54	.50
135 1401N	13558	14.0	14.0	102	16.0	55	.50
135 1601N	13586	16.0	16.0	117	18.0	83	.75
135 1801N	13569	18.0	18.0	127	20.0	77	.75
135 2001N	13595	20.0	20.0	127	22.0	75	.75
135 2501N	13598	25.0	25.0	127	25.0	61	.75

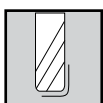
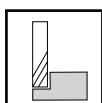
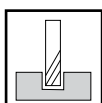
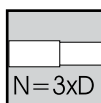
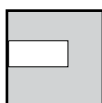
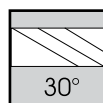
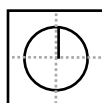
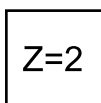


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 1002N	13567	10.0	10.0	89	12.0	47	.50
135 1202N	13577	12.0	12.0	127	14.0	79	.50
135 1402N	13559	14.0	14.0	127	16.0	80	.50
135 1602N	13587	16.0	16.0	133	18.0	99	.75
135 1802N	13578	18.0	18.0	152	20.0	102	.75
135 2002N	13596	20.0	20.0	152	22.0	100	.75
135 2502N	13599	25.0	25.0	152	25.0	86	.75

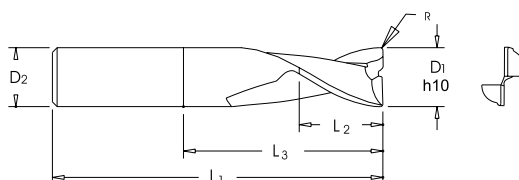
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TuffCut® X-AL Series 135



Corner Radius
Eckenradius
Avec Rayons

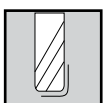
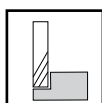
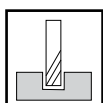
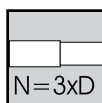
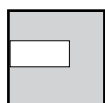
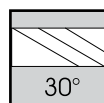
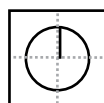
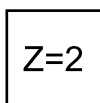


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 03N3	96620	3.0	3.0	38	3.5	11	-
135 03N3-0.5R	96621	3.0	3.0	38	3.5	11	0.5
135 03N3-1.0R	96622	3.0	3.0	38	3.5	11	1.0
135 04N3	96626	4.0	4.0	51	4.8	14	-
135 04N3-0.5R	96627	4.0	4.0	51	4.8	14	0.5
135 04N3-1.0R	96628	4.0	4.0	51	4.8	14	1.0
135 05N3	96632	5.0	6.0	64	6.0	17	-
135 05N3-0.5R	96633	5.0	6.0	64	6.0	17	0.5
135 05N3-1.0R	96634	5.0	6.0	64	6.0	17	1.0
135 06N3	96638	6.0	6.0	64	7.0	20	-
135 06N3-0.5R	96639	6.0	6.0	64	7.0	20	0.5
135 06N3-1.0R	96640	6.0	6.0	64	7.0	20	1.0
135 06N3-1.5R	96641	6.0	6.0	64	7.0	20	1.5
135 06N3-2.0R	96642	6.0	6.0	64	7.0	20	2.0
135 08N3	96648	8.0	8.0	64	9.5	26	-
135 08N3-0.5R	96649	8.0	8.0	64	9.5	26	0.5
135 08N3-1.0R	96650	8.0	8.0	64	9.5	26	1.0
135 08N3-1.5R	96651	8.0	8.0	64	9.5	26	1.5
135 08N3-2.0R	96652	8.0	8.0	64	9.5	26	2.0
135 08N3-3.0R	96653	8.0	8.0	64	9.5	26	3.0
135 10N3	96660	10.0	10.0	76	12.0	34	-
135 10N3-1.0R	96662	10.0	10.0	76	12.0	34	1.0
135 10N3-1.5R	96663	10.0	10.0	76	12.0	34	1.5
135 10N3-2.0R	96664	10.0	10.0	76	12.0	34	2.0
135 10N3-3.0R	96665	10.0	10.0	76	12.0	34	3.0
135 12N3	96671	12.0	12.0	76	14.0	38	-

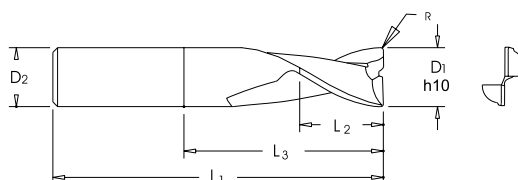
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

TuffCut® X-AL Series 135



Corner Radius
Eckenradius
Avec Rayons

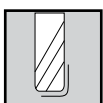
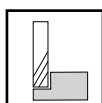
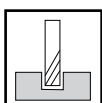
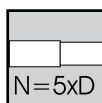
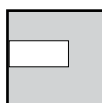
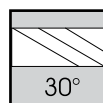
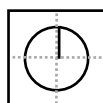
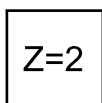


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 12N3-0.5R	96672	12.0	12.0	76	14.0	38	0.5
135 12N3-1.0R	96673	12.0	12.0	76	14.0	38	1.0
135 12N3-1.5R	96674	12.0	12.0	76	14.0	38	1.5
135 12N3-2.0R	96675	12.0	12.0	76	14.0	38	2.0
135 12N3-3.0R	96676	12.0	12.0	76	14.0	38	3.0
135 12N3-4.0R	96677	12.0	12.0	76	14.0	38	4.0
135 16N3	96684	16.0	16.0	117	18.0	53	-
135 16N3-0.5R	96685	16.0	16.0	117	18.0	53	0.5
135 16N3-1.0R	96686	16.0	16.0	117	18.0	53	1.0
135 16N3-1.5R	96687	16.0	16.0	117	18.0	53	1.5
135 16N3-2.0R	96688	16.0	16.0	117	18.0	53	2.0
135 16N3-3.0R	96689	16.0	16.0	117	18.0	53	3.0
135 16N3-4.0R	96690	16.0	16.0	117	18.0	53	4.0
135 20N3-0.5R	96697	20.0	20.0	127	22.0	65	0.5
135 20N3-1.0R	96698	20.0	20.0	127	22.0	65	1.0
135 20N3-1.5R	96699	20.0	20.0	127	22.0	65	1.5
135 20N3-2.0R	96700	20.0	20.0	127	22.0	65	2.0
135 20N3-3.0R	96701	20.0	20.0	127	22.0	65	3.0
135 20N3-4.0R	96702	20.0	20.0	127	22.0	65	4.0
135 25N3-0.5R	96709	25.0	25.0	127	25.0	80	0.5
135 25N3-1.0R	96710	25.0	25.0	127	25.0	80	1.0
135 25N3-1.5R	96711	25.0	25.0	127	25.0	80	1.5
135 25N3-2.0R	96712	25.0	25.0	127	25.0	80	2.0
135 25N3-3.0R	96713	25.0	25.0	127	25.0	80	3.0
135 25N3-4.0R	96714	25.0	25.0	127	25.0	80	4.0

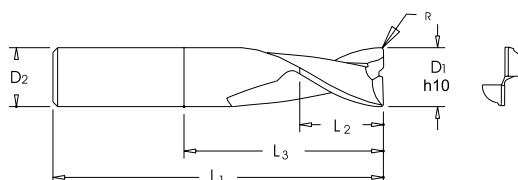
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For Cutting Data See pages 19-21.

TuffCut® X-AL Series 135



Corner Radius
Eckenradius
Avec Rayons

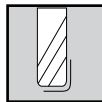
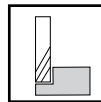
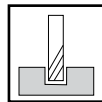
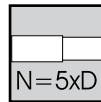
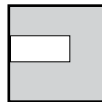
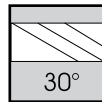
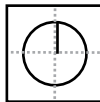
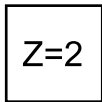


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 03N5	96623	3.0	3.0	38	3.5	16	-
135 03N5-0.5R	96624	3.0	3.0	38	3.5	16	0.5
135 03N5-1.0R	96625	3.0	3.0	38	3.5	16	1.0
135 04N5	96629	4.0	4.0	51	4.8	22	-
135 04N5-0.5R	96630	4.0	4.0	51	4.8	22	0.5
135 04N5-1.0R	96631	4.0	4.0	51	4.8	22	1.0
135 05N5	96635	5.0	6.0	64	6.0	27	-
135 05N5-0.5R	96636	5.0	6.0	64	6.0	27	0.5
135 05N5-1.0R	96637	5.0	6.0	64	6.0	27	1.0
135 06N5	96643	6.0	6.0	64	7.0	32	-
135 06N5-0.5R	96644	6.0	6.0	64	7.0	32	0.5
135 06N5-1.0R	96645	6.0	6.0	64	7.0	32	1.0
135 06N5-1.5R	96646	6.0	6.0	64	7.0	32	1.5
135 06N5-2.0R	96647	6.0	6.0	64	7.0	32	2.0
135 08N5	96654	8.0	8.0	75	9.5	42	-
135 08N5-0.5R	96655	8.0	8.0	75	9.5	42	0.5
135 08N5-1.0R	96656	8.0	8.0	75	9.5	42	1.0
135 08N5-1.5R	96657	8.0	8.0	75	9.5	42	1.5
135 08N5-2.0R	96658	8.0	8.0	75	9.5	42	2.0
135 08N5-3.0R	96659	8.0	8.0	75	9.5	42	3.0
135 10N5-0.5R	96666	10.0	10.0	89	12.0	52	0.5
135 10N5-1.0R	96667	10.0	10.0	89	12.0	52	1.0
135 10N5-1.5R	96668	10.0	10.0	89	12.0	52	1.5
135 10N5-2.0R	96669	10.0	10.0	89	12.0	52	2.0
135 10N5-3.0R	96670	10.0	10.0	89	12.0	52	3.0
135 12N5-0.5R	96678	12.0	12.0	110	14.0	62	0.5

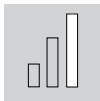
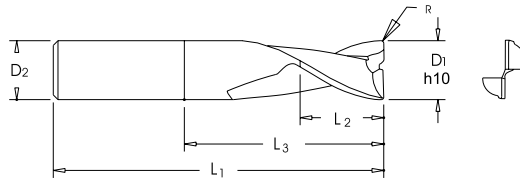
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For Cutting Data See pages 19-21.

TuffCut® X-AL Series 135



Corner Radius
Eckenradius
Avec Rayons

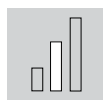
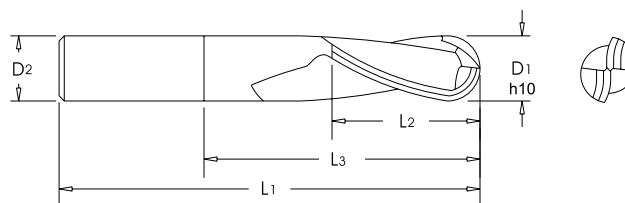
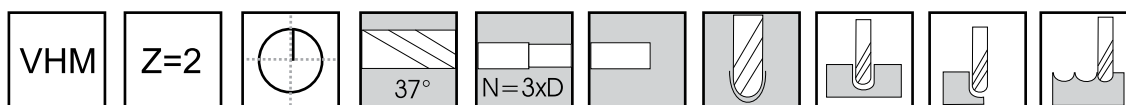


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 12N5-1.0R	96679	12.0	12.0	110	14.0	62	1.0
135 12N5-1.5R	96680	12.0	12.0	110	14.0	62	1.5
135 12N5-2.0R	96681	12.0	12.0	110	14.0	62	2.0
135 12N5-3.0R	96682	12.0	12.0	110	14.0	62	3.0
135 12N5-4.0R	96683	12.0	12.0	110	14.0	62	4.0
135 12N5-5.0R	96723	12.0	12.0	110	14.0	62	5.0
135 16N5-0.5R	96691	16.0	16.0	127	18.0	85	0.5
135 16N5-1.0R	96692	16.0	16.0	127	18.0	85	1.0
135 16N5-1.5R	96693	16.0	16.0	127	18.0	85	1.5
135 16N5-2.0R	96694	16.0	16.0	127	18.0	85	2.0
135 16N5-3.0R	96695	16.0	16.0	127	18.0	85	3.0
135 16N5-4.0R	96696	16.0	16.0	127	18.0	85	4.0
135 20N5-0.5R	96703	20.0	20.0	152	22.0	105	0.5
135 20N5-1.0R	96704	20.0	20.0	152	22.0	105	1.0
135 20N5-1.5R	96705	20.0	20.0	152	22.0	105	1.5
135 20N5-2.0R	96706	20.0	20.0	152	22.0	105	2.0
135 20N5-3.0R	96707	20.0	20.0	152	22.0	105	3.0
135 20N5-4.0R	96708	20.0	20.0	152	22.0	105	4.0
135 20N5-5.0R	96724	20.0	20.0	152	22.0	105	5.0
135 25N5-0.5R	96715	25.0	25.0	180	25.0	130	0.5
135 25N5-1.0R	96716	25.0	25.0	180	25.0	130	1.0
135 25N5-1.5R	96717	25.0	25.0	180	25.0	130	1.5
135 25N5-2.0R	96718	25.0	25.0	180	25.0	130	2.0
135 25N5-3.0R	96719	25.0	25.0	180	25.0	130	3.0
135 25N5-4.0R	96720	25.0	25.0	180	25.0	130	4.0

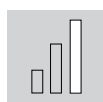
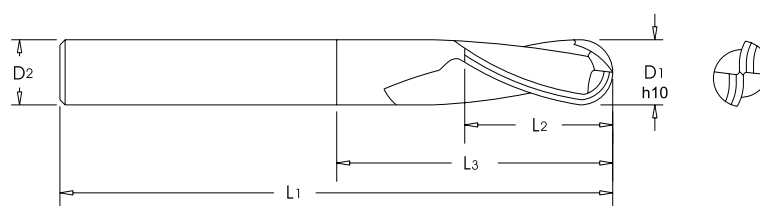
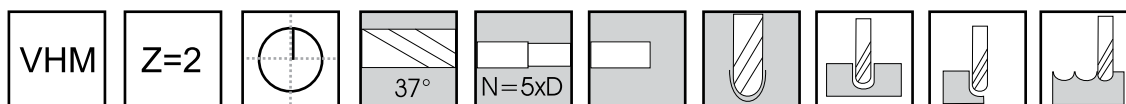
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For Cutting Data See pages 19-21.

TuffCut® X-AL Series 135B



Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3
135B 0300N3	13236	3.0	3.0	38.0	5	11
135B 0400N3	13238	4.0	4.0	51.0	6	14
135B 0500N3	13240	5.0	5.0	64.0	7	17
135B 0600N3	13242	6.0	6.0	64.0	8	20
135B 0800N3	13244	8.0	8.0	64.0	10	26
135B 1000N3	13246	10.0	10.0	70.0	12	32
135B 1200N3	13248	12.0	12.0	76.0	16	38
135B 1600N3	13250	16.0	16.0	89.0	20	50

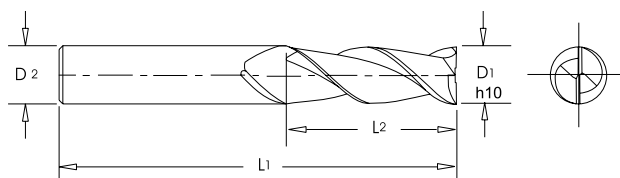
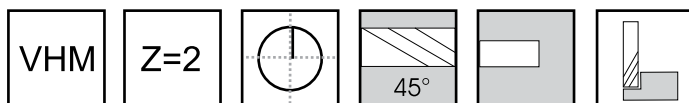


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3
135B 0200N5	13252	2.0	6.0	75.0	4.0	12.0
135B 0300N5	13254	3.0	6.0	75.0	5.0	17.0
135B 0400N5	13256	4.0	6.0	75.0	6.0	22.0
135B 0500N5	13258	5.0	6.0	75.0	7.0	27.0
135B 0600N5	13260	6.0	6.0	110.0	8.0	32.0
135B 0800N5	13262	8.0	8.0	110.0	10.0	42.0
135B 1000N5	13264	10.0	10.0	110.0	12.0	52.0
135B 1200N5	13266	12.0	12.0	120.0	16.0	62.0
135B 1600N5	13268	16.0	16.0	130.0	20.0	82.0

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For Cutting Data See pages 19-21.

TuffCut® X-AL Series 136

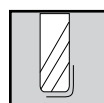
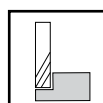
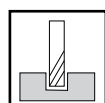
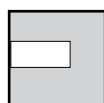
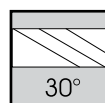
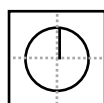
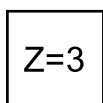


Tool No.	EDP	D1 Tol h10	D2	L1	L2
136 0300	13600	3.0	6.0	52	8.0
136 0400	13602	4.0	6.0	55	11.0
136 0500	13605	5.0	6.0	58	13.0
136 0600	13610	6.0	6.0	58	13.0
136 0800	13615	8.0	8.0	64	19.0
136 1000	13620	10.0	10.0	70	22.0
136 1200	13625	12.0	12.0	84	26.0
136 1400	13626	14.0	14.0	83	26.0
136 1600	13630	16.0	16.0	89	32.0
136 1800	13631	18.0	18.0	92	32.0
136 2000	13635	20.0	20.0	102	38.0

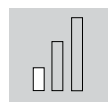
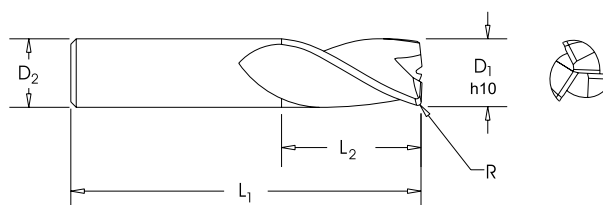
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

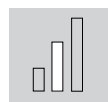
TuffCut® X-AL Series 137



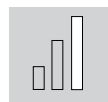
Corner Radius
Eckenradius
Avec Rayons



Uncoated		Fordlube*		D1 Tol. h10	D2	L1	L2	R
Tool No.	EDP	Tool No.	EDP					
137 0500	13701	137 0500F	14348	5.0	5.0	51	6.0	0.25
137 0600	13702	137 0600F	14349	6.0	6.0	64	7.0	0.30
137 0800	13704	137 0800F	14352	8.0	8.0	64	9.5	0.35
137 1000	13708	137 1000F	14356	10.0	10.0	70	12.0	0.50
137 1200	13711	137 1200F	14414	12.0	12.0	76	14.0	0.50
137 1600	13717	137 1600F	14365	16.0	16.0	89	18.0	0.75
137 2000	13723	137 2000F	14371	20.0	20.0	102	22.0	0.75
137 2500	13726	137 2500F	14374	25.0	25.0	102	25.0	0.75



Uncoated		Fordlube		D1 Tol. h10	D2	L1	L2	R
Tool No.	EDP	Tool No.	EDP					
137 1001	13709	137 1001F	14357	10.0	10.0	76	12.0	0.50
137 1201	13712	137 1201F	14360	12.0	12.0	102	14.0	0.50
137 1601	13718	137 1601F	14366	16.0	16.0	117	18.0	0.75
137 2001	13724	137 2001F	14372	20.0	20.0	127	22.0	0.75
137 2501	13727	137 2501F	14375	25.0	25.0	127	25.0	0.75

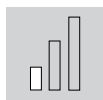
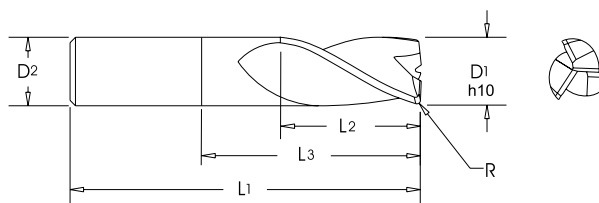
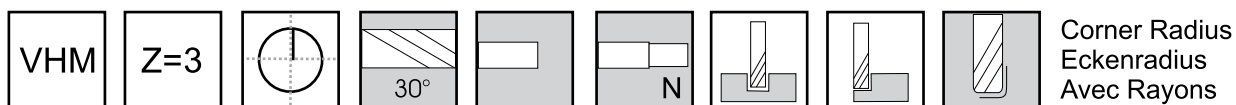


Uncoated		Fordlube		D1 Tol. h10	D2	L1	L2	R
Tool No.	EDP	Tool No.	EDP					
137 1002	13710	137 1002F	14358	10.0	10.0	89	12.0	0.50
137 1202	13713	137 1202F	14361	12.0	12.0	127	14.0	0.50
137 1602	13719	137 1602F	14367	16.0	16.0	133	18.0	0.75
137 2002	13725	137 2002F	14373	20.0	20.0	152	22.0	0.75
137 2502	13728	137 2502F	14376	25.0	25.0	152	25.0	0.75

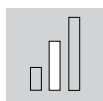
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

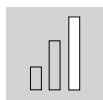
TuffCut® X-AL Series 137N



Uncoated		Fordlube		D1 Tol. h10	D2	L1	L2	L3	R
Tool No.	EDP	Tool No.	EDP						
137 0500N	13734	137 0500NF	14382	5.0	5.0	51	6.0	22	0.25
137 0600N	13735	137 0600NF	14383	6.0	6.0	64	7.0	26	0.30
137 0800N	13738	137 0800NF	14386	8.0	8.0	64	9.5	26	0.35
137 1000N	13742	137 1000NF	14390	10.0	10.0	70	12.0	28	0.50
137 1200N	13745	137 1200NF	14393	12.0	12.0	76	14.0	28	0.50
137 1600N	13751	137 1600NF	14399	16.0	16.0	89	18.0	39	0.75
137 2000N	13757	137 2000NF	14405	20.0	20.0	102	22.0	50	0.75
137 2500N	13760	137 2500NF	14408	25.0	25.0	102	25.0	36	0.75



Uncoated		Fordlube		D1 Tol. h10	D2	L1	L2	L3	R
Tool No.	EDP	Tool No.	EDP						
137 1001N	13743	137 1001NF	14391	10.0	10.0	76	12.0	34	0.50
137 1201N	13746	137 1201NF	14394	12.0	12.0	102	14.0	54	0.50
137 1601N	13752	137 1601NF	14400	16.0	16.0	117	18.0	83	0.75
137 2001N	13758	137 2001NF	14406	20.0	20.0	127	22.0	75	0.75
137 2501N	13761	137 2501NF	14409	25.0	25.0	127	25.0	61	0.75

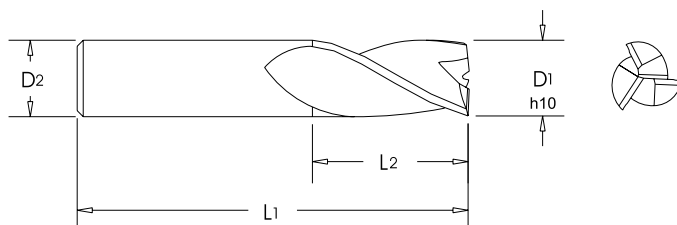
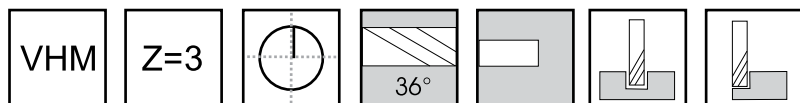


Uncoated		Fordlube		D1 Tol. h10	D2	L1	L2	L3	R
Tool No.	EDP	Tool No.	EDP						
137 1002N	13744	137 1002NF	14392	10.0	10.0	89	12.0	47	0.50
137 1202N	13747	137 1202NF	14395	12.0	12.0	127	14.0	79	0.50
137 1602N	13753	137 1602NF	14401	16.0	16.0	133	18.0	99	0.75
137 2002N	13759	137 2002NF	14407	20.0	20.0	152	22.0	100	0.75
137 2502N	13762	137 2502NF	14410	25.0	25.0	152	25.0	86	0.75

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For Cutting Data See pages 19-21.

TuffCut® X-AL Series 138



Uncoated		Fordlube		D1 Tol. h10	D2	L1	L2
Tool No.	EDP	Tool No.	EDP				
138 0300	13892	138 0300F	14295	3.0	6.0	52	8.0
138 0400	13893	138 0400F	14296	4.0	6.0	55	11.0
138 0500	13894	138 0500F	14297	5.0	6.0	58	13.0
138 0600	13895	138 0600F	14298	6.0	6.0	58	13.0
138 0800	13896	138 0800F	14299	8.0	8.0	64	19.0
138 1000	13897	138 1000F	14300	10.0	10.0	70	22.0
138 1200	13898	138 1200F	14301	12.0	12.0	84	26.0
138 1400	13899	138 1400F	14302	14.0	14.0	84	26.0
138 1600	13900	138 1600F	14303	16.0	16.0	89	32.0
138 1800	13901	138 1800F	14304	18.0	18.0	92	32.0
138 2000	13902	138 2000F	14305	20.0	20.0	102	38.0

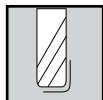
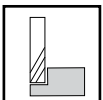
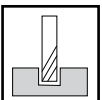
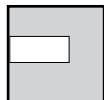
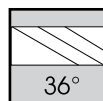
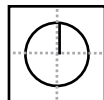
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

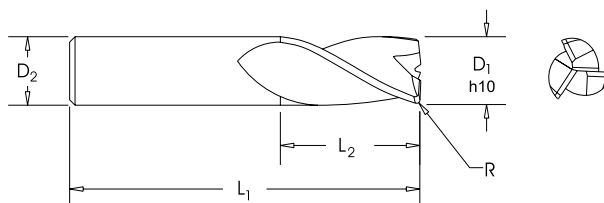
TuffCut® X-AL Series 138R

VHM

Z=3



Corner Radius
Eckenradius
Avec Rayons

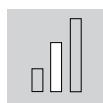
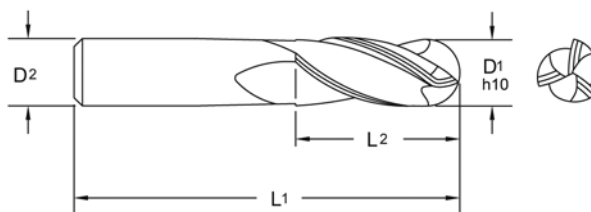
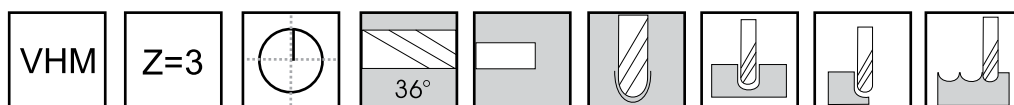


Tool No.	EDP	D1 Tol h10	D2	L1	L2	R
138 0300-0.5R	13100	3.0	6.0	52.0	8.0	0.50
138 0300-1.0R	13101	3.0	6.0	52.0	8.0	1.00
138 0400-0.5R	13102	4.0	6.0	55.0	11.0	0.50
138 0400-1.0R	13103	4.0	6.0	55.0	11.0	1.00
138 0500-0.5R	13104	5.0	6.0	58.0	13.0	0.50
138 0500-1.0R	13105	5.0	6.0	58.0	13.0	1.00
138 0600-0.5R	13106	6.0	6.0	58.0	13.0	0.50
138 0600-1.0R	13107	6.0	6.0	58.0	13.0	1.00
138 0600-1.5R	13108	6.0	6.0	58.0	13.0	1.50
138 0600-2.0R	13109	6.0	6.0	58.0	13.0	2.00
138 0800-0.5R	13110	8.0	8.0	64.0	19.0	0.50
138 0800-1.0R	13111	8.0	8.0	64.0	19.0	1.00
138 0800-1.5R	13112	8.0	8.0	64.0	19.0	1.50
138 0800-2.0R	13113	8.0	8.0	64.0	19.0	2.00
138 0800-3.0R	13114	8.0	8.0	64.0	19.0	3.00
138 1000-0.5R	13115	10.0	10.0	70.0	22.0	0.50
138 1000-1.0R	13116	10.0	10.0	70.0	22.0	1.00
138 1000-1.5R	13117	10.0	10.0	70.0	22.0	1.50
138 1000-2.0R	13118	10.0	10.0	70.0	22.0	2.00
138 1000-3.0R	13119	10.0	10.0	70.0	22.0	3.00
138 1200-0.5R	13120	12.0	12.0	84.0	26.0	0.50
138 1200-1.0R	13121	12.0	12.0	84.0	26.0	1.00
138 1200-1.5R	13122	12.0	12.0	84.0	26.0	1.50
138 1200-2.0R	13123	12.0	12.0	84.0	26.0	2.00
138 1200-3.0R	13124	12.0	12.0	84.0	26.0	3.00
138 1200-4.0R	13125	12.0	12.0	84.0	26.0	4.00
138 1200-5.0R	13126	12.0	12.0	84.0	26.0	5.00
138 1600-0.5R	13127	16.0	16.0	89.0	32.0	0.50
138 1600-1.0R	13128	16.0	16.0	89.0	32.0	1.00
138 1600-1.5R	13129	16.0	16.0	89.0	32.0	1.50
138 1600-2.0R	13130	16.0	16.0	89.0	32.0	2.00
138 1600-3.0R	13131	16.0	16.0	89.0	32.0	3.00
138 1600-4.0R	13132	16.0	16.0	89.0	32.0	4.00
138 1600-5.0R	13133	16.0	16.0	89.0	32.0	5.00
138 2000-0.5R	13134	20.0	20.0	102.0	38.0	0.50
138 2000-1.0R	13135	20.0	20.0	102.0	38.0	1.00
138 2000-1.5R	13136	20.0	20.0	102.0	38.0	1.50
138 2000-2.0R	13137	20.0	20.0	102.0	38.0	2.00
138 2000-3.0R	13138	20.0	20.0	102.0	38.0	3.00
138 2000-4.0R	13139	20.0	20.0	102.0	38.0	4.00
138 2000-5.0R	13140	20.0	20.0	102.0	38.0	5.00

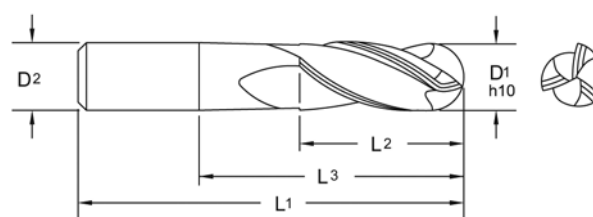
Available with Fordlube upon request.

For Cutting Data See pages 19-21.

TuffCut® X-AL Series 138B



Tool No.	EDP	D1 Tol h10	D2	L1	L2
138B 0300	13356	3.0	3.0	38.0	12.0
138B 0400	13358	4.0	4.0	51.0	15.0
138B 0500	13360	5.0	5.0	64.0	20.0
138B 0600	13362	6.0	6.0	64.0	20.0
138B 0800	13364	8.0	8.0	64.0	20.0
138B 1000	13366	10.0	10.0	70.0	25.0
138B 1200	13368	12.0	12.0	76.0	25.0
138B 1600	13370	16.0	16.0	89.0	35.0

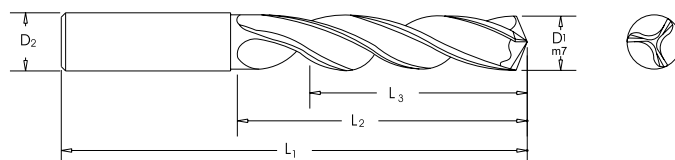
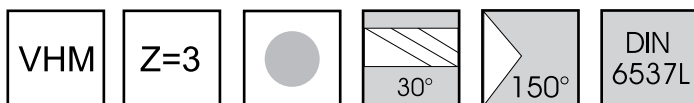


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3
138B 0200N5	13372	2.0	6.0	75.0	4.0	12.0
138B 0300N5	13374	3.0	6.0	75.0	5.0	17.0
138B 0400N5	13376	4.0	6.0	75.0	6.0	22.0
138B 0500N5	13378	5.0	6.0	75.0	7.0	27.0
138B 0600N5	13380	6.0	6.0	110.0	8.0	32.0
138B 0800N5	13382	8.0	8.0	110.0	10.0	42.0
138B 1000N5	13384	10.0	10.0	110.0	12.0	52.0
138B 1200N5	13386	12.0	12.0	120.0	16.0	62.0
138B 1600N5	13388	16.0	16.0	130.0	20.0	82.0

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For Cutting Data See pages 19-21.

Twister® X-AL Series 229

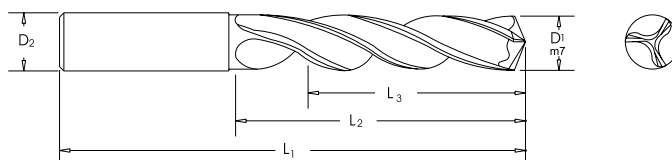
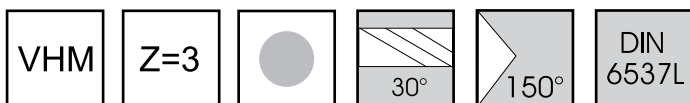


Tool No.	EDP	D1 Tol m7	D2	L1	L2	L3
229 0200	22950	2.0	2	38	16	12
229 0230	23058	2.3	2.3	43	20.5	15
229 0250	22951	2.5	2.5	43	20.5	15
229 0290	22952	2.9	2.9	46	25	19
229 0300	22953	3.0	6	66	28	23
229 0310	23063	3.1	6	66	28	23
229 0320	22945	3.2	6	66	28	23
229 0330	22954	3.3	6	66	28	23
229 0340	22949	3.4	6	66	28	23
229 0350	22955	3.5	6	66	28	23
229 0360	22992	3.6	6	66	28	23
229 0370	22994	3.7	6	66	28	23
229 0380	22996	3.8	6	74	36	29
229 0390	22997	3.9	6	74	36	29
229 0400	22956	4.0	6	74	36	29
229 0410	22998	4.1	6	74	36	29
229 0420	22957	4.2	6	74	36	29
229 0440	22999	4.4	6	74	36	29
229 0450	22958	4.5	6	74	36	29
229 0460	23000	4.6	6	74	36	29
229 0480	23001	4.8	6	82	44	35
229 0490	23002	4.9	6	82	44	35
229 0500	22959	5.0	6	82	44	35
229 0520	23003	5.2	6	82	44	35
229 0550	22960	5.5	6	82	44	35
229 0560	23004	5.6	6	82	44	35
229 0600	22961	6.0	6	82	44	35
229 0620	22980	6.2	8	91	53	43
229 0650	22962	6.5	8	91	53	43
229 0670	22979	6.7	8	91	53	43
229 0680	22963	6.8	8	91	53	43
229 0700	22964	7.0	8	91	53	43
229 0720	23005	7.2	8	91	53	43
229 0730	22940	7.3	8	91	53	43

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Twister® X-AL Series 229



Tool No.	EDP	D1 Tol m7	D2	L1	L2	L3
229 0740	22965	7.4	8.0	91.0	53.0	43.0
229 0750	22966	7.5	8.0	91.0	53.0	43.0
229 0780	23006	7.8	8.0	91.0	53.0	43.0
229 0800	22967	8.0	8.0	91.0	53.0	43.0
229 0810	23008	8.1	10.0	103.0	61.0	49.0
229 0840	22985	8.4	10.0	103.0	61.0	49.0
229 0850	22968	8.5	10.0	103.0	61.0	49.0
229 0900	22989	9.0	10.0	103.0	61.0	49.0
229 0950	23009	9.5	10.0	103.0	61.0	49.0
229 0970	23011	9.7	10.0	103.0	61.0	49.0
229 1000	22969	10.0	10.0	103.0	61.0	49.0
229 1020	22970	10.2	12.0	118.0	71.0	56.0
229 1040	23012	10.4	12.0	118.0	71.0	56.0
229 1050	22986	10.5	12.0	118.0	71.0	56.0
229 1060	23013	10.6	12.0	118.0	71.0	56.0
229 1100	22993	11.0	12.0	118.0	71.0	56.0
229 1150	23014	11.5	12.0	118.0	71.0	56.0
229 1200	22971	12.0	12.0	118.0	71.0	56.0
229 1250	22988	12.5	14.0	124.0	77.0	60.0
229 1300	23015	13.0	14.0	124.0	77.0	60.0
229 1350	23017	13.5	14.0	124.0	77.0	60.0
229 1400	23018	14.0	14.0	124.0	77.0	60.0
229 1450	23020	14.5	16.0	133.0	83.0	63.0
229 1500	23021	15.0	16.0	133.0	83.0	63.0
229 1550	23022	15.5	16.0	133.0	83.0	63.0
229 1580	23023	15.8	16.0	133.0	83.0	63.0
229 1600	23024	16.0	16.0	133.0	83.0	63.0

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For Cutting Data See pages 19-21.

135 series Feed capability. Necked Tools

Série 135 Paramètres de Coupe. Outils Corps Passant

RPM	Diameter - mm					Diamètre - 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
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 indiquée en mm/min

Feed rate allowance for length

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

Feed rate for un-necked tools

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

Diameter	Factor
3 - 8mm	Feed mm/min x 2.0
10 - 25mm	Feed mm/min x 1.35

Surcote sur avance pour la longueur

Article no. exemple	longueur	Fz	Ar	Aa
135 12N3	Court	1	1 x D	1 X D
135 12N5	Moyen	x 0.7	1 x D	1 X D
135 1202N	Long	x 0.6	1 x D	0.25 X D

Avance pour outils décolletés

Veuillez calculer l'avance en fonction de la longueur indiquée dans le tableau ci-dessus - puis appliquer la formule suivante:

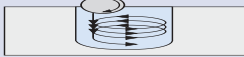
Coefficient diamètre
3 - 8mm Avance mm/min x 2.0
10 - 25 mm Avance mm/min x 1.35

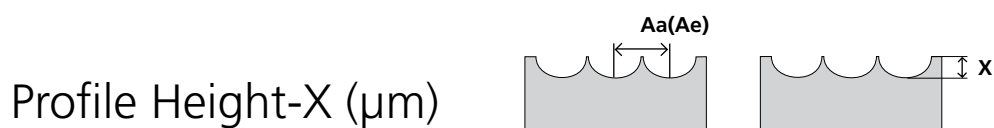
TuffCut® X-AL

Recommended cutting data - Al/Al-Si Alloys

Series		Type of cut		Vc	Diameter - mm		Diamètre - mm		
					2 - 3	4	5	6	8
		Ar	Aa(Ae)	M/Min	fz	fz	fz	fz	fz
134		1 x D	0.5 x D	250-300	-	-	0.063	0.063	0.094
		1 x D	1 x D	250-300	-	-	0.052	0.052	0.084
		0.2 x D	1 x D	250-300	-	-	0.075	0.075	0.125
		0.5 x D	1 x D	250-300	-	-	0.063	0.063	0.094
135		1 x D	0.5 x D	300-425	0.035	0.035	0.075-0.1	0.1-0.23	0.175-0.3
		1 x D	1 x D	250-365	0.030	0.030	0.025-0.05	0.1-0.15	0.1-0.15
		0.2 x D	1 x D	300-425	0.030	0.030	0.05-0.1	0.1-0.23	0.1-0.23
		0.5 x D	1 x D	300-425	0.030	0.030	0.05-0.1	0.1-0.23	0.1-0.23
		1 x D	1 x D	250-365	0.025	0.025	0.025-0.05	0.1-0.15	0.1-0.15
136		0.05 x D	1 x D	215-300	0.030	0.030	0.025-0.08	0.05-0.10	0.08-0.13
		0.1 x D	1 x D	215-300	0.030	0.030	0.025-0.05	0.05-0.10	0.08-0.13
		0.2 x D	1 x D	215-300	0.025	0.025	0.025-0.04	0.05-0.08	0.05-0.10
137		1 x D	0.5 x D	300-425	-	-	0.05-0.06	0.06-0.14	0.011-0.19
		1 x D	1 x D	250-365	-	-	0.015-0.3	0.06-0.09	0.11-0.14
		0.2 x D	1 x D	300-425	-	-	0.05-0.10	0.10-0.23	0.10-0.23
		0.5 x D	1 x D	300-425	-	-	0.05-0.10	0.10-0.23	0.10-0.23
		1 x D	1 x D	250-365	-	-	0.03-0.05	0.10-0.15	0.10-0.15
138		0.05 x D	1 x D	425-610	0.030	0.030	0.03-0.08	0.05-0.10	0.08-0.13
		0.1 x D	1 x D	425-610	0.030	0.030	0.03-0.05	0.05-0.10	0.08-0.13
		0.2 x D	1 x D	425-610	0.030	0.030	0.03-0.04	0.05-0.08	0.05-0.10
135B		1 x D	0.5 x D	150	0.050	0.080	0.12	0.16	0.20
138B		0.1 x D	1 x D	300	0.050	0.080	0.12	0.16	0.20

Trochoidal machining with 135B / 138B tools

	1.5 x D	0.05 x D	300	0.05	0.08	0.12	0.16	0.20
	1.5 x D	0.08 x D	300	0.05	0.08	0.12	0.16	0.20



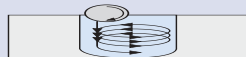
Aa(Ae) mm	Diameter - mm				Diamètre - mm			
	1	2	4	6	8	10	12	16
0.06	0.9	0.45	0.23	0.15	0.11	0.09	0.08	0.06
0.08	1.6	0.8	0.4	0.27	0.2	0.16	0.13	0.1
0.11	3	1.5	0.76	0.5	0.38	0.3	0.25	0.19
0.15	5.7	2.8	1.4	0.94	0.7	0.56	0.47	0.35
0.2	10	5	2.5	1.7	1.3	1	0.83	0.63
0.3	23	11	5.6	3.8	2.8	2.3	1.9	1.41
0.45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

TuffCut® X-AL

Recommended cutting data - Al/Al-Si Alloys

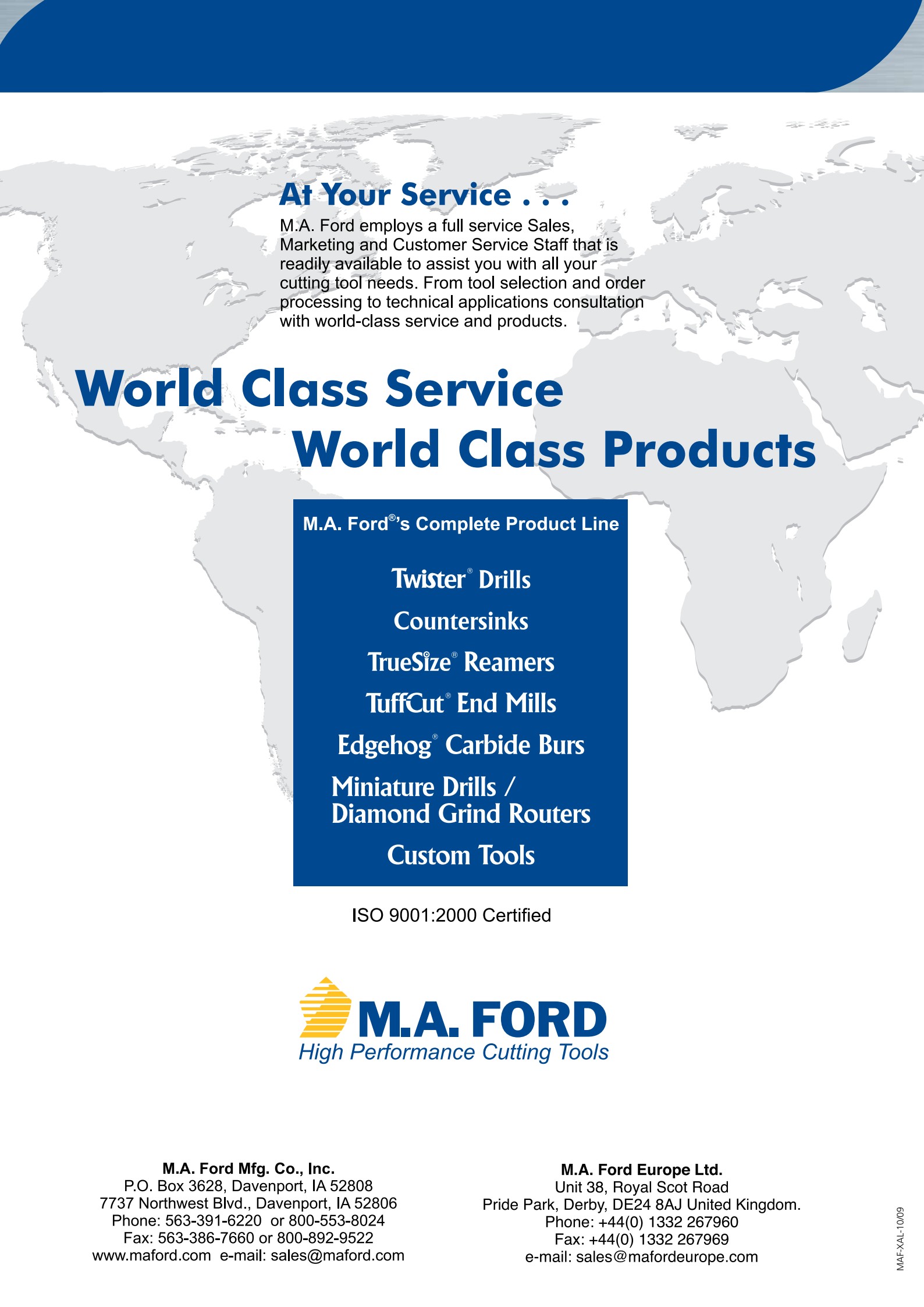
Series		Type of cut		Vc	Diameter - mm		Diamètre - mm		
					10	12	16	20	25
		Ar	Aa(Ae)		M/Min	fz	fz	fz	fz
134		1 x D	0.5 x D	250-300	0.094	0.127	0.19	0.19	0.25
		1 x D	1 x D	250-300	0.084	0.1	0.14	0.14	0.21
		0.2 x D	1 x D	250-300	0.125	0.135	0.225	0.225	0.275
		0.5 x D	1 x D	250-300	0.094	0.127	0.19	0.19	0.25
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
136		0.05 x D	1 x D	215-300	0.08-0.13	0.1-0.15	0.15-0.2	0.15-0.2	0.2-0.25
		0.1 x D	1 x D	215-300	0.08-0.13	0.1-0.15	0.15-0.2	0.15-0.2	0.2-0.25
		0.2 x D	1 x D	215-300	0.05-0.10	0.08-0.13	0.10-0.15	0.10-0.15	0.15-0.20
137		1 x D	0.5 x D	300-425	0.11-0.19	0.15-0.685	0.23-0.61	0.23-0.61	0.23-0.61
		1 x D	1 x D	250-365	0.11-0.14	0.15-0.685	0.23-0.46	0.23-0.46	0.23-0.46
		0.2 x D	1 x D	300-425	0.10-0.23	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	0.10-0.23	0.25-0.89	0.38-0.89	0.38-0.89	0.38-0.89
		1 x D	1 x D	250-365	0.10-0.15	0.25-0.75	0.38-0.75	0.38-0.75	0.38-0.75
138		0.05 x D	1 x D	425-610	0.08-0.13	0.10-0.15	0.15-0.20	0.15-0.20	0.20-0.25
		0.1 x D	1 x D	425-610	0.08-0.13	0.10-0.15	0.15-0.20	0.15-0.20	0.20-0.25
		0.2 x D	1 x D	425-610	0.05-0.1	0.08-0.13	0.10-0.15	0.10-0.15	0.15-0.20
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	-	-

Trochoidal machining

	1.5 x D	0.05 x D	300	0.25	0.50	0.50	-	-
	1.5 x D	0.08 x D	300	0.25	0.50	0.50	-	-

Twister® Drills 229 Drill

Material group	Example	Vc m/min	Diameter - mm			Diamètre - mm		
			1.5	3	6	12	20	25
			f/rev	f/rev	f/rev	f/rev	f/rev	f/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	0.2	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



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