

# Speeds and Feeds



														SFM : ft/min.		
														FEED(IPR) : Inch/rev.		
ISO	VDI 3323	Material Description	HB		SFM	Drill Diameter										
						METRIC	2.0	3.0	-	4.0	6.0	-	-	8.0	-	10.0
						FRACTIONAL	-	-	1/8	-	-	1/4	5/16	-	3/8	-
						DECIMAL	.0787	.1181	.1250	.1575	.2362	.2500	.3125	.3150	.3750	.3937
P	1	Non-alloy steel	125	⊙	247	RPM	11940	7960	5970	3980	2980	2390				
						FEED	.0008 - .0016	.0016 - .0024	.002 - .0031	.0028 - .0039	.0031 - .0047	.0035 - .0055				
P	2		190	⊙	230	RPM	11140	7430	5570	3710	2790	2230				
						FEED	.0008 - .0016	.0016 - .0024	.002 - .0031	.0028 - .0039	.0031 - .0047	.0035 - .0055				
P	3		250	⊙	214	RPM	10350	6900	5170	3450	2590	2070				
						FEED	.0004 - .0012	.0012 - .002	.0016 - .0028	.002 - .0031	.0028 - .0039	.0031 - .0047				
P	6	Low alloy steel	180	⊙	230	RPM	11140	7430	5570	3710	2790	2230				
						FEED	.0008 - .0016	.0016 - .0024	.002 - .0031	.0028 - .0039	.0031 - .0047	.0035 - .0055				
P	7		275	○	181	RPM	8750	5840	4380	2920	2190	1750				
						FEED	.0004 - .0012	.0012 - .002	.0016 - .0028	.002 - .0031	.0028 - .0039	.0031 - .0047				
M	12		Stainless steel	200	○	115	RPM	5570	3710	2790	1860	1390	1110			
							FEED	.0008 - .0016	.0016 - .0024	.002 - .0031	.0028 - .0039	.0031 - .0047	.0035 - .0055			
K	15	Grey cast iron	180	⊙	296	RPM	14320	9550	7160	4770	3580	2860				
						FEED	.0012 - .002	.002 - .0028	.0024 - .0035	.0031 - .0043	.0039 - .0051	.0047 - .0063				
K	16		260	○	230	RPM	11140	7430	5570	3710	2790	2230				
						FEED	.0004 - .0012	.0012 - .002	.0016 - .0028	.002 - .0031	.0028 - .0039	.0031 - .0047				
K	17		Nodular cast iron	160	○	296	RPM	14320	9550	7160	4770	3580	2860			
							FEED	.0012 - .002	.002 - .0028	.0024 - .0035	.0031 - .0043	.0039 - .0051	.0047 - .0063			
K	19	Malleable cast iron	130	○	197	RPM	9550	6370	4770	3180	2390	1910				
						FEED	.0012 - .002	.002 - .0028	.0024 - .0035	.0031 - .0043	.0039 - .0051	.0047 - .0063				
N	21	Aluminum-wrought alloy	60	○	543	RPM	26260	17510	13130	8750	6570	5250				
						FEED	.0016 - .0024	.0024 - .0035	.0031 - .0043	.0039 - .0051	.0047 - .0059	.0059 - .0075				
N	22		100	○	428	RPM	20690	13790	10350	6900	5170	4140				
						FEED	.0016 - .0024	.0024 - .0035	.0031 - .0043	.0039 - .0051	.0047 - .0059	.0059 - .0075				
N	23		Aluminum-cast, alloyed	75	○	362	RPM	17510	11670	8750	5840	4380	3500			
							FEED	.0016 - .0024	.0024 - .0035	.0031 - .0043	.0039 - .0051	.0047 - .0059	.0059 - .0075			
S	36	Titanium Alloys	400 Rm	○	115	RPM	5570	3710	2790	1860	1390	1110				
						FEED	.0004 - .0012	.0012 - .002	.0016 - .0024	.002 - .0031	.0028 - .0039	.0031 - .0047				



# Speeds and Feeds



ISO	VDI 3323	Material Description	HB		SFM	Drill Diameter						
						METRIC	12.0	-	-	16.0	-	20.0
						FRACTIONAL	-	1/2	5/8	-	3/4	-
						DECIMAL	.4724	.5000	.6250	.6299	.7500	.7874
P	1	Non-alloy steel	125	⊙	247	RPM	1990	1890	1490	1260	1190	
P	2		190	⊙	230	FEED	.0043 - .0067	.0043 - .0067	.0051 - .0075	.0051 - .0075	.0059 - .0083	
P	3		250	⊙	214	RPM	1860	1760	1390	1170	1110	
P	6		180	⊙	230	FEED	.0043 - .0067	.0043 - .0067	.0051 - .0075	.0051 - .0075	.0059 - .0083	
P	7		275	○	181	RPM	1720	1630	1290	1090	1030	
P	7		275	○	181	FEED	.0035 - .0055	.0035 - .0055	.0043 - .0067	.0043 - .0067	.0051 - .0075	
M	12	Stainless steel	200	○	115	RPM	1860	1760	1390	1170	1110	
M	12					FEED	.0043 - .0067	.0043 - .0067	.0051 - .0075	.0051 - .0075	.0059 - .0083	
K	15	Grey cast iron	180	⊙	296	RPM	2390	2260	1790	1510	1430	
K	16		260	○	230	FEED	.0059 - .0079	.0059 - .0079	.0071 - .0094	.0071 - .0094	.0087 - .011	
K	17	Nodular cast iron	160	○	296	RPM	1860	1760	1390	1170	1110	
K	17					FEED	.0035 - .0055	.0035 - .0055	.0043 - .0067	.0043 - .0067	.0051 - .0075	
K	19	Malleable cast iron	130	○	197	RPM	2390	2260	1790	1510	1430	
K	19					FEED	.0059 - .0079	.0059 - .0079	.0071 - .0094	.0071 - .0094	.0087 - .011	
N	21	Aluminum-wrought alloy	60	○	543	RPM	1590	1510	1190	1000	950	
N	22		100	○	428	FEED	.0071 - .0091	.0071 - .0091	.0083 - .0106	.0083 - .0106	.0098 - .0122	
N	23	Aluminum-cast, alloyed	75	○	362	RPM	3450	3270	2590	2180	2070	
N	23					FEED	.0071 - .0091	.0071 - .0091	.0083 - .0106	.0083 - .0106	.0098 - .0122	
S	36	Titanium Alloys	400 Rm	○	115	RPM	2920	2770	2190	1840	1750	
S	36					FEED	.0071 - .0091	.0071 - .0091	.0083 - .0106	.0083 - .0106	.0098 - .0122	
						RPM	930	880	700	590	560	
						FEED	.0035 - .0055	.0035 - .0055	.0043 - .0067	.0043 - .0067	.0051 - .0075	



# Speeds and Feeds



**Penetration Rate  
(mm/min)**

$$v_f = f_n \cdot n$$

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

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

**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<sup>3</sup>/min)**

$$MRR = \frac{D_{tool} \cdot f_n \cdot v_c}{4}$$

## Metric

Symbol	Definition	Unit
$v_f$	Penetration rate	mm/min
$f_n$	Feed per revolution	mm/rev
$v_c$	Cutting speed	m/min (SMM)
$n$	Spindle speed	rev/min (RPM)
$D_{tool}$	Tool cutting diameter	mm
$MRR$	Material removal rate	(cm <sup>3</sup> /min)

# 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<sup>3</sup>/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>(in<sup>3</sup>/min)</i>