Speeds and Feeds

1) Select your material in the ISO colored chart.
2) Start with the recommended cutting speed, v_c (m/min) and feed per tooth, f_z (mm). 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	245	285	220	255			0.12	0.17	0.23
		0.45% C Annealed	190	210	245	190	220					
		0.45% C Tempered	250	200	230	180	205					
		0.75% C Annealed	270	175	200	155	180					
		0.75% C Tempered	300	160	190	145	170					
	Low-alloyed Steel	Annealed	180	210	245	190	220			0.11	0.16	0.21
		Tempered	275	175	200	155	180					
		Tempered	300	160	190	145	170					
		Tempered	350	135	160	125	145					
	High-Alloyed Steel and Tool Steel	Annealed	200	125	145	110	130			0.1	0.15	0.2
		Hardened and Tempered	325	90	100	80	90					
M Stainless Steel	Stainless Steel	Ferritic/Martensitic	200			110	130			0.08	0.12	0.16
		Martensitic	240			95	110					
		Austenitic	180			120	140					
		Austenitic/Ferritic	230			95	110					
N Non-Ferrous	Aluminum Alloys Wrought	Cannot be Hardened	60					1205	1390	0.1	0.15	0.2
		Hardened	100					980	1140			
	Cast Aluminum Alloys	≤ 12% Si, not Hardened	75					435	500	0.1	0.15	0.2
		≤ 12% Si, Hardened	90					350	405			
		> 12% Si, not Hardened	130					180	205			
	Copper and Copper Alloys (Bronze/Brass)	Machining Steel, PB> 1%	110					140	160	0.09	0.13	0.18
		CuZn, CuSnZn	90					170	200			
		CuSn, Pb-free Copper, Electrolytic Copper	100					310	360			

Speeds and Feeds

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

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

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

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

Cutting Speed (m/min)
$v_c = \frac{\pi \cdot D_{tool} \cdot n}{1000}$

Spindle Speed (rev/min)
$n = \frac{v_c \cdot 1000}{\pi \cdot D_{tool}}$

Material Removal Rate (cm^3/min)
$MMR = \frac{a_p \cdot a_e \cdot v_f}{1000}$

Metric

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