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	◎	263	RPM	25,460	12,730	362	RPM	11,670		8,750	7,000		5,840		4,380	
							FEED	.0012 - .0020	.0020 - .0028		FEED	.0024 - .0047		.0031 - .0055	.0055 - .0079		.0063 - .0087		.0071 - .0094	
	3		250	25	◎	263	RPM	25,460	12,730	362	RPM	11,670		8,750	7,000		5,840		4,380	
							FEED	.0012 - .0020	.0020 - .0028		FEED	.0024 - .0047		.0031 - .0055	.0055 - .0079		.0063 - .0087		.0071 - .0094	
	4		270	28	◎	263	RPM	25,460	12,730	362	RPM	11,670		8,750	7,000		5,840		4,380	
							FEED	.0012 - .0020	.0020 - .0028		FEED	.0016 - .0039		.0028 - .0051	.0039 - .0063		.0047 - .0071		.0055 - .0079	
	5		300	32	○	230	RPM	22,280	11,140	296	RPM	9,550		7,160	5,730		4,770		3,580	
							FEED	.0012 - .0020	.0020 - .0028		FEED	.0016 - .0039		.0028 - .0051	.0039 - .0063		.0047 - .0071		.0055 - .0079	
	6	Low alloy steel	180	10	◎	263	RPM	25,460	12,730	362	RPM	11,670		8,750	7,000		5,840		4,380	
							FEED	.0012 - .0020	.0020 - .0028		FEED	.0024 - .0047		.0031 - .0055	.0055 - .0079		.0063 - .0087		.0071 - .0094	
	7		275	29	◎	230	RPM	22,280	11,140	296	RPM	9,550		7,160	5,730		4,770		3,580	
							FEED	.0012 - .0020	.0020 - .0028		FEED	.0024 - .0047		.0031 - .0055	.0039 - .0079		.0047 - .0094		.0063 - .0110	
	8		300	32	○	230	RPM	22,280	11,140	296	RPM	9,550		7,160	5,730		4,770		3,580	
							FEED	.0008 - .0016	.0012 - .0020		FEED	.0016 - .0039		.0028 - .0051	.0039 - .0063		.0047 - .0071		.0055 - .0079	
	9		350	38	○	132	RPM	12,730	6,370	165	RPM	5,310		3,980	3,180		2,650		1,990	
							FEED	.0008 - .0016	.0012 - .0020		FEED	.0012 - .0031		.0020 - .0043	.0031 - .0055		.0039 - .0063		.0047 - .0071	
	10	High alloyed steel, and tool steel	200	15	◎	198	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	
	11		325	35	○	132	RPM	12,730	6,370	148	RPM	4,770		3,580	2,860		2,390		1,790	
							FEED	.0008 - .0016	.0012 - .0020		FEED	.0012 - .0031		.0020 - .0043	.0031 - .0055		.0039 - .0063		.0047 - .0071	
M	12	Stainless steel	200	15	○	198	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	.0055 - .0079		.0063 - .0087		.0071 - .0094	
	13		240	23	○	148	RPM	14,320	7,160	181	RPM	5,840		4,380	3,500		2,920		2,190	
							FEED	.0008 - .0016	.0012 - .0020		FEED	.0016 - .0039		.0028 - .0051	.0039 - .0063		.0047 - .0071		.0055 - .0079	
K	15	Grey cast iron	180	10	◎	263	RPM	25,460	12,730	362	RPM	11,670		8,750	7,000		5,840		4,380	
							FEED	.0016 - .0024	.0016 - .0024		FEED	.0031 - .0055		.0047 - .0071	.0059 - .0087		.0079 - .0102		.0087 - .0110	
	16		260	26	○	247	RPM	23,870	11,940	313	RPM	10,080		7,560	6,050		5,040		3,780	
							FEED	.0016 - .0024	.0016 - .0024		FEED	.0024 - .0047		.0031 - .0055	.0055 - .0079		.0063 - .0087		.0071 - .0094	
	17	Nodular cast iron	160	3	◎	296	RPM	28,650	14,320	395	RPM	12,730		9,550	7,640		6,370		4,770	
							FEED	.0016 - .0024	.0016 - .0024		FEED	.0031 - .0055		.0047 - .0071	.0059 - .0087		.0079 - .0102		.0087 - .0110	
	18		250	25	○	198	RPM	19,100	9,550	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	
	19	Malleable cast iron	130		◎	230	RPM	22,280	11,140	296	RPM	9,550		7,160	5,730		4,770		3,580	
							FEED	.0016 - .0024	.0016 - .0024		FEED	.0031 - .0055		.0047 - .0071	.0059 - .0087		.0079 - .0102		.0087 - .0110	
	20		230	21	○	198	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	.0055 - .0079		.0063 - .0087		.0071 - .0094	
H	38	Hardened steel	550	55	○	82	RPM	7,960	3,980	98	RPM	3,180		2,390	1,910		1,590		1,190	
							FEED	.0004- .0008	.0004- .0012		FEED	.0004- .0012		.0004- .0016	.0008- .0020		.0012- .0024		.0012- .0024	

Speeds and Feeds

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Material						Recommended Cutting Values										
Group		Material Description	HB	HRC		SFM (ft/min)	Drill Diameter									
							METRIC	-	10.0	12.0	-	14.0	-	-	16.0	18.0	-	20.0
ISO	VDI 3323						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	◎	362	RPM	3,500		2,920	2,770	2,500		2,190		1,950	1,840	1,750
							FEED	.0075 - .0106		.0083 - .0114	.0083 - .0114	.0091 - .0122		.0098 - .0130		.0110 - .0150	.0110 - .0150	.0118 - .0157
	3		250	25	◎	362	RPM	3,500		2,920	2,770	2,500		2,190		1,950	1,840	1,750
							FEED	.0075 - .0106		.0083 - .0114	.0083 - .0114	.0091 - .0122		.0098 - .0130		.0110 - .0150	.0110 - .0150	.0118 - .0157
	4		270	28	◎	362	RPM	3,500		2,920	2,770	2,500		2,190		1,950	1,840	1,750
							FEED	.0059 - .0091		.0067 - .0098	.0067 - .0098	.0071 - .0102		.0075 - .0106		.0079 - .0118	.0079 - .0118	.0087 - .0126
	5		300	32	○	296	RPM	2,860		2,390	2,260	2,050		1,790		1,590	1,510	1,430
							FEED	.0059 - .0091		.0067 - .0098	.0067 - .0098	.0071 - .0102		.0075 - .0106		.0079 - .0118	.0079 - .0118	.0087 - .0126
	6	Low alloy steel	180	10	◎	362	RPM	3,500		2,920	2,770	2,500		2,190		1,950	1,840	1,750
							FEED	.0075 - .0106		.0083 - .0114	.0083 - .0114	.0091 - .0122		.0098 - .0130		.0110 - .0150	.0110 - .0150	.0118 - .0157
	7		275	29	◎	296	RPM	2,860		2,390	2,260	2,050		1,790		1,590	1,510	1,430
							FEED	.0075 - .0106		.0083 - .0114	.0083 - .0114	.0091 - .0122		.0098 - .0130		.0110 - .0150	.0110 - .0150	.0118 - .0157
	8		300	32	○	296	RPM	2,860		2,390	2,260	2,050		1,790		1,590	1,510	1,430
							FEED	.0059 - .0091		.0067 - .0098	.0067 - .0098	.0071 - .0102		.0075 - .0106		.0079 - .0118	.0079 - .0118	.0087 - .0126
	9		350	38	○	165	RPM	1,590		1,330	1,260	1,140		990		880	840	800
							FEED	.0051 - .0075		.0055 - .0079	.0055 - .0079	.0059 - .0083		.0063 - .0087		.0067 - .0098	.0063 - .0102	.0071 - .0110
	10	High alloyed steel, and tool steel	200	15	◎	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
	11		325	35	○	148	RPM	1,430		1,190	1,130	1,020		900		800	750	720
							FEED	.0051 - .0075		.0055 - .0079	.0055 - .0079	.0059 - .0083		.0063 - .0087		.0067 - .0098	.0063 - .0102	.0071 - .0110
M	12	Stainless steel	200	15	○	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
	13		240	23	○	181	RPM	1,750		1,460	1,380	1,250		1,090		970	920	880
							FEED	.0059 - .0091		.0067 - .0098	.0067 - .0098	.0071 - .0102		.0075 - .0106		.0079 - .0118	.0079 - .0118	.0087 - .0126
K	15	Grey cast iron	180	10	◎	362	RPM	3,500		2,920	2,770	2,500		2,190		1,950	1,840	1,750
							FEED	.0098 - .0130		.0106 - .0138	.0106 - .0138	.0114 - .0146		.0122 - .0154		.0126 - .0165	.0126 - .0165	.0134 - .0173
	16		260	26	○	313	RPM	3,020		2,520	2,390	2,160		1,890		1,680	1,590	1,510
							FEED	.0075 - .0106		.0083 - .0114	.0083 - .0114	.0091 - .0122		.0098 - .0130		.0110 - .0150	.0110 - .0150	.0118 - .0157
	17	Nodular cast iron	160	3	◎	395	RPM	3,820		3,180	3,020	2,730		2,390		2,120	2,010	1,910
							FEED	.0098 - .0130		.0106 - .0138	.0106 - .0138	.0114 - .0146		.0122 - .0154		.0126 - .0165	.0126 - .0165	.0134 - .0173
	18		250	25	○	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
	19	Malleable cast iron	130		◎	296	RPM	2,860		2,390	2,260	2,050		1,790		1,590	1,510	1,430
							FEED	.0098 - .0130		.0106 - .0138	.0106 - .0138	.0114 - .0146		.0122 - .0154		.0126 - .0165	.0126 - .0165	.0134 - .0173
	20		230	21	○	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
H	38	Hardened steel	550	55	○	98	RPM	950		800	750	680		600		530	500	480
							FEED	.0016- .0028		.0016- .0031	.0016- .0031	.0020- .0035		.0020- .0035		.0020- .0039	.0020- .0039	.0020- .0039

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 (in^3/min)
$MRR = D_{tool} \cdot f_n \cdot v_c \cdot 3$

Inch

Symbol	Definition	Unit
v_f	Penetration rate	*in/min*
f_n	Feed per revolution	*in/rev*
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)*