

Speeds and Feeds



- 1) Select your material in the ISO colored chart with respect to material description.
- 2) Start with a middle/average value for cutting speed, V_c (ft/min) and feed, f_n (in/rev). Adjust the cutting speed and/or feed based on your cutting conditions.

Material					Recommended Cutting Values														
Group		Material Description	HB	HRC	SFM (ft/min)	Drill Diameter			SFM (ft/min)	Drill Diameter									
ISO	VDI 3323					METRIC	1.0	2.0		METRIC	3.0	-	4.0	-	5.0	6.0	-	-	8.0
						FRACTIONAL	-	-		FRACTIONAL	-	1/8	-	3/16	-	-	1/4	5/16	-
						DECIMAL	.0394	.0787		DECIMAL	.1181	.1250	.1575	.1875	.1969	.2362	.2500	.3125	.3150
P	2	Non-alloy steel	190	13	⊙	230	RPM	22,280	11,140	329	RPM	10,610	7,960	6,370	5,310	3,980			
							FEED	.0012- .0020	.0020- .0028		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094			
	3		250	25	⊙	230	RPM	22,280	11,140	329	RPM	10,610	7,960	6,370	5,310	3,980			
								FEED	.0012- .0020	.0020- .0028		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094		
	4	270	28	⊙	230	RPM	22,280	11,140	329	RPM	10,610	7,960	6,370	5,310	3,980				
							FEED	.0012- .0020	.0020- .0028		FEED	.0016- .0039	.0028- .0051	.0039- .0063	.0047- .0071	.0055- .0079			
	5	300	32	○	197	RPM	19,100	9,550	263	RPM	8,490	6,370	5,090	4,240	3,180				
							FEED	.0012- .0020	.0020- .0028		FEED	.0016- .0039	.0028- .0051	.0039- .0063	.0047- .0071	.0055- .0079			
	6	180	10	⊙	230	RPM	22,280	11,140	329	RPM	10,610	7,960	6,370	5,310	3,980				
							FEED	.0012- .0020	.0020- .0028		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094			
	7	275	29	⊙	197	RPM	19,100	9,550	263	RPM	8,490	6,370	5,090	4,240	3,180				
						FEED	.0012- .0020	.0020- .0028		FEED	.0024- .0047	.0031- .0055	.0039- .0079	.0047- .0094	.0063- .011				
8	300	32	○	197	RPM	19,100	9,550	263	RPM	8,490	6,370	5,090	4,240	3,180					
						FEED	.0008- .0016	.0012- .0020		FEED	.0016- .0039	.0028- .0051	.0039- .0063	.0047- .0071	.0055- .0079				
9	350	38	○	99	RPM	9,550	4,770	132	RPM	4,240	3,180	2,550	2,120	1,590					
						FEED	.0008- .0016	.0012- .0020		FEED	.0012- .0031	.0020- .0043	.0031- .0055	.0039- .0063	.0047- .0071				
10	200	15	⊙	165	RPM	15,920	7,960	230	RPM	7,430	5,570	4,460	3,710	2,790					
						FEED	.0012- .0020	.0020- .0028		FEED	.0016- .0039	.0028- .0051	.0039- .0063	.0047- .0071	.0055- .0079				
11	325	35	○	99	RPM	9,550	4,770	132	RPM	4,240	3,180	2,550	2,120	1,590					
						FEED	.0008- .0016	.0012- .0020		FEED	.0012- .0031	.002- .0043	.0031- .0055	.0039- .0063	.0047- .0071				
M	12	Stainless steel	200	15	○	165	RPM	15,920	7,960	230	RPM	7,430	5,570	4,460	3,710	2,790			
							FEED	.0012- .0020	.0020- .0028		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094			
13	240	23	○	115	RPM	11,140	5,570	148	RPM	4,770	3,580	2,860	2,390	1,790					
						FEED	.0008- .0016	.0012- .0020		FEED	.0016- .0039	.0028- .0051	.0039- .0063	.0047- .0071	.0055- .0079				
K	15	Grey cast iron	180	10	⊙	230	RPM	22,280	11,140	329	RPM	10,610	7,960	6,370	5,310	3,980			
							FEED	.0016- .0024	.0016- .0024		FEED	.0031- .0055	.0047- .0071	.0059- .0087	.0079- .0102	.0087- .0110			
	16	260	26	○	214	RPM	20,690	10,350	263	RPM	8,490	6,370	5,090	4,240	3,180				
							FEED	.0016- .0024	.0016- .0024		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094			
	17	Nodular cast iron	160	3	⊙	230	RPM	22,280	11,140	329	RPM	10,610	7,960	6,370	5,310	3,980			
							FEED	.0016- .0024	.0016- .0024		FEED	.0031- .0055	.0047- .0071	.0059- .0087	.0079- .0102	.0087- .0110			
	18	250	25	○	165	RPM	15,920	7,960	230	RPM	7,430	5,570	4,460	3,710	2,790				
							FEED	.0016- .0024	.0016- .0024		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094			
	19	Malleable cast iron	130		⊙	197	RPM	19,100	9,550	263	RPM	8,490	6,370	5,090	4,240	3,180			
								FEED	.0016- .0024	.0016- .0024		FEED	.0031- .0055	.0047- .0071	.0059- .0087	.0079- .0102	.0087- .0110		
20	230	21	○	165	RPM	15,920	7,960	230	RPM	7,430	5,570	4,460	3,710	2,790					
						FEED	.0012- .0020	.0020- .0028		FEED	.0024- .0047	.0031- .0055	.0055- .0079	.0063- .0087	.0071- .0094				



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Material					Recommended Cutting Values												
Group		Material Description	HB	HRC	SFM (ft/min)	Drill Diameter											
ISO	VDI 3323					METRIC	-	10.0	12.0	-	14.0	-	-	16.0	18.0	-	20.0
						FRACTIONAL	3/8	-	-	1/2	-	9/16	5/8	-	-	3/4	-
		DECIMAL	.3750	.3937	.4724	.5000	.5512	.5625	.6250	.6299	.7087	.7500	.7874				
P	2	Non-alloy steel	190	13	⊙	329	RPM	3,180	2,650	2,510	2,270	1,990	1,770	1,680	1,590		
							FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157		
	3		250	25	⊙	329	RPM	3,180	2,650	2,510	2,270	1,990	1,770	1,680	1,590		
								FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157	
	4	270	28	⊙	329	RPM	3,180	2,650	2,510	2,270	1,990	1,770	1,680	1,590			
							FEED	.0059-.0091	.0067-.0098	.0067-.0098	.0071-.0102	.0075-.0106	.0079-.0118	.0079-.0118	.0087-.0126		
	5	300	32	○	263	RPM	2,550	2,120	2,010	1,820	1,590	1,410	1,340	1,270			
							FEED	.0059-.0091	.0067-.0098	.0067-.0098	.0071-.0102	.0075-.0106	.0079-.0118	.0079-.0118	.0087-.0126		
	6	Low alloy steel	180	10	⊙	329	RPM	3,180	2,650	2,510	2,270	1,990	1,770	1,680	1,590		
							FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157		
	7		275	29	⊙	263	RPM	2,550	2,120	2,010	1,820	1,590	1,410	1,340	1,270		
							FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157		
8	300	32	○	263	RPM	2,550	2,120	2,010	1,820	1,590	1,410	1,340	1,270				
						FEED	.0059-.0091	.0067-.0098	.0067-.0098	.0071-.0102	.0075-.0106	.0079-.0118	.0079-.0118	.0087-.0126			
9	350	38	○	132	RPM	1,270	1,060	1,010	910	800	710	670	640				
						FEED	.0051-.0075	.0055-.0079	.0055-.0079	.0059-.0083	.0063-.0087	.0067-.0098	.0067-.0098	.0071-.0110			
10	High alloyed steel, and tool steel	200	15	⊙	230	RPM	2,230	1,860	1,760	1,590	1,390	1,240	1,170	1,110			
						FEED	.0059-.0091	.0067-.0098	.0067-.0098	.0071-.0102	.0075-.0106	.0079-.0118	.0079-.0118	.0087-.0126			
11	325	35	○	132	RPM	1,270	1,060	1,010	910	800	710	670	640				
						FEED	.0051-.0075	.0055-.0079	.0055-.0079	.0059-.0083	.0063-.0087	.0067-.0098	.0067-.0098	.0071-.0110			
M	12	Stainless steel	200	15	○	230	RPM	2,230	1,860	1,760	1,590	1,390	1,240	1,170	1,110		
							FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157		
13	240	23	○	148	RPM	1,430	1,190	1,130	1,020	900	800	750	720				
						FEED	.0059-.0091	.0067-.0098	.0067-.0098	.0071-.0102	.0075-.0106	.0079-.0118	.0079-.0118	.0087-.0126			
K	15	Grey cast iron	180	10	⊙	329	RPM	3,180	2,650	2,510	2,270	1,990	1,770	1,680	1,590		
							FEED	.0098-.0130	.0106-.0138	.0106-.0138	.0114-.0146	.0122-.0154	.0126-.0165	.0126-.0165	.0134-.0173		
	16	260	26	○	263	RPM	2,550	2,120	2,010	1,820	1,590	1,410	1,340	1,270			
						FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157			
	17	Nodular cast iron	160	3	⊙	329	RPM	3,180	2,650	2,510	2,270	1,990	1,770	1,680	1,590		
							FEED	.0098-.0130	.0106-.0138	.0106-.0138	.0114-.0146	.0122-.0154	.0126-.0165	.0126-.0165	.0134-.0173		
	18	250	25	○	230	RPM	2,230	1,860	1,760	1,590	1,390	1,240	1,170	1,110			
						FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157			
	19	Malleable cast iron	130		⊙	263	RPM	2,550	2,120	2,010	1,820	1,590	1,410	1,340	1,270		
							FEED	.0098-.0130	.0106-.0138	.0106-.0138	.0114-.0146	.0122-.0154	.0126-.0165	.0126-.0165	.0134-.0173		
20	230	21	○	230	RPM	2,230	1,860	1,760	1,590	1,390	1,240	1,170	1,110				
						FEED	.0075-.0106	.0083-.0114	.0083-.0114	.0091-.0122	.0098-.0130	.0110-.0150	.0110-.0150	.0118-.0157			



Speeds and Feeds



**Penetration Rate
(in/min)**

$$v_f = f_n \cdot n$$

**Feed Per Revolution
(in/rev)**

$$f_n = \frac{v_f}{n}$$

**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
(in³/min)**

$$MRR = D_{tool} \cdot f_n \cdot v_c \cdot 3$$

Inch

Symbol	Definition	Unit
v_f	Penetration rate	<i>in/min</i>
f_n	Feed per revolution	<i>in/rev</i>
v_c	Cutting speed	<i>ft/min (SFM)</i>
n	Spindle speed	<i>rev/min (RPM)</i>
D_{tool}	Tool cutting diameter	<i>in</i>
MRR	Material removal rate	<i>(in³/min)</i>