



Variable Flute Tools Technical Information

- RedLine Variable Flute tools are designed for faster metal removal. We control vibration and chatter through a unique dampening geometry and can handle faster speeds and feeds generated by the application of our AITiNX coating.
- Our offer includes 4- and 5-flute tools which can be run wet or dry and can be used in a wide variety of applications, from roughing and finishing to slotting and pocketing.
- Designed to run in a wide range of materials from cast irons and steels to titanium and high temperature alloys.
- These tools are the ultimate for versatility, performance and lowest overall cost.
- Variable Flute, High Performance Endmills found on pages 9-16.

Variable Flute Tools Speeds & Feeds

Workpiece Material	Type of Cut	Axial DOC	Ra-dial DOC	# Flutes	Speed (SFM)	Feed (Inches Per Tooth)						Speed (M / min)	Feed (mm Per Tooth)							
						1/8	1/4	3/8	1/2	5/8	3/4		1	3.0	6.0	9.0	12.0	16.0	19.0	25.0
Cast Iron - Gray	Slot	1 x D	1 x D	4	400	.0006	.0012	.0019	.0025	.0031	.0038	.0050	122	.0152	.0305	.0483	.0635	.0787	.0965	.0270
	Rough	1.5 x D	.5 x D	4	500	.0007	.0015	.0023	.0030	.0037	.0046	.0060	152	.0183	.0381	.0579	.0762	.0945	.0158	.0524
	Rough	1.5 x D	.5 x D	5	500	--	.0014	.0021	.0028	.0035	.0043	.0056	152	--	.0356	.0533	.0711	.0889	.0092	.0422
Cast Iron - Ductile	Finish	1.5 x D	.01 x D	5	650	--	.0014	.0021	.0028	.0035	.0043	.0056	198	--	.0356	.0533	.0711	.0889	.0092	.0422
	Slot	1 x D	1 x D	4	300	.0006	.0012	.0018	.0023	.0029	.0035	.0046	91	.0152	.0305	.0483	.0635	.0787	.0965	.0270
	Rough	1.5 x D	.5 x D	4	400	.0007	.0014	.0021	.0028	.0035	.0042	.0056	122	.0183	.0356	.0533	.0711	.0889	.0067	.0422
Cast Iron - Malleable	Rough	1.5 x D	.5 x D	5	400	--	.0013	.0020	.0027	.0033	.0040	.0054	122	--	.0330	.0508	.0686	.0838	.0016	.0372
	Finish	1.5 x D	.01 x D	5	520	--	.0013	.0020	.0027	.0033	.0040	.0054	158	--	.0330	.0508	.0686	.0838	.0016	.0372
	Slot	0.75	1 x D	4	250	.0004	.0008	.0012	.0015	.0019	.0023	.0030	76	.0102	.0203	.0305	.0381	.0483	.0584	.0762
Low Carbon Steel ≤ 38 HRC 1018, 12L14, 8620	Rough	1 x D	.75 x D	4	325	.0005	.0011	.0016	.0022	.0027	.0033	.0044	99	.0127	.0279	.0406	.0559	.0686	.0838	.0118
	Rough	1 x D	.75 x D	5	325	--	.0010	.0015	.0021	.0026	.0032	.0042	99	--	.0254	.0381	.0533	.0660	.0813	.0067
	Finish	1.5 x D	.01 x D	5	425	--	.0019	.0028	.0038	.0047	.0057	.0076	130	--	.0483	.0711	.0965	.0194	.0448	.0930
Medium Carbon Steels ≤ 38 HRC 4140, 4340	Slot	1 x D	1 x D	4	350	.0008	.0016	.0024	.0032	.0040	.0048	.0064	107	.0203	.0406	.0610	.0813	.0016	.0219	.0626
	Rough	1.5 x D	.5 x D	4	425	.0010	.0020	.0030	.0040	.0050	.0060	.0080	130	.0254	.0508	.0762	.0016	.0270	.2032	
	Rough	1.5 x D	.5 x D	5	425	--	.0019	.0028	.0038	.0047	.0057	.0076	130	--	.0483	.0711	.0965	.0194	.0448	
Tool & Die Steels ≤ 38 HRC A2, D2, H13, P20	Finish	1.5 x D	.01 x D	5	550	--	.0019	.0028	.0038	.0047	.0057	.0076	168	--	.0483	.0711	.0965	.0194	.0448	.0930
	Slot	1 x D	1 x D	4	325	.0006	.0013	.0020	.0027	.0034	.0040	.0054	99	.0152	.0330	.0508	.0686	.0864	.0016	.0372
	Rough	1.5 x D	.5 x D	4	375	.0008	.0017	.0026	.0035	.0044	.0053	.0070	114	.0203	.0432	.0660	.0889	.0118	.0346	.0778
Tool Steels - 39 HRC to 48 HRC	Rough	1.5 x D	.5 x D	5	375	--	.0016	.0025	.0034	.0042	.0051	.0068	114	--	.0406	.0635	.0864	.0067	.0295	.0727
	Finish	1.5 x D	.01 x D	5	485	--	.0016	.0025	.0034	.0042	.0051	.0068	148	--	.0406	.0635	.0864	.0067	.0295	.0727
	Slot	.75 x D	1 x D	4	225	.0005	.0010	.0015	.0020	.0025	.0030	.0040	69	.0127	.0254	.0381	.0508	.0635	.0762	.0016
Easy to Machine Stainless Steel 416, 410, 302, 303	Rough	1 x D	.5 x D	4	275	.0006	.0012	.0017	.0023	.0029	.0035	.0046	84	.0146	.0292	.0438	.0584	.0730	.0876	.0168
	Rough	1 x D	.5 x D	5	275	--	.0011	.0016	.0022	.0028	.0034	.0044	84	--	.0279	.0406	.0559	.0711	.0864	.0118
	Finish	1.5 x D	.01 x D	5	355	--	.0011	.0016	.0022	.0028	.0034	.0044	108	--	.0279	.0406	.0559	.0711	.0864	.0118
Moderately Difficult Stainless Steel 304, 316, Invar, Kovar	Slot	1 x D	1 x D	4	300	.0006	.0012	.0018	.0025	.0031	.0037	.0050	91	.0152	.0305	.0457	.0635	.0787	.0940	.0270
	Rough	1.5 x D	.5 x D	4	375	.0008	.0016	.0024	.0032	.0040	.0048	.0064	114	.0203	.0406	.0610	.0813	.0016	.0219	.0626
	Rough	1.5 x D	.5 x D	5	375	--	.0015	.0022	.0030	.0037	.0045	.0060	114	--	.0381	.0559	.0762	.0940	.0143	.0524
Difficult to Machine Stainless Steel 316L, 17-4 PH, 15-5 PH, 13-8 PH	Finish	1.5 x D	.01 x D	5	485	--	.0015	.0022	.0030	.0037	.0045	.0060	148	--	.0381	.0559	.0762	.0940	.0143	.0524
	Slot	.75 x D	1 x D	4	275	.0005	.0011	.0016	.0022	.0027	.0033	.0044	84	.0127	.0279	.0406	.0559	.0686	.0838	.0118
	Rough	1.5 x D	.5 x D	4	350	.0007	.0015	.0023	.0032	.0037	.0045	.0064	107	.0178	.0381	.0584	.0813	.0940	.0143	.0626
Titanium Alloys	Rough	1.5 x D	.5 x D	5	350	--	.0014	.0022	.0031	.0036	.0044	.0062	107	--	.0356	.0559	.0787	.0914	.0118	.0575
	Finish	1.5 x D	.01 x D	5	450	--	.0014	.0022	.0031	.0036	.0044	.0062	137	--	.0356	.0559	.0787	.0914	.0118	.0575
	Slot	.5 x D	1 x D	4	250	.0004	.0009	.0012	.0018	.0022	.0027	.0036	76	.0102	.0229	.0305	.0457	.0559	.0686	.0914
High Temperature Alloys	Rough	1 x D	.5 x D	4	300	.0005	.0011	.0016	.0022	.0028	.0033	.0044	91	.0127	.0279	.0406	.0559	.0711	.0838	.0118
	Rough	1 x D	.5 x D	5	300	--	.0010	.0015	.0021	.0026	.0031	.0042	91	--	.0254	.0381	.0533	.0660	.0787	.0067
	Finish	1.5 x D	.01 x D	5	390	--	.0010	.0015	.0021	.0026	.0031	.0042	119	--	.0254	.0381	.0533	.0660	.0787	.0067
High Temperature Alloys	Slot	.5 x D	1 x D	4	250	.0005	.0010	.0015	.0020	.0025	.0030	.0040	76	.0127	.0254	.0381	.0508	.0635	.0762	.0016
	Rough	1 x D	.5 x D	4	300	.0006	.0012	.0017	.0023	.0029	.0035	.0046	91	.0152	.0305	.0432	.0584	.0737	.0889	.0168
	Rough	1 x D	.5 x D	5	300	--	.0010	.0015	.0021	.0027	.0032	.0042	91	--	.0254	.0381	.0533	.0686	.0813	.0067
High Temperature Alloys	Finish	1.5 x D	.01 x D	5	390	--	.0010	.0015	.0021	.0027	.0032	.0042	119	--	.0254	.0381	.0533	.0686	.0813	.0067
	Slot	.25 x D	1 x D	4	70	.0004	.0008	.0012	.0015	.0019	.0024	.0030	21	.0102	.0203	.0305	.0381	.0483	.0610	.0762
	Rough	1 x D	.25 x D	4	95	.0005	.0009	.0014	.0018	.0022	.0028	.0036	29	.0127	.0229	.0356	.0457	.0559	.0711	.0914
High Temperature Alloys	Rough	1 x D	.25 x D	5	95	--	.0009	.0014	.0018	.0022	.0028	.0036	29	--	.0229	.0356	.0457	.0559	.0711	.0914
	Finish	1.5 x D	.01 x D	5	125	--	.0009	.0014	.0018	.0022	.0028	.0036	38	--	.0229	.0356	.0457	.0559	.0711	.0914

D = tool diameter

Reduce feed rates by 20% when using long length tools.

Starting parameters shown





6-Flute Finishers Technical Information

- RedLine 6-flute Finishers are the 1st choice for milling a wide variety of difficult to machine alloys. Our high performance TiAlN coating allows you to run our tools wet or dry in many materials with excellent tool life.
- 6-flute Finisher, High Performance Endmills found on pages 17-21.

Note: For added tool life apply tools with a corner radius.

Do not use tools with Weldon Flats in milling chucks or collet chucks for high speed applications.

6-Flute Finishers Tools Speeds & Feeds

Workpiece Material	Type of Cut	Axial DOC	Ra-dial DOC	# Flutes	Speed (SFM)	Feed (Inches Per Tooth)							Speed (M/min)	Feed (mm Per Tooth)						
						1/8	1/4	3/8	1/2	5/8	3/4	1		3.0	6.0	9.0	12.0	16.0	19.0	25.0
Titanium Alloys	Slot	.25 x D	1 x D	6	225	.0002	.0005	.0007	.0010	.0013	.0016	.0020	69	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.25 x D	6	250	.0003	.0006	.0009	.0013	.0016	.0020	.0026	76	.0076	.0152	.0229	.0330	.0406	.0508	.0660
	Finish	1.5 x D	.01 x D	6	350	.0005	.0010	.0015	.0020	.0025	.0030	.0040	107	.0127	.0254	.0381	.0508	.0635	.0762	.1016
High Temperature Alloys, Inconel, Haynes, Stellite, Hastalloy, Waspalloy	Slot	.25 x D	1 x D	6	70	.0003	.0007	.0011	.0014	.0017	.0022	.0028	21	.0076	.0178	.0279	.0356	.0432	.0559	.0711
	Rough	1 x D	.25 x D	6	95	.0004	.0009	.0013	.0017	.0022	.0026	.0034	29	.0102	.0229	.0330	.0432	.0559	.0660	.0864
	Finish	1.5 x D	.01 x D	6	110	.0005	.0009	.0014	.0019	.0023	.0028	.0038	34	.0127	.0229	.0356	.0483	.0584	.0711	.0965
Carbon & Tool Steels ≤ 38 HRC	Slot	.5 x D	1 x D	6	275	.0003	.0007	.0010	.0015	.0019	.0024	.0030	84	.0076	.0178	.0254	.0381	.0483	.0610	.0762
	Rough	1 x D	.5 x D	6	325	.0005	.0010	.0015	.0020	.0025	.0030	.0040	99	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	6	400	.0006	.0012	.0018	.0025	.0031	.0037	.0050	122	.0152	.0305	.0457	.0635	.0787	.0940	.1270
Carbon & Tool Steels 39 HRC to 48 HRC	HSM	.1 x D	.1 x D	6	800	.0015	.0030	.0045	.0060	.0075	.0090	.0120	244	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Slot	.5 x D	1 x D	6	200	.0002	.0005	.0007	.0010	.0013	.0016	.0020	61	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.5 x D	6	250	.0004	.0007	.0011	.0015	.0019	.0024	.0030	76	.0102	.0178	.0279	.0381	.0483	.0610	.0762
Carbon & Tool Steels 49 HRC to 57 HRC	Finish	1.5 x D	.01 x D	6	325	.0004	.0009	.0013	.0018	.0022	.0027	.0036	99	.0102	.0229	.0330	.0457	.0559	.0686	.0914
	HSM	.1 x D	.1 x D	6	600	.0011	.0022	.0033	.0045	.0056	.0068	.0090	183	.0279	.0559	.0838	.1143	.1422	.1727	.2286
	Slot	.25 x D	1 x D	6	150	.0002	.0005	.0007	.0010	.0012	.0015	.0020	46	.0051	.0127	.0178	.0254	.0305	.0381	.0508
Carbon & Tool Steels 58 HRC to 62 HRC	Rough	1 x D	.25 x D	6	200	.0003	.0007	.0011	.0015	.0018	.0022	.0030	61	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	Finish	1.5 x D	.01 x D	6	275	.0003	.0007	.0011	.0015	.0018	.0022	.0030	84	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	HSM	.1 x D	.1 x D	6	500	.0006	.0012	.0017	.0023	.0028	.0034	.0046	152	.0152	.0305	.0432	.0584	.0711	.0864	.1168
Carbon & Tool Steels 58 HRC to 62 HRC	Slot	.20 x D	1 x D	6	45	.0002	.0005	.0007	.0010	.0013	.0016	.0020	14	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.20 x D	6	65	.0004	.0007	.0011	.0015	.0019	.0024	.0030	20	.0102	.0178	.0279	.0381	.0483	.0610	.0762
	Finish	1.5 x D	.01 x D	6	100	.0004	.0007	.0011	.0015	.0019	.0024	.0030	30	.0102	.0178	.0279	.0381	.0483	.0610	.0762
HSM	.1 x D	.1 x D	6	400	.0005	.0010	.0015	.0020	.0025	.0030	.0040	122	.0127	.0254	.0381	.0508	.0635	.0762	.1016	



High Temp Alloys Technical Information

- RedLine 3-flute 60° endmills are perfect for slotting and profiling in all high temperature alloys like Hastalloy, Waspalloy, Inconel, and Titanium.
- If you are looking for additional speed you can achieve up to a 40% increase in surface footage over uncoated tools by purchasing tools with the AlTiN coating.
- High Temp Alloy, high performance endmills found on page 22.

High Temp Alloys Tools Speeds & Feeds

Workpiece Material	Type of Cut	Axial DOC	Ra-dial DOC	# Flutes	Speed (SFM)	Feed (Inches Per Tooth)							Speed (M/min)	Feed (mm Per Tooth)						
						1/8	1/4	3/8	1/2	5/8	3/4	1		3.0	6.0	9.0	12.0	16.0	19.0	25.0
Titanium Alloys	Slot	.5 x D	1 x D	5	225	.0003	.0007	.0011	.0015	.0018	.0022	.0030	69	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	Rough	1 x D	.5 x D	5	250	.0005	.0010	.0015	.0020	.0025	.0030	.0040	76	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	5	350	.0006	.0012	.0017	.0023	.0029	.0034	.0046	107	.0152	.0305	.0432	.0584	.0737	.0864	.1168
High Temperature Alloys, Inconel, Haynes, Stellite, Hastalloy, Waspalloy	Slot	.25 x D	1 x D	5	70	.0003	.0007	.0011	.0014	.0017	.0022	.0028	21	.0076	.0178	.0279	.0356	.0432	.0559	.0711
	Rough	1 x D	.25 x D	5	95	.0004	.0009	.0013	.0017	.0022	.0026	.0034	29	.0102	.0229	.0330	.0432	.0559	.0660	.0864
	Finish	1.5 x D	.01 x D	5	110	.0005	.0009	.0014	.0019	.0023	.0028	.0038	34	.0127	.0229	.0356	.0483	.0584	.0711	.0965

D = tool diameter

Reduce feed rates by 20% when using long length tools.

Starting parameters shown





Stainless Steels Technical Information

- RedLine 3-flute 45° lead tools are recommended for slotting and profiling of stainless steel and other similar alloys. This tool is designed to run at higher speeds and feeds while producing excellent part finishes.
- RedLine 5-flute 45° lead tools are an excellent choice for profiling and finishing in stainless steels, carbon steels, high temp alloys and exotic materials.
- Stainless Steel, High Performance Endmills found on page 23.

Stainless Steels Tools Speeds & Feeds

Workpiece Material	Type of Cut	Axial DOC	Radial DOC	# Flutes	Speed (SFM)	Feed (Inches Per Tooth)							Speed (M/min)	Feed (mm Per Tooth)						
						1/8	1/4	3/8	1/2	5/8	3/4	1		3.0	6.0	9.0	12.0	16.0	19.0	25.0
Easy to Machine Stainless Steels 416, 410, 302, 303	Finish	1.5 x D	.01 x D	5	375	.0007	.0014	.0021	.0028	.0035	.0042	.0056	114	.0178	.0356	.0533	.0711	.0889	.1067	.1422
Medium Difficulty Stainless Steels 304, 316, Invar, Kovar	Finish	1.5 x D	.01 x D	5	350	.0006	.0012	.0018	.0025	.0031	.0037	.0050	107	.0152	.0305	.0457	.0635	.0787	.0940	.1270
Difficult to Machine Stainless Steels 316L, 17-4 PH, 15-5 PH, 13-8 PH	Rough	1 x D	.5 x D	5	275	.0003	.0007	.0011	.0015	.0019	.0023	.0030	84	.0076	.0178	.0279	.0381	.0483	.0584	.0762
	Finish	1.5 x D	.01 x D	5	325	.0005	.0011	.0017	.0022	.0028	.0033	.0044	99	.0127	.0279	.0432	.0559	.0711	.0838	.1118
Low Carbon Steels ≤ 32 HRc, 1018, 12L14, 8620	Finish	1.5 x D	.01 x D	5	450	.0008	.0015	.0023	.0030	.0037	.0045	.0060	137	.0203	.0381	.0584	.0762	.0940	.1143	.1524
Carbon & Tool Steels 33 HRc to 38 HRc	Finish	1.5 x D	.01 x D	5	400	.0006	.0012	.0018	.0025	.0031	.0037	.0050	122	.0152	.0305	.0457	.0635	.0787	.0940	.1270
Carbon & Tool Steels 39 HRc to 48 HRc	Slot	.5 x D	1 x D	5	225	.0002	.0005	.0007	.0010	.0013	.0016	.0020	69	.0051	.0127	.0178	.0254	.0330	.0406	.0508
	Rough	1 x D	.5 x D	5	275	.0004	.0007	.0011	.0015	.0019	.0024	.0030	84	.0102	.0178	.0279	.0381	.0483	.0610	.0762
	Finish	1.5 x D	.01 x D	5	325	.0004	.0009	.0013	.0018	.0022	.0027	.0036	99	.0102	.0229	.0330	.0457	.0559	.0686	.0914
Copper, Brass, & Bronze	Finish	1.5 x D	.01 x D	5	600	.0008	.0018	.0026	.0035	.0044	.0053	.0070	183	.0203	.0457	.0660	.0889	.1118	.1346	.1778
Aluminum Bronze & Beryllium Copper	Finish	1.5 x D	.01 x D	5	375	.0006	.0013	.0020	.0025	.0032	.0039	.0050	114	.0152	.0330	.0508	.0635	.0813	.0991	.1270
Titanium Alloys	Slot	.5 x D	1 x D	5	225	.0003	.0007	.0011	.0015	.0018	.0022	.0030	69	.0076	.0178	.0279	.0381	.0457	.0559	.0762
	Rough	1 x D	.5 x D	5	250	.0005	.0010	.0015	.0020	.0025	.0030	.0040	76	.0127	.0254	.0381	.0508	.0635	.0762	.1016
	Finish	1.5 x D	.01 x D	5	350	.0006	.0012	.0017	.0023	.0029	.0034	.0046	107	.0152	.0305	.0432	.0584	.0737	.0864	.1168

D = tool diameter

Reduce feed rates by 20% when using long length tools.

Starting parameters shown





ZrN Coated for Aluminum & Non-Ferrous Technical Information

- RedLine 2- and 3-flute ZrN coated tools are designed for high speed machining in aluminum brass and bronze, and can be used for plunging, slotting and profiling in all non-ferrous materials.
- The ZrN coating allows for higher speeds, better tool life and a low affinity for aluminum.
- ZrN coated aluminum and Non-Ferrous, High Performance Endmills found on pages 24 and 31.

ZrN Coated for Aluminum & Non-Ferrous Tools Speeds & Feeds								
Workpiece Material	Speeds (SFM)	(Feed Per Tooth) by Endmill Diameter (Inches)						
		1/8	1/4	3/8	1/2	5/8	3/4	1
Non-Ferrous Materials								
Aluminum	650-1000	.001	.002	.003	.004	.005	.006	.007
Brass/Bronze	1000-1300	.001	.002	.003	.0035	.004	.0045	.005
Copper/Copper Alloys	900-1300	.001	.002	.003	.0035	.004	.0045	.005
Plastics	400-650	.001	.003	.004	.006	.008	.010	.014

- NOTES:** (1) Speeds and Feeds listed are estimated and will vary by application.
 (2) Reduce Speeds by 20% when slotting.
 (3) When exceeding 1/2 the end mill diameter while profiling, reduce feed rate by 25%.
 (4) The use of Long and Extra Long Endmills require a reduction in feed by up to 50%.
 (5) Optimum performance can be achieved when using coated & stub length tools.



Aluminum & Non-Ferrous Technical Information

- RedLine has a comprehensive offering of shank designs, corner radii, and tool lengths for milling all aluminums including die cast, extrusions and non-ferrous alloys.
- Increased feed rates, lower cycle times and excellent surface finishes can be achieved using these tools.
- Aluminum and Non-Ferrous, High Performance Endmills found on pages 25-44.

Aluminum & Non-Ferrous Tools Speeds & Feeds

Workpiece Material	Type of Cut	Axial DOC	Radial DOC	# Flutes	Speed (SFM)	Feed (Inches Per Tooth)							Speed (M/min)	Feed (mm Per Tooth)						
						1/8	1/4	3/8	1/2	5/8	3/4	1		3.0	6.0	9.0	12.0	16.0	19.0	25.0
Aluminum Alloys 2024, 6061, 7075	Slotting	1 x D	1 x D	2	800	.0020	.0040	.0060	.0080	.0100	.0120	.0160	244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
	Rough	1 x D	.75 x D	3	1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200	305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
	Finish	1.5 x D	.01 x D	3	1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250	366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
High Silicon Aluminum A380, A390	Slotting	.5 x D	1 x D	3	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.5 x D	3	600	.0015	.0030	.0045	.0060	.0075	.0090	.0120	183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Finish	1.5 x D	.01 x D	3	800	.0018	.0035	.0055	.0070	.0090	.0110	.0140	244	.0457	.0889	.1397	.1778	.2286	.2794	.3556
Magnesium Alloys	Slotting	1 x D	1 x D	2	800	.0020	.0040	.0060	.0080	.0100	.0120	.0160	244	.0508	.1016	.1524	.2032	.2540	.3048	.4064
	Rough	1 x D	.75 x D	3	1000	.0020	.0050	.0075	.0100	.0120	.0150	.0200	305	.0508	.1270	.1905	.2540	.3048	.3810	.5080
	Finish	1.5 x D	.01 x D	3	1200	.0030	.0060	.0090	.0120	.0160	.0200	.0250	366	.0762	.1524	.2286	.3048	.4064	.5080	.6350
Copper Alloys Brass, Bronze	Slotting	.75 x D	1 x D	2	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.75 x D	3	475	.0012	.0025	.0037	.0050	.0063	.0075	.0100	145	.0305	.0635	.0940	.1270	.1600	.1905	.2540
	Finish	1.5 x D	.01 x D	3	550	.0015	.0030	.0045	.0060	.0075	.0090	.0120	168	.0381	.0762	.1143	.1524	.1905	.2286	.3048
Composites Plastics, Fiberglass	Slotting	1 x D	1 x D	3	400	.0010	.0020	.0030	.0040	.0050	.0060	.0080	122	.0254	.0508	.0762	.1016	.1270	.1524	.2032
	Rough	1 x D	.75 x D	3	600	.0015	.0030	.0045	.0060	.0075	.0090	.0120	183	.0381	.0762	.1143	.1524	.1905	.2286	.3048
	Finish	1.5 x D	.01 x D	3	800	.0018	.0035	.0055	.0070	.0090	.0110	.0140	244	.0457	.0889	.1397	.1778	.2286	.2794	.3556

D = tool diameter

Reduce feed rates by 20% when using long length tools.

Starting parameters shown





Roughers Technical Information



- RedLine High Performance Roughers are designed to perform in hard to machine materials like stainless steel and titanium.
- Higher feed rates can be attained because of our radius chip breaker, without sacrificing finish.
- High Performance Roughers and Finishers found on pages 45 and 46.

Solid Carbide Roughers Speeds & Feeds

Workpiece Material	Hardness HRC	Speeds (SFM)		Chip Load per Tooth	
		Uncoated	AlTiN Coated	1/4"-1/2"	1/2"-1"
Low and Plain Carbon, Alloy & Tool Steels	<19	258-345	430-575	.0015-.0030	.0030-.0045
Low and Plain Carbon, Alloy & Tool Steels	20-30	210-258	350-430	.0015-.0030	.0030-.0045
Low and Plain Carbon, Alloy & Tool Steels	31-40	126-192	210-320	.0011-.0021	.0021-.0032
Austenitic Stainless Steels, 200 & 300	<28	150-300	250-500	.0010-.0025	.0025-.0040
Ferritic, Martensitic 400, 500 & PH Stainless Steels	<35	135-258	225-430	.0015-.0030	.0003-.0045
Titanium Alloys	32-43	75-129	125-215	.0009-.0018	.0018-.0027
Nickel-Based High Temperature Alloys	<32	39-87	65-145	.0009-.0018	.0018-.0027
Nickel-Based High Temperature Alloys	32-50	33-66	55-110	.0009-.0018	.0018-.0027
Cobalt-Based High Temperature Alloys	<45	27-45	45-75	.0009-.0018	.0018-.0027

NOTES: Speeds and Feeds listed are estimated and will vary by application.

Carbide Endmills



General Purpose Carbide Endmills Speeds & Feeds						
Workpiece Material	Speeds (SFM)	(Feed Per Tooth) by Endmill Diameter (Inches)				
		1/8	1/4	1/2	3/4	1
Non-Ferrous Materials						
Aluminum/Aluminum Alloy	1000-2000	.001	.002	.004	.006	.008
Aluminum/Aluminum Alloy +10%	700-1200	.001	.002	.004	.006	.008
Brass	300-450	.001	.002	.003	.004	.005
Bronze	250-350	.001	.002	.003	.004	.005
Copper/Copper Alloys	500-900	.001	.002	.003	.005	.007
Fiberglass	200-600	.001	.002	.003	.004	.005
Graphites	200-400	.001	.006	.010	.015	.020
Graphite/Epoxy	200-400	.001	.002	.003	.004	.005
Magnesium	1000 min.	.001	.002	.004	.006	.008
Cast Iron						
Ductile	250-400	.0005	.0015	.0025	.0040	.0050
Gray	350-500	.0005	.0020	.0040	.0060	.0080
Malleable	200-350	.0005	.0020	.0040	.0060	.0080
Steels						
Low Alloy	350-600	.0005	.0010	.0020	.0040	.0060
Medium Alloy	200-400	.0005	.0010	.0020	.0040	.0060
High Alloy Mold Die	175-250	.0005	.0010	.0020	.0040	.0060
High Strength	75-150	.0005	.0005	.0010	.003	.0040
Stainless Steels						
Free Machine	300-400	.0005	.001	.002	.003	.004
Work Hardening	150-300	.0005	.0015	.0025	.0035	.004
High Temp Alloys						
Nickel Base	70-100	.0005	.0010	.0010	.0015	.0020
Titanium						
Soft	150-300	.0005	.0010	.0020	.0040	.0060
Hard	50-150	.0005	.0005	.0010	.0020	.0040

- NOTES:** (1) Speeds and Feeds listed are estimated and will vary by application.
 (2) Speeds and Feeds listed above are for uncoated tools. For coated tools, SFM may increase by +25% for TiCN and +40% for AlTiN.
 (3) Maximize rigidity to reduce chatter and increase tool life by applying the following tips.
 • Choose the largest diameter possible
 • Use the shortest LOC (Length of Cut) available
 • Use the toolholder which offers the shortest gage length
 (4) To control chatter, increase feed or reduce speed.
 (5) For extra long endmills, reduce SFM by 25%.
 (6) Keep runout to a minimum at all times. As runout increases, the tools' performance decreases and tool life will be reduced.
 (7) Use a coolant or air blast to evacuate chips to avoid premature damage to your carbide cutting tool, which may occur if chips are recut.



High Speed Steel and Cobalt Endmills Speeds & Feeds			
Workpiece Material	Speeds (SFM)		Chip Load Per Flute
	Uncoated	AlTiN Coated	
Non-Ferrous Materials			
Aluminum	600-800	800-1000	.007-.0010
Brass/Bronze	300-400	400-500	.007-.0010
Copper/Copper Alloys	150-250	200-300	.005-.007
Plastics	800-1000	950-1200	.012-.016
Cast Iron			
Malleable	90-130	100-150	.004-.006
Ductile	75-100	90-120	.002-.004
Steels			
Low Carbon Steels	150-200	175-250	.006-.007
Medium Alloy Steels 200, 250, 300	75-100	100-125	.003-.005
High Strength Steels	50-75	75-90	.001-.002
Stainless Steels			
PH Series	90-110	100-120	.002-.004
Austenitic 200,302, 303, 304, 304(L), 316(L)	115-150	120-170	.003-.005
Martensitic 403,410,416,420,440	20-50	30-60	.001-.003
High Temp Alloys			
Nickel Base Inconel 601,625,718 Waspalloy, Hastelloy	20-30	25-35	.002-.0045
Cobalt Base Stellite, Haynes 25	25-35	30-40	.003-.005
Iron Base Incolloy 800-802 Haynes 556	30-40	35-45	.004-.006
Titanium	70-100	80-120	.006-.007

