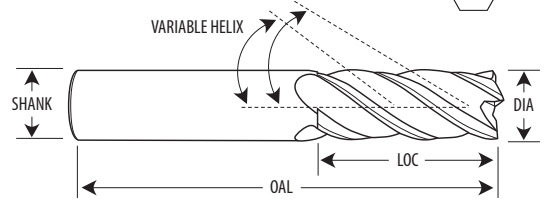
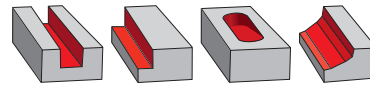
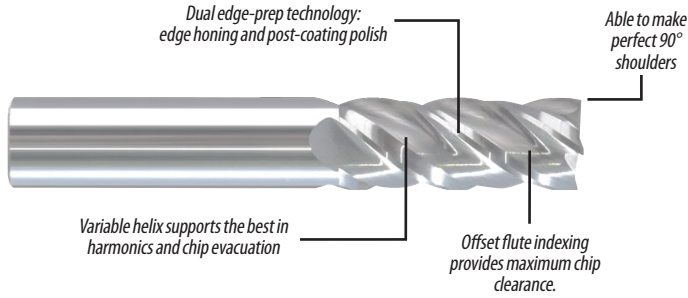


# FUSION



## FUSION ADVANCED HP TECHNOLOGY WITH CLASSIC GP AFFORDABILITY

DIAMETER TOLERANCE: +0.000 / -0.002"

SHANK TOLERANCE: +0.0000 / -0.0004"

DIA	DEC IN	LOC	SHANK	OAL	LENGTH	BRIGHT	ALTiCRN
1/8	0.1250	1/4	1/8	1-1/2	Stub	284-000058	284-000059
		1/2	1/8	1-1/2	Regular	284-000060	284-000061
		3/4	1/8	2-1/4	Long	284-000062	284-000063
		1	1/8	3	X/Long	284-000064	284-000065
3/16	0.1875	3/8	3/16	2	Stub	284-000088	284-000089
		5/8	3/16	2	Regular	284-000090	284-000091
		3/4	3/16	2-1/2	Long	284-000092	284-000093
		1-1/8	3/16	3	X/Long	284-000094	284-000095
1/4	0.2500	1/2	1/4	2-1/2	Stub	284-000118	284-000119
		3/4	1/4	2-1/2	Regular	284-000120	284-000121
		1-1/8	1/4	3	Long	284-000122	284-000123
		1-1/2	1/4	4	X/Long	284-000124	284-000125
5/16	0.3125	1/2	5/16	2-1/2	Stub	284-000148	284-000149
		13/16	5/16	2-1/2	Regular	284-000150	284-000151
		1-1/8	5/16	3	Long	284-000152	284-000153
		1-5/8	5/16	4	X/Long	284-000154	284-000155
3/8	0.3750	5/8	3/8	2-1/2	Stub	284-000178	284-000179
		1	3/8	2-1/2	Regular	284-000180	284-000181
		1-1/8	3/8	3	Long	284-000182	284-000183
		1-3/4	3/8	4	X/Long	284-000184	284-000185
7/16	0.4375	1	7/16	2-3/4	Regular	284-000210	284-000211
		2	7/16	4	Long	284-000212	284-000213
		3	7/16	6	X/Long	284-000214	284-000215
		5/8	1/2	3	Stub	284-000238	284-000239
1/2	0.5000	1	1/2	3	Regular	284-000240	284-000241
		1-1/4	1/2	3	Regular	284-000242	284-000243
		1-1/2	1/2	4	Medium	284-000244	284-000245
		2	1/2	4	Long	284-000246	284-000247
		3	1/2	6	X/Long	284-000248	284-000249
5/8	0.6250	3/4	5/8	3-1/2	Stub	284-000268	284-000269
		1-1/4	5/8	3-1/2	Regular	284-000270	284-000271
		2-1/4	5/8	5	Long	284-000272	284-000273
		3	5/8	6	X/Long	284-000274	284-000275
3/4	0.7500	1	3/4	4	Stub	284-000298	284-000299
		1-1/2	3/4	4	Regular	284-000300	284-000301
		2-1/4	3/4	5	Long	284-000302	284-000303
		3	3/4	6	X/Long	284-000304	284-000305
1	1.0000	4	3/4	7	XX/Long	284-000306	284-000307
		1-1/2	1	4	Regular	284-000330	284-000331
		2-1/4	1	5	Long	284-000332	284-000333
		3	1	6	X/Long	284-000334	284-000335
		4	1	7	XX/Long	284-000336	284-000337

MILLING RECOMMENDATIONS



PROFILING		Workpiece Material Group	Hardness	Surface Feet Per Minute (SFM)					Radial Depth of Cut (RDOC)							Inches Per Tooth (IPT)						
				SFM based on RDOC					IPT* (BASELINE)													
				Cutting Diameter Engaged					Cutting Diameter													
			5%	10%	20%	30%	50%	1/8 <sup>†</sup>	3/16 <sup>†</sup>	1/4 <sup>†</sup>	5/16	3/8	1/2	5/8	3/4	1						
Steels	Free Machining & Low Carbon: 10XX, 11XX, 12XX 12LXX, ASTM A27 ASTM A36	≤ 28 Rc	1050	700	385	375	350	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
	Medium Carbon, High Carbon Steels, Alloy Steels & Easy to Machine Tool: 13XX, 41XX, 43XX 51XX, 86XX, 93XX	28 - 38 Rc	630	420	320	250	210	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
Tool & Die Steels	A2, H13, L6, P20, S7	28 - 44 Rc	525	350	300	275	250	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
Stainless Steel	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	650	600	550	500	450	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
	Moderately Difficult to Machine, Nitronic 50, Nitronic 60, 301, 303 304, 304L Incoloy 27-7MO, 316 316L, 321, 347	≤ 28 Rc	525	400	350	300	250	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
Super Alloys	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	525	400	350	300	250	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	265	200	175	150	100	0.00048	0.00065	0.00096	0.0017	0.0019	0.0028	0.0032	0.0038	0.0054						
Hardened Materials	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	230	200	175	150	125	0.00048	0.00065	0.00096	0.0017	0.0019	0.0028	0.0032	0.0038	0.0054						
	Gray: SAE J431, ASTM A48	45-55 Rc	250	240	230	210	200	0.00360	0.00432	0.00504	0.0022	0.0025	0.0036	0.0043	0.0050	0.0072						
Cast-Iron	Ductile & Malleable: ASTM A536, ASTM 897, ASTM A47, ASTM A220 ASTM A602	≤ 240 HB	425	400	375	350	300	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	> 240 HB	320	300	250	225	200	0.00065	0.00097	0.00120	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						
Non-Ferrous			1000	960	920	880	840	0.00048	0.00065	0.00096	0.0032	0.0038	0.0054	0.0065	0.0076	0.0108						

*CHIP THINNING Adjustments	
RDOC	Increase IPT
50%	None
30%	1.1 x
25%	1.2 x
20%	1.3 x
15%	1.4 x
10%	1.8 x
7%	2.0 x
5%	2.3 x
3%	3.0 x
2%	3.5 x
1%	5.0 x

†1/4" AND SMALLER DIAMETERS: Use caution when Profiling more than 50% or Slotting more than 25%



SLOTING		Workpiece Material Group	Hardness	Surface Feet Per Minute (SFM)			Radial Depth of Cut (RDOC)							Inches Per Tooth (IPT)						
				SFM			IPT* (BASELINE)													
				Cutting Diameter Engaged			Cutting Diameter													
			25%	50%	100%	1/8 <sup>†</sup>	3/16 <sup>†</sup>	1/4 <sup>†</sup>	5/16	3/8	1/2	5/8	3/4	1						
Steels	Free Machining & Low Carbon: 10XX, 11XX, 12XX 12LXX, ASTM A27 ASTM A36	≤ 28 Rc	462	444	420	0.00060	0.00084	0.00120	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
	Medium Carbon, High Carbon Steels, Alloy Steels & Easy to Machine Tool: 13XX, 41XX, 43XX 51XX, 86XX, 93XX	28 - 38 Rc	294	276	2652	0.00048	0.00084	0.00108	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
Tool & Die Steels	A2, H13, L6, P20, S7	28 - 44 Rc	252	234	210	0.00048	0.00072	0.00096	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
Stainless Steel	Easy to Machine, 430F, 301, 303, 410, 416 Annealed, 420F, 430, 430F	≤ 28 Rc	462	444	420	0.00060	0.00084	0.00120	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
	Moderately Difficult to Machine, Nitronic 50, Nitronic 60, 301, 303 304, 304L Incoloy 27-7MO, 316 316L, 321, 347	≤ 28 Rc	294	252	210	0.00048	0.00084	0.00108	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
Super Alloys	Difficult to Machine, 302B, 304B, 309, 310, 316, 316B, 316L, 316Ti, 317, 317L, 321, PH13-8Mo, Nitronics	> 28 Rc	252	234	210	0.00036	0.00048	0.00060	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
	High Temp, Nimonic, Inconel, Monel, Hastelloy	≤ 42 Rc	150	126	108	0.00036	0.00048	0.00060	0.0010	0.0012	0.0016	0.0019	0.0020	0.0031						
Hardened Materials	Titanium: Ti 3Al-2.5V, Ti 6Al-4V Ti 10V-2Fe-3Al	≤ 42 Rc	120	108	96	0.00036	0.00048	0.00060	0.0010	0.0012	0.0016	0.0019	0.0020	0.0031						
	Gray: SAE J431, ASTM A48	34-45 Rc	294	276	252	0.00024	0.00036	0.00048	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
Cast-Iron	Ductile & Malleable: ASTM A536, ASTM 897, ASTM A47, ASTM A220 ASTM A602	≤ 240 HB	540	480	420	0.00060	0.00084	0.00120	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
	Aluminum, Brass, Bronze, Copper, Plastics, Graphite	> 240 HB	360	300	270	0.00048	0.00084	0.00108	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						
Non-Ferrous			900	720	540	0.00132	0.00204	0.00264	0.0019	0.0023	0.0030	0.0037	0.0046	0.0060						

