## **Speeds and Feeds**



Feed: inch/rev

																						R	PM: rev	//min
									Drill Diameter															
ISO			Composition / Structure / Heat Treatment			HRC	1 1	SFM		1.0		METRIC	2.0	3.0	-	4.0	6.0	-	-	8.0	-	10.0	-	13
	VDI 5525	Material Description			пв					-	SFM	FRACTIONAL	-	-	1/8	-	-	1/4	5/16	-	3/8	-	1/2	
										.0394		DECIMAL	.0787	.1181	.1250	.1575	.2362 .	2500	.3125	.3150	.3750	.3937	.5000 .	.5118
		Non-alloy steel			125	1			RPM	8910		RPM	6370	42	40	3180	2120	)	15	90		1,270	980	)
Р	1		About 0.15% C	Annealed			•	92	FEED	.00040012	132	FEED	.00160031	.0024 -	.0039	.00310047	.0047	0063	.0047 -	0071	.0063 -	.0087	.0071	.0094
				Annealed	190				RPM	7960		RPM	5570	37	10	2790	1860	)	13	90	111	10	860	)
Р	2		About 0.45% C			13	•	82	FEED	.00040012	115	FEED	.00160031	.0024 -	.0039	.00310047	.0047	0063	.0047 -	0071	.0063 -	.0087	.0071	.0094
			About 0.45% C	Quenched & tempered	250	25			RPM	6370		RPM	4770	31	80	2390	1590	)	11	90	950.0	000	730	,
Р	3						•	66	FEED	.00040012	99	FEED	.00160031	.0024 -	.0039	.00310047	.0047	0063	.0047 -	0071	.0063 -	.0087	.0071	.0094
			-		270				RPM	4770		RPM	3180	21	20	1590	1060	)	80	00	640.0	000	490	)
Р	4		About 0.75% C	Annealed		28	0	49	FEED	.00040008	66	FEED	.0008002	.0008 -	.0024	.00160031	.0016	0039	.0024 -	0047	.0031 -	.0055	.0047	.0071
		-							RPM	7960	115	RPM	5570	37	10	2790	1860	)	13	90	1110.	.000	860	)
Р	6		Annealed	Annealed	180	10	•	82	FEED	.00040012		FEED	.00160031	.0024 -	.0039	.00310047	.0047	0063	.0047 -	0071	.0063 -	.0087	.0071	.0094
									RPM	6370		RPM	4770	31	80	2390	1590	)	11	90	950.0	000	730	)
Р	7	Low alloy steel		Quenched & tempered	275	29	0	66	FFFD	0004 - 0012	99	FFFD	0016 - 0031	0024	0039	0031 - 0047	0047 -	0063	0047 -	- 0071	0063 -	0087	0071 -	0094
									RPM	6370		RPM	4770	31	80	2390	1590	)	11	90	950.0	000	730	)
Р	8			Quenched & tempered	300	32	0	66	FFFD	0004 - 0008	99	FFFD	0008 - 002	0008	0024	0016 - 0031	0016 -	0039	0024 -	- 0047	0031 -	0055	0047 -	0071
									RPM	4770		RPM	3180	21	20	1590	1061	)	80	10	640 (	000	490	)
Р	10	High alloyed steel, and tool stee		Annealed	200	15	0	49	FFFD	0004 - 0012	66	FFFD	0016 - 0031	0024	0039	0031 - 0047	0047 -	0063	0047 -	- 0071	0063 -	0087	0071 -	0094
									RPM	5730		RPM	3980	26	50	1990	1330	1 1	00-17	10071	800 0	0007	610	1
М	12		Ferritic / Martensitic	Annealed	200	15	•	59	EFED	0004 - 0012	82	EFED	0016 - 0031	0024	0030	0031 - 0047	0047 -	0063	0047	. 0071	0063 -	0087	0071 -	0004
		Stainless steel	Martensitic	Quenched & Tempered Austenitic	240 180	23 10	0		PDM	4770		PDM	3180	.0024	20	1590	106	0003 1	90	10	640 (	.0087		0034
М	13							49	EEED	4770	66	EEED	0016 - 0031	0024	0030	0021 - 0047	0047 -	0063	0047 -	. 0071	0063 -	0087	490	0004
									PDM	3180		PDM	.00100031	.0024	0033	1190	7 <del>-</del> 00.	0005	60	0071	.0003 -	.0087	270	0034
М	14						0	33	EFED	0004 - 0008	49	EFED	0008 - 002	0008	0024	0016 - 0031	0016 -	0030	0024	0047	480.0	0055	0047 -	0071
			Pearlitic / ferritic		180	10			DDM	2010	132	PDM	6270	.0008-	10	2190	.0010	0033	15	0047	1270	.0055	1400.	0071
К	15						0	92	EEED	0004 0012		EEED	0016 0021	0024	0020	0021 0047	0047	0062	0047	0071	0062	0087	0071	0004
		Grey cast iron	Pearlitic (Martensitic) Ferritic Pearlitic Ferritic Pearlitic Pearlitic Not Curable Curable	Hardened	260					.00040012		PDM	.00100031	.0024 -	10	.00310047	.0047	0005	.0047 -	0071	.0003 -	.0087	1100.	0094
К	16					26	0	82		7900	115	RE IVI	0008 003	0000	0024	2750	0016	0020	0024	0047	0021	0055	0047	0071
									PDM	8910		PDM	6270	.0008 -	10	2180	.0010	0039	15	0047 an	1270	.0033	1400.	0071
К	17				160	3	0	92	EFED	0004 - 0012	132	EFED	0016 - 0031	0024	+0	0021 - 0047	0047 -	0063	0047	. 0071	0063 -	0087	0071 -	0004
		Nodular cast iron							PDM	6370		PDM	4770	.0024	20	2200	.0047	0003 1	11	an	950 (	.0087	.0071	0034
К	18				250	25		66	EEED	0004 - 0008	99	EFED	4770	0008	0024	0016 - 0031	0016 -	0030	0024	0047	0031 -	0055	0047 -	0071
									PDM	.00040008		PDM	.0008002 EE 70	.0008 -	10	.00100031	.0010	0039	.0024 -	0047	1110	.0033	.0047	0071
К	19				130		0	82		7900	115	RE IVI	0016 0021	0024	0020	2750	0047	0062	0047	0071	0062	000	0071	0004
		Malleable cast iron							DDM	6270		PDM	4770	.0024	20035	.00310047	1500	0003 N	.0047 -	0071	.0003 -	.0087	.0071	0034
К	K 20				230	21		66	EFED	0004 - 0008	99	EFED	0008 - 002	0008	0024	0016 - 0031	0016 -	0030	0024	0047	0031 -	0055	0047 -	0071
									PDM	14320		PDM	10350	.0000	.0024 10	5170	2450	1 1	25	0047	2070	.0055	1500	0071
N	21				60		0	148	EFED	0008 - 0020	214	EEED	002 - 0035	0028	0043	0047 - 0063	0047 -	0071	0055	0079	0063 -	0087	0087 -	011
		Aluminum-wrought alloy							RPM	14320		RPM	10350	.0020		5170	3/15/	1	.0033-	90	2070	0007	1500	0
Ν	22				100		0	148	EFED	0008 - 0020	214	EEED	002 - 0025	0020	0042	0047 - 0062	0047	, 0071	0055	. 0070	2070.	0087	0087	011
									RDM	11140		RDM	7060	.0020.	10	2000	.0047 2651	1	100	90	1500	000	122	0
Ν	23	Aluminum-cast, alloyed	≤ 12% Si, Not Curable		75		0	115	FFED	0008-0020	165	FFED	002 - 0025	00.25	0043	0047 - 0062	0047	, 0071	0055	. 0070	10063	0087	0097	011
									RPM	6370		RPM	4770	.0020	.0043 R0	2300	15047-1	)	11	90	950 0	000	- 10007	
Ν	29	Non Metallic Materials	Duroplastic, Fiber Reinforced Plastic				0	66	FEED	0004 - 0012	99	FEED	0016 - 0021	0024	0039	0031 - 00/7	0047	- 0063	0047 -	- 0071	0063 -	0087	0071 -	0094
								RPM	4770		RPM	3180	.0024	20	1590	1060	1	90-17- 0.0	10	640 (	000	100	)	
S 36	Titanium Alloys	Pure Titanium		400 Rm		0	49+	FFED	0004 - 0009	66	FFED	0008 - 002	0008	0024	0016 - 0021	002 - 0	-	0024 -	- 0030	0078 -	0051	0031 -	0055	
									1.00	.00040008		1.1.0									.0020-			



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



Symbol	Definition	Unit					
$V_f$	Penetration rate	in/min					
$f_n$	Feed per revolution	in/rev					
V <sub>C</sub>	Cutting speed	ft/min (SFM)					
п	Spindle speed	rev/min (RPM)					
D <sub>tool</sub>	Tool cutting diameter	in					
MRR	Material removal rate	(in³/min)					

