

Metric

Aluminium

Al

(<12.2% Si)

(>12.2% Si)

TuffCut[®] End Mills

Twister[®] Drills



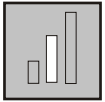




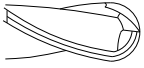
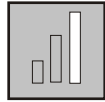


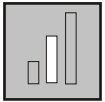





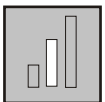





M.A. FORD
High Performance Cutting Tools

ISO 9001:2000 Certified

TuffCut® X-AL Designed for Extreme Productivity

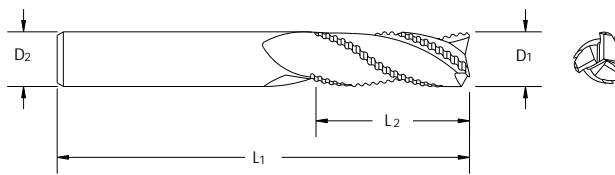
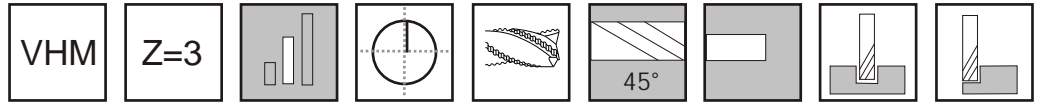
Overview

	Series	Form	No. of Teeth	Lengths	Corner Prep	Application Area
	134		Z=3		Chamfer 45 deg	Older-Lower KW machine, long DOC (Ae)
	135		Z=2		0-5.0 mm radius	High feed machining - 1> mm tooth loading possible
	135B		Z=2		N/A	Rough & finish profile milling
	136		Z=2		Sharp corner radius to order	Finishing Al alloys Wiper flats for surface finishing
	137		Z=3		0.25-0.75 mm radius	3 fluted for smoother roughing cutting action. High tooth loads possible
	138		Z=3		0-5.0 mm radius	High performance finish machining. Wiper flats for surface finishing.
	229		Z=3		N/A	3 fluted high performance drill for use in Ti/a alloys, plastics, brass and copper alloys.

Available Coatings - Delivery 3-4 Weeks

	Micro Hardness (HV)	Max Work Temp. °C	Colour	Coef. Of Friction	Application Area
F - Fordlube	4000	850	Light Grey	<0.45	Al-Si Alloys/Ti Alloys/Mg Alloys/Copper Alloys
G - Gemcoat	8000	700	Black	<0.1	Al-Si Alloys/Al-Mg MMC/Ti6Al4/Graphite/Brass-Bronze/Ceramic/Plastics/Fiberglass/Composites

TuffCut® AL
Series 134



Tool No.	EDP	D ₁	D ₂	L ₁	L ₂
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

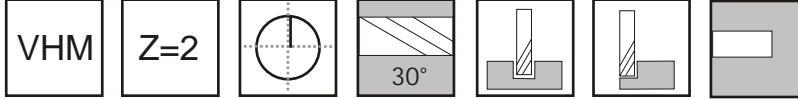
METRIC (mm)	
D1	Tolerance
6.00-25.00	+0.000/-0.127

For Cutting Data see page 12

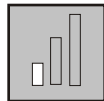
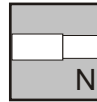
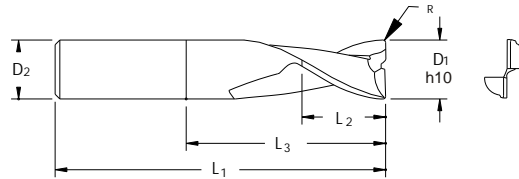
Available with F-coating=Fordlube and G-coating=Gem coating upon request.

Aluminium

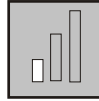
TuffCut® AL
Series 135



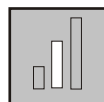
Corner Radius
Eckenradius
Avec Rayons



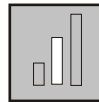
Tool No.	EDP	D1 Tol h10	D2	L1	L2	R
135 0300	13523	3.0	3.0	38	3.5	.20
135 0400	13533	4.0	4.0	51	4.8	.20
135 0500	13502	5.0	5.0	51	6.0	.25
135 0600	13504	6.0	6.0	64	7.0	.30
135 0800	13508	8.0	8.0	64	9.5	.35
135 1000	13515	10.0	10.0	70	12.0	.50
135 1200	13525	12.0	12.0	76	14.0	.50
135 1400	13552	14.0	14.0	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	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



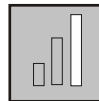
Tool No.	EDP	D1 Tol h10	D2	L1	L2	R
135 1001	13516	10.0	10.0	76	12.0	.50
135 1201	13526	12.0	12.0	102	14.0	.50
135 1401	13554	14.0	14.0	102	16.0	.50
135 1601	13536	16.0	16.0	117	18.0	.75
135 1801	13568	18.0	18.0	127	20.0	.75
135 2001	13546	20.0	20.0	127	22.0	.75
135 2501	13556	25.0	25.0	127	25.0	.75



Tool No.	EDP	D1 Tol h10	D2	L1	L2	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	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

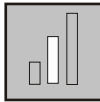
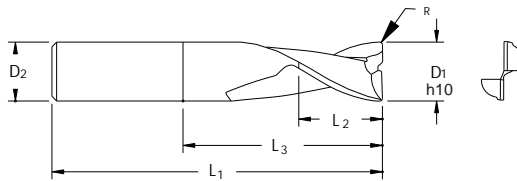
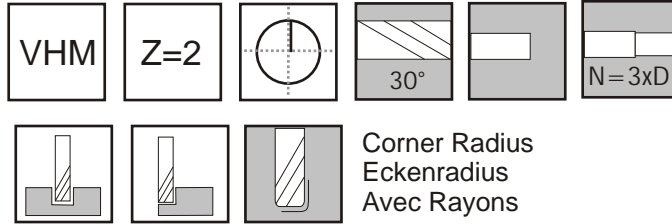


Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 1002N	13567	10.0	10.0	89	12.0	47	.50
135 1202N	13577	12.0	12.0	127	14.0	79	.50
135 1402N	13559	14.0	14.0	127	16.0	80	.50
135 1602N	13587	16.0	16.0	133	18.0	99	.75
135 1802N	13578	18.0	18.0	152	20.0	102	.75
135 2002N	13596	20.0	20.0	152	22.0	100	.75
135 2502N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

For Cutting Data see page 12

Available with F-coating=Fordlube and G-coating=Gem coating upon request.

TuffCut® AL
Series 135



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 10N3-0.5R	96661	10.0	10.0	76	12.0	34	0.5
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	

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

For Cutting Data see page 12

Available with F-coating=Fordlube and G-coating=Gem coating upon request.

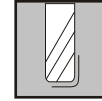
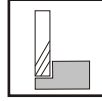
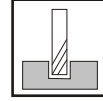
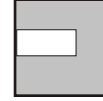
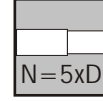
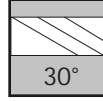
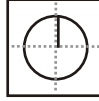
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Aluminium

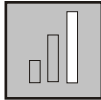
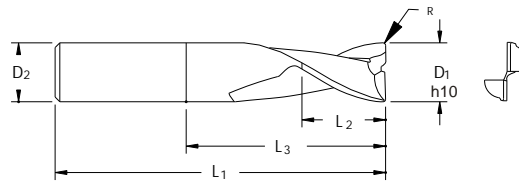
TuffCut® AL
Series 135

VHM

Z=2



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

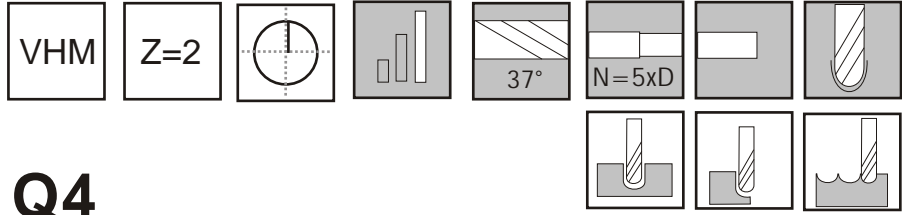
Tool No.	EDP	D1 Tol h10	D2	L1	L2	L3	R
135 12N5-1.0R	96679	12.0	12.0	110	14.0	62	1.0
135 12N5-1.5R	96680	12.0	12.0	110	14.0	62	1.5
135 12N5-2.0R	96681	12.0	12.0	110	14.0	62	2.0
135 12N5-3.0R	96682	12.0	12.0	110	14.0	62	3.0
135 12N5-4.0R	96683	12.0	12.0	110	15.0	62	4.0
* 135 12N5-5.0R		12.0	12.0	110	15.0	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		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

*Available Q4 2007

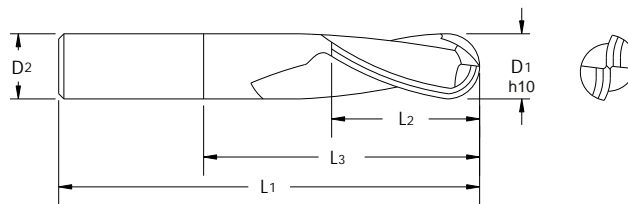
For Cutting Data see page 12

Available with F-coating=Fordlube and G-coating=Gem coating upon request.

TuffCut® AL
Series 135B



Available Q4 2007

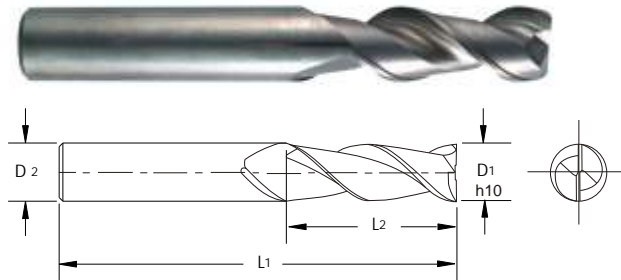
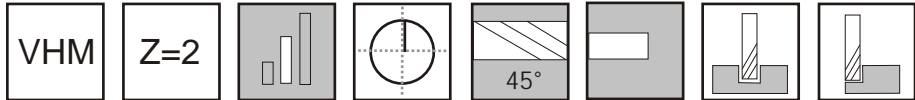


Tool No.	D ₁ Tol. h10	D ₂	L ₁	L ₂	L ₃
135B 0200N-1	2.0	6.0	75	4	12
135B 0300N-1	3.0	6.0	75	5	17
135B 0400N-1	4.0	6.0	75	6	22
135B 0500N-1	5.0	6.0	75	7	27
135B 0600N-1	6.0	6.0	110	8	32
135B 0800N-1	8.0	8.0	110	10	42
135B 1000N-1	10.0	10.0	110	12	52
135B 1200N-1	12.0	12.0	120	16	62
135B 1600N-1	16.0	16.0	130	20	82

Available with F-coating=Fordlube and G-coating=Gem coating upon request.

Aluminium

TuffCut® AL
Series 136



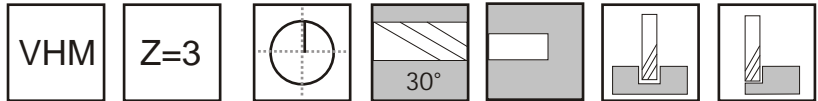
Tool No.	EDP	D1 Tol h10	D2	L1	L2
136 0300	13600	3.0	6.0	52	8.0
136 0400	13602	4.0	6.0	55	11.0
136 0500	13605	5.0	6.0	58	13.0
136 0600	13610	6.0	6.0	58	13.0
136 0800	13615	8.0	8.0	64	19.0
136 1000	13620	10.0	10.0	70	22.0
136 1200	13625	12.0	12.0	84	26.0
136 1400	13626	14.0	14.0	83	26.0
136 1600	13630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

For Cutting Data see page 12

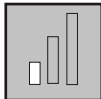
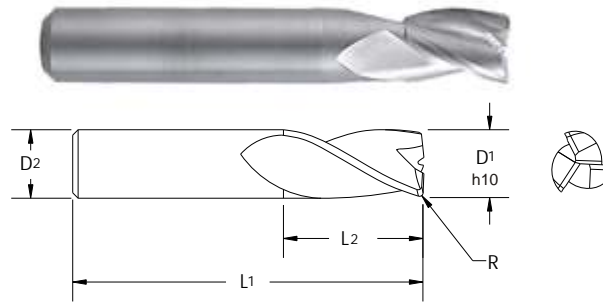
Corner Radius available upon request.

Available with F-coating=Fordlube and G-coating=Gem coating upon request.

TuffCut® X-AL
Series 137



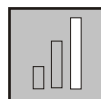
Corner Radius
Eckenradius
Avec Rayons



Uncoated		Gem Coat*		Fordlube*		D ₁ Tol. h10	D ₂	L ₁	L ₂	R
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP					
137 0500	13701	137 0500G	13768	137 0500F	14348	5.0	5.0	51	6.0	0.25
137 0600	13702	137 0600G	13769	137 0600F	14349	6.0	6.0	64	7.0	0.30
137 0800	13704	137 0800G	13772	137 0800F	14352	8.0	8.0	64	9.5	0.35
137 1000	13708	137 1000G	13776	137 1000F	14356	10.0	10.0	70	12.0	0.50
137 1200	13711	137 1200G	13779	137 1200F	14414	12.0	12.0	76	14.0	0.50
137 1600	13717	137 1600G	13785	137 1600F	14365	16.0	16.0	89	18.0	0.75
137 2000	13723	137 2000G	13791	137 2000F	14371	20.0	20.0	102	22.0	0.75
137 2500	13726	137 2500G	13794	137 2500F	14374	25.0	25.0	102	25.0	0.75



Uncoated		Gem Coat*		Fordlube*		D ₁ Tol. h10	D ₂	L ₁	L ₂	R
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP					
137 1001	13709	137 1001G	13777	137 1001F	14357	10.0	10.0	76	12.0	0.50
137 1201	13712	137 1201G	13780	137 1201F	14360	12.0	12.0	102	14.0	0.50
137 1601	13718	137 1601G	13786	137 1601F	14366	16.0	16.0	117	18.0	0.75
137 2001	13724	137 2001G	13792	137 2001F	14372	20.0	20.0	127	22.0	0.75
137 2501	13727	137 2501G	13795	137 2501F	14375	25.0	25.0	127	25.0	0.75



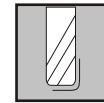
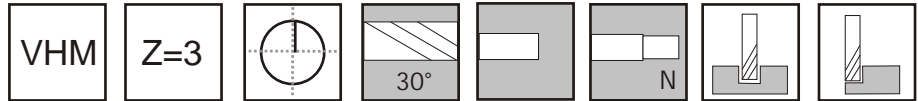
Uncoated		Gem Coat*		Fordlube*		D ₁ Tol. h10	D ₂	L ₁	L ₂	R
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP					
137 1002	13710	137 1002G	13778	137 1002F	14358	10.0	10.0	89	12.0	0.50
137 1202	13713	137 1202G	13781	137 1202F	14361	12.0	12.0	127	14.0	0.50
137 1602	13719	137 1602G	13787	137 1602F	14367	16.0	16.0	133	18.0	0.75
137 2002	13725	137 2002G	13793	137 2002F	14373	20.0	20.0	152	22.0	0.75
137 2502	13728	137 2502G	13796	137 2502F	14376	25.0	25.0	152	25.0	0.75

For Cutting Data see page 13

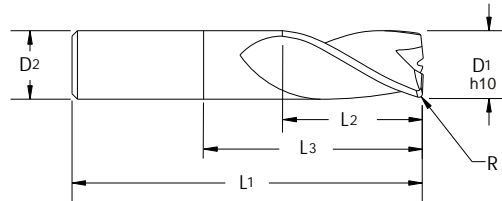
Available with F-coating=Fordlube and G-coating=Gem coating upon request.

Aluminium

TuffCut® X-AL
Series 137N



Corner Radius
Eckenradius
Avec Rayons



Uncoated		Gem Coat*		Fordlube*		D ₁	D ₂	L ₁	L ₂	L ₃	R
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP	Tol. h10					
137 0500N	13734	137 0500NG	14314	137 0500NF	14382	5.0	5.0	51	6.0	22	0.25
137 0600N	13735	137 0600NG	14315	137 0600NF	14383	6.0	6.0	64	7.0	26	0.30
137 0800N	13738	137 0800NG	14318	137 0800NF	14386	8.0	8.0	64	9.5	26	0.35
137 1000N	13742	137 1000NG	14322	137 1000NF	14390	10.0	10.0	70	12.0	28	0.50
137 1200N	13745	137 1200NG	14325	137 1200NF	14393	12.0	12.0	76	14.0	28	0.50
137 1600N	13751	137 1600NG	14331	137 1600NF	14399	16.0	16.0	89	18.0	39	0.75
137 2000N	13757	137 2000NG	14337	137 2000NF	14405	20.0	20.0	102	22.0	50	0.75
137 2500N	13760	137 2500NG	14340	137 2500NF	14408	25.0	25.0	102	25.0	36	0.75

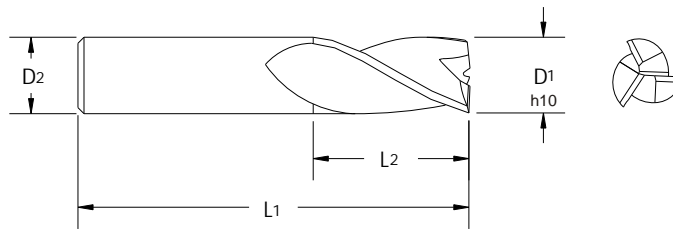
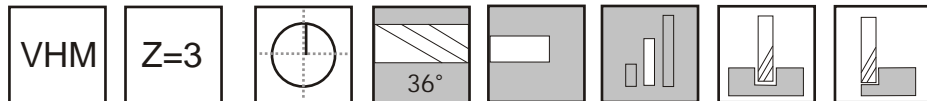
Uncoated		Gem Coat*		Fordlube*		D ₁	D ₂	L ₁	L ₂	L ₃	R
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP	Tol. h10					
137 1001N	13743	137 1001NG	14323	137 1001NF	14391	10.0	10.0	76	12.0	34	0.50
137 1201N	13746	137 1201NG	14326	137 1201NF	14394	12.0	12.0	102	14.0	54	0.50
137 1601N	13752	137 1601NG	14332	137 1601NF	14400	16.0	16.0	117	18.0	83	0.75
137 2001N	13758	137 2001NG	14338	137 2001NF	14406	20.0	20.0	127	22.0	75	0.75
137 2501N	13761	137 2501NG	14341	137 2501NF	14409	25.0	25.0	127	25.0	61	0.75

Uncoated		Gem Coat*		Fordlube*		D ₁	D ₂	L ₁	L ₂	L ₃	R
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP	Tol. h10					
137 1002N	13744	137 1002NG	14324	137 1002NF	14392	10.0	10.0	89	12.0	47	0.50
137 1202N	13747	137 1202NG	14327	137 1202NF	14395	12.0	12.0	127	14.0	79	0.50
137 1602N	13753	137 1602NG	14333	137 1602NF	14401	16.0	16.0	133	18.0	99	0.75
137 2002N	13759	137 2002NG	14339	137 2002NF	14407	20.0	20.0	152	22.0	100	0.75
137 2502N	13762	137 2502NG	14342	137 2502NF	14410	25.0	25.0	152	25.0	86	0.75

For Cutting Data see page 13

*Gemcoat and Fordlube coating - Please check availability.

TuffCut® X-AL
Series 138

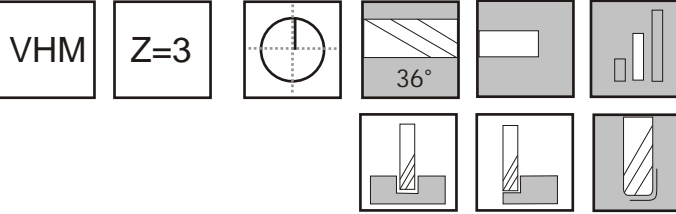


Uncoated		Gem Coat*		Fordlube*		D1	D2	L1	L2
Tool No.	EDP	Tool No.	EDP	Tool No.	EDP	Tol. h10			
138 0300	13892	138 0300G	13995	138 0300F	14295	3.0	6.0	52	8.0
138 0400	13893	138 0400G	13996	138 0400F	14296	4.0	6.0	55	11.0
138 0500	13894	138 0500G	13997	138 0500F	14297	5.0	6.0	58	13.0
138 0600	13895	138 0600G	13998	138 0600F	14298	6.0	6.0	58	13.0
138 0800	13896	138 0800G	13999	138 0800F	14299	8.0	8.0	64	19.0
138 1000	13897	138 1000G	14306	138 1000F	14300	10.0	10.0	70	22.0
138 1200	13898	138 1200G	14307	138 1200F	14301	12.0	12.0	84	26.0
138 1400	13899	138 1400G	14308	138 1400F	14302	14.0	14.0	84	26.0
138 1600	13900	138 1600G	14309	138 1600F	14303	16.0	16.0	89	32.0
138 1800	13901	138 1800G	14310	138 1800F	14304	18.0	18.0	92	32.0
138 2000	13902	138 2000G	14311	138 2000F	14305	20.0	20.0	102	38.0

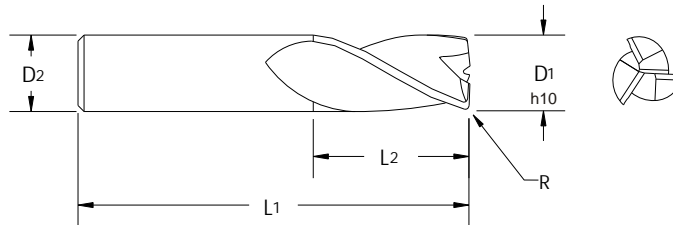
For Cutting Data see page 13

*Gemcoat and Fordlube coating - Please check availability.

TuffCut® X-AL
Series 138R



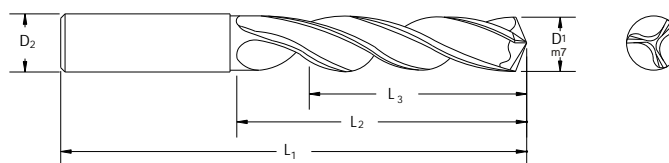
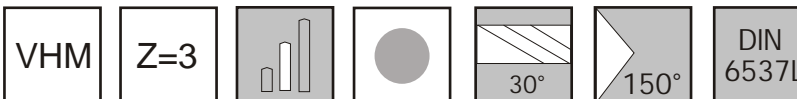
Available Q4 2007



Tool No.	D1 Tol h10	D2	L2	L1	R
138 0300-0.5R	3.0	6.0	8.0	52.0	0.50
138 0300-1.0R	3.0	6.0	8.0	52.0	1.00
138 0400-0.5R	4.0	6.0	11.0	55.0	0.50
138 0400-1.0R	4.0	6.0	11.0	55.0	1.00
138 0500-0.5R	5.0	6.0	13.0	58.0	0.50
138 0500-1.0R	5.0	6.0	13.0	58.0	1.00
138 0600-0.5R	6.0	6.0	13.0	58.0	0.50
138 0600-1.0R	6.0	6.0	13.0	58.0	1.00
138 0600-1.5R	6.0	6.0	13.0	58.0	1.50
138 0600-2.0R	6.0	6.0	13.0	58.0	2.00
138 0800-0.5R	8.0	8.0	19.0	64.0	0.50
138 0800-1.0R	8.0	8.0	19.0	64.0	1.00
138 0800-1.5R	8.0	8.0	19.0	64.0	1.50
138 0800-2.0R	8.0	8.0	19.0	64.0	2.00
138 0800-3.0R	8.0	8.0	19.0	64.0	3.00
138 1000-0.5R	10.0	10.0	22.0	70.0	0.50
138 1000-1.0R	10.0	10.0	22.0	70.0	1.00
138 1000-1.5R	10.0	10.0	22.0	70.0	1.50
138 1000-2.0R	10.0	10.0	22.0	70.0	2.00
138 1000-3.0R	10.0	10.0	22.0	70.0	3.00
138 1200-0.5R	12.0	12.0	26.0	84.0	0.50
138 1200-1.0R	12.0	12.0	26.0	84.0	1.00
138 1200-1.5R	12.0	12.0	26.0	84.0	1.50
138 1200-2.0R	12.0	12.0	26.0	84.0	2.00
138 1200-3.0R	12.0	12.0	26.0	84.0	3.00
138 1200-4.0R	12.0	12.0	26.0	84.0	4.00
138 1200-5.0R	12.0	12.0	26.0	84.0	5.00
138 1600-0.5R	16.0	16.0	32.0	89.0	0.50
138 1600-1.0R	16.0	16.0	32.0	89.0	1.00
138 1600-1.5R	16.0	16.0	32.0	89.0	1.50
138 1600-2.0R	16.0	16.0	32.0	89.0	2.00
138 1600-3.0R	16.0	16.0	32.0	89.0	3.00
138 1600-4.0R	16.0	16.0	32.0	89.0	4.00
138 1600-5.0R	16.0	16.0	32.0	89.0	5.00
138 2000-0.5R	20.0	20.0	38.0	102.0	0.50
138 2000-1.0R	20.0	20.0	38.0	102.0	1.00
138 2000-1.5R	20.0	20.0	38.0	102.0	1.50
138 2000-2.0R	20.0	20.0	38.0	102.0	2.00
138 2000-3.0R	20.0	20.0	38.0	102.0	3.00
138 2000-4.0R	20.0	20.0	38.0	102.0	4.00
138 2000-5.0R	20.0	20.0	38.0	102.0	5.00

Available with F-coating=Fordlube and G-coating=Gem coating upon request.

Twister®AL
Series 229



Tool No.	EDP	D ₁ Tol. m7	D ₂	L ₁	L ₂	L ₃ Ref.
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

Tool No.	EDP	D ₁ Tol. m7	D ₂	L ₁	L ₂	L ₃ Ref.
229 0740	22965	7.4	8	91	53	43
229 0750	22966	7.5	8	91	53	43
229 0780	23006	7.8	8	91	53	43
229 0800	22967	8.0	8	91	53	43
229 0810	23008	8.1	10	103	61	49
229 0840	22985	8.4	10	103	61	49
229 0850	22968	8.5	10	103	61	49
229 0900	22989	9.0	10	103	61	49
229 0950	23009	9.5	10	103	61	49
229 0970	23011	9.7	10	103	61	49
229 1000	22969	10.0	10	103	61	49
229 1020	22970	10.2	12	118	71	56
229 1040	23012	10.4	12	118	71	56
229 1050	22986	10.5	12	118	71	56
229 1060	23013	10.6	12	118	71	56
229 1100	22993	11.0	12	118	71	56
229 1150	23014	11.5	12	118	71	56
229 1200	22971	12.0	12	118	71	56
229 1250	22988	12.5	14	124	77	60
229 1300	23015	13.0	14	124	77	60
229 1350	23017	13.5	14	124	77	60
229 1400	23018	14.0	14	124	77	60
229 1450	23020	14.5	16	133	83	63
229 1500	23021	15.0	16	133	83	63
229 1550	23022	15.5	16	133	83	63
229 1580	23023	15.8	16	133	83	63
229 1600	23024	16.0	16	133	83	63





For Cutting Data see page 13

Coolant Fed extended lengths available by special order.






TuffCut® AL

Recommended cutting data - Al/Al-Si Alloys




134 Series

Vc M/Min	250-300 m/min			
	Slotting		Profiling	
	Ar=1xD	Ar=1xD	Ar=0.2xD	Ar=0.5xD
	Ae=0.5xD	Ae=1xD	Ae=1xD	Ae=1xD
				
Diameter	mm/tooth/rev			
5	0.063	0.052	0.075	0.063
6	0.063	0.052	0.075	0.063
8	0.094	0.084	0.125	0.094
10	0.094	0.084	0.125	0.094
12	0.127	0.1	0.135	0.127
16	0.19	0.14	0.225	0.19
20	0.19	0.14	0.225	0.19
25	0.25	0.21	0.275	0.25

135 Series

Vc M/Min	Slotting		Profiling		
	300-425	250-365	300-425		250-365
	Ar=1xD	Ar=1xD	Ar=0.2xD	Ar=0.5xD	Ar=1xD
	Ae=0.5xD	Ae=1xD	Ae=1xD	Ae=1xD	Ae=1xD
					
Diameter	mm/tooth/rev				
3	0.035	0.03	0.03	0.03	0.025
4	0.035	0.03	0.03	0.03	0.025
5	0.075-0.1	0.025-0.05	0.05-0.1	0.05-0.1	0.025-0.05
6	0.1-0.23	0.1-0.15	0.1-0.23	0.1-0.23	0.1-0.15
8	0.175-0.3	0.1-0.15	0.1-0.23	0.1-0.23	0.1-0.15
10	0.175-0.3	0.1-0.15	0.1-0.23	0.1-0.23	0.1-0.15
12	0.25-1.15	0.25-0.75	0.25-1.15	0.25-0.89	0.25-0.75
16	0.38-1.02	0.38-0.75	0.38-1.02	0.38-0.89	0.38-0.75
20	0.38-1.02	0.38-0.75	0.38-1.02	0.38-0.89	0.38-0.75
25	0.38-1.02	0.38-0.75	0.38-1.02	0.38-0.89	0.38-0.75






136 Series

Vc M/Min	Profiling		
	215-300		
	Ar=0.05xD	Ar=0.1xD	Ar=0.2xD
	Ae=1xD	Ae=1xD	Ae=1xD
			
Diameter	mm/tooth/rev		
3	0.03	0.03	0.025
4	0.03	0.03	0.025
5	0.025-0.075	0.025-0.05	0.025-0.04
6	0.05-0.10	0.05-0.10	0.05-0.075
8	0.075-0.125	0.075-0.125	0.050-0.10
10	0.075-0.125	0.075-0.125	0.050-0.10
12	0.10-0.15	0.10-0.15	0.075-0.125
16	0.15-0.20	0.15-0.20	0.10-0.15
20	0.15-0.20	0.15-0.20	0.10-0.15
25	0.20-0.25	0.20-0.25	0.15-0.20




TuffCut® X-AL

Recommended cutting data - Al/Al-Si Alloys

137 Series

Vc M/Min	Slotting		Profiling		
	300-425	250-365	300-425		250-365
	Ar=1xD	Ar=1xD	Ar=0.2xD	Ar=0.5xD	Ar=1xD
	Ae=0.5xD	Ae=1xD	Ae=1xD	Ae=1xD	Ae=1xD
					
Diameter	mm/tooth/rev				
5	0.045-0.06	0.15-0.30	0.05-0.10	0.05-0.10	0.025-0.05
6	0.06-0.135	0.06-0.09	0.10-0.23	0.10-0.23	0.10-0.15
8	0.105-0.185	0.105-0.135	0.10-0.23	0.10-0.23	0.10-0.15
10	0.105-0.185	0.105-0.135	0.10-0.23	0.10-0.23	0.10-0.15
12	0.15-0.685	0.15-0.685	0.25-1.15	0.25-0.89	0.25-0.75
16	0.23-0.61	0.23-0.46	0.38-1.02	0.38-0.89	0.38-0.75
20	0.23-0.61	0.23-0.46	0.38-1.02	0.38-0.89	0.38-0.75
25	0.23-0.61	0.23-0.46	0.38-1.02	0.38-0.89	0.38-0.75

138 Series

Profile Finishing			
Vc M/Min	425-610		
	Ar=0.05xD	Ar=0.1xD	Ar=0.2xD
	Ae=1xD	Ae=1xD	Ae=1xD
			
Diameter	mm/tooth/rev		
3	0.03	0.03	0.025
4	0.03	0.03	0.025
5	0.025-0.075	0.025-0.05	0.025-0.04
6	0.05-0.10	0.05-0.10	0.05-0.075
8	0.075-0.125	0.075-0.125	0.50-0.10
10	0.075-0.125	0.075-0.125	0.050-0.10
12	0.10-0.15	0.10-0.15	0.075-0.125
16	0.15-0.20	0.15-0.20	0.10-0.15
20	0.15-0.20	0.15-0.20	0.10-0.15
25	0.20-0.25	0.20-0.25	0.15-0.20

Twister® Drills

229 Series

Material Group	Material Examples	Vc M/Min	Feed Code
Titanium Alloys	Ti-6Al-4V	30	A
Aluminium < 10% Si	6061-T6/7075-T6	215	D
Aluminium > 10% Si		155	C
Brass/Copper		120	C
Plastics		90	C

Drill Feed Rate Chart (mm/rev)						
Code	Diameter					
	1.5mm	3mm	6mm	12mm	20mm	25mm
A	.013	.050	.110	.150	.200	.250
B	.025	.025	.025	.050	.080	.080
C	.050	.080	.150	.250	.305	.350
D	.080	.200	.305	.450	.610	.760

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