Standard cutting condition

Workpiece materials	Heat treatment	Hardness HB	Hardness HRC	Cutting speed *Vc* (m/min)	Feed *f* (mm/rev)
Free-cutting carbon steels **S10C ~ S15C**	Cold drawn	160 - 190	(5) - (11)	130	Refer to Fig. 1
S30C ~ S50C	Cold drawn	200 - 230	(12) - 20	100	
S35C ~ S50C	Hardened and tempered	250 - 300	25 - 32	80	
Carbon steels **S10C ~ S35C**	Annealed	110 ~ 120		130	
S10C ~ S50C	Annealed	120 ~ 185	~ (9)	120	
S50C ~	Annealed	170 ~ 200	(5) ~ (13)	100	
S20C ~ S30C	Hardened and tempered	210 ~ 250	(16) ~ 24	90	Refer to Fig. 2
S30C ~ S55C	Hardened and tempered	260 ~ 310	26 ~ 33	70	
S50C ~	Hardened and tempered	320 ~ 375	34 ~ 40	50	
S55C ~	Hardened and tempered	380 ~ 440	41 ~ 47	40	
Cast steels SCr, SNC SNCM, SCM SMn etc.	Annealed	150 ~ 230	~ (20)	90	Refer to Fig. 2
	Annealed or Hardened and tempered	240 ~ 310	23 ~ 33	70	Refer to Fig. 2
		315 ~ 370	34 ~ 40	50	Refer to Fig. 3
		380 ~ 440	40 ~ 47	40	
		450 ~ 500	48 ~ 51	30	
Cast steels **SC**	Hardened and tempered	140 ~ 180	~ (8)	100	Refer to Fig. 2
	Annealed	190 ~ 240	(11) ~ 22	90	
Tool steels SKS, SKD etc.	Annealed	150 ~ 200	~ (13)	70	Refer to Fig. 3
	Annealed	210 ~ 300	(16) ~ 32	50	
Stainless steels Ferritic **SUS405, 430**	Annealed	150 ~ 200	~ (13)	70	Refer to Fig. 3
Austenitic **SUS304, 305**	Annealed	160 ~ 220	~ (18)	50	
Martensitic **SUS403, 410**	Hardened and tempered	160 ~ 220	~ (18)	70	
		300 ~ 350	32 ~ 38	50	
Grey cast irons **FC100 ~ 350**		110 ~ 180		90	Refer to Fig. 4
		190 ~ 220		80	
		220 ~ 260		70	
Ductile cast irons **FCD400 ~ 700**		120 ~ 170		80	Refer to Fig. 5
		180 ~ 240		65	
		240 ~ 280		55	
		260 ~ 320		40	
Malleable cast irons **FCMB FCMP**		110 ~ 180		90	
		190 ~ 220		80	
		220 ~ 260		70	
Cast aluminum alloys AC3A etc. Aluminum die cast alloys	Annealed	500load 40 ~ 100		180	Refer to Fig. 4
Copper alloys	Annealed	120 ~ 160		< 150	Refer to Fig. 4
		160 ~ 205		< 150	Refer to Fig. 5
Bearing steels		150 ~ 210		70	Refer to Fig. 3
Difficult to cut material				20	
High speed steels		210 ~ 285	(16) ~ 30	50	

- No. of revolutions: n (min^{-1}) = Cutting speed: Vc (m/min) × 1000 ÷ 3.14 ÷ Tool diameter: øDc (mm)
- Feed speed: Vf (mm/min) = No. of revolutions: n × Feed: f (mm/rev)

Feed selection diagram

Fig. 1 Carbon steels

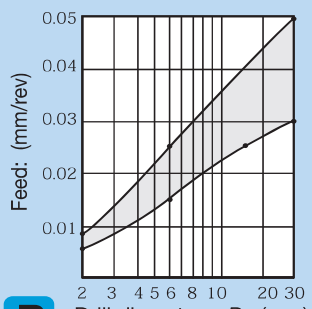
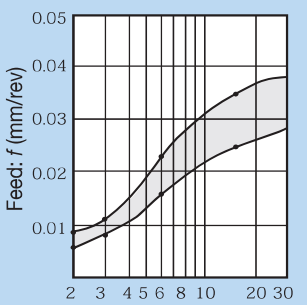


Fig. 2 Alloy steels



P

Fig. 3 Tool steels and other special steels

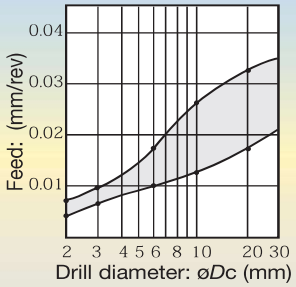


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Fig. 4 Cast irons, aluminum alloys

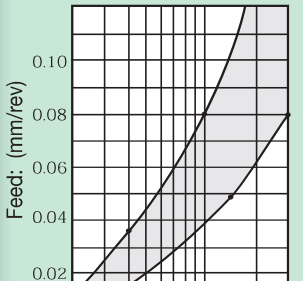

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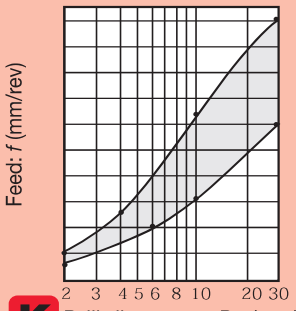
Fig. 5 Ductile and malleable cast irons



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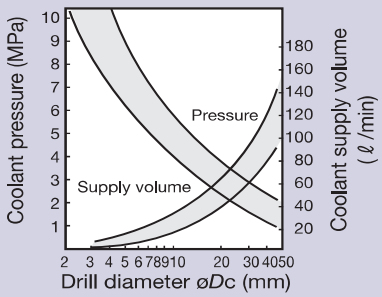
Coolant supply pressure and volume



11 Drilling Tools