

Operating Guidelines

ISO	Material		Condition	Tensile Strength (N/mm2)	Hardness HB	Material Group No.	Cutting Speed Vc (SFM)	Drill Diameter mm (inch)						
								6.0-7.9	8.0-9.9	10.0-11.9	12.0-13.9			
								(.236-.311)	(.315-.390)	(.394-.469)	(.472-.547)			
								Feed Rate - IPR (inches/rev)						
P	Non-alloy steel and cast steel, free cutting steel	<0.25%C	Annealed	420	125	1	260-460	.003-.005	.005-.008	.006-.011	.007-.012			
		≥0.25%C	Annealed	650	190	2	260-430							
		<0.55%C	Quenched and tempered	850	250	3	260-400							
		≥0.55%C	Annealed	750	220	4	230-360							
			Quenched and tempered	1000	300	5	165-300							
	Low alloy steel and cast steel (less than 5% of alloying elements)	Annealed	600	200	6	230-400	.003-.006	.005-.010	.005-.011	.006-.012				
			Quenched and tempered	930	275	7					230-360			
				1000	300	8					165-300			
				1200	350	9					130-230			
	High alloy steel, cast steel and tool steel	Annealed	680	200	10	165-300	.003-.005	.005-.008	.005-.008	.006-.010				
Quenched and tempered			1100	325	11	130-260								
M	Stainless steel and cast steel	Ferritic/martensitic	680	200	12	130-230	.003-.004	.004-.006	.005-.007	.005-.008				
		Martensitic	820	240	13	130-230								
		Austenitic	600	180	14	100-230								
K	Grey cast iron (GG)	Ferritic/pearlitic	-	160	15	300-530	.005-.007	.006-.012	.008-.014	.010-.016				
		Pearlitic	-	250	16	260-460								
	Cast iron nodular (GGG)	Ferritic	-	180	17	300-595								
		Pearlitic	-	260	18	260-460								
	Malleable cast iron	Ferritic	-	130	19	300-530								
		Pearlitic	-	230	20	260-460								
N	Aluminum-wrought alloy	Not curable	-	60	21	300-725	.006-.012	.008-.014	.010-.016	.012-.018				
		Cured	-	100	22	300-725								
	Alum.-cast, alloyed	≤12% Si	Not curable	-	75	23					300-725			
			Cured	-	90	24					300-725			
		>12% Si	High temperature	-	130	25					265-525			
	Copper alloys	>1% Pb	Free cutting	-	110	26					300-725			
			Brass	-	90	27					300-725			
			Electrolitic copper	-	100	28					300-725			
	Non-metallic	Duroplastics, fiber plastics	-	-	29	-					-	-	-	-
		Hard rubber	-	-	30	-					-	-	-	-
S	High temp. alloys	Fe based	Annealed	-	200	31	100-200	.002-.003	.002-.004	.003-.005	.004-.006			
			Cured	-	280	32	70-165							
		Ni or Co based	Annealed	-	250	33	70-165							
			Cured	-	350	34	70-165							
			Cast	-	320	35	70-165							
	Titanium and Ti alloys	-	Rm 400	-	36	70-165	.002-.005		.003-.006	.004-.007				
		Alpa+bata alloys cured	Rm 1050	-	37	70-165								
H	Hardened steel	Hardened	-	55HRC	38	70-165	.002-.003	.002-.005	.003-.006	.004-.007				
		Hardened	-	60HRC	39	70-165								
	Chilled cast iron	Cast	-	400	40	-					-	-	-	
	Cast iron nodular (GGG)	Hardened	-	55HRC	41	-					-	-	-	

Note: Feed and speed recommendations are starting operating parameters. They are only guidelines from which further optimization should take place. Operating parameters are influenced by many machining variables. These variables may cause for reductions in feeds and speed or dramatic increases.

Operating Guidelines (continued)

ISO	Material		Condition	Tensile Strength (N/mm2)	Hardness HB	Material Group No.	Cutting Speed Vc (SFM)	Drill Diameter mm (inch)					
								14.0-15.9	16.0-19.9	20.0-25.9			
								(.551-.626)	(.630-.783)	(.787-1.019)			
								Feed Rate - IPR (inches/rev)					
P	Non-alloy steel and cast steel, free cutting steel	<0.25%C	Annealed	420	125	1	260-460	.008-.014	.010-.018	.010-.018			
		≥0.25%C	Annealed	650	190	2	260-430						
		<0.55%C	Quenched and tempered	850	250	3	260-400						
		≥0.55%C	Annealed	750	220	4	230-360						
			Quenched and tempered	1000	300	5	165-300						
	Low alloy steel and cast steel (less than 5% of alloying elements)		Annealed	600	200	6	230-400	.007-.014	.009-.016	.010-.018			
			Quenched and tempered	930	275	7	230-360						
		1000		300	8	165-300							
		1200		350	9	130-230							
	High alloy steel, cast steel and tool steel		Annealed	680	200	10	165-300	.007-.011	.008-.012	.009-.013			
		Quenched and tempered	1100	325	11	130-260							
M	Stainless steel and cast steel		Ferritic/martensitic	680	200	12	130-230	.006-.009	.006-.010	.007-.012			
			Martensitic	820	240	13	130-230						
			Austenitic	600	180	14	100-230						
K	Grey cast iron (GG)		Ferritic/pearlitic	-	160	15	300-530	.012-.018	.014-.022	.014-.024			
			Pearlitic	-	250	16	260-460						
	Cast iron nodular (GGG)		Ferritic	-	180	17	300-595						
			Pearlitic	-	260	18	260-460						
	Malleable cast iron		Ferritic	-	130	19	300-530						
			Pearlitic	-	230	20	260-460						
N	Aluminum-wrought alloy		Not curable	-	60	21	300-725	.014-.020	.016-.024	.018-.028			
			Cured	-	100	22	300-725						
	Alum.-cast, alloyed	≤12% Si	Not curable	-	75	23	300-725						
			Cured	-	90	24	300-725						
		>12% Si	High temperature	-	130	25	265-525						
	Copper alloys	>1% Pb	Free cutting	-	110	26	300-725						
			Brass	-	90	27	300-725						
			Electrolitic copper	-	100	28	300-725						
	Non-metallic		Duroplastics, fiber plastics	-	-	29	-				-	-	-
			Hard rubber	-	-	30	-				-	-	-
S	High temp. alloys	Fe based	Annealed	-	200	31	100-200	.005-.007	.005-.008	.006-.009			
				Cured	-	280	32				70-165		
		Ni or Co based	Annealed	-	250	33	70-165						
				Cured	-	350	34				70-165		
				Cast	-	320	35				70-165		
	Titanium and Ti alloys		-	Rm 400	-	36	70-165	.005-.008	.006-.009	.006-.010			
			Alpa+bata alloys cured	Rm 1050	-	37	70-165						
H	Hardened steel		Hardened	-	55HRC	38	70-165	.005-.008	.006-.009	.006-.010			
			Hardened	-	60HRC	39	70-165						
	Chilled cast iron		Cast	-	400	40	-	-	-	-			
	Cast iron nodular (GGG)		Hardened	-	55HRC	41	-	-	-	-			

Note: Feed and speed recommendations are starting operating parameters. They are only guidelines from which further optimization should take place. Operating parameters are influenced by many machining variables. These variables may cause for reductions in feeds and speed or dramatic increases.