Speeds and Feeds

1) Select your material in the ISO colored chart.
2) Start with the recommended cutting speed, v_c (ft/min) and feed per tooth, f_z (in). Adjust the cutting speed and/or feed based on your cutting conditions. Calculated RPM may exceed the maximum RPM of the cutter body. **WARNING: Never exceed the maximum RPM rating of the cutter body.**

HAPN - Haas Parallelogram Positive Negative

Material				Recommended Cutting Speed						Recommended Feed Per Tooth		
				Insert Grades						Application		
				HP30		HMP20		HN25				
Group	Description	Condition	Hardness (HB)	a_e / D	a_e / D	a_e / D	a_e / D	a_e / D	a_e / D	Finishing	Medium Cut	Roughing
				1/1 | 3/4	1/5	1/1 | 3/4	1/5	1/1 | 3/4	1/5			
P Steel	Unalloyed Steel	0.15% C Annealed	125	804	935	722	837			0.005	0.007	0.009
		0.45% C Annealed	190	689	804	623	722					
		0.45% C Tempered	250	656	755	591	673					
		0.75% C Annealed	270	574	656	509	591					
		0.75% C Tempered	300	525	623	476	558					
	Low-alloyed Steel	Annealed	180	689	804	623	722			0.004	0.006	0.008
		Tempered	275	574	656	509	591					
		Tempered	300	525	623	476	558					
		Tempered	350	443	525	410	476					
	High-Alloyed Steel and Tool Steel	Annealed	200	410	476	361	427			0.004	0.006	0.008
		Hardened and Tempered	325	295	328	262	295					
M Stainless Steel	Stainless Steel	Ferritic/Martensitic	200			361	427			0.003	0.005	0.006
		Martensitic	240			312	361					
		Austenitic	180			394	459					
		Austenitic/Ferritic	230			312	361					
N Non-Ferrous	Aluminum Alloys Wrought	Cannot be Hardened	60					3953	4560	0.004	0.006	0.008
		Hardened	100					3215	3740			
	Cast Aluminum Alloys	≤ 12% Si, not Hardened	75					1427	1640	0.004	0.006	0.008
		≤ 12% Si, Hardened	90					1148	1329			
		> 12% Si, not Hardened	130					591	673			
	Copper and Copper Alloys (Bronze/Brass)	Machining Steel, PB> 1%	110					459	525	0.004	0.005	0.007
		CuZn, CuSnZn	90					558	656			
		CuSn, Pb-free Copper, Electrolytic Copper	100					1017	1181			

Speeds and Feeds

Feed Rate, Per Revolution (in/min)
$v_f = f_n \cdot n$

Feed Rate, Per Tooth (in/min)
$v_f = f_z \cdot n \cdot Z$

Feed Per Revolution (in/rev)
$f_n = \frac{v_f}{n}$

Feed Per Tooth (in)
$f_z = \frac{v_f}{n \cdot Z}$

Cutting Speed (ft/min)
$v_c = \frac{\pi \cdot D_{tool} \cdot n}{12}$

Spindle Speed (rev/min)
$n = \frac{v_c \cdot 12}{\pi \cdot D_{tool}}$

Material Removal Rate (in^3/min)
$MMR = a_p \cdot a_e \cdot v_f$

Inch

Symbol	Definition	Unit
v_f	Feed rate	*in/min*
f_n	Feed per revolution	*in/rev*
f_z	Feed per tooth	*in*
v_c	Cutting speed	*ft/min (SFM)*
n	Spindle speed	*rev/min (RPM)*
D_{tool}	Tool cutting diameter	*in*
MRR	Material removal rate	*(in^3/min)*
a_e	Radial depth of cut	*in*
a_p	Axial depth of cut	*in*
Z	Number of teeth/flutes	