

# 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 rate,  $v_f$  (mm/min). Adjust the cutting speed and/or feed rate 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.**

**HRNP – Haas Rectangle Negative Positive**

Material				Recommended Cutting Speed										Recommended Feed Rate			
Group	Description	Condition	Hardness (HB)	Insert Grades										Application			
				HP30		HMP20		HMP35		HK25		HN25		Finishing	Medium Cut	Roughing	
				$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$	$a_e / D$				
				1/1   3/4	1/5	1/1   3/4	1/5	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	260	300	245	285	260	300						0.0030		
		0.45% C Annealed	190	225	255	210	245	225	255								
		0.45% C Tempered	250	210	240	200	230	210	240								
		0.75% C Annealed	270	185	210	175	200	185	210								
		0.75% C Tempered	300	170	195	160	190	170	195								
	Low-alloyed Steel	Annealed	180	225	255	210	245	225	255						0.0028		
		Tempered	275	185	210	175	200	185	210								
		Tempered	300	170	195	160	190	170	195								
		Tempered	350	145	165	135	160	145	165								
	High-Alloyed Steel and Tool Steel	Annealed	200	130	150	125	145	130	150						0.0027		
Hardened and Tempered		325	95	105	90	100	95	105									
M Stainless Steel	Stainless Steel	Ferritic/Martensitic	200			125	145	130	150						0.0021		
		Martensitic	240			105	120	110	130								
		Austenitic	180			130	155	140	160								
		Austenitic/Ferritic	240			105	120	110	130								
K Cast Iron	Grey Cast Iron	Perlitic/Ferritic	180			270	315				320	370			0.0033		
		Perlitic/Martensitic	260			160	190				190	220					
	Ductile Cast Iron	Ferritic	160			185	215				220	255			0.0030		
		Perlitic	250			125	145				145	170					
	Malleable Cast Iron	Ferritic	130			225	260				265	305			0.0030		
Perlitic	230			150	175				175	205							
N Non-Ferrous	Aluminum Alloys Wrought	Cannot be Hardened	60										1504	1735	0.0026		
		Hardened	100										1225	1420			
	Cast Aluminum Alloys	≤ 12% Si, not Hardened	75											540	620	0.0026	
		≤ 12% Si, Hardened	90											435	505		
		> 12% Si, not Hardened	130											220	255		
	Copper and Copper Alloys (bronze/brass)	Machining Steel, PB> 1%	110											170	195	0.0023	
		CuZn, CuSnZn	90											210	245		
CuSn, Pb-free Copper, Electrolytic Copper		100											385	445			



# 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 (mm <sup>3</sup> /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
$MMR$	Material removal rate	(mm <sup>3</sup> /min)
$a_e$	Radial depth of cut	mm
$a_p$	Axial depth of cut	mm
$Z$	Number of teeth/flutes	