

TECHNICAL INFO

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Material Group 各国材料对照		WKR	DIN	BS	EN	AFNOR	UNI	UNE	SS	JIS	AISI / SAE / UNS
ISO	VDI^ 3323	Germany	Germany	U.K.	U.K.	France	Italy	Spain	Sweden	Japan	USA
P	1	1.0402	C 22	050 A 20	2C	CC20	C 20 , C 21	F.112	1450		1020, G 10200
	1	1.0715	9 SMn 28	230 M 07		S250	CF 9 SMn 28	115Mn28	1912	SUM 22	1213, G 12130
	1	1.0722	10 SPb 20			10PbF2	CF 10 SPb 20	10SPb20			11 L 08
	1	1.0736	9 SMn 36	240 M 07	1B	S300	CF 9 SMn 36	12SMN35			1215, G 12150
	1	1.0737	9 SMnPb 36			S300Pb	CF 9 SMnPb 36	12SMnP35	1926		12 L 14, G 12144
	1	1.0401	C 15	080 M 15	CS	CC12	C16	F.111	1350	S 15 CK	1015, G 10170
	1	1.0718	9 SMnPb 28			S250Pb	CF 9 SMnPb 28	115MnPb28	1914	SUM 22 L	12 L 13, G 12134
	1	1.1141	Ck 15	080 M 15	32C	XC12 , XC15 , XC18	C15		1370	S15C	1015, G 10170
	2	1.1170	28 Mn 6	150 M 28	14A	20M5	C 28 Mn			SCMn 1	1330
	2 / 3	1.0501	C 35	060 A 35		CC35	C 35	F.113	1550	S 35 C	1035, G 10350
	2 / 3	1.0503	C 45	080 M 46		CC45	C 45	F.114	1650	S45C	1045, G 10430
	2 / 3	1.1191	Ck 45	080 M 46			C 45	F.1140	1672	S48C	1045, G 10420
	2 / 3	1.0726	35 S 20	212 M 36	8M	35 MF 4		F.210.G	1957		1140, G 11400
	2 / 3	1.1157	40 Mn 4	150 M 36	15	35 M 5					1039, G10390
	2 / 3	1.1167	36 Mn 5	150 M 36		40 M 5		F.411	2120	SMn438(H)	1335, G 13350
	4 / 5	1.0535	C 55	070 M 55			C 55	F.1150	1655	S 55 C	1055
	4 / 5	1.0601	C 60	080 A 62	43D	CC 55	C 60			S 58 C	1060, G 10600
	4 / 5	1.1203	Ck 55	070 M 55		XC 55	C 50		1655	S 55 C	1055
	4 / 5	1.1221	Ck 60	080 A 62	43D	XC 60	C 60	F.1150	1665; 1678	S 58 C	1060, G 10640
	4 / 5	1.1545	C 105 W1	BW 1A			C 100 KU	F.5118	1880	SK 3	W 110, T 72301
	4 / 5	1.1274	Ck 101	060 A 96				F.5117	1870	SUP 4	1095, G 10950
	5 / 9	1.5120	38 MnSi 4								
	6 / 7	1.6657	10 NiCrMo 13-4	832 M 13	36C		15 NiCrMo 13	14NiCrMo131			
	6 / 7	1.5423	16 Mo 5	1503-245- 420			16 Mo 5	16Mo5		SB 450 M	4520, G 45200
	6 / 7	1.7131	16 MnCr 5	527 M 17		16 MC 5	16 MnCr 5	F.1516	2511	SCR 415	5115, G 51170
	6 / 7	1.5622	14 Ni 6			16 N 6	14 Ni 6	15Ni6			A350LF5
	6 / 7	1.5415	15 Mo 3	1501-240		15 D 3	16 Mo 3	16Mo3	2912		A204GrA
	6 / 7	1.5752	14 NiCr 14	655 M 13	36A	12 NC 15				SNC 815 (H)	3310, 3415, 9314, G 33106
	6 / 7	1.6587	17 CrNiMo 6	820 A 16		18 NCD 6	18 NiCrMo 7				
	6 / 7	1.7262	15 CrMo 5			12 CD 4	12 CrMo 4	12CrMo4	2216		
	6 / 7	1.7335	13 CrMo 4-4	1501-620 Gr. 27		15 CD 3.5	14 CrMo 4 5	14CrMo45	2216		A 182-F11, F12
	6 / 7	1.7380	10 CrMo 9-10	1501-622 Gr. 31, 45		10 CD 9.10	12 CrMo 9 10	F.155	2218		A 182-F22, J 21890
	6 / 7	1.7715	14 MoV 6-3	1503-660- 440							
	6 / 7	1.7015	10 Cr 3	523 M 15		12 C 3				SCr 415 (H)	5015, G 50150
	6 / 8	1.7033	34 Cr 4	530 A 32	18B	32 C 4	34 Cr 4 (KB)			SCr 430 (H)	5132, G 51320
	6 / 8	1.7218	25 CrMo 4	1717 CDS 110		25 CD 4 5	25 CrMo 4 (KB)	F.1251	2225	SCM 420, SCM 430	4130, G 41300
	6 / 8	1.6523	21 NiCrMo 2	805 M 20	362	20 NCD 2	20 NiCrMo 2	F.1522	2506	SNCM 220 (H)	8620, G 86170
	6 / 9	1.7220	34 CrMo 4	708 A 37		35 CD 4	35 CrMo 4		2234	SCM 432, SCrM 3	4135, 4137, G 41350
	6 / 9	1.7225	42 CrMo 4	708 M 40		42 CD 4	42 CrMo 4		2244	SCM 440 (H)	4140, 4142, G 41400
	6 / 9	1.8509	41 CrAlMo 7	905 M 39	41B	40 CAD 6.12	41 CrAlMo 7			SACM 645	A355GrA, K 24065
	6 / 9	1.0961	60 SiCr 7			60 SC 7	60 SiCr 8			9262	
	6 / 9	1.2067	100 Cr 6	BL 3							L 3, T 61203
	6 / 9	1.2419	105 WCr 6			105 WC 13	107 WCr 5 KU		2140	SKS 31	
	6 / 9	1.2542	45 WCr 7	BS 1			45 WCrV 8 KU		2710		S 1, T 41901
	6 / 9	1.2713	55 NiCrMoV 6			55 NCDV 7		F.520.5		SKT 4	L 6, T 61206
	6 / 9	1.7035	41 Cr 4	530 M 40	18	42 C 4	41 Cr 4			SCr 440 (H)	5140, G 51400
	6 / 9	1.7176	55 Cr 3	527 A 60	48	55 C 3	55 Cr 3		2253	SUP 9 (A)	5155, G 51550
	6 / 9	1.6546	40 NiCrMo 2-2	311-Type 7		40 NCD 2	40 NiCrMo 2 (KB)			SNCM 240	8740, G 87400
	6 / 9	1.6511	36 CrNiMo 4	816 M 40	110	40 NCD 3	38 NiCrMo 4 (KB)				9840, G 98400
	6 / 9	1.6582	34 CrNiMo 6	817 M 40	24	35 NCD 6	35 NiCrMo 6 (KW)		2541	SNCM 447	4340
	6 / 9	1.7361	32 CrMo 12	722 M 24	40B	30 CD 12	32 CrMo 12		2240		
	6 / 9	1.8159	50 CrV 4	735 A 50	47	50 CV 4	51 CrV 4	51CrV4	2230	SUP 10	6145, 6150
	6 / 9	1.8523	39 CrMoV 13-9	897 M 39	40C		36 CrMoV 13 9				
	6 / 9	1.8161	58 CrV 4								
	10 / 11	1.5680	12 Ni 19			Z 18 N 5					2515
	10 / 11	1.2363	X100 CrMoV 5-1	BA 2		Z 100 CDV 5	X 100 CrMoV 5 1 KU	F.5227	2260	SKD 12	A 2, T 30102
	10 / 11	1.2436	X210 CrW 12				X 215 CrW 12 1 KU	F.5213	2312	SKD 2	D 4
	10 / 11	1.2601	X165 CrMoV 12				X 165 CrMoV 12 KU		2310		
	10 / 11	1.3343	S 6-5-2	BM 2		Z 85 WDCV 06.05.04.02	HS 6-5-2		2722	SKH 51	M 2, T 11302
	10 / 11	1.2344	X40 CrMoV 5-1	BH 13		Z 40 CDV 5	X 40 CrMo 5 1 1 KU	F.5318	2242	SKD 61	H 13, T 20813
	10 / 11	1.2581	X30 WCrV 9-3	BH 21		Z 30 WCV 9	X 30 WCrV 9 3 KU			SKD 5	H 21, T 20821
	10 / 11	1.2080	X210 Cr 12	BD 3		Z 200 C 12	X 210 Cr 13 KU			SKD 1	D 3, T 30403
	10 / 11	1.3243	S 6-5-2-5	BM 35		Z 85 WDKCV 06.05.05.04.02	HS 6-5-2-5	HS 6-5-2-5	2723	SKH 55	M35
	10 / 11	1.3348	S 2-9-2			Z 100 DCWV 09.04.02.02	HS 2-9-2	HS 2-9-2	2782		M 7, T 11307



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ISO	VDI [^] 3323	Germany	Germany	U.K.	U.K.	France	Italy	Spain	Sweden	Japan	USA	
P	10 / 11	1.3255	S 18-1-2-5	BT 4		Z 80 WKC 18.05.04.0	HS 18-1-1-5	HS 18-1-1-5		SKH 3	T 4, T 12004	
	10 / 11	1.3355	S 18-0-1	BT 1		Z 80 WCV 18.04.01	HS 18-0-1	HS 18-0-1		SKH 2	T 1, T 12001	
	10 / 11	1.4718	X45 CrSi 9-3	401 S 45	52	Z 45 CS 9	X 45 CrSi 8			SUH 1	HNV 3, S 65007	
	12 / 13	1.4104	X12 CrMoS 17	420 S 37		Z 10 CF 17	X 10 CrS 17	F.3117	2383	SUS 430 F	430 F, S 43020	
	12 / 13	1.4000	X6 Cr 13	403 S 17		Z 6 C 13	X 6 Cr 13	F.3110	2301	SUS 403	403, S 40300	
	12 / 13	1.4016	X6 Cr 17	430 S 15	60	Z 8 C 17	X 8 Cr 17	F.3113	2320	SUS 430	430, S 43000	
	12 / 13	1.4113	X6 CrMo 17	434 S 17		Z 8 CD 17.01	X 8 CrMo 17			SUS 434	434, S 43400	
	12 / 13	1.4006	X12 Cr 13	410 S 21	56A	Z10 C 13	X 12 Cr 13	F.3401	2302	SUS 410	410 S, S 41000	
	12 / 13	1.4001	X7 Cr 14					F.8401		SUS 429	429	
	12 / 13	1.4871	X53 CrMnNiN 21-9	349 S 52		Z 52 CMN 21.09	X 53 CrMnNiN 21 9			SUH 35	EV 8, S 63008	
	12 / 13	1.4034	X46 Cr 13	420 S 45	56D	Z 40 C 14	X 40 Cr 14	F.3405	2304	SUS 420J2		
	12 / 13	1.4057	X19 CrNi 17-2	431 S 29	57	Z 15 CN 16.02	X 16 CrNi 16	F.3427	2321	SUS 431	431, S 43100	
12 / 13	1.4313	X3 CrNi 13-4	425 C 11		Z 5 CN 13.4	X 6 CrNi 13 04			SCS 5	CA 6-NM, J 91540		
12 / 13	1.4027	G-X20Cr14	420 C 24	56B	Z 20 C 13 M				SCS 2			
M	14.1	1.4436	X3 CrNiMo 17-13-3	316 S 33		Z 6 CND 18.12.03	X 5 CrNiMo 17 13 2		2343	SUS 316	316, S 31600	
	14.1	1.4310	X10 CrNi 18-8	301 S 21		Z 12 CN 17.07	X2CrNi18 07	F.3517	2331	SUS 301	301, S 30100	
	14.1	1.4401	X5 CrNiMo 17-12-2	316 S 31	58J	Z 6 CND 17.11	X 5 CrNiMo 17 12	F.3543	2347	SUS 316	316, S 31600	
	14.1	1.4429	X2CrNiMoN 17-13-3	316 S 62		Z 2 CND 17.13 Az	X 2 CrNiMoN 17 13 3			2375	SUS 316 LN	316 LN, S 31653
	14.1	1.4583	X6 CrNiMoNb 18-12				X 6 CrNiMoNb 17 13					318
	14.1	1.4305	X10 CrNiS 18-10	303 S 21	58M	Z 10 CNF 18.09	X 10 CrNi 18 09	F.3508	2346	SUS 303	303, S 30300	
	14.1	1.4301	X5 CrNi 18-10	304 S 15	58E	Z 6 CN 18.09	X 5 CrNi 18 11	F.3504	2332, 2333	SUS 304	304, 304 H, S 30400	
	14.1	1.4571	X6 CrNiMoTi17-12-2	320 S 31	58J	Z 6 CNT 17.12	X 6 CrNiMoTi 17 12	F.3535	2350	SUS 316 Ti	316 Ti, S 31635	
	14.1	1.4311	X2 CrNiN 18 10	304 S 62		Z 2 CN 18.10	X2CrNiN18 10	F.3541	2371	SUS 304 LN	304 LN, S 30453	
	14.1	1.4308	G-X6CrNi 18-9	304 C 15	58E	Z 6 CN 18.10 M				2333	SCS 13	CF-8, J 92590
	14.1	1.4408	G-X6CrNiMo 18-10	316 C 16						2343	SCS 14	CF-8M, J 92900
	14.1	1.4581	G-X5CrNiMoNb 18	318 C 17		Z 4 CNDNb 18.12	GX5CrNiMoNb 19 11 2				SCS 22	
	14.2	1.4845	X12 CrNi 25-21	310 S 24		Z 12 CN 25.20	X 6 CrNi 25 20	F.331	2361	SUH 310; SUS 310 S		310 S
	14.2	1.4878	X12 CrNiTi 18-9	321 S 51	58B	Z6CNT18.12B			F.3523	2337	SUS 321	321
	14.2	1.4541	X14 CrNiTi 18-10	321 S 12		Z 6 CNT 18.10	X 6 CrNiTi 18 11	F.3523	2337	SUS 321	321 H, S 32100	
	14.2	1.4550	X6 CrNiNb 18-10	347 S 17	58F	Z 6 CNNb 18.10	X 6 CrNiNb 18 11	F.3524	2338	SUS 347	347, S 34700	
	14.3	1.4545	X5CrNiCuNb15-5-4			EZ5CNU15-05						S15500, 15-5 PH
	14.3	1.4542	X5CrNiCuNb16-4			Z6CNU17-04						S17400, 17-4 PH; 630
K	15 / 16	0.6020	GG 20	180, 200/220, 220, Grade180, Grade260		FGL200, Ft20D	G 20	FG20	120	FC200	200/225, 25B, 30, 30B	
	15	0.6010	GG-10		100	FT 10 D	G10		0110-00	FC100		
	15	0.6015	GG 15	Grade 150		FT 15 D	G 15	FG 15	0115-00	FC150	NO 25 B	
	15	0.6660	GGL-NiCr202	L-NiCuCr202		L-NC 202			0523-00		A436 Type 2	
	15	0.7040	GGG 40	SNG 420/12		FCS 400-12	G5400-12	FGE 38-17	0717-02	FCD400	60-40-18	
	16	0.6030	GG30	Grade 300		Ft 30 D	G30	FG30	01 30-00	FC300	300/325, 40B, 45/50, 45B	
	16	0.6035	GG-35	GRADE 350		Ft35D	G 35	FG 35	135	FC350	A48-50	
	16	0.6040	GG40	GRADE400		Ft 40 D			140		A48-60 B	
	16	0.7070	GGG-70	SNG700/2	EN-JS1070	FGS 700-2	GGG 70	GGG 70	07 37-01	FCD700, FCD700-2	100-70-03	
	17	0.7033	GGG35.3						07 17-15		Ni-ResistD-5B, S-NiCr35-3	
	17	0.7043	GGG-40.3	370/7	EN-JS1025	FGS 370/17			0717-15	FCD400-18L	60/40/18	
	17	0.7050	GGG50	SNG500/7	EN-JS1050	FGS 500/7	GGG 50	FGE50-7	0727-02	FCD500, FCD500-7	65-45-12, 70-50-05, 80-55-06	
	17	0.7652	GGG-NiMn 13 7	S-NiMn 137		S-Mn 137						
	17	0.7660	GGG-NiCr 20 2	Grade S6		S-NC 202			0772-00		A43D2, Ni-ResistD-2, S-NiCr20-2	
	18	0.6025	GG25	Grade260		Ft 25 D	G25	FG25	0717-12		250/275, 35, 35B, 40	
	18	0.7060	GGG60	SNG600/3	EN-JS1060	FGS600-3	G 25	FG 25	07 32-03	FC250	100-70-03, 80-55-06, 80-60-03	
	18								0727-03	FCD600	A48 40 B	
	19	0.8055	GTW55									
	19	0.8135	GTS-35-10	B 340/2		Mn 35-10			GTS 35	810		
	19	0.8145	GTS-45-06	P 440/7		Mn 450-6				0815-00		A220-40010
	19		GTS-35	B 340/12			0852-00	GMN 45				
	19			8 290/6		MN 32-8						
	19		GTS-35	B340/12		MN 35-10				0810-00		32510
	20	0.8035	GTM-35	W340/3		MB35-7				814	AC4A	
	20	0.8040	GTW-40	W410/4		MB40-10				08 15	FCMW330	
	20	0.8045							GTM 35	852		
	20	0.8065	GTMW-65				GMB40	GTM 40				
	20	0.8155	GTS-55-04	P 510/4		Mn 550-4	GMB45	GTM 45				A220-50005
20	0.8165	GTS-65-02	P 570/3		Mn 650-3				0854-00		70003	
20	0.8170	GTS-70-02	P 690/2		Mn 700-2	GMN 55, 65			0854-00	FCMP490	90001	
20		GTS-45	P440/7			20 Mn 7		F.1515-20 Mn 6		SMnC 420	400 10	
20		GTS-65	P 570/3		MP 60-3	C 36; C 38			1572	S 35 C	70003	



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ISO	VDI 3323	Germany	Germany	U.K.	U.K.	France	Italy	Spain	Sweden	Japan	USA	
N	21	3.0205							08 52		A199	
	21	3.0255	Al99.5	L31/34/36		A59050C	P-Al99.5		Al99.5	FCMP540	1000	
	21	3.3315	AlMg1									
	21	3.0505	AlMn0.5Mg0.5									
	21	3.0275	Al99.7		4508, 9001-3, P-Al99.7		1070A	Al99.7			1070, A1070	1070A
	21	3.0285	Al99.8		1080A		1080A	4590, 9001-4, P-Al99.8			1080A, 1080A	1080A, 1080A
	22	3.1325	AlCuMg 1				2017A	P-AlCu4MgMnSi			2017	A92017
	22	3.1655	AlCuSiPb									
	22	3.2315	AlMgSi1									
	22	3.4345	AlZnMgCu0,5		L 86		AZ 4 GU/9051					7050
	22	3.1305	AlCuMg0.5		L86		A-U2G2117	P-AlCu2.5MgSi			2117	2117
	22	3.0517	AlMnCu									
	23	3.2381	G-AlSi 10 Mg		G-AlSi9Mg		A-510G			AlSi10Mg	AC4A, ADC3	A03590
	23	3.2382	GD-AlSi10Mg							811-04	ADC3	
	23	3.2581	G-AlSi12		LM20		A-512U	G-AlSi13CuMn		AlSi12Cu	AC3A	A04130
	23	3.3561	G-AlMg 5								AC7A, ADC5, Al-Mg6	
	23	3.5101	G-MgZn4sE1Zr1		MAG 5							ZE 41
	23	3.5103	MgSE3Zn27r1		MAG 6		G-TR3Z2					EZ 33
	23	3.5812	G-MgAl8Zn1		NMAG 1							AZ 81
	23	3.5912	G-MgAl9Zn1		MAG 7							AZ 91
	23	3.3549	AlMg5Mn									
	23	3.3555	AlMg5									
	23	3.3547	AlMg4.5, AlMg4.5Mn		5083		5183	P-AlMg4.4		AlMg4.5Mn	5082	A95083
	23-24	3.2383	G-AlSi0Mg(Cu)		LM9					4253		A360.2
	23-24				2789;1973		NF A32-201					A356-72
	23-24				LM25					4244	A5052	356.1
	23-24		G-AlSi12		LM 6					4261		A413.2
	23-24		G-AlSi 12 (Cu)		LM 20					4260	ADC12	A413.1
	23-24		GD-AlSi12							4247	A6061	A413.0
	23-24		GD-AlSi8Cu3		LM24					4250	A7075	A380.1
	24	2.1871	G-AlCu 4 TiMg									
	24	3.1754	G-AlCu5Ni1,5									
	24	3.2163	G-AlSi9Cu3								ADC10	
	24	3.2371	G-AlSi 7 Mg								AC4CH	4218 B
	24	3.2373	G-AlSi9MGWA				A-57G			4251	C4BS	5C64D
	24	3.5106	G-MgAg3SE2Zr1		mag 12							QE 22
	24		G-ALMG5		LM5		A-SU12			4252		GD-AlSi12
	26	2.1090	G-CuSn 7 5 pb				U-E 7 Z 5 pb 4					C93200
	26	2.1096	G-CuSn5ZnPb		LG 2							c 83600
	26	2.1098	G-CuSn 2 Znpb									C 83600
	26	2.1182	G-CuPb15Sn		LB1		U-pb 15 E 8					C23000
	27	2.0240	CuZn 15									
	27	2.0321	CuZn 37		cz 108		CuZn 36, CuZn 37	C 2700				C27200
	27	2.0590	G-CuZn40Fe									
	27	2.0592	G-CuZn 35 Al 1		U-Z 36 N 3		HTB 1					C 86500
	27	2.1293	CuCrZr		CC 102		U-Cr 0.8 Zr					C 18200
	28	2.0060	E-Cu57									
	28	2.0375	CuZn36Pb3									
28	2.0966	CuAl 10 Ni 5 Fe 4		Ca 104		U-A 10 N					C 63000	
28	2.0975	G-CuAl 10 Ni									B-148-52	
28	2.1050	G-CuSn 10		CT1							c 90700	
28	2.1052	G-CuSn 12		pb 2		UE 12 P					C 90800	
28	2.1292	G-CuCrF 35		CC1-FF							C 81500	
28	2.4764	CoCr20W15Ni										



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ISO	VDI [^] 3323	Germany	Germany	U.K.	U.K.	France	Italy	Spain	Sweden	Japan	USA	
S	31	1.4558	X 2 NiCrAlTi 32 20	NA 15							N 08800	
	31	1.4562	X 1 NiCrMoCu 32 28 7								N 08031	
	31	1.4563	X 1 NiCrMoCuN 31 27 4						2584		N 08028	
	31	1.4864	X 12 NiCrSi 36 16	NA 17		Z 12 NCS 35.16				SUH 330	INCOLOY DS,, N08330	
	31	1.4865	G-X40NiCrSi38 18	330 C 40			XG50NiCr39 19			SCH15	N 08004	
	31	1.4958	X 5 NiCrAlTi 31 20									
	31	2.4668	NiCr19NbMo				NC20K14					AMS 5544
	32	1.4977	X 40 CoCrNi 20 20				Z 42 CNKDOWNb					
	33	2.4360	NiCu30Fe	NA 13			NU 30					Monel 400
	33	2.4603					NC22FeD					5390A
	33	2.4610	NiMo16Cr16Ti									Hastelloy C-4
	33	2.4630	NiCr20Ti	HR 5,203-4			NC 20 T					Nimonic 75
	33	2.4642	NiC29Fe				Nnc 30 Fe					Inconel 690
	33	2.4856	NiCr22Mo9Nb	NA 21			NC 22 FeDNb					INCONEL 625, N 26625
	33	2.4858	NiCr21Mo	NA 16			NC 21 Fe DU					Incoloy 825
	34	2.4375	NiCu30 Al	NA 18			NU 30 AT					Monel k-500
	34	2.4631	NiCr20TiAl	Hr40:601, NA 20			NC20TA					N 07080
	34	2.4668	NiCr19FeNbMo				NC 19 Fe Nb					Inconel 718
	34	2.4694	NiCr16fE7TiAl									Inconel
	34	2.4955	NiFe25Cr20NbTi									
	34	2.4668	NiCr19Fe19NbMo	HR8			NC19eNB					5383
	34	2.4670	S-NiCr13A16MoNb	3146-3			NC12AD					5391
	34	2.4662	NiFe35Cr14MoTi				ZSNCDT42					5660
	34	2.4964	CoCr20W15Ni				KC20WN					5537C
	34		CoCr22W14Ni				KC22WN					AMS 5772
	34											N07725, Inconel 725
	35	2.4669	NiCr15Fe7TiAl				NC 15 TNb A					Inconel X-750
	35	2.4685	G-NiMo28									Hastelloy B
	35	2.4810	G-NiMo30									Hastelloy C
	35	2.4973	NiCr19Co11MoTi				NC19KDT					AMS 5399
	35	3.7115	TiAl5Sn2									
	36	3.7025	Ti 1	2 TA 1								R 50250
	36	3.7225	Ti 1 pd	TP 1								R 52250
	36	2.4674	NiCo15Cr10MoAlTi									AMS 5397
	37	3.7124	TiCu2	2 TA 21-24								
	37	3.7145	TiAl6Sn2Zr4Mo2Si									R 54620
	37	3.7165	TiAl6V4	TA 10-13;TA 28			T-A 6 V					
37	3.7185	TiAl4Mo4Sn2	TA 45-51; TA 57									
37	3.7195	TiAl 3 V 2.5										
37		TiAl4Mo4Sn4Si0.5										
37		TiAl5Sn2.5	TA14/17			T-A5E					AMS R54520	
37		TiAl6V4	TA10-13/TA28			T-A6V					AMS R56400	
37		TiAl6V4ELI	TA11								AMS R56401	
H	38	1.1545	C 105 W1	BW 1A		Y1 105	C 100 KU	F-5118	1880	SK 3	W 1	
	38	1.2762	75 CrMoNiW 6 7									
	38	1.4125	X105 CrMo 17			Z 100 CD 17					440C	
	38	1.6746	32 nlcRmO 14 5	832 M 31		35 NCD 14						
	40	0.9620	G-X 260 NiCr 4 2	Grade 2 A			0512-00				Ni- Hard 2	
	40	0.9625	G-X 330 Ni Cr 4 2	Grade 2 B							Ni- Hard 1	
	40	0.9630	G-X 300 CrNiSi 9 5 2				0513-00				Ni-Hard 4	
	40	0.9640	G-X 300 CrMoNi 15 2 1									
	40	0.9650	G-X 260 Cr 27	Grade 3 D							A 532 III A 25% Cr	
	40	0.9655	G-X 300 CrNiMo 27 1	Grade 3 E							A 532 III A 25% Cr	
	40	1.2419	105 WCr 6	105WC 13				0466-00				
	40	1.4841	X15 CrNiSi 25 20	314 531		Z 15 CNS 25-20					310	
	41	0.9635	G-X 300 CrMo 15 3									
41	0.9645	G-X 260 CrMoNi 20 2 1						107 WCr 5 KU				

Technical Information Speeds & Feeds - Taps



ISO VDI Material Group 工件材料类别 Sutton 应用材料代号

P	A	Steel 钢件	N	UNI
M	R	Stainless Steel 不锈钢	VA	
K	F	Cast Iron 铸铁	GG	
N	N	Non-Ferrous Metals, Aluminiums & Coppers 有色金属	Al W	
S	S	Titaniums & Super Alloys 钛合金及超级合金	Ti Ni	
H	H	Hard Materials (≥ 45 HRC) 淬火钢(≥ 45 HRC)	H	

ISO及VDI应用材料代号

^ VDI 3323 material groups can also be determined by referring to the workpiece material cross reference listing. Refer to main index of this section.

^ VDI 3323 工件材料类别明细可查阅产品目录技术篇的工件材料分类表。

Catalogue Code 产品号 M

UNC

UNF

Material 材质

Surface Finish 表面处理

Sutton Designation 神盾工具代号

Geometry 几何结构

Thread Depth 有效攻入深度

挤压	先端-通孔用	直槽 (盲孔及通孔用)	螺旋-盲孔用
THREAD FORMING	THROUGH HOLES	BLIND/THROUGH	FOR TAPPING BLIND HOLES
T514/T515 T520/T521 T526/T527 T662/T623 T539	T499 T500 T548 T615 T616 T621 T622	T294/T295 T296/T297	T503/T606 T504/T607 T690 T570/T611 T577
HSS Co.8	HSSE	SPM VHM	HSSE PM-HSS Co
TiN	Brt Blu	TiCN	Brt Blu Blu Brt
N	N VA	XH VH	N VA VADH H
Single Coolant Groove Multi Coolant Groove	Special Relief	Special Relief	R40 R15
≤ 3xØ	≤ 3xØ	≤ 1.5xØ	≤ 2.5xØ ≤ 1.5xØ

ISO	VDI 3323	Material 工件材料	Condition 材料状态	HB 硬度	N/mm ²	Vc (m/min)	Vc (m/min)	Vc (m/min)	Vc (m/min)										
P	1	Steel - Non-alloy, cast & free cutting 钢件-非合金及易切削	~ 0.15 %C	A	125	440	18	18	12	13	13	-	-	10	11	11	18	-	
	2			A	190	640	18	18	12	13	13	-	-	10	11	11	15	-	
	3			QT	250	840	15	15	10	11	11	-	-	8	9	9	12	8	
	4			A	270	910	17	17	11	12	12	-	-	9	10	-	12	8	
	5	QT	300	1010	-	-	-	-	-	11	16	-	-	-	-	-	5	-	
	6	Steel - Low alloy & cast < 5% of alloying elements 钢件-低合金钢	~ 0.75 %C	A	180	610	18	18	12	13	13	-	-	10	11	11	12	-	
	7			QT	275	930	-	-	8	9	9	-	-	6	7	7	10	6	
	8			QT	300	1010	-	-	-	-	-	7	11	-	-	-	-	-	5
	9			QT	350	1180	-	-	-	-	-	4	5	-	-	-	-	-	4
	10	Steel - High alloy, cast & tool 高合金钢及工具钢		A	200	680	-	-	-	-	-	9	14	-	-	-	-	-	5
	11			HT	325	1100	-	-	-	-	-	7	11	-	-	-	-	-	4
12	Steel - Corrosion resistant & cast 钢件-耐酸钢	Ferritic / Martensitic	A	200	680	-	-	-	6	6	-	-	-	4	4	4	4	4	
13			QT	240	810	-	-	-	-	-	4	5	-	-	-	-	-	4	
M	14.1	Stainless Steel 不锈钢	Austenitic	A	180	610	9	9	-	7	7	-	-	-	5	5	8	-	
	14.2			Duplex	250	840	6	6	-	4	4	-	-	-	4	4	5	-	
	14.3			Precipitation Hardening	250	840	-	-	-	3	3	-	-	-	3	3	4	4	
K	15	Cast Iron - Grey (GG) 灰铸铁	Ferritic / Pearlitic	A	180	610	-	-	12	13	-	-	-	-	10	11	-	-	20
	16			Pearlitic	260	880	-	-	-	-	-	-	-	-	-	-	-	-	15
	17	Cast Iron - Nodular (GGG) 球墨铸铁	Ferritic	A	160	570	-	-	12	13	-	-	-	-	10	11	-	-	14
	18			Pearlitic	250	840	-	-	-	-	-	-	-	-	-	-	-	-	14
	19			Ferritic	130	460	-	-	15	17	-	-	-	-	12	13	-	-	14
20	Pearlitic	230	780	-	-	12	13	-	-	-	-	10	11	-	-	14			
N	21	Aluminum & Magnesium - wrought alloy 锻造铝合金	Non Heat Treatable	A	60	210	18	18	12	-	-	-	-	10	-	-	-	-	
	22			Heat Treatable	AH	100	360	23	23	15	-	-	-	-	12	-	-	-	-
	23	Aluminum & Magnesium - cast alloy ≤ 12% Si 压铸铝 ≤ 12% Si	Non Heat Treatable	A	75	270	23	23	15	-	-	-	-	12	-	-	-	-	
	24			Heat Treatable	AH	90	320	23	23	15	-	-	-	-	12	-	-	-	-
	25	Al & Mg-cast alloy 压铸铝 > 12% Si	Non Heat Treatable	A	130	460	-	-	-	-	-	-	-	-	-	-	-	-	
	26	Copper & Cu alloys (Brass/Bronze) 铜及铜合金	Free cutting, Pb > 1%	A	110	390	12	12	8	-	-	-	-	6	-	-	-	-	
	27			Brass (CuZn, CuSnZn)	90	320	-	-	18	-	-	21	32	14	-	-	-	14	
	28	Bronze (CuSn)	100	360	21	21	-	-	-	-	-	-	-	-	-	-	-		
	29	Non-metallic - Thermosetting & fiber-reinforced plastics	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
30	Non-metallic - Hard rubber, wood etc.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-		
S	31	High temp. alloys 耐热合金	Fe based	A	200	680	-	-	-	-	-	-	-	-	-	-	-	-	
	32			AH	280	950	-	-	-	-	-	-	-	-	-	-	-	-	
	33			Ni / Co based	A	250	840	-	-	-	-	-	-	-	-	-	-	-	-
	34				AH	350	1180	-	-	-	-	-	-	-	-	-	-	-	-
	35				C	320	1080	-	-	-	-	-	-	-	-	-	-	-	-
	36	Titanium & Ti alloys 钛合金	CP Titanium	A	400	MPa	-	-	-	-	-	-	-	-	-	-	-	-	
	37.1			860	MPa	-	-	-	-	-	-	-	-	-	-	-	-		
	37.2			Alpha alloys	A	960	MPa	-	-	-	-	-	-	-	-	-	-	-	
37.3	Alpha / Beta alloys			AH	1170	MPa	-	-	-	-	-	-	-	-	-	-	-		
37.4	Beta alloys			A	830	MPa	-	-	-	-	-	-	-	-	-	-	-		
37.5	AH	1400	MPa	-	-	-	-	-	-	-	-	-	-	-	-				
H	38.1	Hardened steel 淬火钢	HT	45 HRC	-	-	-	-	-	-	-	4	5	-	-	-	-		
	38.2			55 HRC	-	-	-	-	-	-	-	-	4	-	-	-	-		
	39.1			58 HRC	-	-	-	-	-	-	-	-	-	4	-	-	-		
	39.2			62 HRC	-	-	-	-	-	-	-	-	-	4	-	-	-		
	40	Cast Iron 硬铸铁	Chilled	C	400	1350	-	-	-	-	-	-	-	-	-	-	-	15	
41	HT			55 HRC	-	-	-	-	-	-	-	-	4	-	-	-			

Condition (材料状态): A (Annealed) (正火), AH (Age Hardened) (时效硬化), C (Cast) (铸件), HT (Hardened & Tempered) (淬火及回火), QT (Quenched & Tempered) (调质及回火)

Bold = Optimal | Regular = Effective 粗体 = 非常适合 | 细体 = 适合

Notes on Tapping

- The speeds listed above are a recommendation only, and are based on depth of thread listed, speeds can be adjusted on application. As a general rule;
 - If hole depth required is less than above mentioned = increase speed
 - If hole depth required is more than above mentioned = reduce speed
- Taps must be driven by the square to eliminate slippage, eg, ER-GB collets (square drive).
- When using spiral flute taps with length compensation tapping attachment, it is recommended to short pitch the feed 95%, to eliminate tap cutting oversize, eg. M6x1 @ 1000RPM, Feedrate= 950mm/min.

METRIC TAPS (mm size)

Ø	= nominal tap size (mm)	n	= $\frac{v_c \times 1000}{\phi \times \pi} \approx \frac{v_c}{\phi} \times 318$
P	= thread pitch (mm)	n	= spindle speed (RPM)
n	= spindle speed (RPM)	V _c	= $\frac{n \times \phi \times \pi}{1000} \approx \frac{n \times \phi}{318}$
V _c	= cutting speed (m/min)	V _f	= feed rate (mm/min)
V _f	= feed rate (mm/min)	V _f	= feed rate per rev (mm/rev)
V _f	= feed rate per rev (mm/rev)	V _f	= n x P

Technical Information Speeds & Feeds - Endmills



ISO	VDI	Material Group	工件材料类别	Sutton	应用材料代号
P	A	Steel	钢件	N	UNI
M	R	Stainless Steel	不锈钢	VA	
K	F	Cast Iron	铸铁	GG	
N	N	Non-Ferrous Metals, Aluminiums & Coppers	有色金属	Al W	
S	S	Titaniums & Super Alloys	钛合金及超级合金	Ti	
H	H	Hard Materials (≥ 45 HRC)	淬火钢(≥ 45 HRC)	H	

ISO及VDI应用材料代号

^ VDI 3323 material groups can also be determined by referring to the workpiece material cross reference listing. Refer to main index of this section.

^ VDI 3323 工件材料类别明细可查阅产品目录技术篇的工件材料分类表。

- Catalogue Code 产品号
- Material 材质
- Surface Finish 表面处理
- Sutton Designation 神盾工具代号
- Geometry 几何结构
- Type of Cut: Slotting 槽铣
- Finishing 精铣
- Universal 侧铣
- Roughing 粗铣
- Profiling 仿型铣
- ap x Ø 切深
- ae x Ø 切深

E100		E102/E225		E125/E227		E127/E229		E126	
HSS Co.8									
BrT		BrT		BrT		BrT		TiCN	
N									
R30									
•		•		•		•		•	
				•		•		•	
				•				•	
						•			
0.5		0.5		1.5		1.5		1.5	
1.0		1.0		0.1		0.25		0.1	
1.0		1.0		0.1		0.25		0.1	

ISO	VDI ³³²³	Material 工件材料	Condition 材料状态	HB 硬度	N/mm ²	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #			
P	1	Steel - Non-alloy, cast & free cutting 钢件-非合金及易切削	~ 0.15 %C	A	125	440	30	6	18	4	40	4	40	5	24	3	50	4	40	5
	2			A	190	640	30	6	18	4	40	4	40	5	24	3	50	4	40	5
	3		QT	250	840	30	6	18	4	40	4	40	5	24	3	50	4	40	5	
	4		~ 0.75 %C	A	270	910	30	6	18	4	40	4	40	5	24	3	50	4	40	5
	5			QT	300	1010	20	5	12	3	25	3	25	4	15	2	30	3	25	4
	6	Steel - Low alloy & cast < 5% of alloying elements 钢件-低合金钢	A	180	610	30	6	18	4	40	4	40	5	24	3	50	4	40	5	
	7		QT	275	930	25	5	15	3	30	3	30	4	18	3	40	4	35	5	
	8		QT	300	1010	20	5	12	3	25	3	25	4	15	3	30	3	25	4	
	9		QT	350	1180	-	-	-	-	-	-	-	-	-	-	25	3	20	4	
	10		A	200	680	20	5	12	3	25	3	25	4	20	3	30	3	25	4	
	11	HT	325	1100	-	-	-	-	-	-	-	-	-	-	25	3	20	4		
12	Steel - Corrosion resistant & cast 钢件-耐酸钢	Ferritic / Martensitic	A	200	680	-	-	-	-	10	2	10	3	8	2	12	2	10	3	
13		Martensitic	QT	240	810	15	4	10	2	22	3	22	4	15	3	25	3	20	4	
M	14.1	Stainless Steel 不锈钢	Austenitic	A	180	610	-	-	-	-	-	-	-	-	20	3	16	4		
	14.2		Duplex	250	840	-	-	-	-	-	-	-	-	-	15	1	12	3		
	14.3		Precipitation Hardening	250	840	-	-	-	-	-	-	-	-	-	12	2	10	3		
K	15	Cast Iron - Grey (GG) 灰铸铁	Ferritic / Pearlitic	180	610	30	5	18	3	35	3	35	4	20	3	40	3	32	4	
	16		Pearlitic	260	880	25	4	15	2	25	2	25	3	15	2	30	2	24	3	
	17		Ferritic	160	570	20	3	12	2	22	2	22	3	12	2	5	2	4	3	
	18		Pearlitic	250	840	20	3	12	2	22	2	22	3	12	2	5	2	4	3	
	19		Ferritic	130	460	20	3	12	2	22	2	22	3	12	2	5	2	4	3	
20	Pearlitic	230	780	20	3	12	2	22	2	22	3	12	2	5	2	4	3			
N	21	Aluminum & Magnesium - wrought alloy 锻造铝合金	Non Heat Treatable	60	210	70	6	40	4	70	5	70	6	40	4	75	5	60	6	
	22		Heat Treatable	AH	100	360	70	6	40	4	70	5	70	6	40	4	75	5	60	6
	23	Aluminum & Magnesium - cast alloy ≤12% Si 压铸铝 ≤12% Si	Non Heat Treatable	75	270	50	5	30	3	55	4	55	5	35	3	60	4	45	5	
	24		Heat Treatable	AH	90	320	50	5	30	3	55	4	55	5	35	3	60	4	45	5
	25	Al & Mg-cast alloy 压铸铝 >12% Si	Non Heat Treatable	130	460	30	6	13	4	-	-	-	-	-	50	4	35	5		
	26	Copper & Cu alloys (Brass/Bronze) 铜及铜合金	Free cutting, Pb > 1%	110	390	25	5	15	3	40	4	40	5	24	3	40	4	32	5	
	27		Brass (CuZn, CuSnZn)	90	320	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	28		Bronze (CuSn)	100	360	50	6	30	4	70	5	70	6	40	4	75	5	60	6	
	29	Non-metallic - Thermosetting & fiber-reinforced plastics																		
	30	Non-metallic - Hard rubber, wood etc.																		
S	31	High temp. alloys 耐热合金	Fe based	A	200	680	-	-	-	-	-	-	-	-	-	-	-	-		
	32			AH	280	950	-	-	-	-	-	-	-	-	-	-	-	-		
	33		Ni / Co based	A	250	840	-	-	-	-	-	-	-	-	-	-	-	-		
	34			AH	350	1180	-	-	-	-	-	-	-	-	-	-	-	-		
	35			C	320	1080	-	-	-	-	-	-	-	-	-	-	-	-		
	36	Titanium & Ti alloys 钛合金	CP Titanium	400 MPa																
	37.1		Alpha alloys	860 MPa																
	37.2		Alpha / Beta alloys	A	960 MPa															
	37.3		AH	1170 MPa																
	37.4		A	830 MPa																
37.5	AH	1400 MPa																		
H	38.1	Hardened steel 淬火钢	HT	45 HRC																
	38.2		HT	55 HRC																
	39.1		HT	58 HRC																
	39.2		HT	62 HRC																
	40		Cast Iron 硬铸铁	Chilled	C	400	1350	-	-	-	25	3	25	3	20	2	35	3	35	3
41	HT	55 HRC																		

Condition (材料状态):
 A (Annealed) (正火), AH (Age Hardened) (时效硬化),
 C (Cast) (铸件), HT (Hardened & Tempered) (淬火及回火),
 QT (Quenched & Tempered) (调质及回火)
 Bold = Optimal | Regular = Effective
 粗体 = 非常适合 | 细体 = 适合

Notes on Milling

- Above values are guidelines for the size and type of cut nominated.
- For long series tools, reduce speed by 40% and feed by 20%.

Ø	Feed Table (f) (mm/tooth) 进给量查表 f (mm/齿)																			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
2	0.001	0.002	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.010	0.011	0.013	0.014	0.016	0.018	0.020	0.022	0.024	0.026	0.030
3	0.002	0.003	0.004	0.005	0.006	0.008	0.009	0.010	0.012	0.014	0.016	0.018	0.020	0.023	0.025	0.028	0.032	0.034	0.038	0.042
4	0.004	0.005	0.006	0.007	0.009	0.010	0.012	0.014	0.016	0.018	0.021	0.023	0.026	0.030	0.032	0.036	0.040	0.044	0.045	0.050
5	0.005	0.006	0.008	0.009	0.011	0.013	0.015	0.017	0.020	0.023	0.025	0.030	0.032	0.036	0.040	0.044	0.050	0.055	0.060	0.065
6	0.006	0.008	0.009	0.011	0.013	0.016	0.018	0.021	0.024	0.028	0.030	0.034	0.038	0.042	0.045	0.050	0.055	0.060	0.070	0.075
8	0.010	0.012	0.014	0.017	0.019	0.022	0.025	0.028	0.032	0.036	0.040	0.045	0.050	0.055	0.060	0.065	0.075	0.080	0.085	0.095
10	0.013	0.015	0.018	0.021	0.024	0.028	0.032	0.036	0.040	0.045	0.050	0.055	0.060	0.070	0.075	0.085	0.090	0.100	0.11	0.12
12	0.016	0.019	0.022	0.026	0.030	0.034	0.038	0.044	0.050	0.055	0.060	0.065	0.075	0.080	0.090	0.100	0.11	0.12	0.13	0.14
16	0.020	0.024	0.028	0.034	0.038	0.044	0.050	0.055	0.060	0.070	0.080	0.085	0.095	0.11	0.12	0.13	0.14	0.16	0.17	0.18
20	0.022	0.028	0.032	0.038	0.044	0.050	0.060	0.065	0.075	0.085	0.095	0.11	0.12	0.13	0.15	0.16	0.18	0.19	0.21	0.23
25	0.025	0.032	0.038	0.045	0.055	0.060	0.070	0.080	0.090	0.10	0.12	0.13	0.15	0.16	0.18	0.20	0.22	0.24	0.26	0.29

Technical Information Speeds & Feeds - Endmills



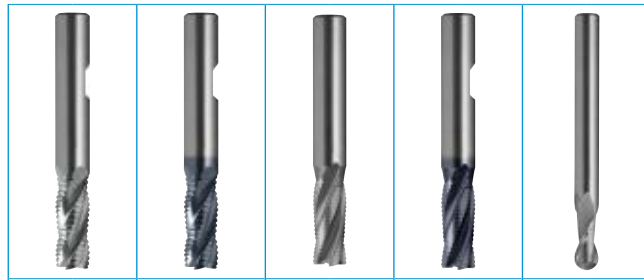
ISO VDI Material Group 工件材料类别 Sutton 应用材料代号

P	A	Steel 钢件	N	IMI
M	R	Stainless Steel 不锈钢	VA	
K	F	Cast Iron 铸铁	GG	
N	N	Non-Ferrous Metals, Aluminiums & Coppers 有色金属	Al W	
S	S	Titaniums & Super Alloys 钛合金及超级合金	Ti Ni	
H	H	Hard Materials (≥ 45 HRC) 淬火钢(≥ 45 HRC)	H	

ISO及VDI应用材料代号

^ VDI 3323 material groups can also be determined by referring to the workpiece material cross reference listing. Refer to main index of this section.

^ VDI 3323 工件材料类别明细可查阅产品目录技术篇的工件材料分类表。



E142/E144	E143/E145	E168	E171	E113
HSS Co.8				
Br _t	TiCN	Br _t	TiCN	Br _t
WN		NH		N
R30 NR		R30 HR		R30
Finishing 精铣				
Universal 侧铣				
Roughing 粗铣				
Profiling 仿型铣				
ap × Ø		ap × Ø		ap × Ø
ae × Ø		ae × Ø		ae × Ø
1.0	1.0	1.0	1.0	0.05
0.5	0.5	0.5	0.5	0.02-0.05

Catalogue Code 产品号

Material 材质

Surface Finish 表面处理

Sutton Designation 神盾工具代号

Geometry 几何结构

Type of Cut: Slotting 槽铣

Finishing 精铣

Universal 侧铣

Roughing 粗铣

Profiling 仿型铣

ap × Ø 切深

ae × Ø 切深

ISO	VDI ³³²³	Material 工件材料	Condition 材料状态	HB 硬度	N/mm ²	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	Vc	Feed #	VDI ³³²³	ISO
P	1	Steel - Non-alloy, cast & free cutting 钢件-非合金及易切削	~ 0.15 %C	A	125	440	36	5	40	5	-	-	-	-	40	5	1
	2			A	190	640	36	5	40	5	-	-	-	-	40	5	2
	3			QT	250	840	36	5	40	5	30	3	-	-	40	5	3
	4			A	270	910	36	5	40	5	-	-	-	-	40	5	4
	5			QT	300	1010	-	-	40	5	30	3	35	3	30	4	5
	6	Steel - Low alloy & cast < 5% of alloying elements 钢件-低合金钢	~ 0.75 %C	A	180	610	36	5	40	5	-	-	-	-	40	5	6
	7			QT	275	930	-	-	40	5	38	3	40	3	35	4	7
	8			QT	300	1010	-	-	40	5	30	3	35	3	30	4	8
	9			QT	350	1180	-	-	-	-	25	3	30	3	-	-	9
	10	Steel - High alloy, cast & tool 高合金钢及工具钢		A	200	680	-	-	-	-	30	3	35	3	30	4	10
	11			HT	325	1100	-	-	-	-	25	3	30	3	-	-	11
	12	Steel - Corrosion resistant & cast 钢件-耐酸钢	Ferritic / Martensitic	A	200	680	-	-	-	-	15	3	20	3	-	-	12
	13			QT	240	810	-	-	-	-	25	3	30	3	-	-	13
M	14.1	Stainless Steel 不锈钢	Austenitic	A	180	610	-	-	-	-	-	35	4	20	4	14.1	
	14.2			Duplex	250	840	-	-	-	-	25	3	15	2	14.2		
	14.3			Precipitation Hardening	250	840	-	-	-	-	20	3	-	-	14.3		
K	15	Cast Iron - Grey (GG) 灰铸铁	Ferritic / Pearlitic	A	180	610	-	-	50	8	50	8	60	8	40	4	15
	16			Pearlitic	260	880	-	-	-	-	40	8	30	3	16		
	17	Cast Iron - Nodular (GGG) 球墨铸铁	Ferritic	A	160	570	-	-	20	8	20	8	30	8	25	2	17
	18			Pearlitic	250	840	-	-	-	-	30	8	25	2	18		
	19			Ferritic	130	460	-	-	20	8	20	8	30	8	25	2	19
20	Cast Iron - Malleable 可锻铸铁	Pearlitic	A	230	780	-	-	-	-	30	8	25	2	20			
21			HT	325	1100	-	-	-	-	25	3	30	3	-	-		
N	21	Aluminum & Magnesium - wrought alloy 锻造铝合金	Non Heat Treatable	A	60	210	80	9	90	9	-	-	-	-	80	6	21
	22			AH	100	360	80	9	90	9	-	-	-	-	80	6	22
	23	Aluminum & Magnesium - cast alloy ≤12% Si 压铸铝 ≤12% Si	Heat Treatable	A	75	270	55	8	65	8	-	-	-	-	55	5	23
	24			AH	90	320	55	8	65	8	-	-	-	-	55	5	24
	25	Al & Mg cast alloy 压铸铝 >12% Si	Non Heat Treatable	A	130	460	-	-	-	-	-	-	-	-	50	5	25
	26			AH	110	390	30	6	35	6	-	-	-	-	25	5	26
	27	Copper & Cu alloys (Brass/Bronze) 铜及铜合金	Free cutting, Pb > 1%	A	90	320	-	-	-	-	25	5	30	5	-	-	27
	28			AH	100	360	40	6	50	6	-	-	-	-	50	6	28
	29	Non-metallic - Thermosetting & fiber-reinforced plastics															29
	30	Non-metallic - Hard rubber, wood etc.															30
S	31	High temp. alloys 耐热合金	Fe based	A	200	680	-	-	-	-	-	-	-	-	-	31	
	32			AH	280	950	-	-	-	-	-	-	-	-	-	32	
	33			Ni / Co based	A	250	840	-	-	-	-	-	-	-	-	-	33
	34				AH	350	1180	-	-	-	-	-	-	-	-	-	34
	35	Titanium & Ti alloys 钛合金	CP Titanium	C	320	1080	-	-	-	-	-	-	-	-	-	35	
	36			400 MPa	-	-	-	-	-	-	-	-	-	-	-	36	
	37.1			Alpha alloys	860 MPa	-	-	-	-	-	-	-	-	-	-	37.1	
	37.2			Alpha / Beta alloys	960 MPa	-	-	-	-	-	-	-	-	-	-	37.2	
37.3	Beta alloys	Alpha / Beta alloys	AH	1170 MPa	-	-	-	-	-	-	-	-	-	-	37.3		
37.4			A	830 MPa	-	-	-	-	-	-	-	-	-	-	37.4		
37.5			AH	1400 MPa	-	-	-	-	-	-	-	-	-	-	37.5		
H	38.1	Hardened steel 淬火钢	HT	45 HRC	-	-	-	-	-	25	3	30	3	-	-	38.1	
	38.2			55 HRC	-	-	-	-	-	-	-	-	-	-	-	38.2	
	39.1			58 HRC	-	-	-	-	-	-	-	-	-	-	-	39.1	
	39.2			62 HRC	-	-	-	-	-	-	-	-	-	-	-	39.2	
	40			Cast Iron 硬铸铁	Chilled	C	400	1350	-	-	-	-	-	-	40	8	-
	41	HT	55 HRC			-	-	-	-	-	-	-	-	-	-	41	

IMPERIAL ENDMILLS (inch size)

Ø = nominal tool diameter (inch)
 n = Spindel speed (RPM) $n = \frac{v_c \times 12}{\phi \times \pi} \approx \frac{v_c}{\phi} \times 3.82$
 v_c = Cutting speed (SFM)
 f_s = Feed rate per tooth (inch/tooth) $v_c = \frac{n \times \phi \times \pi}{12} \approx \frac{n \times \phi}{3.82}$
 v_f = Feed rate (inch/min)
 z = No. cutting edges $f_s = \frac{v_f}{z \times n}$ $v_f = f_s \times z \times n$
 Q = Metal removal rate (in³/min)
 a_p = Cutting depth (inch)
 a_e = Cutting width (inch) $Q = \frac{a_p \times a_e \times v_f}{1000}$

METRIC ENDMILLS (mm size)

Ø = nominal tool diameter (mm)
 n = Spindel speed (RPM) $n = \frac{v_c \times 1000}{\phi \times \pi} \approx \frac{v_c}{\phi} \times 318$
 v_c = Cutting speed (m/min)
 f_s = Feed rate per tooth (mm/tooth) $v_c = \frac{n \times \phi \times \pi}{1000} \approx \frac{n \times \phi}{318}$
 v_f = Feed rate (mm/min)
 z = No. cutting edges $f_s = \frac{v_f}{z \times n}$ $v_f = f_s \times z \times n$
 Q = Metal removal rate (cm³/min)
 a_p = Cutting depth (mm)
 a_e = Cutting width (mm) $Q = \frac{a_p \times a_e \times v_f}{1000}$

Trade Name 名称	Coating 涂层类型	Coating Structure 涂层结构	Micro- hardness HV硬度	Coeff. of Friction vs Steel 摩擦系数	Thermal Stability 高温氧化温度	Colour 涂层颜色	Application & Benefits 用途及特点
Br 光亮,无表面处理	-	-	-	0.8 - 1.0	-	-	<ul style="list-style-type: none"> For general purpose applications
Blu 表面氧化处理(黑色)	Steam Oxide	-	-	0.8 - 1.0	-	Blue - Black 蓝黑	<ul style="list-style-type: none"> For ferrous metals Prevents chip build-up on the cutting edges, especially in low carbon steels Oxide layer protects surface Good carrier of lubricants
Ni 表面氮化处理	Plasma Nitride	-	-	0.8 - 1.0	-	-	<ul style="list-style-type: none"> Increases surface hardness Better lubricant carrying properties Abrasive materials - cast iron and aluminium alloys
Futura Nano (TiAlN) 高铝钛涂层	Titanium Aluminium Nitride	Nano Layer	3300 HV	0.3 - 0.35	up to 900°C	Violet - Grey 灰紫	<ul style="list-style-type: none"> Abrasive materials - cast iron and heat treated steel Difficult to machine materials, such as stainless steel Higher speeds and feeds Reduces or eliminates use of coolants
Hardlube HL 涂层	TiAlN + WC/C	Nano Layer	3000 HV	0.15 - 0.20	up to 800°C	Dark Grey 灰黑	<ul style="list-style-type: none"> Excellent friction and lubricating properties of the coating provide optimal chip flow Tapping and drilling of hard to machine materials Suitable for minimum quantity lubrication (MQL) and dry machining
Alcrona (AlCrN) 氮化铝铬涂层	Aluminium Chromium Nitride	Mono Layer	3200 HV	0.35	up to 1100°C	Blue - Grey 灰蓝	<ul style="list-style-type: none"> Low alloy steels and high tensile steels Hardened steels up to 54 HRC Ideal for carbide tools
Helica Helica涂层	Alcrona based	Multi Layer	3000 HV	0.25	up to 1100°C	Copper 紫铜	<ul style="list-style-type: none"> Longer tool life Higher cutting speeds and feeds Superb chip evacuation Greater number of regrinds Improved drill hole quality Excellent performance in abrasive material
Aldura Aldura涂层	TiAlN + ALCrXn	Multi Layer	3300 HV	<0.4	>1100°C	Blue - Grey 灰蓝	<ul style="list-style-type: none"> High speed machining Suitable for minimum quantity lubrication (MQL) and dry machining Machining of hardened steels (>60HRC) Ideal for carbide tools
TiCN 碳氮化钛涂层	Titanium Carbonitride	Gradient Coating	3000 HV	0.4	up to 400°C	Blue - Grey 灰蓝	<ul style="list-style-type: none"> High performance applications Difficult to machine materials Abrasive materials - cast iron and aluminium alloys Adhesive materials - copper and copper based alloys
TiN 氮化钛涂层	Titanium Nitride	Mono Layer	2300 HV	0.4	up to 600°C	Gold - Yellow 金黄	<ul style="list-style-type: none"> General purpose use Wide range of materials 3 to 8 times longer tool life than uncoated tools Higher tool speeds and feeds than uncoated tools
TiSiN TiSiN涂层	TiSi based	Multi Layer	3600 HV	0.3	<1200°C	Copper 紫铜	<ul style="list-style-type: none"> Suitable for high speed (wet / dry) and hard machining for difficult materials above 52 HRC. Suitable for high speed machining with hardened steels above 60 HRC to maximum of 63 HRC Vc & Vf = +50%
CrN 氮化铬涂层	Chromium Nitride	Gradient Coating	1750 HV	0.5	up to 700°C	Silver - Grey 银灰	<ul style="list-style-type: none"> Cutting and forming of copper, nickel, & monel metal Enhanced thermal stability and oxidation resistance Excellent corrosion resistance Low internal stress of coating results in excellent adhesion under high loads

Latest advances in thin film coatings to optimise your machining application

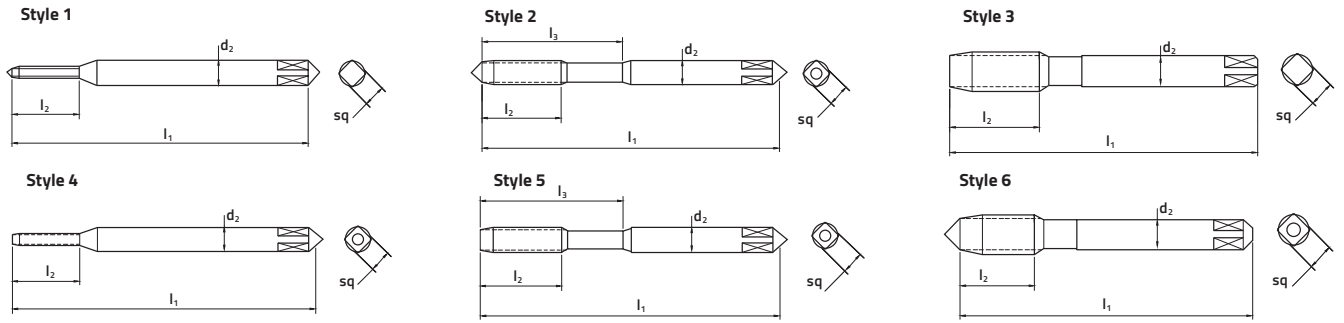


Abbreviations 名称缩写	Type 类型	Application 用途	Description 说明
HSS 高速钢	Conventional high speed steel	Standard tool material for most common applications	Used for the manufacturing of cutting tools such as twist drills, end mills and taps.
HSS Co 含钴高速钢	5% cobalt grade of high speed steel	High-heat resistance, especially suited for roughing or when coolant insufficient	Cobalt alloyed, tungsten-molybdenum high speed steel possessing high hardness, excellent cutting properties, high-red hardness and good toughness.
HSSE Co8% 含8%钴高速钢	8% cobalt grade of high speed steel	Increased heat resistance & hardness, suitable for difficult-to-machine materials	Available for applications that require a strong resistance to softening at elevated cutting temperatures. The ability of the steel to maintain its "red-hot hardness" is provided by the addition of cobalt. The high hot hardness is required for machining difficult materials such as nickel-base, titanium and highly alloyed steel.
HSSE 钒钼高速钢	Premium grade of high speed steel	Wide range of machine taps.	Vanadium grade gives high wear resistance and toughness for most tapping applications.
PM-HSSE 粉末冶金高速钢	Powdered metallurgy - vanadium grade of high speed steel	Materials with hardness up to 40 HRC Difficult to machine materials eg. stainless steels.	PM-HSS V3 for higher performance tools, incorporates very fine and uniform grain structure allowing a high hardness to be achieved, whilst maintaining good toughness.
PM-HSS Co 粉末冶金含钴高速钢	Powdered metallurgy - 8% Cobalt grade of high speed steel	Materials with hardness up to 45 HRC	The addition of cobalt provides this material with the ability to maintain its strength and hardness level when exposed to extremely high cutting temperatures. This makes PM-HSS Co suitable for heavy duty tapping, in materials such as high alloyed steels to non-ferrous metals like Ni-base alloys & Ti-alloys.
SPM 粉末冶金含11%钴高速钢	Powdered metallurgy - 11% Cobalt grade of high speed steel	Special applications, requiring very high edge hardness. Cutting tools with the appropriate geometry can be applied to workpiece materials with hardness up to 55 HRC	An excellent bridge material between high speed steel and carbide. SPM offers very high red hardness, wear resistance and the highest compressive strength of any high speed steel.
VHM 硬质合金 (0.8µm)	Sub-micron grade of solid Carbide (ISO K15-K30)	Tapping hardened steel	Ultra fine grain type (0.8µm) with maximum toughness & high hardness, therefore especially recommended for rotating tools to machine hardened parts.
VHM 硬质合金 (0.6µm)	Sub-micron grade of solid Carbide (ISO K40)	Sutton standard grade for endmills & drills	Ultra fine grain type (0.6µm) offers the ideal combination of hardness & toughness for high performance drilling & general milling applications
VHM-ULTRA 硬质合金 (0.5µm)	Sub-micron grade of solid Carbide (ISO K40-K50)	High performance grade for endmills	Ultra fine grain type (0.5µm) offers the best wear resistance for high performance milling applications.

Computer controlled vacuum heat treatment ensures consistent high quality



Tap Styles



技术数据HSS刀柄技术资料

Technical Information Shank Designs - HSS Tools

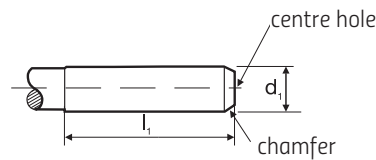
High Speed Steel Straight Shanks HSS刀具带直柄

DIN 1835

Form A (plain) 圆柱直柄

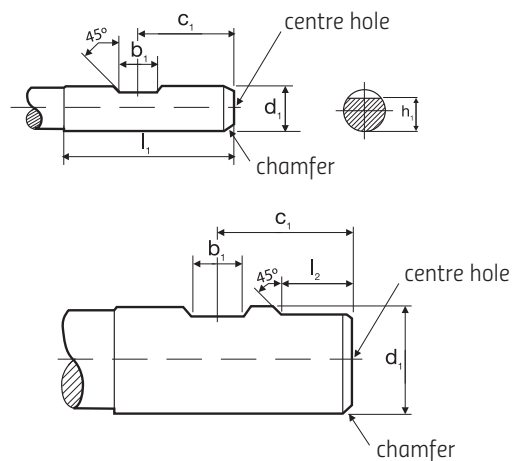
d_1 h6	l_1 +2 -0
3	28
4	28
5	28
6	36
8	36
10	40
12	45

d_1 h6	l_1 +2 -0
16	48
20	50
25	56
32	60
40	70
50	80
63	90



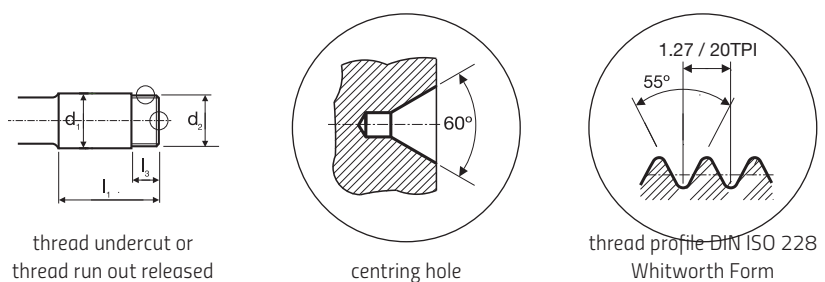
Form B (with drive flat) 侧固直柄

d_1 h6	b_1 +0.05 -0	c_1 0 -1	h_1 h13	l_1 +2 -0	l_2 +1 -0
6	4.2	18	4.8	36	-
8	5.5	18	6.6	36	-
10	7	20	8.4	40	-
12	8	22.5	10.4	45	-
16	10	24	14.2	48	-
20	11	25	18.2	50	-
25	12	32	23	56	17
32	14	36	30	60	19
40	14	40	38	70	19
50	18	45	47.8	80	23
63	18	50	60.8	90	23



Form D (screwed shank) 螺纹柄

d_1	l_1 +2 -0	l_3 +1 -0	d_2
6	36	10	5.9
10	40	10	9.9
12	45	10	11.9
16	48	10	15.9
20	50	15	19.9
25	56	15	24.9
32	60	15	31.9



suttontools

Fluteless taps 挤压丝锥

Fluteless taps do not cut threads in the same manner as conventional taps – but actually FORM and FLOW the threads with an absence of chips. Used under suitable conditions, these taps produce threads with a high degree of finish not possible with ordinary taps. Ductile materials are most appropriate for forming of threads and must have a minimum 10% elongation.

Benefits of thread forming 挤压丝锥的好处

- Higher speeds and tool life
- Reduced possibility of breakage due to no cutting edges and robust tool construction

Figure 1. No chips produced

Figure 2. Higher tensile strength threads produced due to grain structure following the thread form

Figure 3. For use in through and blind holes applications

Figure 1.

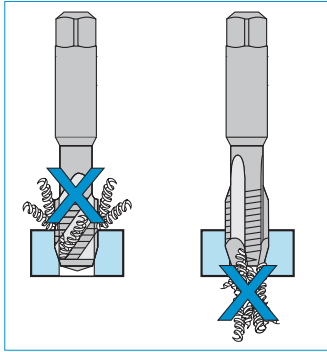


Figure 2.

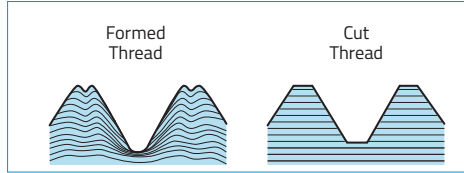
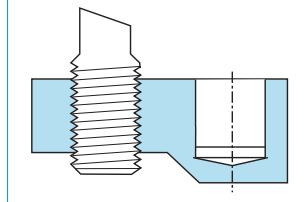


Figure 3.



Suitable for wide range materials 适合广泛材料

- Low carbon steels
- Leaded steels
- Austenitic stainless steels
- Alloy steels; typically up to 1200 N/mm², (36 Rc) with a minimum 10% elongation

- Aluminium die castings alloys (low silicon, 10% max;)
- Wrought aluminium alloys (Ductile)
- Zinc die casting alloys
- Copper and copper alloys

Percentage of thread required 所需的螺纹咬合率

Because the thread produced by a fluteless tap is substantially stronger than a conventional thread, greater tool life and efficiency may be obtained when forming up to 65% thread.

Threads may be formed up to 80% of depth, but tool life will be reduced and work clamping pressure necessarily increased. Greater tapping speeds allow the metal to flow for more readily, so 60 feet per minute minimum may be used as a guide, but this could increase with the type of material being tapped. A depth of 65% is recommended for the ductile materials mentioned, but this percentage will be reduced for less ductile materials to maintain all-round efficiency.

Tapping drill formula for fluteless taps 挤压丝锥底孔钻的的计算公式

Refer Tapping Drill Size Chart for recommended sizes (Suitable for Unified, Whitworth and Metric sizes only).

The formula to calculate the theoretical hole size for a required percentage of thread is:

Formula 公式	Example 例子
Drill size = nominal thread dia. (in mm)– (0.007 x % of thread x pitch)	Drill size for 65% of thread in a M6 x 1.0 threaded hole would be: Drill size = 6 – (0.007 x 65 x 1.0 (pitch)) = 5.54mm (Use 5.50mm drill (Stockable drill) = 71%)

It is to be noted that the drill size for fluteless tapping is always larger than the P.D. of the thread. A drill size equal to the P.D. of the thread would produce 100% of thread, but this is NOT recommended.

As the additional driving torque is only up to 50% increase, any conventional driving equipment using the square as a drive is suitable for fluteless tapping.

Lubrication 润滑

In general it is best to use a good cutting oil or lubricant rather than a coolant for fluteless tapping. Sulphur base and mineral oils, along with most friction reducing lubricants recommended for use in cold extrusion or metal drawing, have proven best for this work. Make sure lubricant is clean, free from chips swarf and filings in suspension, which produce a poor finish and jamming, sometimes breakage – extra filtration may be required.

Countersinking 倒角

Because the fluteless tap displaces metal, some metal will be displaced above the mouth of the hole during tapping, countersink or chamfer the hole prior to tapping will reduce the extrusion within the countersink and not interfere with the mating part.

What's New? 有何新意 ?

Figure 4. New polygon profile

Figure 5. New radiused blend on polygon profile

Figure 6. Thread profile with radius crest

Figure 7. Polished tool surface, surface finish

Figure 4.

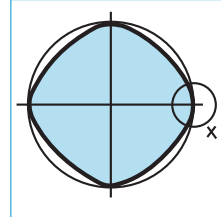


Figure 5.

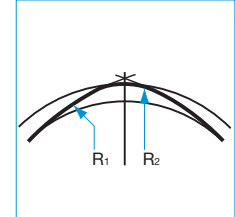


Figure 6.

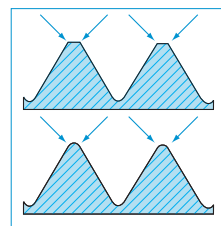


Figure 7.





(Fluteless) Roll Taps 挤压丝锥:

Thread Size 螺纹			ISO Coarse ISO粗牙		UNC		BSW	
Metric 公制	Fraction 分数	M/C Screw Gauge 号数	Pitch (mm) 牙距	Tapping Drill (mm) 钻径	T.P.I.	Tapping Drill mm 钻径	T.P.I.	Tapping Drill mm 钻径
M1.0			0.25	0.90				
M1.1			0.25	1.00				
M1.2			0.25	1.10				
M1.4			0.3	1.25				
M1.6			0.35	1.45				
M1.7			0.35	1.55				
M1.8			0.35	1.65				
M2.0			0.4	1.80				
M2.2			0.45	2.00				
M2.3			0.4	2.10				
M2.5			0.45	2.30				
M2.6			0.45	2.40				
M3.0			0.5	2.75				
	1/8						40	2.90
M3.5			0.6	3.20				
		#6			32	3.10		
	5/32						32	3.60
M4			0.7	3.70				
		#8			32	3.80		
	3/16						24	4.30
		#10			24	4.30		
M5			0.8	4.60				
M6			1.0	5.55				
	1/4				20	5.80	20	5.80
	5/16				18	7.30	18	7.30
M8			1.25	7.40				
	3/8				16	8.80	16	8.80
M10			1.50	9.30				



Code 编号		Problem 加工问题						
1		Thread is oversize						
2		Axial miscutting of thread						
3		Thread is undersize						
4		Thread has bellmouthed entry						
5		Thread surface is rough and unclean						
6		Low tool life						
7		Partial or complete tap breakage on FORWARD or BACKWARD movement						
1	2	3	4	5	6	7	Possible reason 可能原因	Solution 对策
●		●	●	●	●	●	Wrong tap, cutting geometry of the tap is not suitable for this operation	Use correct tap for the material group. See Expert Tool Selector, at www.suttontools.com/expert-tool-selector
●				●	●		Tap hole diameter is undersize	Tap hole diameter should be in accordance to DIN336 or respective standard. For cold forming taps, a special hole diameter is needed.
●			●			●	Misalignment - tap hole position, or angle is not correct	a) check workpiece clamping b) check machine settings
●							The axial machine spindle movement is not free and easy	a) use mechanical feed b) use tap holder with length compensation
●							Cold welding on the thread flanks of the tap	a) use a new tap b) improve and check lubrication c) remove cold welding area from tap d) use tap with surface treatment or coatings
●							Poor guidance of the tap because of little thread depth	a) use mechanical feed b) use tap that has better guiding characteristics
●				●	●		Speed is too high	a) improve lubrication b) lower speed
●				●	●		Chip clogging	a) use tap with different flute form b) use coated taps c) use tap set
●				●	●		The lubrication wrong, additives or the coolant supply is not sufficient	Make sure that the coolant is correct and that the supply is sufficient
	●						Spiral fluted taps are over pressured in the initial cutting phase (retracting pulling force)	Spiral fluted taps should only be lightly pushed into the tap hole until it begins to cut. The tap holder should immediately begin to apply tension to the tap.
	●						Spiral pointed taps (gun taps) are not receiving enough pressure in the initial cutting phase	Spiral pointed taps and even left hand spiral flute taps must have a stronger pressure until they begin to cut. The tap holder should immediately begin to apply pressure to the tap (pushing force)
●		●					Tolerance on the tap is not identical to the tolerance on the drawing or on the gauge	Use a tap which has a correct tolerance
			●				Wrong initial cutting pressure has been used or the machine spindle is not moving along its axis free and easy	a) use mechanical feed b) use tap holder with length compensation
				●	●		Tap is over loaded, either from coarse pitch and/or tough material	Use set of taps
					●		Cold welding, material build-up (pick-up)	a) improve coolant supply, use taps with surface treatments or coatings b) check if surface treatment is correct for this application
					●	●	Hardened walls in drilled hole	a) use drill best suited to material being drilled b) use new drill or boring tool c) resharpen drilling or boring tools d) if possible, heat treatment and coatings should only be made after threading
						●	Over loading of teeth in the chamfer area	a) use a longer chamfer (check if the tap hole is blind hole or through) b) use increased number of teeth in the chamfer area by selecting tap with increased number of flutes
						●	Tap hole chamfer is missing or wrong	Countersink tap hole chamfer with correct angle
						●	Tap crashed against the bottom of tap hole	Use tap holder with length compensation and over load clutch



Code 编号	Problem 加工问题										Possible reason 可能原因
1	Poor workpiece finish										Cutting edge wear, cutter radial run-out
2	Splintering of workpiece edge										Unsuitable cutting conditions, unsuitable shape of cutting edge
3	Non-parallel or uneven surface										Low stiffness of the cutter or of the workpiece (loose)
4	Extreme flank wear										Unsuitable cutting conditions, unsuitable shape of cutting edge
5	Extreme crater wear										
6	Breaks and shelling due to thermal shock										
7	Formation of built-up edges										
8	Poor chip clearance, chip blockage										
9	Lack of Rigidity										Difficult cutting conditions, clamping of the workpiece
10	Endmill cutter breaks										Unsuitable cutting conditions, flute length of the cutter
1	2	3	4	5	6	7	8	9	10	Solution 对策	
●						●	●			increase cutting speed	
			●	●				●		reduce cutting speed	
						●	●			increase feed rate	
●	●	●		●	●		●	●	●	reduce feed rate	
●	●	●		●	●			●	●	reduce cutting depth	
							●	●	●	change cutter diameter and cut width	
●			●	●		●	●			check use of cooling lubricant, flush swarf away	
	●	●	●	●	●	●	●	●		increase clearance angle (Radial relief)	
	●			●	●					increase wedge angle (Rake angle)	
	●									increase number of teeth	
		●					●	●	●	reduce number of teeth	
							●			select larger chip space (Cutter)	
●	●	●	●		●					change shape of minor cutting edge	
		●			●					cutter - change radial run-out	
	●	●			●			●	●	change cutter stiffness, flute length (l/D ratio)	
	●	●			●			●		select machine with higher power and stiffness	



Metric Taps; Comparison Tap Limits & Product Classes and Grades

公制丝锥; 丝锥精度与内螺纹的等级对比

Product Tolerance 内螺纹公差					Tap Limits 丝锥精度					
Tap Size mm	Pitch	ISO	6H	JIS 2	ISO	Tap Limits Microns μm	Recommended Limit			
		Tolerance Class	Upper Deviation Tolerance μm	Old/JIS Product Tolerance μm			P 1 μm	P 2 μm	P 3 μm	P 4 μm
M1.0	x 0.25	5H	56	60	ISO 1	+ 6 / 17	+ 10 / 25			
M1.1	x 0.25	5H	56	60	ISO 1	+ 6 / 17	+ 10 / 25			
M1.2	x 0.25	5H	56	60	ISO 1	+ 6 / 17	+ 10 / 25			
M1.4	x 0.3	5H	60	60	ISO 1	+ 6 / 18	+ 10 / 25			
M1.6	x 0.35	5H	67	85	ISO 1	+ 7 / 20	+ 10 / 25 + 25 / 40			
M1.7	x 0.35	6H	85	85	ISO 2	+ 20 / 34	+ 10 / 25 + 25 / 40			
M1.8	x 0.35	6H	85	85	ISO 2	+ 20 / 34	+ 10 / 25 + 25 / 40			
M2.0	x 0.4	6H	90	70	ISO 2	+ 21 / 36	+ 10 / 25 + 25 / 40			
M2.2	x 0.45	6H	95	95	ISO 2	+ 23 / 38	+ 10 / 25 + 25 / 40			
M2.3	x 0.4	6H	90	95	ISO 2	+ 21 / 36	+ 10 / 25 + 25 / 40			
M2.5	x 0.45	6H	95	95	ISO 2	+ 23 / 38	+ 10 / 25 + 25 / 40			
M2.6	x 0.45	6H	95	95	ISO 2	+ 23 / 38	+ 10 / 25 + 25 / 40			
M3.0	x 0.5	6H	100	100	ISO 2	+ 24 / 40	+ 10 / 25 + 25 / 40			
M3.5	x 0.6	6H	112	90	ISO 2	+ 27 / 45	+ 10 / 25 + 25 / 40			
M4.0	x 0.7	6H	118	118	ISO 2	+ 29 / 48	+ 20 / 40			
M5	x 0.8	6H	125	125	ISO 2	+ 30 / 50	+ 20 / 40			
M6	x 1.0	6H	150	120	ISO 2	+ 35 / 59	+ 20 / 40			
M7	x 1.0	6H	150	120	ISO 2	+ 35 / 59	+ 20 / 40			
M8	x 1.25	6H	160	130	ISO 2	+ 38 / 63	+ 20 / 40 + 40 / 60			
M10	x 1.5	6H	180	140	ISO 2	+ 42 / 70	+ 20 / 40 + 40 / 60			
M12	x 1.75	6H	200	160	ISO 2	+ 48 / 80	+ 40 / 60 + 60 / 80			
M14	x 2.0	6H	212	170	ISO 2	+ 51 / 85	+ 40 / 60 + 60 / 80			
M16	x 2.0	6H	212	170	ISO 2	+ 51 / 85	+ 40 / 60 + 60 / 80			
M18	x 2.5	6H	224	190	ISO 2	+ 54 / 90	+ 40 / 60 + 60 / 80			
M20	x 2.5	6H	224	190	ISO 2	+ 54 / 90	+ 40 / 60 + 60 / 80			
M22	x 2.5	6H	224	190	ISO 2	+ 54 / 90	+ 40 / 60 + 60 / 80			
M24	x 3.0	6H	265	200	ISO 2	+ 64 / 106	+ 40 / 60 + 60 / 80			

P limits; they stock the smaller P limit for SP Taps, and the larger P limit for PO taps.
Where there is only the one "P" limit; it is the same limit for both SP & PO Taps



Tensile Strength vs Hardness (≈)

强度对应硬度

Tensile Strength 强度			Hardness 硬度	
N/mm ²	Kg/mm ²	Tons/Inch ²	Brinell [HB]	Rockwell [HRC (HRB)]
400	40.8	26.0	119	69 HRB
450	45.9	29.0	133	75 HRB
500	50.1	32.4	149	81 HRB
550	56.0	35.6	163	85.5 HRB
600	61.0	38.9	178	89 HRB
650	66.2	42.1	193	92 HRB
700	71.4	45.3	208	95 HRB
750	76.5	48.5	221	97 HRB
800	81.6	51.8	238	22 HRC
850	86.7	55.1	252	25 HRC
900	91.8	58.3	266	27 HRC
1000	102.0	64.7	296	31 HRC
1100	112.2	71.2	325	35 HRC
1200	122.4	77.7	354	38 HRC
1300	132.6	84.1	383	41 HRC
1400	142.8	90.5	408	44 HRC
1500	152.9	97.0	444	47 HRC
1600	163.1	103.5	461	49 HRC
1700	173.3	109.9	477	50 HRC
1800	183.5	116.4	514	52 HRC
1900	193.7	122.9	549	54 HRC
2000	203.9	129.3	584	56 HRC
2100	214.1	135.8	607	57 HRC
2200	224.3	142.2	622	58 HRC
2300	233.1	148.7	653	60 HRC

Conversion of values depends on the actual alloy content; this chart therefore indicates a general conversion only.

Manufacturing Tolerances

生产公差

Nominal Diameter in mm above 公称直径或以上	up to and including 公称直径上限	Tolerance Grade in Microns 公差级别 (0.001mm)										1 Micron = 0.001mm			
		e8	h5	h6	h7	h8	h9	h10	js12	js14	k8	k9	k10	m7	
0	3	-14	0	0	0	0	0	0	+50	+125	+14	+25	+40	+12	
		-18	-4	-6	-10	-14	-25	-40	-50	-125	0	0	0	+2	
3	6	-20	0	0	0	0	0	0	+60	+150	+18	+30	+48	+16	
		-38	-5	-8	-12	-18	-30	-48	-60	-150	0	0	0	+4	
6	10	-25	0	0	0	0	0	0	+75	+180	+22	+36	+58	+21	
		-47	-6	-9	-15	-22	-36	-58	-75	-180	0	0	0	+6	
10	18	-32	0	0	0	0	0	0	+90	+215	+27	+43	+70	+25	
		-59	-8	-11	-18	-27	-43	-70	-90	-215	0	0	0	+7	
18	30	-40	0	0	0	0	0	0	+105	+260	+33	+52	+84	+29	
		-73	-9	-13	-21	-33	-52	-84	-105	-260	0	0	0	+8	
30	50	-50	0	0	0	0	0	0	+125	+310	+39	+62	+100	+34	
		-89	-11	-16	-25	-39	-62	-100	-125	-310	0	0	0	+9	
50	80	-60	0	0	0	0	0	0	+150	+370	+46	+74	+120	+41	
		-106	-13	-19	-30	-46	-74	-120	-150	-370	0	0	0	+11	
80	120	-72	0	0	0	0	0	0	+175	+435	+54	+87	+140	+48	
		-126	-15	-22	-35	-54	-87	-140	-175	-435	0	0	0	+13	

Conversion: 1 micron equals .00004 inches

