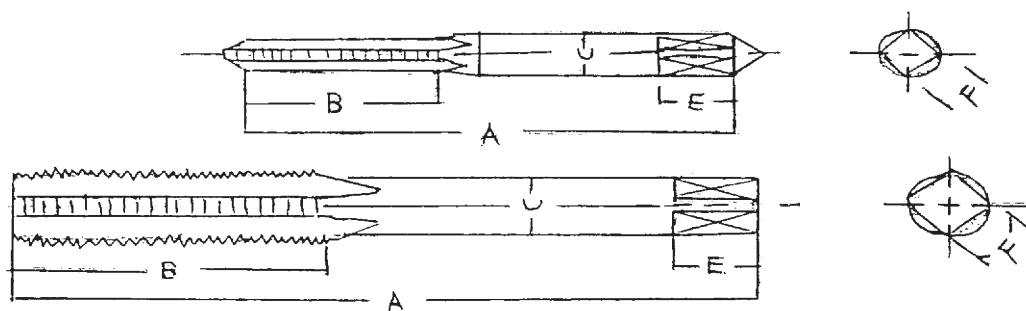


螺絲攻牙鑽孔徑和螺絲攻各部尺寸表



螺絲攻牙鑽孔徑				絲攻各部尺寸				
規格	下孔徑			A	B	C	E	F
	1級牙	2級牙	3級牙					
M 1 x 0.25	0.77 (85%)	0.78 (80%)		30	8	3	5	2.5
M 1.2 x 0.25	0.97 (85%)	0.98 (80%)		32	9	3	5	2.5
M 1.4 x 0.3	1.12 (85%)	1.14 (80%)		34	11	3	5	2.5
M 1.7 x 0.35	1.40 (80%)	1.42 (75%)		36	13	3	5	2.5
M 2 x 0.4	1.65 (80%)	1.67 (75%)		40	15	3	5	2.5
M 2.3 x 0.4	1.95 (80%)	1.97 (75%)		42	15	3	5	2.5
M 2.6 x 0.45	2.21 (85%)	2.22 (75%)		44	16	3	5	2.5
M 3 x 0.6	2.42 (90%)	2.42 (90%)	2.42 (90%)	46	18	4	6	3.2
M 3 x 0.5	2.57 (80%)	2.59 (75%)	2.59 (75%)	46	18	4	6	3.2
M 3.5 x 0.6	2.95 (85%)	3.01 (75%)	3.05 (70%)	47	18	4	6	3.2
M 4 x 0.75	3.23 (95%)	3.31 (85%)	3.31 (85%)	52	20	5	7	4
M 4 x 0.7	3.36 (85%)	3.39 (80%)	3.43 (75%)	52	20	5	7	4
M 4.5 x 0.75	3.81 (85%)	3.85 (80%)	3.89 (75%)	55	20	5	7	4
M 5 x 0.9	4.07 (85%)	4.17 (85%)	4.17 (75%)	60	22	5.5	7	4.5
M 5 x 0.8	4.26 (85%)	4.31 (80%)	4.35 (75%)	60	22	5.5	7	4.5
M 5.5 x 0.9	4.57 (95%)	4.67 (85%)	4.67 (85%)	60	22	5.5	7	4.5
M 6 x 1	5.08 (85%)	5.13 (80%)	5.19 (75%)	62	24	6	7	4.5
M 7 x 1	6.08 (85%)	6.13 (80%)	6.19 (75%)	65	26	6.2	8	5
M 8 x 1.25	6.85 (85%)	6.85 (95%)	6.92 (80%)	70	30	6.2	8	5
M 9 x 1.25	7.85 (85%)	7.85 (85%)	7.92 (80%)	72	30	7	8	5.5
M 10 x 1.5	8.54 (90%)	8.62 (85%)	8.70 (80%)	75	32	7	8	5.5
M 11 x 1.5	9.54 (90%)	9.62 (85%)	9.70 (80%)	80	38	8	8	6.5
M 12 x 1.75	10.3 (90%)	10.4 (85%)	10.5 (80%)	82	38	8.5	9	6.5
M 14 x 2	12.1 (90%)	12.2 (85%)	12.3 (80%)	88	42	10.5	11	8
M 16 x 2	14.2 (90%)	14.2 (85%)	14.3 (80%)	95	45	12.5	13	10
M 18 x 2.5	15.7 (90%)	15.7 (85%)	15.7 (85%)	100	48	14	14	11
M 20 x 2.5	17.7 (90%)	17.7 (85%)	17.7 (85%)	105	50	15	15	12
M 22 x 2.5	19.7 (90%)	19.7 (85%)	19.7 (85%)	115	55	17	16	13
M 24 x 3	21.2 (90%)	21.2 (85%)	21.2 (85%)	120	58	19	18	15
M 27 x 3	24.2 (90%)	24.2 (85%)	24.2 (85%)	130	62	20	18	15
M 30 x 3.5	26.6 (90%)	26.6 (90%)	26.8 (85%)	135	65	23	20	17
M 33 x 3.5	29.6 (90%)	29.6 (90%)	29.8 (85%)	145	70	25	22	19
M 36 x 4	32.1 (85%)	32.1 (90%)	32.3 (85%)	155	75	28	24	21

mm

# TECHNICAL 技術資料

## ドリル切削馬力表

上表是鑽孔鈍化之系數1.2, K=1孔時之100r.p.m.  
之相當切削馬力表示

D=鑽孔徑(吋) K=材料系數

F = 每一回轉切削量

N<sub>2</sub>=切削馬力

## CUTTING HORSEPOWER FOR DRILLING

$$N_s = D^2 (0.056 + 38F) K$$

Figures in the table indicate cutting horsepower per 100 rpm of drill spindle when drill blunting coefficient is assumed 1.2, and material coefficient (K), 1.

D = Drill diameter (inches)

K = Material coefficient

F = Feed per revolution of drill spindle

N<sub>s</sub> = Cutting horsepower

鑽孔直徑 Drill Dia. (in)	進刀速度 FEED RATE									
	0.001 (in)	0.002 (in)	0.003 (in)	0.004 (in)	0.005 (in)	0.006 (in)	0.007 (in)	0.008 (in)	0.009 (in)	0.010 (in)
	0.025 (mm)	0.050 (mm)	0.076 (mm)	0.101 (mm)	0.127 (mm)	0.152 (mm)	0.178 (mm)	0.203 (mm)	0.229 (mm)	0.254 (mm)
1/16	0.0004	0.0005	0.0007							
1/8	0.0015	0.0021	0.0027	0.0033	0.0038					
3/16	0.0033	0.0047	0.0060	0.0073	0.0087	0.010	0.0113	0.013	0.014	0.0154
1/4	0.006	0.0083	0.011	0.013	0.0154	0.018	0.020	0.023	0.025	0.0273
5/16	0.009	0.013	0.017	0.020	0.024	0.028	0.032	0.035	0.039	0.043
3/8	0.013	0.019	0.024	0.029	0.035	0.040	0.045	0.051	0.056	0.061
7/16	0.018	0.025	0.033	0.040	0.047	0.054	0.062	0.069	0.076	0.084
1/2	0.024	0.033	0.043	0.052	0.062	0.071	0.081	0.090	0.100	0.109
9/16	0.030	0.042	0.054	0.066	0.078	0.090	0.102	0.114	0.126	0.138
5/8	0.037	0.052	0.066	0.081	0.096	0.111	0.126	0.141	0.155	0.170
11/16	0.044	0.062	0.080	0.098	0.116	0.134	0.152	0.170	0.188	0.206
3/4	0.053	0.074	0.096	0.117	0.138	0.160	0.181	0.203	0.224	0.245
13/16	0.062	0.087	0.112	0.137	0.162	0.188	0.213	0.238	0.263	0.288
7/8	0.072	0.101	0.130	0.159	0.188	0.217	0.247	0.276	0.305	0.334
15/16	0.083	0.116	0.149	0.183	0.216	0.250	0.283	0.316	0.350	0.383
1	0.094	0.132	0.170	0.208	0.246	0.284	0.322	0.360	0.398	0.436
1 1/8	0.119	0.167	0.215	0.263	0.311	0.359	0.408	0.456	0.504	0.552
1 1/4	0.147	0.207	0.266	0.325	0.384	0.444	0.503	0.563	0.622	0.681
1 3/8	0.178	0.250	0.321	0.393	0.465	0.537	0.609	0.681	0.753	0.824
1 1/2	0.212	0.297	0.383	0.468	0.554	0.639	0.725	0.810	0.896	0.981
1 5/8	0.248	0.349	0.449	0.549	0.650	0.750	0.850	0.951	1.051	1.151
1 3/4	0.288	0.404	0.521	0.637	0.753	0.870	0.986	1.103	1.219	1.335
1 7/8	0.331	0.464	0.598	0.731	0.865	0.999	1.132	1.266	1.399	1.533
2	0.376	0.528	0.680	0.832	0.984	1.136	1.288	1.440	1.592	1.744
2 1/4	0.476	0.668	0.861	1.053	1.245	1.438	1.630	1.822	2.015	2.207
2 1/2	0.588	0.825	1.062	1.300	1.537	1.775	2.012	2.250	2.483	2.725
2 3/4	0.711	0.998	1.286	1.573	1.860	2.148	2.435	2.722	3.010	3.297
3	0.846	1.188	1.530	1.872	2.214	2.556	2.898	3.240	3.582	3.924

鑽孔直徑 Drill Dia. (in)	進刀速度 FEED RATE									
	0.011 (in)	0.012 (in)	0.013 (in)	0.014 (in)	0.015 (in)	0.016 (in)	0.017 (in)	0.018 (in)	0.019 (in)	0.020 (in)
	0.0279 (mm)	0.305 (mm)	0.330 (mm)	0.355 (mm)	0.381 (mm)	0.406 (mm)	0.432 (mm)	0.457 (mm)	0.483 (mm)	0.508 (mm)
1/16										
1/8										
3/16										
1/4										
5/16										
3/8										
7/16	0.091	0.098								
1/2	0.119	0.128								
9/16	0.150	0.162								
5/8	0.185	0.200	0.215	0.230	0.245	0.259	0.274	0.289	0.304	0.319
11/16	0.224	0.242	0.260	0.278	0.296	0.314	0.332	0.350	0.368	0.386
3/4	0.267	0.288	0.309	0.331	0.352	0.374	0.395	0.416	0.438	0.459
13/16	0.313	0.338	0.363	0.388	0.413	0.438	0.463	0.489	0.514	0.539
7/8	0.363	0.392	0.421	0.450	0.479	0.508	0.538	0.567	0.596	0.625
15/16	0.417	0.450	0.483	0.517	0.550	0.584	0.617	0.650	0.684	0.717
1	0.474	0.512	0.550	0.588	0.626	0.664	0.702	0.740	0.778	0.816
1 1/8	0.600	0.648	0.696	0.744	0.792	0.840	0.889	0.937	0.985	1.033
1 1/4	0.741	0.800	0.859	0.919	0.978	1.038	1.097	1.156	1.216	1.275
1 3/8	0.896	0.968	1.040	1.112	1.184	1.255	1.327	1.400	1.471	1.543
1 1/2	1.067	1.152	1.238	1.323	1.409	1.494	1.580	1.665	1.751	1.836
1 5/8	1.252	1.352	1.452	1.553	1.653	1.753	1.854	1.954	2.054	2.155
1 3/4	1.452	1.568	1.684	1.801	1.917	2.034	2.150	2.266	2.383	2.499
1 7/8	1.666	1.800	1.934	2.067	2.201	2.334	2.468	2.602	2.735	2.869
2	1.896	2.048	2.200	2.352	2.504	2.656	2.808	2.960	3.112	3.264
2 1/4	2.400	2.592	2.784	2.977	3.169	3.361	3.554	3.746	3.939	4.131
2 1/2	2.962	3.200	3.437	3.675	3.912	4.150	4.387	4.625	4.862	5.100
2 3/4	3.585	3.872	4.159	4.447	4.734	5.022	5.309	5.596	5.884	6.171
3	4.266	4.608	4.950	5.292	5.634	5.976	6.318	6.660	7.002	7.344

材料係數 MATERIAL COEFFICIENT				
SEA NO. (JIS)	抗張強度 TENSILE STRENGTH		布氏硬度 BRINELL HARDNESS	材料係數 K MATERIAL COEFFICIENT
	lb/in <sup>2</sup>	kg/cm <sup>2</sup>		
鑄鐵 CAST IRON (FC20)	30,000	2,100	177	1.00
鑄鐵 CAST IRON (FC25)	40,000	2,800	198	1.39
鑄鐵 CAST IRON (FC30)	50,000	3,500	224	1.88
1020 (S20C)	78,000	5,500	160	2.22
x 1112	88,000	6,200	183	1.42
x 1335	90,000	6,300	197	1.45
3115	77,000	5,300	163	1.56
3120	98,000	6,900	174	2.02
3140	125,000	8,800	241	2.32
4115	89,000	6,300	167	1.62
4130 (SCM430)	109,000	7,700	229	2.10
4140 (SCM440)	134,000	9,400	269	2.41
4615	107,000	7,500	212	2.12
4820	199,000	14,000	390	3.44
5150	135,000	9,500	277	2.46
6115	83,000	5,800	174	2.08
6120	114,000	8,000	255	2.22
6130	112,000	7,900		2.20

高速鋼鑽孔之切削條件及超硬鑽孔之切削條件

Conditions for Drilling with High Speed Steel Drills and Carbide Drills

v=切削速度 m/min  
f=進刀量mm/rev  
v = Cutting speed m/min  
f = Feed mm/rev.

被削材 Material cut	引張強さ Tensile strength kg/mm <sup>2</sup>	区分 Class	高速度鋼ドリルの直径 D mm Diameter of High Speed Steel Drill					被削材 Material cut	引張強さ Tensile strength kg/mm <sup>2</sup>	超硬ドリルの直径 Diameter of carbide drill	
			2	3~5	6~11	12~18	19~25			5~10	11~30
鋼 Steel	50 以下 50 max.	v	20~25	20~25	20~25	30~35	30~35	工具鋼 Tool steel	100 以下 100 max.	35~40	40~45
		f	0.04	0.1	0.2	0.25	0.3			0.1	0.15
	50~70	v	20~25	20~25	20~25	20~25	25~30		180~190	8~11	11~14
		f	0.04	0.1	0.2	0.2	0.2			0.04	0.06
70~90	v	15~18	15~18	15~18	150~18	18~22	230	6	7~10		
	f	0.02	0.05	0.1	0.2	0.3		<0.02	<0.03		
90~110	v	10~14	10~14	10~14	12~18	16~20	可鍛鑄鉄 Malleable cast iron		35~38	38~40	
	f	0.02	0.05	0.1	0.15	0.2			0.15	0.3	
鑄鉄 Cast iron	12~18	v	25~30	25~30	30~40	25~30	20	鑄鋼 Cast iron	50~60	35~38	38~40
		f	0.04	0.1	0.2	0.35	0.6			0.1	0.15
18~30	v	12~18	12~18	14~18	16~20	16~20	ニッケルクロム鋼 Nickel chrome steel	140	15~20	20~25	
	f	0.04	0.1	0.15	0.20	0.3			0.04	0.06	
黄銅・青銅 および軽合金 Brass, bronze, light alloys	軟 Mild	v	50 max.	50 max.	50 max.	50 max.	50 max.	ステンレス鋼 Stainless steel		25~27	27~35
		f	0.04	0.1	0.15	0.3	0.45			0.1	0.15
硬 Hard	v	35 max.	35 max.	35 max.	35 max.	35 max.	黄銅および軽合金 Brass and light alloys		125~150	130~140	
	f	0.04	0.1	0.1	0.2	0.35			0.3	0.3	

適合切削油剤

※油剤種類

0. 乾式

- 1. 不水溶性切削油剤 軽切削用
- 2. 不水溶性切削油剤 軽、中切削用
- 3. 不水溶性切削油剤 重切削用
- 4. 水溶性切削油剤 軽切削用
- 5. 水溶性切削油剤 重切削用
- 6. 水溶性化学合成液 軽切削用
- 7. 水溶性化学合成液 重切削用

※工具材質

- HSS 高速度工具鋼
- HM 超硬質合金

Cutting Oils and Coolants

●Types of oil

- 0. Dry
- 1. Water insoluble cutting oil (Straight oil) for light cutting
- 2. Water insoluble cutting oil (Straight oil) for light to medium cutting
- 3. Water insoluble cutting oil (Straight oil) for heavy cutting
- 4. Water soluble oil (Soluble type) for light cutting
- 5. Water soluble oil (Emulsion type) for heavy cutting
- 6. Water soluble compound (Chemical solution) for light cutting
- 7. Water soluble compound (Chemical solution) for heavy cutting

●Tool materials

- HSS High speed tool steel
- HM Carbide alloy

被削材 Material cut	硬 度 Hardness	螺旋鑽孔 Twist drill		油壓鑽孔 Oil hole drill		鏟型鑽孔 Spade drill		槍鑽 Gun drill	
		HSS	HM	HSS	HM	HSS	HM	HSS	HM
快削性炭素鋼 Free cutting carbon steel	HB100~275	1,4,6	0,4,6	1,4,6	4,6	1,4,6	0,4,6	1,4,6	1,4,6
	HB275~425	2,5,7	0,4,6	1,4,6	4,6	1,4,6	0,4,6	2,5,7	1,4,6
	RC 48~65	3	3	3	2	3	2	3	2,3
炭素鋼 Carbon steel	HB 85~275	1,4,6	0,4,6	1,4,6	4,6	1,4,6	0,4,6	1,4,6	1,4,6
	HB275~425	2,5,7	0,4,6	1,4,6	4,6	1,4,6	0,4,6	2,5,7	1,4,6
	RC 48~65	3	3	3	2	3	2	3	2,3
快削性合金鋼 Free cutting steel alloy	HB150~275	1,4,6	0,4,6	1,4,6	4,6	1,4,6	0,4,6	1,4,6	1,4,6
	HB275~425	2,5,7	1,5,7	1,4,6	4,6	2,5,7	1,5,7	2,5,7	2,5,7
	RC 45~65	3	3	3	2	3	2	3	2,3
合金鋼 Steel alloy	HB125~275	1,4,6	0,4,6	1,4,6	4,6	1,4,6	0,4,6	1,4,6	1,4,6
	HB275~425	2,5,7	1,5,7	1,4,6	4,6	2,5,7	1,5,7	2,5,7	2,5,7
	RC 45~65	3	3	3	2	3	2	3	2,3

被削材 Material cut		硬 度 Hardness	ツイストドリル Twist drill		オイルホールドリル Oil hole drill		スペードドリル Spade drill		ガンドリル Gun drill	
			HSS	HM	HSS	HM	HSS	HM	HSS	HM
高張力鋼 High spring steel		HB225 ~ 275	1,4,6	0,4,6	1,4,6	4,6	1,4,6	0,4,6	1,4,6	1,4,6
		HB275 ~ 425	2,5,7	1,5,7	1,4,6	4,6	2,5,7	1,5,7	2,5,7	2,5,7
		RC45 (min.)	3	3	3	3	3	2	3	2,3
工具鋼 Tool steel	焼戻し鋼 Tempered	HB100 ~ 200	2,5,7	1,4,6	1,4,6	1,4,6	2,5,7	1,4,6	3,5,7	2,5,7
		HB200 ~ 325	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	2,5,7
	焼入鋼 Hardened	HB325 ~ 425	3	2,5,7	3	2,5,7	2,5,7	2,5,7	2,3	2,5,7
		RC 45 ~ 65	3	3,5,7	3	2,5,7	3	2	3	3,5,7
ねずみ鋳鉄 Grey iron		HB120 ~ 320	4,6	0,4,6	4,6	4,6	4,6	0,4,6	3,5	SPECIAL
可鍛鋳鉄 Malleable cast iron		HB110 ~ 260	4,6	0,4,6	4,6	4,6	4,6	0,4,6	SPECIAL	SPECIAL
ダクタイル鋳鉄 Ductile cast iron		HB120 ~ 400	4,6	0,4,6	4,6	4,6	4,6	0,4,6	SPECIAL	SPECIAL
鋼合金 Steel alloy		HB 10 ~ 100	4,6	4,6	4,6	4,6	4,6	4,6	SPECIAL	SPECIAL
構造用鋼 Structural steel		HB100 ~ 300	1,4,6	0,4,6	1,4,6	4,6	1,4,6	0,4,6	1,4,6	1,4,6
		HB300 (min.)	2,5,7	2,5,7	2,5,7	2,5,7	1,4,6	0,4,6	2,5,7	2,5,7
不銹鋼 Free-cutting stainless steel		HB135 ~ 275	1,4,6	1,4,6	1,4,6	1,4,6	1,4,6	1,4,6	2,5,7	1,4,6
		HB275 (min.)	1,4,6	1,4,6	1,4,6	1,4,6	1,4,6	1,4,6	2,5,7	1,4,6
ステンレス鋼 フェライト、オーステナイト系 Stainless steel ferrite, Austenite		HB135 ~ 275	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	2,5,7
		HB275 ~ 375	2,5,7	1,5,7	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	2,5,7
ステンレス鋼 マルテンサイト系 Stainless steel Martensite		HB135 ~ 275	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	1,4,6	2,5,7	2,5,7
		HB275 ~ 425	2	1,5,7	2,5,7	1,4,6	2	2,5,7	2	2,5,7
		RC 48 ~ 56	3	3,5,7	3	2,5,7	3	2,5,7	3	3,5,7
塑膠 Plastics			0,4,6	0,4,6	-	-	0,4,6	-	-	-

高速鋼鑽孔之切削條件及超硬鑽孔之切削條件  
Cutting Conditions for High Speed Steel and Carbide Reamers

v = 切削速度 m/min  
f = 進刀量mm/rev  
v = Cutting speed m/min  
f = Feed mm/rev.

被削材 Material cut	引張強さ Tensile strength kg/mm <sup>2</sup>	区分 Class	高速度鋼リーマの直径 D mm Diameter of high speed steel reamer				被削材 Material cut	引張強さ Tensile strength kg/mm <sup>2</sup>	超硬リーマの直径 D mm Diameter of carbide reamer		
			1~5	6~10	11~15	16~25			5~10	11~15	16~25
構造用炭素鋼 工具鋼 Structural carbon steel Tool steel Cast steel	軟質 Mild 45 max.	v	5~6	5~6	5~6	5~6	鋼 Steel	75~110	12~20	12~20	12~20
		f	0.2	0.3	0.4	0.5			0.3	0.4	0.5
	中質 Med. 45~70	v	4~5	4~5	4~5	4~5		110~140	10	10	10
	硬質 Hard 70 min.	f	0.2	0.3	0.4	0.5		140 min.	10	10	10
		v	3~4	3~4	3~4	3~4			0.3	0.4	0.5
鑄鉄 Cast iron	12~18	v	5~6	5~6	5~6	5~6	鑄鉄 Cast iron	HB 200 max.	12	20	20
		f	0.5	0.5~1.0	1.0~1.5	1.0~1.5			0.3	0.5	0.8
	18~30	v	4~5	4~5	4~5	4~5		HB 200 min.	10	10	10
		f	0.5~1.0	0.5~1.0	1.0~1.5	1.0~1.5			0.2	0.3	0.4
青銅・黄銅 Brass, Bronze		v	8~15	8~15	8~15	8~15	青銅・黄銅 Bronze, brass		15~30	15~30	15~30
		f	0.2	0.3	0.5	0.8			0.3	0.5	0.8
軽合金 Light alloys		v	10~20	10~20	10~20	10~20	軽合金 Light alloys		60	60	60
		f	0.3	0.4	0.6	0.8			0.4	0.6	0.8

攻牙加工之各種被切削材之對切削速度標準表  
Standard Cutting Speeds for Tapping Various Materials

被削材 Material cut	切削速度 m/min(タップ材質別) Cutting speed by tap material (mm)			被削材 Material cut	切削速度 m/min(タップ材質別) Cutting speed by tap material (mm)		
	SKS7	SKH2	SKH3		SKS7	SKH2	SKH3
普通鋼 Regular steel	3~7	9~15	18~30	ステンレス鋼、マンガン鋼 Stainless steel, Manganese steel	-	3~8	2~8
普通鋼 70kg/mm <sup>2</sup> 以上 Regular steel; over 70kg/mm <sup>2</sup>	3~3	5~8	10~15	Ni、V、Cr、Mo、W鋼 Ni, V, Cr, Mo, W steel	-	3~8	2~8
合金鋼 引張強さ70~90kg/mm <sup>2</sup> Steel alloy; 70 - 90kg/mm <sup>2</sup>	手送り Manual feed	5~7	8~12	銅合金、もろい黄銅 Copper alloy, frangible brass	12~18	20~30	-
合金鋼 90kg/mm <sup>2</sup> 以上 Steel alloy; over 90kg/mm <sup>2</sup>	-	1~4	5~7	銅合金、強じん黄銅 Copper alloy, rigid brass	8~12	14~20	-
鑄鉄 (軟) Cast iron; mild	6~8	12~16	18~20	銅合金、青銅 Copper alloy, bronze	6~12	12~25	-
鑄鉄 (硬) Cast iron; hard	3~5	8~12	12~16	鋁合金及鋅合金 Aluminum alloy, zinc alloy	12~20	20~30	-
特殊鑄鉄 Specialty steel	3~5	6~12	8~16	鎂鋁合金 Magnesium alloy	15~20	23~35	-
工具鋼 Tool steel	3~5	6~8	6~10				