4-Flute, High Performance, Variable Index Endmills, Square, Corner Radius & Ball End, 38 Degree Helix

- RedLine HP Variable 4-Flute tools are designed for fast metal removal. We control vibration and chatter through a unique dampening geometry and can handle faster speeds and feeds.
- Our HP Variable 4-flute tools can be ran 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 High Performance tools can be found on pages 43-46, 56.

HP Variable Index 4-Flute Tools Speeds & Feeds (Cont'd)

Material	Grades	Cut Type	Axial DOC	Radial DOC	Stub/Regular SFM AlCrNX	Long/X-Long SFM AlCrNX	Feed by Endmill Diameter (IPT) 1/8 (.1250)	1/4 (.2500)	3/8 (.3750)	1/2 (.5000)	5/8 (.6250)	3/4 (.7500)	1 (1.000)
P - Steels													
High Strength Tool Steel	A2, D2, P20, H11, H13, S2, 01	Slotting	1 x D	1 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - Rough	1.25 x D	.3 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - HEM	2 x D	.15 x D	300-360	210-250	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
High Strength Tool Steel > 32 HRC	Reduce SFM by 40%	N/A	N/A	N/A	180-216	126-150	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Low Carbon	A36, 12L14, 12L15, 1005, 1018, 1020, 1108-1119, 1213-1215, 1513-1518, 4012, 5015, 9310	Slotting	1 x D	1 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - Rough	1.25 x D	.5 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - HEM	2 x D	.15 x D	560-660	400-550	.0008-.0016	.0036-.0040	.0060-.0064	.0070-.0074	.0078-.0082	.0082-.0086	.0108-.0112
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Medium Carbon	1040-1095, 1140-1151, 1330-1345, 1520-1572, 4023-4063, 4120-4161, 4330-4340, 4620-4640, 8620-8660, 8740-8750, 6150, 51000, 52100	Slotting	1 x D	1 x D	525-630	380-520	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - Rough	1.25 x D	.5 x D	525-630	380-520	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - HEM	2 x D	.15 x D	525-630	380-520	.0008-.0016	.0036-.0040	.0060-.0064	.0070-.0074	.0078-.0082	.0082-.0086	.0108-.0112
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
M - Stainless Steels													
Austenitic	301-304L, 310, 316L, 321, 347	Slotting	1 x D	1 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - Rough	1.25 x D	.3 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - HEM	2 x D	.10 x D	300-360	210-250	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Austenitic > 32 HRC	Reduce SFM by 20%	N/A	N/A	N/A	240-288	168-200	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Martensitic	403, 410, 416, 420, 430, 431, 440	Slotting	1 x D	1 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - Rough	1.25 x D	.3 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - HEM	2 x D	.15 x D	300-360	210-250	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Precipitation Hardening	12/8, 15/5, 17/4, AM-350/355/363, PH13-8MO, PH14-8/MO	Slotting	1 x D	1 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - Rough	1.25 x D	.3 x D	300-360	210-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - HEM	1.5 x D	.10 x D	300-360	210-250	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Precipitation Hardening > 32 HRC	Reduce SFM by 20%	N/A	N/A	N/A	240-288	168-200	N/A	N/A	N/A	N/A	N/A	N/A	N/A

D = tool diameter. Reduce feed rates by 20% when using long length tools. Starting parameters shown. Speeds and Feeds listed are estimated and will vary by application.

HP Variable Index 4-Flute Tools Speeds & Feeds

Material	Grades	Cut Type	Axial DOC	Radial DOC	Stub/Regular SFM AlCrNX	Long/X-Long SFM AlCrNX	Feed by Endmill Diameter (IPT) 1/8 (.1250)	1/4 (.2500)	3/8 (.3750)	1/2 (.5000)	5/8 (.6250)	3/4 (.7500)	1 (1.000)
K - Cast Irons													
Ductile	A536, J434 60-40-18	Slotting	1 x D	1 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - Rough	1.25 x D	.5 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - HEM	2 x D	.15 x D	560-660	400-550	.0008-.0016	.0036-.0040	.0060-.0064	.0070-.0074	.0078-.0082	.0082-.0086	.0108-.0112
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Gray	A48, A436, A319 Class 20, G4000	Slotting	1 x D	1 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - Rough	1.25 x D	.5 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - HEM	2 x D	.15 x D	560-660	400-550	.0008-.0016	.0036-.0040	.0060-.0064	.0070-.0074	.0078-.0082	.0082-.0086	.0108-.0112
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Malleable	A220, A602, J158	Slotting	1 x D	1 x D	400-450	350-425	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - Rough	1.25 x D	.3 x D	400-450	350-425	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - HEM	2 x D	.15 x D	400-450	350-425	.0008-.0016	.0036-.0040	.0060-.0064	.0070-.0074	.0078-.0082	.0082-.0086	.0108-.0112
		Finish	N/A	N/A		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
N - Non-Ferrous													
Brass/Bronze	Aluminum Bronze, Low Silicon Bronze	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Composites	G-10, Fiber-glass, Graphite, Graphite Epoxy, Plastics	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper		Slotting	1 x D	1 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - Rough	1.25 x D	.3 x D	560-660	400-550	.0004-.0008	.0018-.0020	.0030-.0032	.0035-.0037	.0039-.0041	.0041-.0043	.0054-.0056
		Peripheral - HEM	2 x D	.15 x D	560-660	400-550	.0008-.0016	.0036-.0040	.0060-.0064	.0070-.0074	.0078-.0082	.0082-.0086	.0108-.0112
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Magnesium		Slotting	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
S - High Temp Alloys													
Cobalt Base	Stellite, HS-21, Haynes 25/188, X40, L605	Slotting	1 x D	1 x D	95-210	65-150	.0004-.0008	.0009-.0016	.0012-.0019	.0016-.0028	.0019-.0031	.0024-.0037	.0029-.0041
		Peripheral - Rough	1.25 x D	.25 x D	95-210	65-150	.0004-.0008	.0009-.0016	.0012-.0019	.0016-.0028	.0019-.0031	.0024-.0037	.0029-.0041
		Peripheral - HEM	1.5 x D	.10 x D	95-210	65-150	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cobalt Base > 32 HRC	Reduce SFM by 40%	N/A	N/A	N/A	95-210	39-90	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron Base	Incoloy 800-802, Multmet N-155, Timkin 16-25-6, Car-penter 22-b3	Slotting	1 x D	1 x D	95-210	65-150	.0004-.0008	.0009-.0016	.0012-.0019	.0016-.0028	.0019-.0031	.0024-.0037	.0029-.0041
		Peripheral - Rough	1.25 x D	.25 x D	95-210	65-150	.0004-.0008	.0009-.0016	.0012-.0019	.0016-.0028	.0019-.0031	.0024-.0037	.0029-.0041
		Peripheral - HEM	1.5 x D	.10 x D	95-210	65-150	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron Base > 32 HRC	Reduce SFM by 40%	N/A	N/A	N/A	95-210	39-90	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel Base	Inconel 625/718, Inco 700, 713C, 718, Monel 400-401, 404, K401, Rene, Rene 41 & 95 Hastelloy, Waspoloy, Udimet 500 & 700	Slotting	1 x D	1 x D	95-210	65-150	.0004-.0008	.0009-.0016	.0012-.0019	.0016-.0028	.0019-.0031	.0024-.0037	.0029-.0041
		Peripheral - Rough	1.25 x D	.25 x D	95-210	65-150	.0004-.0008	.0009-.0016	.0012-.0019	.0016-.0028	.0019-.0031	.0024-.0037	.0029-.0041
		Peripheral - HEM	1.5 x D	.10 x D	95-210	65-150	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel Base >32 HRC	Reduce SFM by 40%	N/A	N/A	N/A	95-210	39-90	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Titanium	Commercially Pure, 6Al-4V ASTM 1/2/3, 6Al-25N-4Zr-2Mo-Si, Ti-8Al-1Mo, Ti-8Al-4Mo	Slotting	1 x D	1 x D	240-375	150-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - Rough	1.25 x D	.3 x D	240-375	150-250	.0004-.0008	.0014-.0016	.0017-.0019	.0026-.0028	.0029-.0031	.0035-.0037	.0039-.0041
		Peripheral - HEM	1.5 x D	.10 x D	240-375	150-250	.0008-.0016	.0018-.0032	.0024-.0038	.0032-.0056	.0038-.0062	.0048-.0074	.0058-.0082
		Finish	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A