



CLE-LINE

Drills
Taps
End Mills
Carbide Rotary Burrs
Saws

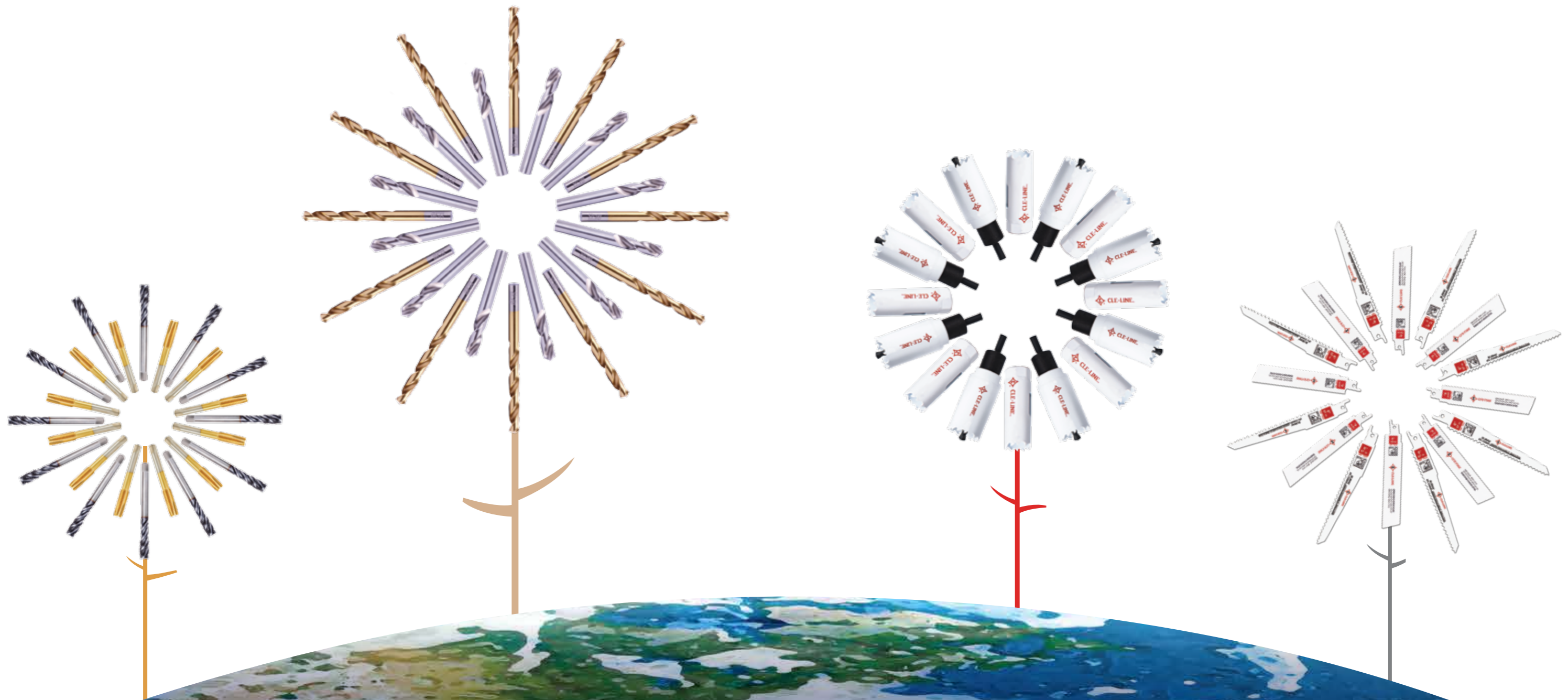




About CLE-LINE

As one of the major brands of Greenfield Industries Inc., Cle-line has a more than 40-years of glorious history. Cle-line products are manufactured to high quality that allows the products to be used in a broad range of applications from maintenance to production.

In 2009, TDC acquired GREENFIELD INDUSTRIES and the Cle-line brand. TDC has made major investments in Cle-line to expand its offering and create a global presence.



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Drills

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 DIN 1897
 DIN 338
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 DIN 345
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 ASME(B94.11M) short
 ASME(B94.11M)
 ASME(B94.11M) long
 6"&12" Aircraft Drill
 DIN 333 Centre Drill Type A&R
 DIN 333 Centre Drill Type B



Taps

GB T3464.1-94
 GB T3506-93
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 JIS
 DIN 352
 DIN 371
 DIN 374
 DIN 376
 ASME NPS&NPT



End Mills

DIN 327
 DIN 844



Carbide Rotary Burrs

Cylinder
 Cylinder With End Cut
 Cylinder With Radius End
 Ball
 Oval
 Tree With Radius End
 Tree With Pointed End
 Flame
 Cone 60°
 Cone 90°
 Taper Radius
 Cone
 Inverted Cone



Saw

Reciprocating Saws
 Hacksaws
 Hole Saws
 Band Saws



Technical knowledge and common problems

HSS
HSCo5

Mo is a high speed steel, high toughness, high abrasion resistance, red hardness and good comprehensive performance.

Mo is a high speed steel, with high performance of Co5% superhard high speed steel, has the high hardness and red hardness.

ST

Steam tempering can produce high adhesion of blue oxidation surface, the surface is easy to keep cutting fluid, can prevent the chip and tool stick welding together, so can prevent cutting tumor generation.

Bronze

Bronze thin oxide layer is formed on the surface is in the cutting tool, mainly used for cobalt high speed steel with vanadium high speed steel.

N

Nitriding treatment can increase the tool surface hardness and wear resistance, twist drill nitriding treatment, can increase the strength of the circular blade wear and abrasion resistance, for abrasive materials such as cast iron, bakelite tap, especially suitable for nitriding processing.

TiN

Titanium nitride is by physical vapor deposition (PVD) produced gold coating, it has high hardness and low friction resistance, improve the cutting performance and life of the tools.

TiAlN

Titanium nitride aluminum is using PVD technology of the composite coating, high toughness and oxidation stability, these features make it in high cutting speed and feed are ideal processing performance, but also can improve the tool life, can be used in dry cutting.

TiCN

Carbon titanium nitride coating produced by PVD technology, carbon titanium nitride high hardness, low friction coefficient, the hardness, toughness and good wear resistance integrated together.



Drills



Drills

Taps

End Mills

Carbide Rotary Burrs

Saws

Products	Standard	Size range	Type	Cutting material	Cutting direction	Web thinning	Surface	point angle
	DIN338	1.0-13.0	N	HSS	R.H.	≥2.5 Form C	Bronze	118°
		1.0-13.0	N	HSS	R.H.	≥2.5 Form C	TiN	118°
		1.0-13.0	SN	HSS	R.H.	≥2.5 Form C	TiN	130°
		1.0-13.0	UDL	HSS	R.H.	≥2.5 Form C	TiN	130°
	DIN340	1.0-13.0	N	HSS	R.H.	≥2.5 Form C	TiN	118°
	DIN345	12.0-60.0	N	HSS	R.H.	Form A	TiN	118°
	DIN1899	0.10-1.0	N	HSS	R.H.	—	Bright	118°
	DIN1897	1.0-13.0	N	HSS	R.H.	Form C	TiN	118°
	DIN1869 Series 1	2.0-13.0	para 1	HSS	R.H.	Form C	Bright	130°
		2.0-13.0	Para 2	HSS	R.H.	Form C	Nitrided	130°
	DIN1869 Series 2	3.0-13.0	Para 1	HSS	R.H.	Form C	Bright	130°
		3.0-13.0	Para 2	HSS	R.H.	Form C	Nitrided	130°
	DIN1869 Series 3	3.5-13.0	Para 1	HSS	R.H.	Form C	Bright	130°
		3.5-13.0	Para 2	HSS	R.H.	Form C	Nitrided	130°
	ASME	13.0-40.0	N	HSS	R.H.	—	TiN	118°
	ASME (B94.11M)	1/64-11/16 #1-#97 A-Z	N	HSS	R.H.	Form C	TiN	118°
		3/64-2 #1-#60 A-Z	N	HSS	R.H.	Form C	TiN	118°
		1/64-1-3/4 #1-#80 A-Z	N	HSS	R.H.	Form C	TiN	118°
	ASME 6"	3/64-1/2 #1-#60 A-Z	N	HSS	R.H.	Form C	Nitrided	118°
	ASME 12"	3/64-1/2 #1-#60 A-Z	N	HSS	R.H.	Form C	Nitrided	118°
	DIN333	1.00-10.00	A	HSS	R.H.	—	Bright	118°
		1.00-10.00	R	HSS	R.H.	—	Bright	118°
		1.00-10.00	B	HSS	R.H.	—	Bright	118°

Flute type Applications

Type	Products Examples	Shank Type	Cutting material	Surface	Applications		
N		Straight Shank	HSS	Bronze	General-purpose drill with type N, to drill steels with tensile strength up to 1,000 N/mm ² , cast steel, grey cast iron, malleable cast iron, nickel brass and graphite.		
				TiN	General-purpose drill with type N, to drill steels with tensile strength up to 1,000 N/mm ² , cast steel, grey cast iron, malleable cast iron, nickel brass and graphite. TiN coating provides longer tool life or increased cutting speeds.		
SN				TiN	Universal, very robust drill with type SN for all standard applications. The split point permits very good positioning and reduced feed force and torque. Longer tool life due to reduced heat evolution. To drill steels with tensile strength up to 1,000 N/mm ² , cast steel, grey cast iron, malleable cast iron, nickel brass and graphite. TiN coating provides longer tool life or increased cutting speeds.		
UDL				HSS	TiN	Drill with type UDL for stainless steels made of 5% cobalt material with excellent heat resistance. To drill steels with tensile strength up to 1,400 N/mm ² , stainless steels as well as heat- and acid resistant steels. Particularly applicable on automatics. TiN coating provides longer tool life or increased cutting speeds.	
					Nitrided	Applicable to the drilling of deep hole of stainless steel, mold steel, high strength alloy steel, and malleable cast iron.	
					Bright	Applicable to processing high-tensile alloy, austenitic stainless steel, light alloys, aluminum, aluminum alloy, copper, copper alloy, zinc, zinc alloy, cast iron, nodular cast iron and other materials.	
Para 2				HSS	Bright	Miniature drill with reinforced straight shank to drill small holes with high precision, especially for watch and clock industry as well as precision applications. Particularly applicable when drilling high alloyed steels.	
Para 1							
N				Straight Shank Miniature Drills	HSS	Bright	General-purpose drill, to drill steels with tensile strength up to 1,000 N/mm ² , cast steel, grey cast iron, malleable cast iron, nickel brass and graphite. TiN coating provides longer tool life or increased cutting speeds.
N				Taper Shank	HSS	TiN	

Drills

Taps

End Mills

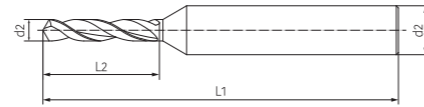
Carbide Rotary Burrs

Saws

Miniature Drills with straight shank HSCo DIN1899



Type	N
Cutting material	HSCo
Cutting direction	R.H.
Web thinning	—
Surface	Bright
Point angle	118°
List-No.	1501

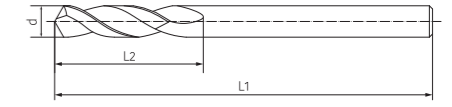


d1 mm	d2 mm	L1 mm	L2 mm
0.10	1.0	25.0	0.5
0.15	1.0	25.0	0.8
0.20	1.0	25.0	1.5
0.25	1.0	25.0	1.9
0.30	1.0	25.0	1.9
0.35	1.0	25.0	2.4
0.40	1.0	25.0	3.0
0.45	1.0	25.0	3.0
0.50	1.0	25.0	3.4
0.55	1.0	25.0	3.9
0.60	1.0	25.0	3.9
0.65	1.0	25.0	4.2
0.70	1.0	25.0	4.8
0.75	1.0	25.0	4.8
0.80	1.5	25.0	5.3
0.85	1.5	25.0	5.3
0.90	1.5	25.0	6.0
0.95	1.5	25.0	6.0
1.00	1.5	25.0	6.8

Twist Drills with straight shank HSS DIN 1897



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	≥2.5 Form C
Surface	TiN
Point angle	118°
List-No.	1401



d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm
1.0	26	6	5.2	62	26	9.4	84	40
1.1	28	7	5.3	62	26	9.5	84	40
1.2	30	8	5.4	66	28	9.6	89	43
1.3	30	8	5.5	66	28	9.7	89	43
1.4	32	9	5.6	66	28	9.8	89	43
1.5	32	9	5.7	66	28	9.9	89	43
1.6	34	10	5.8	66	28	10.0	89	43
1.7	34	10	5.9	66	28	10.1	89	43
1.8	36	11	6.0	66	28	10.2	89	43
1.9	36	11	6.1	70	31	10.3	89	43
2.0	38	12	6.2	70	31	10.4	89	43
2.1	38	12	6.3	70	31	10.5	89	43
2.2	40	13	6.4	70	31	10.6	89	43
2.3	40	13	6.5	70	31	10.7	95	47
2.4	43	14	6.6	70	31	10.8	95	47
2.5	43	14	6.7	70	31	10.9	95	47
2.6	43	14	6.8	74	34	11.0	95	47
2.7	46	16	6.9	74	34	11.1	95	47
2.8	46	16	7.0	74	34	11.2	95	47
2.9	46	16	7.1	74	34	11.3	95	47
3.0	46	16	7.2	74	34	11.4	95	47
3.1	49	18	7.3	74	34	11.5	95	47
3.2	49	18	7.4	74	34	11.6	95	47
3.3	49	18	7.5	74	34	11.7	95	47
3.4	52	20	7.6	79	37	11.8	95	47
3.5	52	20	7.7	79	37	11.9	102	51
3.6	52	20	7.8	79	37	12.0	102	51
3.7	52	20	7.9	79	37	12.1	102	51
3.8	55	22	8.0	79	37	12.2	102	51
3.9	55	22	8.1	79	37	12.3	102	51
4.0	55	22	8.2	79	37	12.4	102	51
4.1	55	22	8.3	79	37	12.5	102	51
4.2	55	22	8.4	79	37	12.6	102	51
4.3	58	24	8.5	79	37	12.7	102	51
4.4	58	24	8.6	84	40	12.8	102	51
4.5	58	24	8.7	84	40	12.9	102	51
4.6	58	24	8.8	84	40	13.0	102	51
4.7	58	24	8.9	84	40			
4.8	62	26	9.0	84	40			
4.9	62	26	9.1	84	40			
5.0	62	26	9.2	84	40			
5.1	62	26	9.3	84	40			

Twist Drills with straight shank HSS, HSCo DIN 338

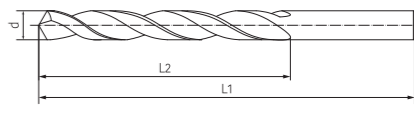
Type	N	N	SN	UDL
Cutting material	HSS	HSS	HSS	HSCo
Cutting direction	R.H.	R.H.	R.H.	R.H.
Web thinning	≥2.5 Form C	≥2.5 Form C	≥2.5 Form C	≥2.5 Form C
Surface	Bronze	TiN	TiN	TiN
Point angle	118°	118°	130°	130°
List-No.	0301	0302	0303	0304



d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm
1.0	34	12	5.2	86	52	9.4	125	81
1.1	36	14	5.3	86	52	9.5	125	81
1.2	38	16	5.4	93	57	9.6	133	87
1.3	38	16	5.5	93	57	9.7	133	87
1.4	40	18	5.6	93	57	9.8	133	87
1.5	40	18	5.7	93	57	9.9	133	87
1.6	43	20	5.8	93	57	10.0	133	87
1.7	43	20	5.9	93	57	10.1	133	87
1.8	46	22	6.0	93	57	10.2	133	87
1.9	46	22	6.1	101	63	10.3	133	87
2.0	49	24	6.2	101	63	10.4	133	87
2.1	49	24	6.3	101	63	10.5	133	87
2.2	53	27	6.4	101	63	10.6	133	87
2.3	53	27	6.5	101	63	10.7	142	94
2.4	57	30	6.6	101	63	10.8	142	94
2.5	57	30	6.7	101	63	10.9	142	94
2.6	57	30	6.8	109	69	11.0	142	94
2.7	61	33	6.9	109	69	11.1	142	94
2.8	61	33	7.0	109	69	11.2	142	94
2.9	61	33	7.1	109	69	11.3	142	94
3.0	61	33	7.2	109	69	11.4	142	94
3.1	65	36	7.3	109	69	11.5	142	94
3.2	65	36	7.4	109	69	11.6	142	94
3.3	65	36	7.5	109	69	11.7	142	94
3.4	70	39	7.6	117	75	11.8	142	94
3.5	70	39	7.7	117	75	11.9	151	101
3.6	70	39	7.8	117	75	12.0	151	101
3.7	70	39	7.9	117	75	12.1	151	101
3.8	75	43	8.0	117	75	12.2	151	101
3.9	75	43	8.1	117	75	12.3	151	101
4.0	75	43	8.2	117	75	12.4	151	101
4.1	75	43	8.3	117	75	12.5	151	101
4.2	75	43	8.4	117	75	12.6	151	101
4.3	80	47	8.5	117	75	12.7	151	101
4.4	80	47	8.6	125	81	12.8	151	101
4.5	80	47	8.7	125	81	12.9	151	101
4.6	80	47	8.8	125	81	13.0	151	101
4.7	80	47	8.9	125	81			
4.8	86	52	9.0	125	81			
4.9	86	52	9.1	125	81			
5.0	86	52	9.2	125	81			
5.1	86	52	9.3	125	81			

Twist Drills with straight shank HSS DIN 340

Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	≥2.5 Form C
Surface	TiN
Point angle	118°
List-No.	0401

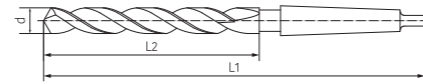


d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm
1.0	56	33	5.2	132	87	9.4	175	115
1.1	60	37	5.3	132	87	9.5	175	115
1.2	65	41	5.4	139	91	9.6	184	121
1.3	65	41	5.5	139	91	9.7	184	121
1.4	70	45	5.6	139	91	9.8	184	121
1.5	70	45	5.7	139	91	9.9	184	121
1.6	76	50	5.8	139	91	10.0	184	121
1.7	76	50	5.9	139	91	10.1	184	121
1.8	80	53	6.0	139	91	10.2	184	121
1.9	80	53	6.1	148	97	10.3	184	121
2.0	85	56	6.2	148	97	10.4	184	121
2.1	85	56	6.3	148	97	10.5	184	121
2.2	90	59	6.4	148	97	10.6	184	121
2.3	90	59	6.5	148	97	10.7	195	128
2.4	95	62	6.6	148	97	10.8	195	128
2.5	95	62	6.7	148	97	10.9	195	128
2.6	95	62	6.8	156	102	11.0	195	128
2.7	100	66	6.9	156	102	11.1	195	128
2.8	100	66	7.0	156	102	11.2	195	128
2.9	100	66	7.1	156	102	11.3	195	128
3.0	100	66	7.2	156	102	11.4	195	128
3.1	106	69	7.3	156	102	11.5	195	128
3.2	106	69	7.4	156	102	11.6	195	128
3.3	106	69	7.5	156	102	11.7	195	128
3.4	112	73	7.6	165	109	11.8	195	128
3.5	112	73	7.7	165	109	11.9	205	134
3.6	112	73	7.8	165	109	12.0	205	134
3.7	112	73	7.9	165	109	12.1	205	134
3.8	119	78	8.0	165	109	12.2	205	134
3.9	119	78	8.1	165	109	12.3	205	134
4.0	119	78	8.2	165	109	12.4	205	134
4.1	119	78	8.3	165	109	12.5	205	134
4.2	119	78	8.4	165	109	12.6	205	134
4.3	126	82	8.5	165	109	12.7	205	134
4.4	126	82	8.6	175	115	12.8	205	134
4.5	126	82	8.7	175	115	12.9	205	134
4.6	126	82	8.8	175	115	13.0	205	134
4.7	126	82	8.9	175	115			
4.8	132	87	9.0	175	115			
4.9	132	87	9.1	175	115			
5.0	132	87	9.2	175	115			
5.1	132	87	9.3	175	115			

Twist Drills with taper shank HSS, standard length DIN 345



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	Form A
Surface	TiN
Point angle	118°
List-No.	0501

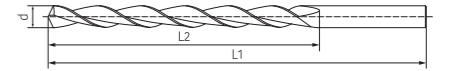


d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm	d mm	L1 mm	L2 mm
12.0	182	101	25.0	281	160	38.0	349	200
12.5	182	101	25.5	286	165	38.5	349	200
13.0	182	101	26.0	286	165	39.0	349	200
13.5	189	108	26.5	286	165	39.5	349	200
14.0	189	108	27.0	291	170	40.0	349	200
14.5	212	114	27.5	291	170	41.0	354	205
15.0	212	114	28.0	291	170	42.0	354	205
15.5	218	120	28.5	296	175	43.0	359	210
16.0	218	120	29.0	296	175	44.0	359	210
16.5	223	125	29.5	296	175	45.0	359	210
17.0	223	125	30.0	296	175	46.0	364	215
17.5	228	130	30.5	301	180	47.0	364	215
18.0	228	130	31.0	301	180	48.0	369	220
18.5	233	135	31.5	301	180	49.0	369	220
19.0	233	135	32.0	334	185	50.0	369	220
19.5	238	140	32.5	334	185	51.0	412	225
20.0	238	140	33.0	334	185	52.0	412	225
20.5	243	145	33.5	334	185	53.0	412	225
21.0	243	145	34.0	339	190	54.0	417	230
21.5	248	150	34.5	339	190	55.0	417	230
22.0	248	150	35.0	339	190	56.0	417	230
22.5	253	155	35.5	339	190	57.0	422	235
23.0	253	155	36.0	344	195	58.0	422	235
23.5	276	155	36.5	344	195	59.0	422	235
24.0	281	160	37.0	344	195	60.0	422	235
24.5	281	160	37.5	344	195			

Twist Drills with straight shank HSS/HSCo, extra long series DIN 1869/series 1



Type	Para 1	Para 2
Cutting material	HSS	HSCo
Cutting direction	R.H.	R.H.
Web thinning	Form C	Form C
Surface	Bright	Nitrided
Point angle	130°	130°
List-No.	1101	1102

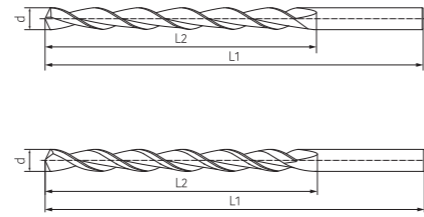


d mm	L1 mm	L2 mm
2.0	125	85
2.5	140	95
3.0	150	100
3.5	165	115
4.0	175	120
4.5	185	125
5.0	195	135
5.5	205	140
6.0	205	140
6.5	215	150
7.0	225	155
7.5	225	155
8.0	240	165
8.5	240	165
9.0	250	175
9.5	250	175
10.0	265	185
10.5	265	185
11.0	280	195
11.5	280	195
12.0	295	205
12.5	295	205
13.0	295	205

Twist Drills with straight shank HSS/HSCo, extra long series DIN 1869/series 2



Type	Para 1	Para 2
Cutting material	HSS	HSCo
Cutting direction	R.H.	R.H.
Web thinning	Form C	Form C
Surface	Bright	Nitrided
Point angle	130°	130°
List-No.	1201	1202

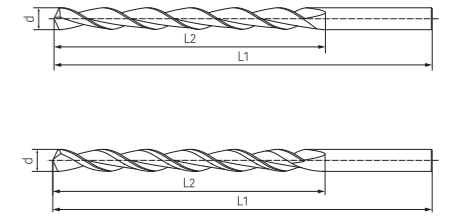


d mm	L1 mm	L2 mm
3.0	190	130
3.5	210	145
4.0	220	150
4.5	235	160
5.0	245	170
5.5	260	180
6.0	260	180
6.5	275	190
7.0	290	200
7.5	290	200
8.0	305	210
8.5	305	210
9.0	320	220
9.5	320	220
10.0	340	235
10.5	340	235
11.0	365	250
11.5	365	250
12.0	375	260
12.5	375	260
13.0	375	260

Twist Drills with straight shank HSS/HSCo, extra long series DIN 1869/series 3



Type	Para 1	Para 2
Cutting material	HSS	HSCo
Cutting direction	R.H.	R.H.
Web thinning	Form C	Form C
Surface	Bright	Nitrided
Point angle	130°	130°
List-No.	1301	1302

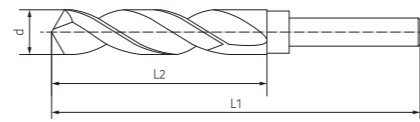


d mm	L1 mm	L2 mm
3.5	265	180
4.0	280	190
4.5	295	200
5.0	315	210
5.5	330	225
6.0	330	225
6.5	350	235
7.0	370	250
7.5	370	250
8.0	390	265
8.5	390	265
9.0	410	280
9.5	410	280
10.0	430	295
10.5	430	295
11.0	455	310
11.5	455	310
12.0	480	330
12.5	480	330
13.0	480	330

Twist Drills with 1/2" shank HSS, standard length ASME



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	—
Surface	TiN
Point angle	118°
List-No.	1701

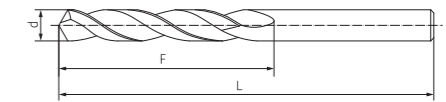


d mm	L1 mm	L2 mm
13	6	3
14	6	3
15	6	3
16	6	3
17	6	3
18	6	3
19	6	3
20	6	3
21	6	3
22	6	3
24	6	3
26	6	3
27	6	3
28	6	3
29	6	3
30	6	3
31	6	3
32	6	3
33	6	3
34	6	3
35	6	3
36	6	3
37	6	3
38	6	3
39	6	3
40	6	3

Inch Straight Shank Drill (Short) ASME(B94.11M)



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	Form C
Surface	TiN
Point angle	118°
List-No.	2101

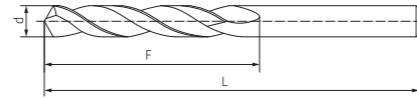


D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch
Fractional				45/64	0.7031	3	4-3/4	#7	.2010	1-3/16	2-1/4	#51	.0670	11/16	1-11/16
				23/32	0.7188	3	4-3/4	#8	.1990	1-3/16	2-1/4	#52	.0635	11/16	1-11/16
3/64	0.0469	1/2	1-3/8	47/64	0.7344	3-1/8	5	#9	.1960	1-3/16	2-1/4	#53	.0595	5/8	1-5/8
1/16	0.0625	5/8	1-5/8	3/4	0.7500	3-1/8	5	#10	.1935	1-3/16	2-1/4	#54	.0550	5/8	1-5/8
5/64	0.0781	11/16	1-11/16	49/64	0.7656	3-1/4	5-1/8	#11	.1910	1-3/16	2-1/4	#55	.0520	5/8	1-5/8
3/32	0.0938	3/4	1-3/4	25/32	0.7812	3-1/4	5-1/8	#12	.1890	1-3/16	2-1/4	#56	.0465	1/2	1-3/8
7/64	0.1094	13/16	1-13/16	51/64	0.7969	3-3/8	5-1/4	#13	.1850	1-1/8	2-3/16	#57	.0430	1/2	1-3/8
1/8	0.1250	7/8	1-7/8	13/16	0.8125	3-3/8	5-1/4	#14	.1820	1-1/8	2-3/16	#58	.0420	1/2	1-3/8
9/64	0.1406	15/16	1-15/16	53/64	0.8281	3-1/2	5-3/8	#15	.1800	1-1/8	2-3/16	#59	.0410	1/2	1-3/8
5/32	0.1562	1	2-1/16	27/32	0.8438	3-1/2	5-3/8	#16	.1770	1-1/8	2-3/16	#60	.0400	1/2	1-3/8
11/64	0.1719	1-1/16	2-1/8	55/64	0.8594	3-1/2	5-1/2	#17	.1730	1-1/8	2-3/16	Letter			
3/16	0.1875	1-1/8	2-3/16	7/8	0.8750	3-1/2	5-1/2	#18	.1695	1-1/16	2-1/8	A	.2340	1-15/16	2-7/16
13/64	0.2031	1-3/16	2-1/4	57/64	0.8906	3-5/8	5-5/8	#19	.1660	1-1/16	2-1/8	B	.2380	1-3/8	2-1/2
7/32	0.2188	1-1/4	2-3/8	29/32	0.9062	3-5/8	5-5/8	#20	.1610	1-1/16	2-1/8	C	.2420	1-3/8	2-1/2
15/64	0.2344	1-5/16	2-7/16	59/64	0.9219	3-3/4	5-3/4	#21	.1590	1-1/16	2-1/8	D	.2460	1-3/8	2-1/2
1/4	0.2500	1-3/8	2-1/2	15/16	0.9375	3-3/4	5-3/4	#22	.1570	1-1/16	2-1/8	E	.2500	1-3/8	2-1/2
17/64	0.2656	1-7/16	2-5/8	61/64	0.9531	3-7/8	5-7/8	#23	.1540	1	2-1/16	F	.2570	1-7/16	2-5/8
9/32	0.2812	1-1/2	2-11/16	31/32	0.9688	3-7/8	5-7/8	#24	.1520	1	2-1/16	G	.2610	1-7/16	2-5/8
19/64	0.2969	1-9/16	2-3/4	63/64	0.9844	4	6	#25	.1495	1	2-1/16	H	.2660	1-1/2	2-11/16
5/16	0.3125	1-5/8	2-13/16	1	1.0000	4	6	#26	.1470	1	2-1/16	I	.2720	1-1/2	2-11/16
21/64	0.3281	1-11/16	2-15/16	1-1/16	1.0625	4	6-1/4	#27	.1440	1	2-1/16	J	.2770	1-1/2	2-11/16
11/32	0.3438	1-11/16	3	1-1/8	1.1250	4	6-3/8	#28	.1405	15/16	1-15/16	K	.2810	1-1/2	2-11/16
23/64	0.3594	1-3/4	3-1/16	1-3/16	1.1875	4-1/4	6-5/8	#29	.1360	15/16	1-15/16	L	.2900	1-9/16	2-3/4
3/8	0.3750	1-13/16	3-1/8	1-1/4	1.2500	4-3/8	6-3/4	#30	.1285	15/16	1-15/16	M	.2950	1-9/16	2-3/4
25/64	0.3906	1-7/8	3-1/4	1-5/16	1.3125	4-3/8	7	#31	.1200	7/8	1-7/8	N	.3020	1-5/8	2-13/16
13/32	0.4062	1-15/16	3-5/16	1-3/8	1.3750	4-1/2	7-1/8	#32	.1160	7/8	1-7/8	O	.3160	1-11/16	2-15/16
27/64	0.4219	2	3-3/8	1-7/16	1.4375	4-3/4	7-3/8	#33	.1130	7/8	1-7/8	P	.3230	1-11/16	2-15/16
7/16	0.4375	2-1/16	3-7/16	1-1/2	1.5000	4-7/8	7-1/2	#34	.1110	7/8	1-7/8	Q	.3320	1-11/16	3
29/64	0.4531	2-1/8	3-9/16	1-9/16	1.5625	4-7/8	7-3/4	#35	.1100	7/8	1-7/8	R	.3390	1-11/16	3
15/32	0.4688	2-1/8	3-5/8	1-5/8	1.6250	4-7/8	7-3/4	#36	.1065	13/16	1-13/16	S	.3480	1-3/4	3-1/16
31/64	0.4844	2-3/16	3-11/16	1-11/16	1.6875	5-1/8	8	#37	.1040	13/16	1-13/16	T	.3580	1-3/4	3-1/16
1/2	0.5000	2-1/4	3-3/4	1-3/4	1.7500	5-1/8	8	#38	.1015	13/16	1-13/16	U	.3680	1-13/16	3-3/8
33/64	0.5156	2-3/8	3-7/8	1-13/16	1.8125	5-3/8	8-1/4	#39	.0995	13/16	1-13/16	V	.3770	1-7/8	3-1/4
17/32	0.5312	2-3/8	3-7/8	1-7/8	1.8750	5-3/8	8-1/4	#40	.0980	13/16	1-13/16	W	.3860	1-7/8	3-1/4
35/64	0.5469	2-1/2	4	1-15/16	1.9375	5-5/8	8-1/2	#41	.0960	13/16	1-13/16	X	.3970	1-15/16	3-15/16
9/16	0.5625	2-1/2	4	2	2.0000	5-5/8	8-1/2	#42	.0935	3/4	1-3/4	Y	.4040	1-15/16	3-15/16
37/64	0.5781	2-5/8	4-1/8	Wire				#43	.0890	3/4	1-3/4	Z	.4130	2	3-3/8
19/32	0.5938	2-5/8	4-1/8	#1	.2280	1-5/16	2-7/16	#44	.0860	3/4	1-3/4				
39/64	0.6094	2-3/4	4-1/4	#2	.2210	1-5/16	2-7/16	#45	.0820	3/4	1-3/4				
5/8	0.6250	2-3/4	4-1/4	#3	.2130	1-1/4	2-3/8	#46	.0810	3/4	1-3/4				
41/64	0.6406	2-7/8	4-1/2	#4	.2090	1-1/4	2-3/8	#47	.0785	11/16	1-11/16				
21/32	0.6562	2-7/8	4-1/2	#5	.2055	1-1/4	2-3/8	#48	.0760	11/16	1-11/16				
43/64	0.6719	2-7/8	4-5/8	#6	.2040	1-1/4	2-3/8	#49	.0730	11/16	1-11/16				
11/16	0.6875	2-7/8	4-5/8					#50	.0700	11/16	1-11/16				

Inch Straight Shank Drill ASME(B94.11M)



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	Form C
Surface	TiN
Point angle	118°
List-No.	2001



D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch
Fractional				43/64	.6719	5-5/8	7-5/8
1/64	.0156	3/16	3/4	11/16	.6875	5-5/8	7-5/8
1/32	.0312	1/2	1-3/8	Wire			
3/64	.0469	3/4	1-3/4	#1	.2280	2-5/8	3-7/8
1/16	.0625	7/8	1-7/8	#2	.2210	2-5/8	3-7/8
5/64	.0781	1	2	#3	.2130	2-1/2	3-3/4
3/32	.0938	1-1/4	2-1/4	#4	.2090	2-1/2	3-3/4
7/64	.1094	1-1/2	2-5/8	#5	.2055	2-1/2	3-3/4
1/8	.1250	1-5/8	2-3/4	#6	.2040	2-1/2	3-3/4
9/64	.1406	1-3/4	2-7/8	#7	.2010	2-7/16	3-5/8
5/32	.1562	2	3-1/8	#8	.1990	2-7/16	3-5/8
11/64	.1719	2-1/8	3-1/4	#9	.1960	2-7/16	3-5/8
3/16	.1875	2-5/16	3-1/2	#10	.1935	2-7/16	3-5/8
13/64	.2031	2-7/16	3-5/8	#11	.1910	2-5/16	3-1/2
7/32	.2188	2-1/2	3-3/4	#12	.1890	2-5/16	3-1/2
15/64	.2344	2-5/8	3-7/8	#13	.1850	2-5/16	3-1/2
1/4	.2500	2-3/4	4	#14	.1820	2-3/16	3-3/8
17/64	.2656	2-7/8	4-1/8	#15	.1800	2-3/16	3-3/8
9/32	.2812	2-15/16	4-1/4	#16	.1770	2-3/16	3-3/8
19/64	.2969	3-1/16	4-3/8	#17	.1730	2-3/16	3-3/8
5/16	.3125	3-3/16	4-1/2	#18	.1695	2-1/8	3-1/4
21/64	.3281	3-5/16	4-5/8	#19	.1660	2-1/8	3-1/4
11/32	.3438	3-7/16	4-3/4	#20	.1610	2-1/8	3-1/4
23/64	.3594	3-1/2	4-7/8	#21	.1590	2-1/8	3-1/4
3/8	.3750	3-5/8	5	#22	.1570	2	3-1/8
25/64	.3906	3-3/4	5-1/8	#23	.1540	2	3-1/8
13/32	.4062	3-7/8	5-1/4	#24	.1520	2	3-1/8
27/64	.4219	3-15/16	5-3/8	#25	.1495	1-7/8	3
7/16	.4375	4-1/16	5-1/2	#26	.1470	1-7/8	3
29/64	.4531	4-3/16	5-5/8	#27	.1440	1-7/8	3
15/32	.4688	4-5/16	5-3/4	#28	.1405	1-3/4	2-7/8
31/64	.4844	4-3/8	5-7/8	#29	.1360	1-3/4	2-7/8
1/2	.5000	4-1/2	6	#30	.1285	1-5/8	2-3/4
33/64	.5156	4-13/16	6-5/8	#31	.1200	1-5/8	2-3/4
17/32	.5312	4-13/16	6-5/8	#32	.1160	1-5/8	2-3/4
35/64	.5469	4-13/16	6-5/8	#33	.1130	1-1/2	2-5/8
9/16	.5625	4-13/16	6-5/8	#34	.1110	1-1/2	2-5/8
37/64	.5781	4-13/16	6-5/8	#35	.1100	1-1/2	2-5/8
19/32	.5938	5-3/16	7-1/8	#36	.1065	1-7/16	2-1/2
39/64	.6094	5-3/16	7-1/8	#37	.1040	1-7/16	2-1/2
5/8	.6250	5-3/16	7-1/8	#38	.1015	1-7/16	2-1/2
41/64	.6406	5-3/16	7-1/8	#39	.0995	1-3/8	2-3/8
21/32	.6562	5-3/16	7-1/8	#40	.0980	1-3/8	2-3/8

Inch Straight Shank Drill ASME(B94.11M)

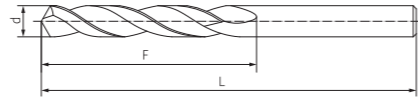
D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch
#41	.0960	1-3/8	2-3/8	#85	.0110	3/32	3/4
#42	.0935	1-1/4	2-1/4	#86	.0105	3/32	3/4
#43	.0890	1-1/4	2-1/4	#87	.0100	5/64	3/4
#44	.0860	1-1/8	2-1/8	#88	.0095	5/64	3/4
#45	.0820	1-1/8	2-1/8	#89	.0091	5/64	3/4
#46	.0810	1-1/8	2-1/8	#90	.0087	5/64	3/4
#47	.0785	1	2	#91	.0083	5/64	3/4
#48	.0760	1	2	#92	.0079	1/16	3/4
#49	.0730	1	2	#93	.0075	1/16	3/4
#50	.0700	1	2	#94	.0071	1/16	3/4
#51	.0670	1	2	#95	.0067	1/16	3/4
#52	.0635	7/8	1-7/8	#96	.0063	1/16	3/4
#53	.0595	7/8	1-7/8	#97	.0059	1/16	3/4
#54	.0550	7/8	1-7/8	Letter			
#55	.0520	7/8	1-7/8	A	.2340	2-5/8	3-7/8
#56	.0465	3/4	1-3/4	B	.2380	2-3/4	4
#57	.0430	3/4	1-3/4	C	.2420	2-3/4	4
#58	.0420	11/16	1-5/8	D	.2460	2-3/4	4
#59	.0410	11/16	1-5/8	E	.2500	2-3/4	4
#60	.0400	11/16	1-5/8	F	.2570	2-7/8	4-1/8
#61	.0390	11/16	1-5/8	G	.2610	2-7/8	4-1/8
#62	.0380	5/8	1-1/2	H	.2660	2-7/8	4-1/8
#63	.0370	5/8	1-1/2	I	.2720	2-7/8	4-1/8
#64	.0360	5/8	1-1/2	J	.2770	2-7/8	4-1/8
#65	.0350	5/8	1-1/2	K	.2810	2-15/16	4-1/4
#66	.0330	1/2	1-3/8	L	.2900	2-15/16	4-1/4
#67	.0320	1/2	1-3/8	M	.2950	3-1/16	4-3/8
#68	.0310	1/2	1-3/8	N	.3020	3-1/16	4-3/8
#69	.0292	1/2	1-3/8	O	.3160	3-3/16	4-1/2
#70	.0280	3/8	1-1/4	P	.3230	3-5/16	4-5/8
#71	.0260	3/8	1-1/4	Q	.3320	3-7/16	4-3/4
#72	.0250	5/16	1-1/8	R	.3390	3-7/16	4-3/4
#73	.0240	5/16	1-1/8	S	.3480	3-1/2	4-7/8
#74	.0225	1/4	1	T	.3580	3-1/2	4-7/8
#75	.0210	1/4	1	U	.3680	3-5/8	5
#76	.0200	3/16	7/8	V	.3770	3-5/8	5
#77	.0180	3/16	7/8	W	.3860	3-3/4	5-1/8
#78	.0160	3/16	7/8	X	.3970	3-3/4	5-1/8
#79	.0145	1/8	3/4	Y	.4040	3-7/8	5-1/4
#80	.0135	1/8	3/4	Z	.4130	3-7/8	5-1/4
#81	.0130	3/32	3/4				
#82	.0125	3/32	3/4				
#83	.0120	3/32	3/4				
#84	.0115	3/32	3/4				



Inch Straight Shank Drill (Long) ASME(B94.11M)



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	Form C
Surface	TiN
Point angle	118°
List-No.	2201



D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch
Fractional				45/64	0.7031	5-5/8	9-1/2
1/64	0.0156	5/16	1-1/2	23/32	0.7188	5-5/8	9-1/2
1/32	0.0312	3/4	2	47/64	0.7344	5-7/8	9-3/4
3/64	0.0469	1-1/8	2-1/4	3/4	0.7500	5-7/8	9-3/4
1/16	0.0625	1-3/4	3	49/64	0.7656	6	9-7/8
5/64	0.0781	2	3-3/4	25/32	0.7812	6	9-7/8
3/32	0.0938	2-1/4	4-1/4	51/64	0.7969	6-1/8	10
7/64	0.1094	2-1/2	4-5/8	13/16	0.8125	6-1/8	10
1/8	0.1250	2-3/4	5-1/8	53/64	0.8281	6-1/8	10
9/64	0.1406	3	5-3/8	27/32	0.8438	6-1/8	10
5/32	0.1562	3	5-3/8	55/64	0.8594	6-1/8	10
11/64	0.1719	3-3/8	5-3/4	7/8	0.8750	6-1/8	10
3/16	0.1875	3-3/8	5-3/4	57/64	0.8906	6-1/8	10
13/64	0.2031	3-5/8	6	29/32	0.9062	6-1/8	10
7/32	0.2188	3-5/8	6	59/64	0.9219	6-1/8	10-3/4
15/64	0.2344	3-3/4	6-1/8	15/16	0.9375	6-1/8	10-3/4
1/4	0.2500	3-3/4	6-1/8	61/64	0.9531	6-3/8	11
17/64	0.2656	3-7/8	6-1/4	31/32	0.9688	6-3/8	11
9/32	0.2812	3-7/8	6-1/4	63/64	0.9844	6-3/8	11
19/64	0.2969	4	6-3/8	1	1.0000	6-3/8	11
5/16	0.3125	4	6-3/8	1-1/64	1.0156	6-1/2	11-1/8
21/64	0.3281	4-1/8	6-1/2	1-1/32	1.0312	6-1/2	11-1/8
11/32	0.3438	4-1/8	6-1/2	1-3/64	1.0469	6-5/8	11-1/4
23/64	0.3594	4-1/4	6-3/4	1-1/16	1.0625	6-5/8	11-1/4
3/8	0.3750	4-1/4	6-3/4	1-1/8	1.0781	6-7/8	11-1/2
25/64	0.3906	4-3/8	7	1-3/32	1.0938	6-7/8	11-1/2
13/32	0.4062	4-3/8	7	1-7/64	1.1094	7-1/8	11-3/4
27/64	0.4219	4-5/8	7-1/4	1-1/8	1.1250	7-1/8	11-3/4
7/16	0.4375	4-5/8	7-1/4	1-9/64	1.1406	7-1/4	11-7/8
29/64	0.4531	4-3/4	7-1/2	1-5/32	1.1562	7-1/4	11-7/8
15/32	0.4688	4-3/4	7-1/2	1-11/64	1.1719	7-3/8	12
31/64	0.4844	4-3/4	7-3/4	1-3/16	1.1875	7-3/8	12
1/2	0.5000	4-3/4	7-3/4	1-1/8	1.2031	7-1/2	12-1/8
33/64	0.5156	4-3/4	8	1-13/64	1.2188	7-1/2	12-1/8
17/32	0.5312	4-3/4	8	1-7/32	1.2344	7-7/8	12-1/2
35/64	0.5469	4-7/8	8-1/4	1-15/64	1.2500	7-7/8	12-1/2
9/16	0.5625	4-7/8	8-1/4	1-1/4	1.2656	7-7/8	12-1/2
37/64	0.5781	4-7/8	8-3/4	1-5/16	1.3125	8-5/8	14-1/4
19/32	0.5938	4-7/8	8-3/4	1-3/8	1.3250	8-5/8	14-1/4
39/64	0.6094	4-7/8	8-3/4	1-3/8	1.3375	8-7/8	14-1/2
5/8	0.6250	4-7/8	8-3/4	1-7/16	1.4375	9-1/8	14-3/4
41/64	0.6406	5-1/8	9	1-1/2	1.5000	9-3/8	15
21/32	0.6562	5-1/8	9	1-1/2	1.5000	9-3/8	15
43/64	0.6719	5-3/8	9-1/4	1-9/16	1.5625	9-5/8	15-1/4
11/16	0.6875	5-3/8	9-1/4	1-5/8	1.6250	9-7/8	15-5/8
				1-3/4	1.7500	10-1/2	16-1/4

Inch Straight Shank Drill (Long) ASME(B94.11M)

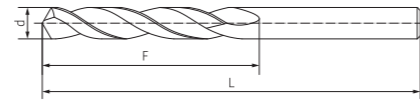
D inch	Dec. Equiv.	F inch	L inch	D inch	Dec. Equiv.	F inch	L inch
Wire				#55	.0520	1-3/4	3
#1	.2280	3-3/4	6-1/8	#56	.0465	1-1/8	2-1/4
#2	.2210	3-3/4	6-1/8	#57	.0430	1-1/8	2-1/4
#3	.2130	3-5/8	6	#58	.0420	1-1/8	2-1/4
#4	.2090	3-5/8	6	#59	.0410	1-1/8	2-1/4
#5	.2055	3-5/8	6	#60	.0400	1-1/8	2-1/4
#6	.2040	3-5/8	6	#61	.0390	1-1/8	2-1/4
#7	.2010	3-5/8	6	#62	.0380	3/4	2
#8	.1990	3-5/8	6	#63	.0370	3/4	2
#9	.1960	3-5/8	6	#64	.0360	3/4	2
#10	.1935	3-5/8	6	#65	.0350	3/4	2
#11	.1910	3-5/8	6	#66	.0330	3/4	2
#12	.1890	3-5/8	6	#67	.0320	3/4	2
#13	.1850	3-3/8	5-3/4	#68	.0310	3/4	2
#14	.1820	3-3/8	5-3/4	#69	.0292	3/4	2
#15	.1800	3-3/8	5-3/4	#70	.0280	3/4	2
#16	.1770	3-3/8	5-3/4	#71	.0260	3/4	2
#17	.1730	3-3/8	5-3/4	#72	.0250	5/16	1-1/2
#18	.1695	3-3/8	5-3/4	#73	.0240	5/16	1-1/2
#19	.1660	3-3/8	5-3/4	#74	.0225	5/16	1-1/2
#20	.1610	3-3/8	5-3/4	#75	.0210	5/16	1-1/2
#21	.1590	3-3/8	5-3/4	#76	.0200	5/16	1-1/2
#22	.1570	3-3/8	5-3/4	#77	.0180	5/16	1-1/2
#23	.1540	3	5-3/8	#78	.0160	5/16	1-1/2
#24	.1520	3	5-3/8	#79	.0145	5/16	1-1/2
#25	.1495	3	5-3/8	#80	.0135	5/16	1-1/2
#26	.1470	3	5-3/8	Letter			
#27	.1440	3	5-3/8	A	.2340	3-3/4	6-1/8
#28	.1405	3	5-3/8	B	.2380	3-3/4	6-1/8
#29	.1360	3	5-3/8	C	.2420	3-3/4	6-1/8
#30	.1285	3	5-3/8	D	.2460	3-3/4	6-1/8
#31	.1200	2-3/4	5-1/8	E	.2500	3-3/4	6-1/8
#32	.1160	2-3/4	5-1/8	F	.2570	3-7/8	6-1/4
#33	.1130	2-3/4	5-1/8	G	.2610	3-7/8	6-1/4
#34	.1110	2-3/4	5-1/8	H	.2660	3-7/8	6-1/4
#35	.1100	2-3/4	5-1/8	I	.2720	3-7/8	6-1/4
#36	.1065	2-1/2	4-5/8	J	.2770	3-7/8	6-1/4
#37	.1040	2-1/2	4-5/8	K	.2810	3-7/8	6-1/4
#38	.1015	2-1/2	4-5/8	L	.2900	4	6-3/8
#39	.0995	2-1/2	4-5/8	M	.2950	4	6-3/8
#40	.0980	2-1/2	4-5/8	N	.3020	4	6-3/8
#41	.0960	2-1/2	4-5/8	O	.3160	4-1/8	6-1/2
#42	.0935	2-1/4	4-1/4	P	.3230	4-1/8	6-1/2
#43	.0890	2-1/4	4-1/4	Q	.3320	4-1/8	6-1/2
#44	.0860	2-1/4	4-1/4	R	.3390	4-1/8	6-1/2
#45	.0820	2-1/4	4-1/4	S	.3480	4-1/4	6-3/4
#46	.0810	2-1/4	4-1/4	T	.3580	4-1/4	6-3/4
#47	.0785	2-1/4	4-1/4	U	.3680	4-1/4	6-3/4
#48	.0760	2	3-3/4	V	.3770	4-3/8	7
#49	.0730	2	3-3/4	W	.3860	4-3/8	7
#50	.0700	2	3-3/4	X	.3970	4-3/8	7
#51	.0670	2	3-3/4	Y	.4040	4-3/8	7
#52	.0635	2	3-3/4	Z	.4130	4-5/8	7-1/4
#53	.0595	1-3/4	3				
#54	.0550	1-3/4	3				

HSS, Straight Shank, 6"&12" Aircraft Drill ASME(B94.11M)

HSS, Straight Shank, 6"&12" Aircraft Drill ASME(B94.11M)



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	Form C
Surface	Nitrided
Point angle	118°
Overall length	6"
List-No.	2301



Type	N
Cutting material	HSS
Cutting direction	R.H.
Web thinning	Form C
Surface	Nitrided
Point angle	118°
Overall length	12"
List-No.	2401



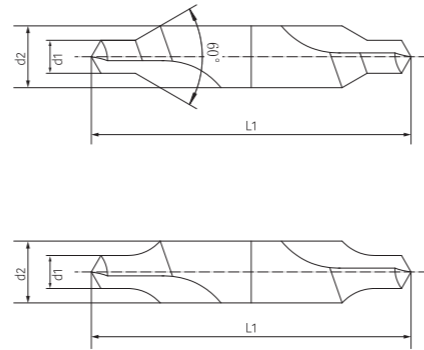
D inch	Dec. Equiv.	F inch	L inch	L inch	D inch	Dec. Equiv.	F inch	L inch	L inch	D inch	Dec. Equiv.	F inch	L inch	L inch
Fractional					Wire									
3/64	.0469	3/4	6	12	#1	.2280	2-5/8	6	12	#31	.1200	1-5/8	6	12
1/16	.0625	7/8	6	12	#2	.2210	2-5/8	6	12	#32	.1160	1-5/8	6	12
5/64	.0781	1	6	12	#3	.2130	2-1/2	6	12	#33	.1130	1-1/2	6	12
3/32	.0938	1-1/4	6	12	#4	.2090	2-1/2	6	12	#34	.1110	1-1/2	6	12
7/64	.1094	1-1/2	6	12	#5	.2055	2-1/2	6	12	#35	.1100	1-1/2	6	12
1/8	.1250	1-5/8	6	12	#6	.2040	2-1/2	6	12	#36	.1065	1-7/16	6	12
9/64	.1406	1-3/4	6	12	#7	.2010	2-7/16	6	12	#37	.1040	1-7/16	6	12
5/32	.1562	2	6	12	#8	.1990	2-7/16	6	12	#38	.1015	1-7/16	6	12
11/64	.1719	2-1/8	6	12	#9	.1960	2-7/16	6	12	#39	.0995	1-3/8	6	12
3/16	.1875	2-5/16	6	12	#10	.1935	2-7/16	6	12	#40	.0980	1-3/8	6	12
13/64	.2031	2-7/16	6	12	#11	.1910	2-5/16	6	12	#41	.0960	1-3/8	6	12
7/32	.2188	2-1/2	6	12	#12	.1890	2-5/16	6	12	#42	.0935	1-1/4	6	12
15/64	.2344	2-5/8	6	12	#13	.1850	2-5/16	6	12	#43	.0890	1-1/4	6	12
1/4	.2500	2-3/4	6	12	#14	.1820	2-3/16	6	12	#44	.0860	1-1/8	6	12
17/64	.2656	2-7/8	6	12	#15	.1800	2-3/16	6	12	#45	.0820	1-1/8	6	12
9/32	.2812	2-15/16	6	12	#16	.1770	2-3/16	6	12	#46	.0810	1-1/8	6	12
19/64	.2969	3-1/16	6	12	#17	.1730	2-3/16	6	12	#47	.0785	1	6	12
5/16	.3125	3-3/16	6	12	#18	.1695	2-1/8	6	12	#48	.0760	1	6	12
21/64	.3281	3-5/16	6	12	#19	.1660	2-1/8	6	12	#49	.0730	1	6	12
11/32	.3438	3-7/16	6	12	#20	.1610	2-1/8	6	12	#50	.0700	1	6	12
23/64	.3594	3-1/2	6	12	#21	.1590	2-1/8	6	12	#51	.0670	1	6	12
3/8	.3750	3-5/8	6	12	#22	.1570	2	6	12	#52	.0635	7/8	6	12
25/64	.3906	3-3/4	6	12	#23	.1540	2	6	12	#53	.0595	7/8	6	12
13/32	.4062	3-7/8	6	12	#24	.1520	2	6	12	#54	.0550	7/8	6	12
27/64	.4219	3-15/16	6	12	#25	.1495	1-7/8	6	12	#55	.0520	7/8	6	12
7/16	.4375	4-1/16	6	12	#26	.1470	1-7/8	6	12	#56	.0465	3/4	6	12
29/64	.4531	4-3/16	6	12	#27	.1440	1-7/8	6	12	#57	.0430	3/4	6	12
15/32	.4688	4-5/16	6	12	#28	.1405	1-3/4	6	12	#58	.0420	11/16	6	12
31/64	.4844	4-3/8	6	12	#29	.1360	1-3/4	6	12	#59	.0410	11/16	6	12
1/2	.5000	4-1/2	6	12	#30	.1285	1-5/8	6	12	#60	.0400	11/16	6	12

D inch	Dec. Equiv.	F inch	L inch	L inch
Letter				
A	.2340	2-5/8	6	12
B	.2380	2-3/4	6	12
C	.2420	2-3/4	6	12
D	.2460	2-3/4	6	12
E	.2500	2-3/4	6	12
F	.2570	2-7/8	6	12
G	.2610	2-7/8	6	12
H	.2660	2-7/8	6	12
I	.2720	2-7/8	6	12
J	.2770	2-7/8	6	12
K	.2810	2-15/16	6	12
L	.2900	2-15/16	6	12
M	.2950	3-1/16	6	12
N	.3020	3-1/16	6	12
O	.3160	3-3/16	6	12
P	.3230	3-5/16	6	12
Q	.3320	3-7/16	6	12
R	.3390	3-7/16	6	12
S	.3480	3-1/2	6	12
T	.3580	3-1/2	6	12
U	.3680	3-5/8	6	12
V	.3770	3-5/8	6	12
W	.3860	3-3/4	6	12
X	.3970	3-3/4	6	12
Y	.4040	3-7/8	6	12
Z	.4130	3-7/8	6	12

Centre Drills HSS DIN 333



Type	A	R
Cutting material	HSS	HSS
Cutting direction	R.H.	R.H.
Web thinning	—	—
Surface	Bright	Bright
Point angle	118°	118°
List-No.	0201	0202

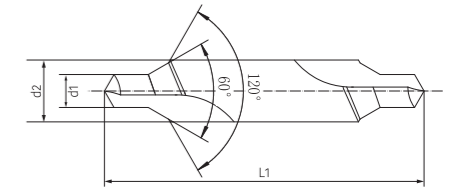


d1 mm	L1 mm	d2 mm
1.00	31.5	3.15
1.25	31.5	3.15
1.60	35.5	4.00
2.00	40.0	5.00
2.50	45.0	6.30
3.15	50.0	8.00
4.00	56.0	10.00
5.00	63.0	12.50
6.30	71.0	16.00
8.00	80.0	20.00
10.00	100.0	25.00

Centre Drills HSS DIN 333



Type	B
Cutting material	HSS
Cutting direction	R.H.
Web thinning	—
Surface	Bright
Point angle	118°
List-No.	0203



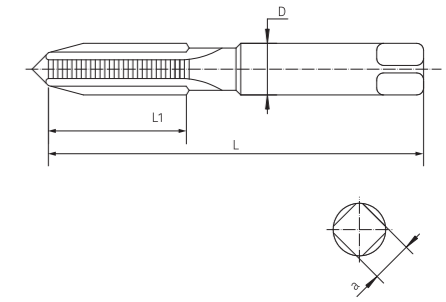
d1 mm	L1 mm	d2 mm
1.00	35.5	4.0
1.25	40.0	5.0
1.60	45.0	6.3
2.00	50.0	8.0
2.50	56.0	10.0
3.15	60.0	11.2
4.00	67.0	14.0
5.00	75.0	18.0
6.30	80.0	20.0
8.00	100.0	25.0
10.00	125.0	31.5

Taps

Machine taps HSS/HSCo GB/T3464.1-94



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2501 2504



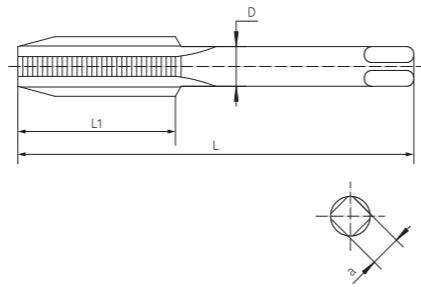
Products	Standard	Size range	Cutting material	Cutting direction	Type of hole	Surface	
	GB/T3464.1-94	M2-M10	HSS/HSCo	R.H.	through hole	TiN	
		M3-M52	HSS/HSCo	R.H.	through hole	TiN	
	GB/T3506-93	M3-M33	HSS/HSCo	R.H.	blind hole	TiN	
	JB5612-91	M2-M10	HSS/HSCo	R.H.	through hole	TiN	
		M3-M52	HSS/HSCo	R.H.	through hole	TiN	
	JIS	M3-M6	HSS/HSCo	R.H.	through hole	TiN	
		M7-M50	HSS/HSCo	R.H.	through hole	TiN	
		M3-M6	HSS/HSCo	R.H.	blind hole	TiN	
		M7-M48	HSS/HSCo	R.H.	blind hole	TiN	
		M3-M6	HSS/HSCo	R.H.	through hole	TiN	
		M7-M48	HSS/HSCo	R.H.	through hole	TiN	
		DIN 352	M3-M12	HSS/HSCo	R.H.	blind hole	TiN
			M3-M12	HSS/HSCo	R.H.	through hole	TiN
	DIN 371	M3-M10	HSS/HSCo	R.H.	through hole	TiN	
		M3-M10	HSS/HSCo	R.H.	blind hole	TiN	
	DIN 374	M3-M10	HSS/HSCo	R.H.	through hole	TiN	
		M3-M52	HSS/HSCo	R.H.	through hole	TiN	
		M3-M52	HSS/HSCo	R.H.	blind hole	TiN	
	DIN 376	M3-M52	HSS/HSCo	R.H.	through hole	TiN	
		M3-M30	HSS/HSCo	R.H.	through hole	TiN	
		M3-M30	HSS/HSCo	R.H.	blind hole	TiN	
	ASME B94.9-1999(NPS)	M3-M30	HSS/HSCo	R.H.	through hole	TiN	
		M3-M30	HSS/HSCo	R.H.	through hole	TiN	
	ASME B94.9-1999(NPT)	1/16-3(inch)	HSS/HSCo	R.H.	through hole	Bright	
	ASME B94.9-1999(NPT)	1/16-3(inch)	HSS/HSCo	R.H.	through hole	Bright	

Size	p mm	L mm	L1 mm	D mm	axa mm
M2	0.4	41	8	2.5	2
M2	0.25	41	8	2.5	2
M2.2	0.45	45	10	2.8	2.24
M2.2	0.25	45	10	2.8	2.24
M2.5	0.45	45	10	2.8	2.24
M2.5	0.35	45	10	2.8	2.24
M3	0.5	48	11	3.15	2.5
M3	0.35	48	11	3.15	2.5
M3.5	0.6	50	13	3.55	2.8
M3.5	0.35	50	13	3.55	2.8
M4	0.7	53	13	4	3.15
M4	0.5	53	13	4	3.15
M4.5	0.75	53	13	4.5	3.55
M4.5	0.5	53	13	4.5	3.55
M5	0.8	58	16	5	4
M5	0.5	58	16	5	4
M6	1	66	19	6.3	5
M6	0.5	66	19	6.3	5
M6	0.75	66	19	6.3	5
M7	1	66	19	7.1	5.6
M7	0.75	66	19	7.1	5.6
M8	1.25	72	22	8	6.3
M8	0.5	66	19	8	6.3
M8	0.75	66	19	8	6.3
M8	1	72	22	8	6.3
M9	1.25	72	22	9	7.1
M9	0.75	66	19	9	7.1
M9	1	72	22	9	7.1
M10	0.75	73	20	10	8
M10	1.5	80	24	10	8
M10	1	80	24	10	8
M10	1.25	80	24	10	8

Machine taps HSS/HSCo GB/T3464.1-94



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2502 2505

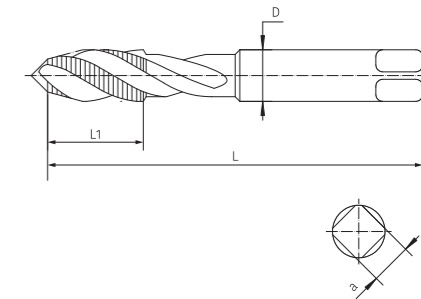


Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	48	11	2.24	1.8	M16	1.5	102	32	12.5	10	M33	3	151	51	22.4	18
M3	0.35	48	11	2.24	1.8	M17	1.5	102	32	12.5	10	M35	1.5	144	39	25	20
M3.5	0.6	50	13	2.5	2	M18	2.5	112	37	14	11.2	M36	4	162	57	25	20
M3.5	0.35	50	13	2.5	2	M18	1	97	22	14	11.2	M36	1.5	144	39	25	20
M4	0.7	53	13	3.15	2.5	M18	1.5	112	37	14	11.2	M36	2	144	39	25	20
M4	0.5	53	13	3.15	2.5	M18	2	112	37	14	11.2	M36	3	162	57	25	20
M4.5	0.75	53	13	3.55	2.8	M20	2.5	112	37	14	11.2	M38	1.5	149	39	28	22.4
M4.5	0.5	53	13	3.55	2.8	M20	1	102	22	14	11.2	M39	4	170	60	28	22.4
M5	0.8	58	16	4	3.15	M20	1.5	112	37	14	11.2	M39	1.5	149	39	28	22.4
M5	0.5	58	16	4	3.15	M20	2	112	37	14	11.2	M39	2	149	39	28	22.4
M6	1	66	19	4.5	3.55	M22	2.5	118	38	16	12.5	M39	3	170	60	28	22.4
M6	0.75	66	19	4.5	3.55	M22	1	109	24	16	12.5	M42	4.5	170	60	28	22.4
M7	1	66	19	5.6	4.5	M22	1.5	118	38	16	12.5	M42	1.5	149	39	28	22.4
M7	0.75	66	19	5.6	4.5	M22	2	118	38	16	12.5	M42	2	149	39	28	22.4
M8	1.25	72	22	6.3	5	M24	3	130	45	18	14	M42	3	170	60	28	22.4
M8	0.75	66	19	6.3	5	M24	1	114	24	18	14	M42	4	170	60	28	22.4
M8	1	72	22	6.3	5	M24	1.5	130	45	18	14	M45	4.5	187	67	31.5	25
M9	1.25	72	22	7.1	5.6	M24	2	130	45	18	14	M45	1.5	165	45	31.5	25
M9	0.75	66	19	7.1	5.6	M25	1.5	130	45	18	14	M45	2	165	45	31.5	25
M9	1	72	22	7.1	5.6	M25	2	130	45	18	14	M45	3	187	67	31.5	25
M10	0.75	73	20	8	6.3	M26	1.5	120	35	18	14	M45	4	187	67	31.5	25
M10	1.5	80	24	8	6.3	M27	3	135	45	20	16	M48	5	187	67	31.5	25
M10	1	80	24	8	6.3	M27	1	120	25	20	16	M48	1.5	165	45	31.5	25
M10	1.25	80	24	8	6.3	M27	1.5	127	37	20	16	M48	2	165	45	31.5	25
M11	1.5	85	25	8	6.3	M27	2	127	37	20	16	M48	3	187	67	31.5	25
M11	0.75	80	22	8	6.3	M28	1	120	25	20	16	M48	4	187	67	31.5	25
M11	1	80	22	8	6.3	M28	1.5	127	37	20	16	M50	1.5	165	45	31.5	25
M12	1.75	89	29	9	7.1	M28	2	127	37	20	16	M50	2	165	45	31.5	25
M12	1	80	22	9	7.1	M30	3.5	138	48	20	16	M50	3	187	67	31.5	25
M12	1.25	89	29	9	7.1	M30	1	120	25	20	16	M52	5	200	70	35.5	28
M12	1.5	89	29	9	7.1	M30	1.5	127	37	20	16	M52	1.5	175	45	35.5	28
M14	2	95	30	11.2	9	M30	2	127	37	20	16	M52	2	175	45	35.5	28
M14	1	87	22	11.2	9	M30	3	138	48	20	16	M52	3	200	70	35.5	28
M14	1.25	95	30	11.2	9	M32	1.5	137	37	22.4	18	M52	4	200	70	35.5	28
M14	1.5	95	30	11.2	9	M32	2	137	37	22.4	18						
M15	1.5	95	30	11.2	9	M33	3.5	151	51	22.4	18						
M16	2	102	32	12.5	10	M33	1.5	137	37	22.4	18						
M16	1	92	22	12.5	10	M33	2	137	37	22.4	18						

Machine taps HSS/HSCo GB/T3506-93



Type of hole	blind hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2503 2506

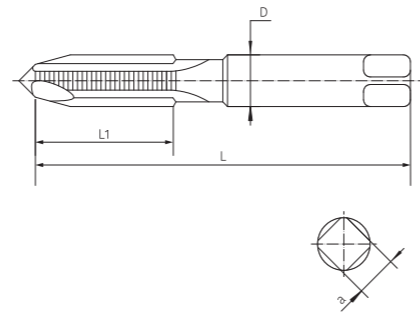


Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	48	11	3.15	2.5	M16	1.5	102	32	12.5	10
M3	0.35	48	11	3.15	2.5	M16	2	102	32	12.5	10
M3.5	0.6	50	13	3.55	2.8	M17	1.5	102	32	12.5	10
M3.5	0.35	50	13	3.55	2.8	M18	1.5	104	29	14	11.2
M4	0.7	53	13	4	3.15	M18	2	112	37	14	11.2
M4	0.5	53	13	4	3.15	M18	2.5	112	37	14	11.2
M4.5	0.75	53	13	4.5	3.55	M20	1.5	104	29	14	11.2
M4.5	0.5	53	13	4.5	3.55	M20	2	112	37	14	11.2
M5	0.8	58	16	5	4	M20	2.5	112	37	14	11.2
M5	0.5	58	16	5	4	M22	1.5	113	33	16	12.5
M5.5	0.5	62	17	5.6	4.5	M22	2	118	38	16	12.5
M6	1	66	19	6.3	5	M22	2.5	118	38	16	12.5
M6	0.75	66	19	6.3	5	M24	1.5	120	35	18	14
M7	1	66	19	5.6	4.5	M24	2	120	35	18	14
M7	0.75	66	19	5.6	4.5	M24	3	130	45	18	14
M8	1.25	72	22	6.3	5	M25	1.5	120	35	18	14
M8	1	69	19	6.3	5	M25	2	120	35	18	14
M9	1.25	72	22	7.1	5.6	M27	1.5	127	37	20	16
M9	1	69	19	7.1	5.6	M27	2	127	37	20	16
M10	1.5	80	24	8	6.3	M27	3	135	45	20	16
M10	1	76	20	8	6.3	M28	1.5	127	37	20	16
M10	1.25	76	20	8	6.3	M28	2	127	37	20	16
M11	1.5	85	25	8	6.3	M30	1.5	127	37	20	16
M12	1.25	84	24	9	7.1	M30	2	127	37	20	16
M12	1.5	89	29	9	7.1	M30	3	138	48	20	16
M12	1.75	89	29	9	7.1	M32	1.5	137	37	22.4	18
M14	1.25	90	25	11.2	9	M32	2	137	37	22.4	18
M14	1.5	95	30	11.2	9	M33	1.5	137	37	22.4	18
M14	2	95	30	11.2	9	M33	2	137	37	22.4	18
M15	1.5	95	30	11.2	9	M33	3	151	51	22.4	18

Machine taps HSS/HSCo JB5612-91



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2601 2603

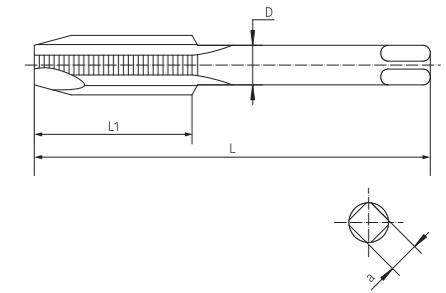


Size	p mm	L mm	L1 mm	D mm	axa mm
M2	0.4	41	8	2.5	2
M2	0.25	41	8	2.5	2
M2.2	0.45	45	10	2.8	2.24
M2.2	0.25	45	10	2.8	2.24
M2.5	0.45	45	10	2.8	2.24
M2.5	0.35	45	10	2.8	2.24
M3	0.5	48	11	3.15	2.5
M3	0.35	48	11	3.15	2.5
M3.5	0.6	50	13	3.55	2.8
M3.5	0.35	50	13	3.55	2.8
M4	0.7	53	13	4	3.15
M4	0.5	53	13	4	3.15
M4.5	0.75	53	13	4.5	3.55
M4.5	0.5	53	13	4.5	3.55
M5	0.8	58	16	5	4
M5	0.5	58	16	5	4
M5.5	0.5	62	17	5.6	4.5
M6	1	66	19	6.3	5
M6	0.75	66	19	6.3	5
M7	1	66	19	7.1	5.6
M7	0.75	66	19	7.1	5.6
M8	1.25	72	22	8	6.3
M8	0.75	66	19	8	6.3
M8	1	69	19	8	6.3
M9	1.25	72	22	9	7.1
M9	0.75	66	19	9	7.1
M9	1	69	19	9	7.1
M10	0.75	73	20	10	8
M10	1.5	80	24	10	8
M10	1	76	20	10	8
M10	1.25	76	20	10	8

Machine taps HSS/HSCo JB5612-91



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2602 2604

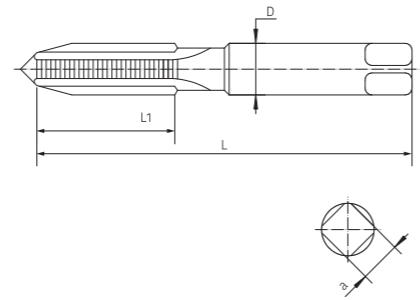


Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	48	11	2.24	1.8	M20	1	102	22	14	11.2
M3	0.35	48	11	2.24	1.8	M20	1.5	104	29	14	11.2
M3.5	0.6	50	13	2.5	2	M20	2	112	37	14	11.2
M3.5	0.35	50	13	2.5	2	M22	2.5	118	38	16	12.5
M4	0.7	53	13	3.15	2.5	M22	1	109	24	16	12.5
M4	0.5	53	13	3.15	2.5	M22	1.5	113	33	16	12.5
M4.5	0.75	53	13	3.55	2.8	M22	2	118	38	16	12.5
M4.5	0.5	53	13	3.55	2.8	M24	3	130	45	18	14
M5	0.8	58	16	4	3.15	M24	1	114	24	18	14
M5	0.5	58	16	4	3.15	M24	1.5	120	35	18	14
M6	1	66	19	4.5	3.55	M24	2	120	35	18	14
M6	0.75	66	19	4.5	3.55	M25	1.5	120	35	18	14
M7	1	66	19	5.6	4.5	M25	2	120	35	18	14
M7	0.75	66	19	5.6	4.5	M26	1.5	120	35	18	14
M8	1.25	72	22	6.3	5	M27	3	135	45	20	16
M8	0.75	66	19	6.3	5	M27	1	120	25	20	16
M8	1	69	19	6.3	5	M27	1.5	127	37	20	16
M9	1.25	72	22	7.1	5.6	M27	2	127	37	20	16
M9	0.75	66	19	7.1	5.6	M30	3.5	138	48	20	16
M9	1	69	19	7.1	5.6	M33	3.5	151	51	22.4	18
M10	0.75	73	20	8	6.3	M35	1.5	144	39	25	20
M10	1.5	80	24	8	6.3	M36	1.5	144	39	25	20
M10	1	76	20	8	6.3	M38	1.5	149	39	28	22.4
M10	1.25	76	20	8	6.3	M39	1.5	149	39	28	22.4
M11	1.5	85	25	8	6.3	M39	2	149	39	28	22.4
M11	0.75	80	22	8	6.3	M39	3	170	60	28	22.4
M11	1	80	22	8	6.3	M40	1.5	149	39	28	22.4
M12	1.75	89	29	9	7.1	M40	2	149	39	28	22.4
M12	1	80	22	9	7.1	M40	3	170	60	28	22.4
M12	1.25	84	24	9	7.1	M42	1.5	149	39	28	22.4
M12	1.5	89	29	9	7.1	M42	2	149	39	28	22.4
M14	2	95	30	11.2	9	M42	3	170	60	28	22.4
M14	1	87	22	11.2	9	M45	1.5	165	45	31.5	25
M14	1.25	90	25	11.2	9	M45	2	165	45	31.5	25
M14	1.5	95	30	11.2	9	M45	3	187	67	31.5	25
M15	1.5	95	30	11.2	9	M48	1.5	165	45	31.5	25
M16	2	102	32	12.5	10	M48	2	165	45	31.5	25
M16	1	92	22	12.5	10	M48	3	187	67	31.5	25
M16	1.5	102	32	12.5	10	M50	1.5	165	45	31.5	25
M17	1.5	102	32	12.5	10	M50	2	165	45	31.5	25
M18	2.5	112	37	14	11.2	M50	3	187	67	31.5	25
M18	1	97	22	14	11.2	M52	1.5	175	45	35.5	28
M18	1.5	104	29	14	11.2	M52	2	175	45	35.5	28
M18	2	112	37	14	11.2	M52	3	200	70	35.5	28
M20	2.5	112	37	14	11.2						

Machine taps HSS/HSCo JIS B (4430:1998)



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2701 2707

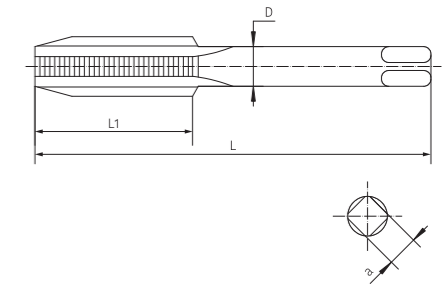


Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	46	11	4.0	3.2
M3	0.35	46	10	4.0	3.2
M3.5	0.6	48	13	4.0	3.2
M3.5	0.35	48	10	4.0	3.2
M4	0.7	52	13	5.0	4.0
M4	0.5	52	13	5.0	4.0
M4.5	0.75	55	13	5.0	4.0
M4.5	0.5	55	13	5.0	4.0
M5	0.8	60	16	5.5	4.5
M5	0.5	60	15	5.5	4.5
M5.5	0.5	60	15	5.5	4.5
M6	1	62	19	6.0	4.5
M6	0.75	62	19	6.0	4.5

Machine taps HSS/HSCo JIS B (4430:1998)



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2702 2708

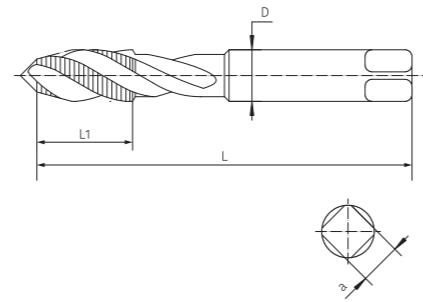


Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M7	1	65	19	6.2	5.0	M27	1.5	130	45	20.0	15.0
M7	0.75	65	19	6.2	5.0	M27	1	95	30	20.0	15.0
M8	1.25	70	22	6.2	5.0	M28	2	135	45	21.0	17.0
M8	1	70	22	6.2	5.0	M28	1.5	130	45	21.0	17.0
M8	0.75	70	20	6.2	5.0	M28	1	105	30	21.0	17.0
M9	1.25	72	22	7.0	5.5	M30	3.5	135	51	23.0	17.0
M9	1	72	22	7.0	5.5	M30	3	135	48	23.0	17.0
M9	0.75	72	20	7.0	5.5	M30	2	135	45	23.0	17.0
M10	1.5	75	24	7.0	5.5	M30	1.5	130	45	23.0	17.0
M10	1.25	75	24	7.0	5.5	M30	1	105	30	23.0	17.0
M10	1	75	24	7.0	5.5	M32	2	105	37	24.0	19.0
M10	0.75	75	20	7.0	5.5	M32	1.5	105	37	24.0	19.0
M11	1.5	80	25	8.0	6.0	M33	3.5	145	51	25.0	19.0
M11	1	80	25	8.0	6.0	M33	3	145	51	25.0	19.0
M11	0.75	80	20	8.0	6.0	M33	2	110	37	25.0	19.0
M12	1.75	82	29	8.5	6.5	M33	1.5	110	37	25.0	19.0
M12	1.5	82	29	8.5	6.5	M35	1.5	110	37	26.0	21.0
M12	1.25	82	29	8.5	6.5	M36	4	155	57	28.0	21.0
M12	1	82	29	8.5	6.5	M36	3	155	57	28.0	21.0
M14	2	88	30	10.5	8.0	M36	2	110	37	28.0	21.0
M14	1.5	88	30	10.5	8.0	M36	1.5	110	37	28.0	21.0
M14	1	88	30	10.5	8.0	M38	1.5	115	37	28.0	21.0
M15	1.5	95	30	10.5	8.0	M39	4	165	60	30.0	23.0
M15	1	95	30	10.5	8.0	M39	3	165	60	30.0	23.0
M16	1.5	95	32	12.5	10.0	M39	2	115	37	30.0	23.0
M16	1	95	30	12.5	10.0	M39	1.5	115	37	30.0	23.0
M17	1.5	100	32	13.0	10.0	M40	3	165	60	30.0	23.0
M17	1	95	30	13.0	10.0	M40	2	115	37	30.0	23.0
M18	2.5	100	37	14.0	11.0	M40	1.5	115	37	30.0	23.0
M18	2	100	37	14.0	11.0	M42	4.5	175	67	32.0	26.0
M18	1.5	100	37	14.0	11.0	M42	4	175	60	32.0	26.0
M18	1	95	30	14.0	11.0	M42	3	175	60	32.0	26.0
M20	2.5	105	37	15.0	12.0	M42	2	120	37	32.0	26.0
M20	2	105	37	15.0	12.0	M42	1.5	120	37	32.0	26.0
M20	1.5	105	37	15.0	12.0	M45	4.5	180	67	35.0	26.0
M20	1	95	30	15.0	12.0	M45	4	180	67	35.0	26.0
M22	2.5	115	38	17.0	13.0	M45	3	180	67	35.0	26.0
M22	2	115	38	17.0	13.0	M45	2	120	37	35.0	26.0
M22	1.5	115	38	17.0	13.0	M45	1.5	120	37	35.0	26.0
M22	1	95	30	17.0	13.0	M48	5	185	70	38.0	29.0
M24	3	120	45	19.0	15.0	M48	4	180	67	38.0	29.0
M24	2	120	45	19.0	15.0	M48	3	180	67	38.0	29.0
M24	1.5	120	45	19.0	15.0	M48	2	125	37	38.0	29.0
M24	1	95	30	19.0	15.0	M48	1.5	125	37	38.0	29.0
M25	2	130	45	19.0	15.0	M50	3	180	67	40.0	32.0
M25	1.5	130	45	19.0	15.0	M50	2	130	45	40.0	32.0
M25	1	95	30	19.0	15.0	M50	1.5	130	45	40.0	32.0
M26	1.5	130	45	20.0	15.0						
M27	3	130	45	20.0	15.0						
M27	2	130	45	20.0	15.0						

Machine taps HSS/HSCo JIS B (4430:1998)



Type of hole	blind hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2703 2709

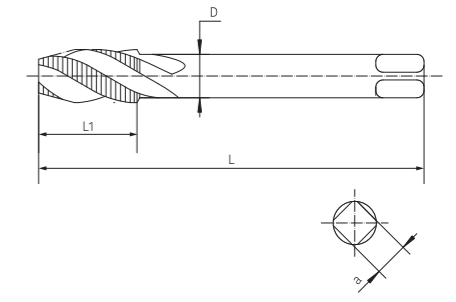


Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	46	11	4.0	3.2
M3	0.35	46	11	4.0	3.2
M3.5	0.6	48	13	4.0	3.2
M3.5	0.35	48	13	4.0	3.2
M4	0.7	52	13	5.0	4.0
M4	0.5	52	13	5.0	4.0
M4.5	0.75	55	13	5.0	4.0
M5	0.8	60	16	5.5	4.5
M5	0.5	60	16	5.5	4.5
M5.5	0.5	60	17	5.5	4.5
M6	1	62	19	6.0	4.5
M6	0.75	62	19	6.0	4.5

Machine taps HSS/HSCo JIS B (4430:1998)



Type of hole	blind hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2704 2710

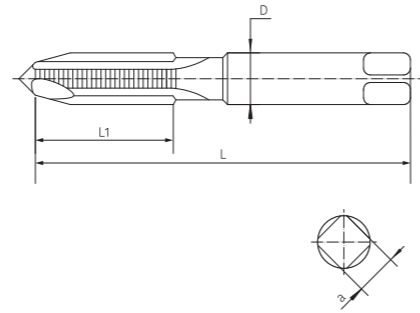


Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M7	1	65	19	6.2	5.0	M24	3	120	45	19.0	15.0
M7	0.75	65	19	6.2	5.0	M24	2	120	45	19.0	15.0
M8	1.25	70	22	6.2	5.0	M24	1.5	120	45	19.0	15.0
M8	1	70	22	6.2	5.0	M24	1	120	45	19.0	15.0
M8	0.75	70	22	6.2	5.0	M25	2	130	45	19.0	15.0
M9	1.25	72	22	7.0	5.5	M25	1.5	130	45	19.0	15.0
M9	1	72	22	7.0	5.5	M26	1.5	130	45	20.0	15.0
M10	1.5	75	24	7.0	5.5	M27	3	130	45	20.0	15.0
M10	1.25	75	24	7.0	5.5	M27	2	130	45	20.0	15.0
M10	1	75	24	7.0	5.5	M27	1.5	130	45	20.0	15.0
M10	0.75	75	24	7.0	5.5	M27	1	130	45	20.0	15.0
M11	1.5	80	25	8.0	6.0	M28	2	135	48	21.0	17.0
M11	1	80	25	8.0	6.0	M28	1.5	135	48	21.0	17.0
M11	0.75	80	25	8.0	6.0	M30	3.5	135	48	23.0	17.0
M12	1.75	82	29	8.5	6.5	M30	3	135	48	23.0	17.0
M12	1.5	82	29	8.5	6.5	M30	2	135	48	23.0	17.0
M12	1.25	82	29	8.5	6.5	M30	1.5	135	48	23.0	17.0
M12	1	82	29	8.5	6.5	M32	1.5	110	37	24.0	19.0
M14	2	88	30	10.5	8.0	M33	3.5	145	51	25.0	19.0
M14	1.5	88	30	10.5	8.0	M33	2	110	37	25.0	19.0
M14	1	88	30	10.5	8.0	M33	1.5	110	37	25.0	19.0
M15	1.5	95	32	10.5	8.0	M35	1.5	110	39	26.0	21.0
M15	1	95	32	10.5	8.0	M36	4	155	57	28.0	21.0
M16	2	95	32	12.5	10.0	M36	3	155	57	28.0	21.0
M16	1.5	95	32	12.5	10.0	M36	2	110	39	28.0	21.0
M16	1	95	32	12.5	10.0	M36	1.5	110	39	28.0	21.0
M17	1.5	100	37	13.0	10.0	M39	4	165	60	30.0	23.0
M17	1	100	37	13.0	10.0	M42	4.5	175	60	32.0	26.0
M18	2.5	100	37	14.0	11.0	M42	3	175	60	32.0	26.0
M18	2	100	37	14.0	11.0	M42	2	120	39	32.0	26.0
M18	1.5	100	37	14.0	11.0	M42	1.5	120	39	32.0	26.0
M18	1	100	37	14.0	11.0	M45	4.5	180	67	35.0	26.0
M20	2.5	105	37	15.0	12.0	M45	3	180	67	35.0	26.0
M20	2	105	37	15.0	12.0	M45	2	120	45	35.0	26.0
M20	1.5	105	37	15.0	12.0	M45	1.5	120	45	35.0	26.0
M20	1	105	37	15.0	12.0	M48	5	185	67	38.0	29.0
M22	2.5	115	38	17.0	13.0	M48	3	185	67	38.0	29.0
M22	2	115	38	17.0	13.0	M48	2	125	45	38.0	29.0
M22	1.5	115	38	17.0	13.0	M48	1.5	125	45	38.0	29.0
M22	1	115	38	17.0	13.0						

Machine taps HSS/HSCo JIS B (4430:1998)



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2705 2711

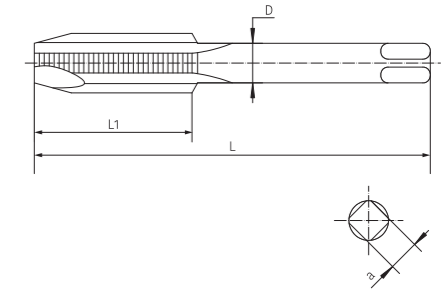


Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	46	11	4.0	3.2
M3	0.35	46	11	4.0	3.2
M3.5	0.6	48	13	4.0	3.2
M3.5	0.35	48	13	4.0	3.2
M4	0.7	52	13	5.0	4.0
M4	0.5	52	13	5.0	4.0
M4.5	0.75	55	13	5.0	4.0
M5	0.8	60	16	5.5	4.5
M5	0.5	60	16	5.5	4.5
M5.5	0.5	60	17	5.5	4.5
M6	1	62	19	6.0	4.5
M6	0.75	62	19	6.0	4.5

Machine taps HSS/HSCo JIS B (4430:1998)



Type of hole	through hole
Cutting material	HSS HSCo
Cutting direction	R.H.
Precision	H2
Surface	TiN
List-No.	2706 2712

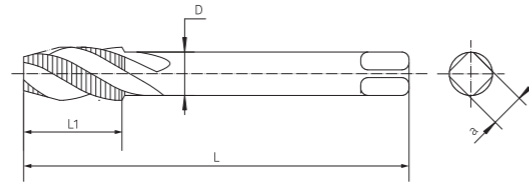


Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M7	1	65	19	6.2	5.0	M24	3	120	45	19.0	15.0
M7	0.75	65	19	6.2	5.0	M24	2	120	45	19.0	15.0
M8	1.25	70	22	6.2	5.0	M24	1.5	120	45	19.0	15.0
M8	1	70	22	6.2	5.0	M24	1	120	45	19.0	15.0
M8	0.75	70	22	6.2	5.0	M25	2	130	45	19.0	15.0
M9	1.25	72	22	7.0	5.5	M25	1.5	130	45	19.0	15.0
M9	1	72	22	7.0	5.5	M26	1.5	130	45	20.0	15.0
M10	1.5	75	24	7.0	5.5	M27	3	130	45	20.0	15.0
M10	1.25	75	24	7.0	5.5	M27	2	130	45	20.0	15.0
M10	1	75	24	7.0	5.5	M27	1.5	130	45	20.0	15.0
M10	0.75	75	24	7.0	5.5	M27	1	130	45	20.0	15.0
M11	1.5	80	25	8.0	6.0	M28	2	135	48	21.0	17.0
M11	1	80	25	8.0	6.0	M28	1.5	135	48	21.0	17.0
M11	0.75	80	25	8.0	6.0	M30	3.5	135	48	23.0	17.0
M12	1.75	82	29	8.5	6.5	M30	3	135	48	23.0	17.0
M12	1.5	82	29	8.5	6.5	M30	2	135	48	23.0	17.0
M12	1.25	82	29	8.5	6.5	M30	1.5	135	48	23.0	17.0
M12	1	82	29	8.5	6.5	M32	1.5	110	37	24.0	19.0
M14	2	88	30	10.5	8.0	M33	3.5	145	51	25.0	19.0
M14	1.5	88	30	10.5	8.0	M33	2	110	37	25.0	19.0
M14	1	88	30	10.5	8.0	M33	1.5	110	37	25.0	19.0
M15	1.5	95	32	10.5	8.0	M35	1.5	110	39	26.0	21.0
M15	1	95	32	10.5	8.0	M36	4	155	57	28.0	21.0
M16	2	95	32	12.5	10.0	M36	3	155	57	28.0	21.0
M16	1.5	95	32	12.5	10.0	M36	2	110	39	28.0	21.0
M16	1	95	32	12.5	10.0	M36	1.5	110	39	28.0	21.0
M17	1.5	100	37	13.0	10.0	M39	4	165	60	30.0	23.0
M17	1	100	37	13.0	10.0	M42	4.5	175	60	32.0	26.0
M18	2.5	100	37	14.0	11.0	M42	3	175	60	32.0	26.0
M18	2	100	37	14.0	11.0	M42	2	120	39	32.0	26.0
M18	1.5	100	37	14.0	11.0	M42	1.5	120	39	32.0	26.0
M18	1	100	37	14.0	11.0	M45	4.5	180	67	35.0	26.0
M20	2.5	105	37	15.0	12.0	M45	3	180	67	35.0	26.0
M20	2	105	37	15.0	12.0	M45	2	120	45	35.0	26.0
M20	1.5	105	37	15.0	12.0	M45	1.5	120	45	35.0	26.0
M20	1	105	37	15.0	12.0	M48	5	185	67	38.0	29.0
M22	2.5	115	38	17.0	13.0	M48	3	185	67	38.0	29.0
M22	2	115	38	17.0	13.0	M48	2	125	45	38.0	29.0
M22	1.5	115	38	17.0	13.0	M48	1.5	125	45	38.0	29.0
M22	1	115	38	17.0	13.0						

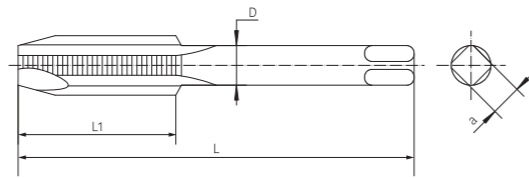
Machine taps HSS/HSCo DIN 352



Type of hole	blind hole	through hole
Cutting material	HSS HSCo	HSS HSCo
Cutting direction	R.H.	R.H.
Precision	H2	H2
Surface	TiN	TiN
List-No.	0601 0603	0602 0604



Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	40	11	3.5	2.7
M4	0.7	45	13	4.5	3.4
M5	0.8	50	16	6	4.9
M6	1	50	19	6	4.9
M8	1.25	56	22	6	4.9
M10	1.5	70	24	7	5.5
M12	1.75	75	29	9	7

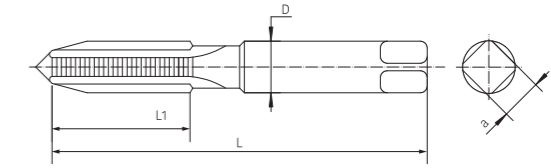


Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	40	10	3.5	2.7
M4	0.7	45	12	4.5	3.4
M5	0.8	50	14	6	4.9
M6	1	56	16	6	4.9
M8	1.25	63	18	6	4.9
M10	1.5	70	20	7	5.5
M12	1.75	75	23	9	7

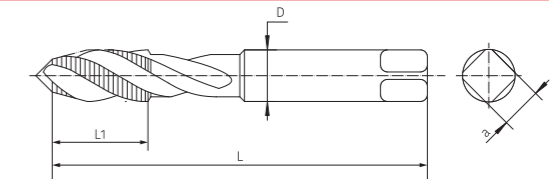
Machine taps HSS/HSCo DIN 371



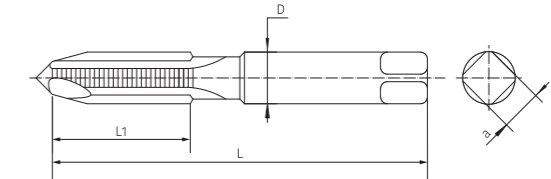
Type of hole	through hole	blind hole	through hole
Cutting material	HSS HSCo	HSS HSCo	HSS HSCo
Cutting direction	R.H.	R.H.	R.H.
Precision	H2	H2	H2
Surface	TiN	TiN	TiN
List-No.	0701 0704	0702 0705	0703 0706



Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.50	56	11	3.5	2.7
M3.5	0.60	56	13	4.0	3.0
M4	0.70	63	13	4.5	3.4
M4.5	0.75	70	16	6.0	4.9
M5	0.80	70	16	6.0	4.9
M6	1.00	80	19	6.0	4.9
M7	1.00	80	19	7.0	5.5
M8	1.25	90	22	8.0	6.2
M9	1.25	90	22	9.0	7.0
M10	1.50	100	24	10.0	8.0



Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.50	56	5	3.5	2.7
M3.5	0.60	56	6	4.0	3.0
M4	0.70	63	7	4.5	3.4
M4.5	0.75	70	8	6.0	4.9
M5	0.80	70	8	6.0	4.9
M6	1.00	80	10	6.0	4.9
M7	1.00	80	10	7.0	5.5
M8	1.25	90	13	8.0	6.2
M9	1.25	90	13	9.0	7.0
M10	1.50	100	15	10.0	8.0

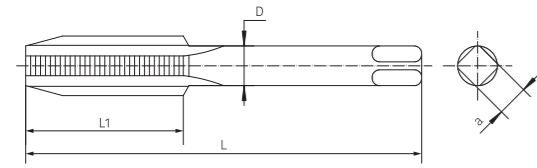


Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.50	56	11	3.5	2.7
M3.5	0.60	56	13	4.0	3.0
M4	0.70	63	13	4.5	3.4
M4.5	0.75	70	16	6.0	4.9
M5	0.80	70	16	6.0	4.9
M6	1.00	80	19	6.0	4.9
M7	1.00	80	19	7.0	5.5
M8	1.25	90	22	8.0	6.2
M9	1.25	90	22	9.0	7.0
M10	1.50	100	24	10.0	8.0

Machine taps HSS/HSCo DIN 374



Type of hole	through hole	blind hole	through hole
Cutting material	HSS HSCo	HSS HSCo	HSS HSCo
Cutting direction	R.H.	R.H.	R.H.
Precision	H2	H2	H2
Surface	TiN	TiN	TiN
List-No.	0801 0804	0802 0805	0803 0806



Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.35	56	9	2.2	1.85	M27	1.50	140	28	20.0	16.00
M3.5	0.35	56	10	2.5	2.10	M27	2.00	140	28	20.0	16.00
M4	0.50	63	10	2.8	2.10	M28	1.50	140	28	20.0	16.00
M5	0.50	70	12	3.5	2.70	M30	1.50	150	28	22.0	18.00
M6	0.75	80	14	4.5	3.40	M30	2.00	150	28	22.0	18.00
M8	0.75	80	19	6.0	4.90	M32	1.50	150	28	22.0	18.00
M8	1.00	90	22	6.0	4.90	M33	1.50	160	30	25.0	20.00
M9	1.00	90	22	7.0	5.50	M33	2.00	160	30	25.0	20.00
M10	1.00	90	20	7.0	5.50	M34	1.50	170	30	28.0	22.00
M10	1.25	100	24	7.0	5.50	M35	1.50	170	30	28.0	22.00
M12	1.00	100	22	9.0	7.00	M36	1.50	170	30	28.0	22.00
M12	1.25	100	22	9.0	7.00	M36	2.00	170	30	28.0	22.00
M12	1.50	100	22	9.0	7.00	M38	1.50	170	30	28.0	22.00
M14	1.25	100	22	11.0	9.00	M40	1.50	170	30	32.0	24.00
M14	1.50	100	22	11.0	9.00	M42	1.50	170	30	32.0	24.00
M16	1.00	100	22	12.0	9.00	M42	2.00	170	30	32.0	24.00
M16	1.50	100	22	12.0	9.00	M42	3.00	200	60	32.0	24.00
M18	1.50	110	25	14.0	11.00	M45	1.50	180	32	36.0	29.00
M18	2.00	125	34	14.0	11.00	M45	2.00	180	32	36.0	29.00
M20	1.50	125	25	16.0	12.00	M48	1.50	190	32	36.0	29.00
M20	2.00	125	34	16.0	12.00	M48	2.00	190	32	36.0	29.00
M22	1.50	125	25	18.0	14.50	M50	1.50	190	32	36.0	29.00
M22	2.00	140	34	18.0	14.50	M50	2.00	190	32	36.0	29.00
M24	1.50	140	28	18.0	14.50	M52	1.50	190	32	40.0	32.00
M24	2.00	140	28	18.0	14.50	M52	2.00	190	32	40.0	32.00
M26	1.50	140	28	18.0	14.50						

Machine taps HSS/HSCo DIN 374



Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.35	56	9	2.2	1.85	M3	0.35	56	9	2.2	1.85
M3.5	0.35	56	10	2.5	2.10	M3.5	0.35	56	10	2.5	2.10
M4	0.50	63	10	2.8	2.10	M4	0.50	63	10	2.8	2.10
M5	0.50	70	12	3.5	2.70	M5	0.50	70	12	3.5	2.70
M6	0.75	80	14	4.5	3.40	M6	0.75	80	14	4.5	3.40
M8	0.75	80	19	6.0	4.90	M8	0.75	80	19	6.0	4.90
M8	1.00	90	22	6.0	4.90	M8	1.00	90	22	6.0	4.90
M9	1.00	90	22	7.0	5.50	M9	1.00	90	22	7.0	5.50
M10	1.00	90	20	7.0	5.50	M10	1.00	90	20	7.0	5.50
M10	1.25	100	24	7.0	5.50	M10	1.25	100	24	7.0	5.50
M12	1.00	100	22	9.0	7.00	M12	1.00	100	22	9.0	7.00
M12	1.25	100	22	9.0	7.00	M12	1.25	100	22	9.0	7.00
M12	1.50	100	22	9.0	7.00	M12	1.50	100	22	9.0	7.00
M14	1.25	100	22	11.0	9.00	M14	1.25	100	22	11.0	9.00
M14	1.50	100	22	11.0	9.00	M14	1.50	100	22	11.0	9.00
M16	1.00	100	22	12.0	9.00	M16	1.00	100	22	12.0	9.00
M16	1.50	100	22	12.0	9.00	M16	1.50	100	22	12.0	9.00
M18	1.50	110	25	14.0	11.00	M18	1.50	110	25	14.0	11.00
M18	2.00	125	34	14.0	11.00	M18	2.00	125	34	14.0	11.00
M20	1.50	125	25	16.0	12.00	M20	1.50	125	25	16.0	12.00
M20	2.00	125	34	16.0	12.00	M20	2.00	125	34	16.0	12.00
M22	1.50	125	25	18.0	14.50	M22	1.50	125	25	18.0	14.50
M22	2.00	140	34	18.0	14.50	M22	2.00	140	34	18.0	14.50
M24	1.50	140	28	18.0	14.50	M24	1.50	140	28	18.0	14.50
M24	2.00	140	28	18.0	14.50	M24	2.00	140	28	18.0	14.50
M26	1.50	140	28	18.0	14.50	M26	1.50	140	28	18.0	14.50
M27	1.50	140	28	20.0	16.00	M27	1.50	140	28	20.0	16.00
M27	2.00	140	28	20.0	16.00	M27	2.00	140	28	20.0	16.00
M28	1.50	140	28	20.0	16.00	M28	1.50	140	28	20.0	16.00
M30	1.50	150	28	22.0	18.00	M30	1.50	150	28	22.0	18.00
M30	2.00	150	28	22.0	18.00	M30	2.00	150	28	22.0	18.00
M32	1.50	150	28	22.0	18.00	M32	1.50	150	28	22.0	18.00
M33	1.50	160	30	25.0	20.00	M33	1.50	160	30	25.0	20.00
M33	2.00	160	30	25.0	20.00	M33	2.00	160	30	25.0	20.00
M34	1.50	170	30	28.0	22.00	M34	1.50	170	30	28.0	22.00
M35	1.50	170	30	28.0	22.00	M35	1.50	170	30	28.0	22.00
M36	1.50	170	30	28.0	22.00	M36	1.50	170	30	28.0	22.00
M36	2.00	170	30	28.0	22.00	M36	2.00	170	30	28.0	22.00
M38	1.50	170	30	28.0	22.00	M38	1.50	170	30	28.0	22.00
M40	1.50	170	30	32.0	24.00	M40	1.50	170	30	32.0	24.00
M42	1.50	170	30	32.0	24.00	M42	1.50	170	30	32.0	24.00
M42	2.00	170	30	32.0	24.00	M42	2.00	170	30	32.0	24.00
M42	3.00	200	60	32.0	24.00	M42	3.00	200	60	32.0	24.00
M45	1.50	180	32	36.0	29.00	M45	1.50	180	32	36.0	29.00
M45	2.00	180	32	36.0	29.00	M45	2.00	180	32	36.0	29.00
M48	1.50	190	32	36.0	29.00	M48	1.50	190	32	36.0	29.00
M48	2.00	190	32	36.0	29.00	M48	2.00	190	32	36.0	29.00
M50	1.50	190	32	36.0	29.00	M50	1.50	190	32	36.0	29.00
M50	2.00	190	32	36.0	29.00	M50	2.00	190	32	36.0	29.00
M52	1.50	190	32	40.0	32.00	M52	1.50	190	32	40.0	32.00
M52	2.00	190	32	40.0	32.00	M52	2.00	190	32	40.0	32.00

Machine taps HSS/HSCo DIN 376

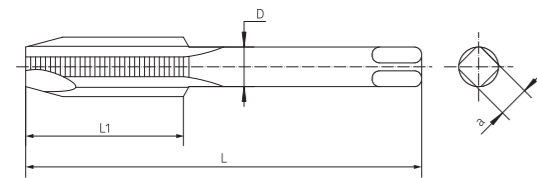
ASME Inch Coarse Thread "NPS/NPT" Taps ASME B94.9-1999



Type of hole	through hole	blind hole	through hole
Cutting material	HSS HSCo	HSS HSCo	HSS HSCo
Cutting direction	R.H.	R.H.	R.H.
Precision	H2	H2	H2
Surface	TiN	TiN	TiN
List-No.	0901 0904	0902 0905	0903 0906



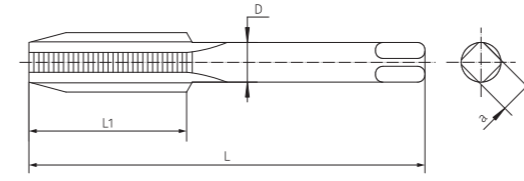
Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	56	11	2.2	1.85	M3	0.5	56	5	2.2	1.85
M3.5	0.6	56	13	2.5	2.1	M3.5	0.6	56	6	2.5	2.1
M4	0.7	63	13	2.8	2.1	M4	0.7	63	7	2.8	2.1
M4.5	0.75	70	16	3.5	2.7	M4.5	0.75	70	8	3.5	2.7
M5	0.8	70	16	3.5	2.7	M5	0.8	70	8	3.5	2.7
M6	1	80	19	4.5	3.4	M6	1	80	10	4.5	3.4
M7	1	80	19	5.5	4.3	M7	1	80	10	5.5	4.3
M8	1.25	90	22	6	4.3	M8	1.25	90	13	6	4.3
M9	1.25	90	22	7	5.5	M9	1.25	90	13	7	5.5
M10	1.5	100	24	7	5.5	M10	1.5	100	15	7	5.5
M12	1.75	110	29	9	7	M12	1.75	110	18	9	7
M14	2	110	30	11	9	M14	2	110	20	11	9
M16	2	110	32	12	9	M16	2	110	20	12	9
M18	2.5	125	34	14	11	M18	2.5	125	25	14	11
M20	2.5	140	34	16	12	M20	2.5	140	25	16	12
M22	2.5	140	34	18	14.5	M22	2.5	140	25	18	14.5
M24	3	160	38	18	14.5	M24	3	160	30	18	14.5
M27	3	160	38	20	16	M27	3	160	30	20	16
M30	3.5	180	45	22	18	M30	3.5	180	35	22	18



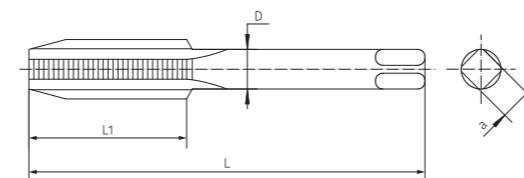
Size	p mm	L mm	L1 mm	D mm	axa mm	Size	p mm	L mm	L1 mm	D mm	axa mm
M3	0.5	56	11	2.2	1.85	M12	1.75	110	29	9	7
M3.5	0.6	56	13	2.5	2.1	M14	2	110	30	11	9
M4	0.7	63	13	2.8	2.1	M16	2	110	32	12	9
M4.5	0.75	70	16	3.5	2.7	M18	2.5	125	34	14	11
M5	0.8	70	16	3.5	2.7	M20	2.5	140	34	16	12
M6	1	80	19	4.5	3.4	M22	2.5	140	34	18	14.5
M7	1	80	19	5.5	4.3	M24	3	160	38	18	14.5
M8	1.25	90	22	6	4.9	M27	3	160	38	20	16
M9	1.25	90	22	7	5.5	M30	3.5	180	45	22	18
M10	1.5	100	24	7	5.5						



Type of hole	through hole	through hole
Cutting material	HSS	HSS
Cutting direction	R.H.	R.H.
Precision	H2	H2
Surface	Bright	Bright
List-No.	1801	1901



Size	TPI	L mm	L1 mm	D mm	axa mm
1/16(NPS)	27	54.1	17.5	7.9	5.9
1/8(NPS)	27	54.1	19.1	7.9	5.9
1/8(NPS)	27	54.1	19.1	11.1	8.3
1/4(NPS)	18	62.0	26.9	14.3	10.7
3/8(NPS)	18	65.0	26.9	17.8	13.5
1/2(NPS)	14	79.5	35.1	17.5	14.6
3/4(NPS)	14	82.6	35.1	23.0	17.2
1"(NPS)	11-1/2	95.3	44.5	28.6	21.4
1-1/4(NPS)	11-1/2	101.6	44.5	33.3	25.0
1-1/2(NPS)	11-1/2	108.0	44.5	38.1	28.6
2"(NPS)	11-1/2	108.0	44.5	47.6	35.7
2-1/2(NPS)	8	139.7	65.0	57.2	42.8
3"(NPS)	8	152.4	66.8	66.7	50.0



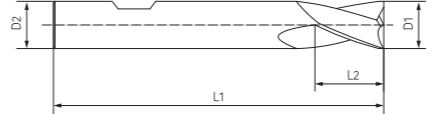
Size	TPI	L mm	L1 mm	D mm	axa mm
1/16(NPT)	27	54.1	17.5	7.9	5.9
1/8(NPT)	27	54.1	19.1	7.9	5.9
1/8(NPT)	27	54.1	19.1	11.1	8.3
1/4(NPT)	18	62.0	26.9	14.3	10.7
3/8(NPT)	18	65.0	26.9	17.8	13.5
1/2(NPT)	14	79.5	35.1	17.5	14.6
3/4(NPT)	14	82.6	35.1	23.0	17.2
1"(NPT)	11-1/2	95.3	44.5	28.6	21.4
1-1/4(NPT)	11-1/2	101.6	44.5	33.3	25.0
1-1/2(NPT)	11-1/2	108.0	44.5	38.1	28.6
2"(NPT)	11-1/2	108.0	44.5	47.6	35.7
2-1/2(NPT)	8	139.7	65.0	57.2	42.8
3"(NPT)	8	152.4	66.8	66.7	50.0

End Mills

Products	Standard	Size range	Shank Length	Cutting Edge	Shank Type	Cutting material	Surface
	DIN 327	1.0-40.0	Standard	Two Flute Square	Form HA/HB/HE	HSS	Bright
		1.0-25.0		Two Flute Ballnose			
		2.0-32.0	Long Length	Two Flute Square			
		2.0-25.0		Two Flute Ballnose			
	DIN 844	1.0-40.0	Standard	Four Flute Square			
		1.0-25.0		Four Flute Ballnose			
		2.0-40.0	Long Length	Four Flute Square			
		2.0-25.0		Four Flute Ballnose			

End Mills HSS, Two Flute Standard Square Endmill DIN 327

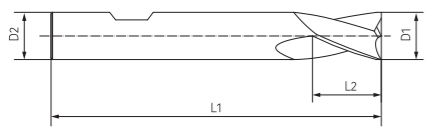
Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Standard	Standard	Standard
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	0101/0113	0102/0114	0103/0115



D1 mm	D2 mm	L2 mm	L1 mm	Flute	D1 mm	D2 mm	L2 mm	L1 mm	Flute
1	6	3	47	2	14	12	16	73	2
1.5	6	4	47	2	15	12	16	73	2
2	6	4	48	2	16	16	19	79	2
2.5	6	5	49	2	17	16	19	79	2
3	6	5	49	2	18	16	19	79	2
3.5	6	7	51	2	19	16	19	79	2
4	6	7	51	2	20	20	22	88	2
4.5	6	8	52	2	21	20	22	88	2
5	6	8	52	2	22	20	22	88	2
5.5	6	8	52	2	23	20	22	88	2
6	6	8	52	2	24	25	26	102	2
6.5	10	10	60	2	25	25	26	102	2
7	10	10	60	2	26	25	26	102	2
7.5	10	11	61	2	28	25	26	102	2
8	10	11	61	2	30	25	26	102	2
8.5	10	13	63	2	32	32	32	112	2
9	10	13	63	2	34	32	32	112	2
9.5	10	13	63	2	36	32	32	112	2
10	10	13	63	2	40	40	38	130	2
11	12	16	73	2					
12	12	16	73	2					
13	12	16	73	2					

End Mills HSS, Two Flute Long Length Square Endmill DIN 327

Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Long Length	Long Length	Long Length
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	0104/0116	0105/0117	0106/0118



D1 mm	D2 mm	L2 mm	L1 mm	Flute
2	6	7	54	2
3	6	8	56	2
4	6	11	63	2
5	6	13	68	2
6	6	13	68	2
7	10	16	80	2
8	10	19	88	2
9	10	19	88	2
10	10	22	95	2
12	12	26	110	2
14	12	26	110	2
16	16	32	123	2
18	16	32	123	2
20	20	38	141	2
22	20	38	141	2
24	25	45	166	2
25	25	45	166	2
26	25	45	166	2
28	25	45	166	2
30	25	45	186	2
32	32	53	186	2

End Mills HSS, Two Flute Standard Ballnose Endmill DIN 327

Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Standard	Standard	Standard
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	0107/0119	0108/0120	0109/0121



D1 mm	D2 mm	L2 mm	L1 mm	Flute
1	6	3	47	2
1.5	6	4	48	2
2	6	4	48	2
2.5	6	5	49	2
3	6	5	49	2
3.5	6	7	51	2
4	6	7	51	2
4.5	6	8	52	2
5	6	8	52	2
5.5	6	8	52	2
6	6	8	52	2
6.5	10	10	60	2
7	10	10	60	2
7.5	10	11	61	2
8	10	11	61	2
8.5	10	13	63	2
9	10	13	63	2
9.5	10	13	63	2
10	10	13	63	2
11	12	16	73	2
12	12	16	73	2
13	12	16	73	2
14	12	16	73	2
15	12	16	73	2
16	16	19	79	2
17	16	19	79	2
18	16	19	79	2
19	16	19	79	2
20	20	22	88	2
21	20	22	88	2
22	20	22	88	2
23	20	22	88	2
24	25	26	102	2
25	25	26	102	2

End Mills HSS, Two Flute Long Length Ballnose Endmill DIN 327

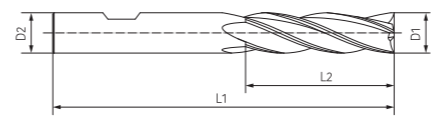
Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Long Length	Long Length	Long Length
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	0110/0122	0111/0123	0112/0124



D1 mm	D2 mm	L2 mm	L1 mm	Flute
2	6	7	54	2
3	6	8	56	2
4	6	11	63	2
5	6	13	68	2
6	6	13	68	2
7	10	16	80	2
8	10	19	88	2
9	10	19	88	2
10	10	22	95	2
12	12	26	110	2
14	12	26	110	2
16	16	32	123	2
18	16	32	123	2
20	20	38	141	2
22	20	38	141	2
24	25	45	166	2
25	25	45	166	2

End Mills HSS, Four Flute Standard Square Endmill DIN 844

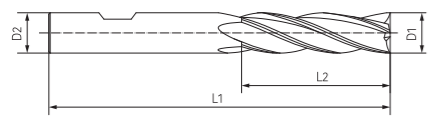
Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Standard	Standard	Standard
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	1001/1013	1002/1014	1003/1015



D1 mm	D2 mm	L2 mm	L1 mm	Flute
1	6	5	48	4
1.5	6	7	51	4
2	6	7	51	4
2.5	6	8	52	4
3	6	8	52	4
3.5	6	10	54	4
4	6	11	55	4
4.5	6	11	55	4
5	6	13	57	4
5.5	6	13	57	4
6	6	13	57	4
6.5	10	16	66	4
7	10	16	66	4
7.5	10	19	69	4
8	10	19	69	4
8.5	10	19	69	4
9	10	19	69	4
9.5	10	22	72	4
10	10	22	72	4
11	12	22	79	4
12	12	26	83	4
13	12	26	83	4
14	12	26	83	4
15	12	26	83	4
16	16	32	92	4
17	16	32	92	4
18	16	32	92	4
19	16	32	92	4
20	20	38	104	4
21	20	38	104	4
22	20	38	104	4
23	20	38	104	4
24	25	45	121	4
25	25	45	121	4
26	25	45	121	4
28	25	45	121	4
30	25	45	121	4
32	32	53	133	4
34	32	53	133	4
36	32	53	133	4
40	40	63	155	4

End Mills HSS, Four Flute Long Length Square Endmill DIN 844

Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Long Length	Long Length	Long Length
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	1004/1016	1005/1017	1006/1018



D1 mm	D2 mm	L2 mm	L1 mm	Flute
2	6	10	54	4
3	6	12	56	4
4	6	19	63	4
5	6	24	68	4
6	6	24	68	4
7	10	30	80	4
8	10	38	88	4
9	10	38	88	4
10	10	45	95	4
12	12	53	110	4
14	12	53	110	4
16	16	63	123	4
18	16	63	123	4
20	20	75	141	4
22	20	75	141	4
24	25	90	166	4
25	25	90	166	4
26	25	90	166	4
28	25	90	166	4
30	25	90	166	4
32	32	106	186	4
34	32	106	186	4
36	32	106	186	4
40	40	125	217	4

End Mills HSS, Four Flute Standard Ballnose Endmill DIN 844

Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Standard	Standard	Standard
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	1007/1019	1008/1020	1009/1021



D1 mm	D2 mm	L2 mm	L1 mm	Flute
1	6	5	48	4
1.5	6	7	51	4
2	6	7	51	4
2.5	6	8	52	4
3	6	8	52	4
3.5	6	10	54	4
4	6	11	55	4
4.5	6	11	55	4
5	6	13	57	4
5.5	6	13	57	4
6	6	13	57	4
6.5	10	16	66	4
7	10	16	66	4
7.5	10	19	69	4
8	10	19	69	4
8.5	10	19	69	4
9	10	19	69	4
9.5	10	22	72	4
10	10	22	72	4
11	12	22	79	4
12	12	26	83	4
13	12	26	83	4
14	12	26	83	4
15	12	26	83	4
16	16	32	92	4
17	16	32	92	4
18	16	32	92	4
19	16	32	92	4
20	20	38	104	4
21	20	38	104	4
22	20	38	104	4
23	20	38	104	4
24	25	45	121	4
25	25	45	121	4

End Mills HSS, Four Flute Long Length Ballnose Endmill DIN 844

Type	N	N	N
Cutting material	HSS	HSS	HSS
Cutting direction	R.H.	R.H.	R.H.
Shank length	Long Length	Long Length	Long Length
Surface	Bright/TiN	Bright/TiN	Bright/TiN
Shank type	Form HB	Form HA	Form HE
List-No.	1010/1022	1011/1023	1012/1024

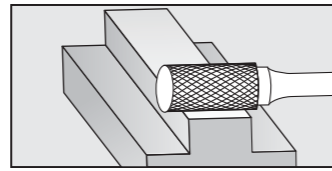
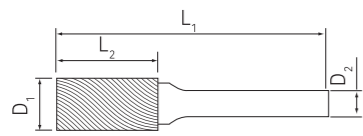
D1 mm	D2 mm	L2 mm	L1 mm	Flute
2	6	10	54	4
3	6	12	56	4
4	6	19	63	4
5	6	24	68	4
6	6	24	68	4
7	10	30	80	4
8	10	38	88	4
9	10	38	88	4
10	10	45	95	4
12	12	53	110	4
14	12	53	110	4
16	16	63	123	4
18	16	63	123	4
20	20	75	141	4
22	20	75	141	4
24	25	90	166	4
25	25	90	166	4

Carbide Rotary Burrs



Cylinder

A



Code	SA-61S	SA-61D	SA-63S	SA-63D	SA-41S	SA-41D	SA-42S	SA-42D	SA-43S	SA-43D	SA-52S	SA-52D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	1/16	1/16	3/32	3/32	1/16	1/16	3/32	3/32	1/8	1/8	5/32	5/32
L2(In.)	1/4	1/4	3/8	3/8	1/4	1/4	7/16	7/16	9/16	9/16	1/2	1/2
D2(In.)	3/32	3/32	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 7/8"	1 7/8"
D1(mm)	1.60	1.60	2.38	2.38	1.60	1.60	3.00	3.00	3.00	3.00	4.00	4.00
L2(mm)	6.00	6.00	10.00	10.00	6.00	6.00	11.00	11.00	14.00	14.00	13.00	13.00
D2(mm)	2.38	2.38	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L1(mm)	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	38.00	48.00	48.00



Code	SA-53S	SA-53D	SA-51S	SA-51D	SA-81S	SA-81D	SA-11S	SA-11D	SA-12S	SA-12D	SA-13S	SA-13D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/16	3/16	1/4	1/4	3/16	3/16	1/8	1/8	1/8	1/8	5/32	5/32
L2(In.)	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8
D2(In.)	1/8	1/8	1/8	1/8	3/16	3/16	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	1 7/8"	1 7/8"	1 7/8"	1 7/8"	2"	2"	2"	2"	2"	2"	2"	2"
D1(mm)	5.00	5.00	6.00	6.00	5.00	5.00	3.00	3.00	3.00	3.00	4.00	4.00
L2(mm)	13.00	13.00	12.00	12.00	12.00	12.00	12.00	12.00	16.00	16.00	16.00	16.00
D2(mm)	3.00	3.00	3.00	3.00	5.00	5.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	48.00	48.00	48.00	48.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00	51.00

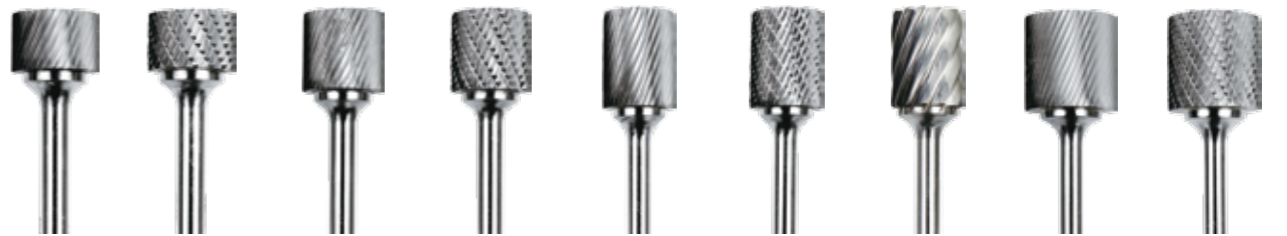
Cylinder



Code	SA-14S	SA-14D	SA-1S	SA-1D	SA-1N	SA-1LS	SA-1LD	SA-2S	SA-2D	SA-3S	SA-3D	SA-3N
Cut	S	D	S	D	N	S	D	S	D	S	D	N
D1(In.)	3/16	3/16	1/4	1/4	1/4	1/4	1/4	5/16	5/16	3/8	3/8	3/8
L2(In.)	5/8	5/8	5/8	5/8	5/8	1"	1"	3/4	3/4	3/4	3/4	3/4
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2"	2"	2"	2"	2 15/32"	2 15/32"	2 15/32"	2 15/32"	2 15/32"
D1(mm)	5.00	5.00	6.00	6.00	6.00	6.00	6.00	8.00	8.00	10.00	10.00	10.00
L2(mm)	16.00	16.00	16.00	16.00	16.00	25.00	25.00	20.00	20.00	20.00	20.00	20.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	51.00	51.00	51.00	51.00	51.00	63.00	63.00	63.00	63.00	63.00



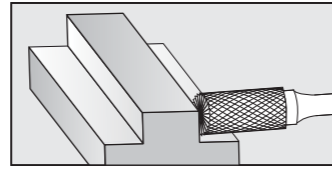
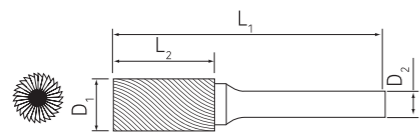
Code	SA-3LS	SA-3LD	SA-3XS	SA-3XD	SA-4S	SA-4D	SA-5S	SA-5D	SA-5N	SA-6S	SA-6D	SA-6N
Cut	S	D	S	D	S	D	S	D	N	S	D	N
D1(In.)	3/8	3/8	3/8	3/8	7/16	7/16	1/2	1/2	1/2	5/8	5/8	5/8
L2(In.)	1"	1"	1 1/2"	1 1/2"	1"	1"	1"	1"	1"	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 23/32"	2 23/32"	3 7/32"	3 7/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	10.00	10.00	10.00	10.00	11.00	11.00	12.00	12.00	12.00	16.00	16.00	16.00
L2(mm)	25.00	25.00	38.00	38.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00	25.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	70.00	70.00	82.00	82.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00



Code	SA-15S	SA-15D	SA-16S	SA-16D	SA-7S	SA-7D	SA-7N	SA-9S	SA-9D
Cut	S	D	S	D	S	D	N	S	D
D1(In.)	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1"	1"
L2(In.)	1/2	1/2	3/4	3/4	1"	1"	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 7/32"	2 7/32"	2 15/32"	2 15/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	20.00	20.00	20.00	20.00	20.00	20.00	20.00	25.00	25.00
L2(mm)	12.00	12.00	20.00	20.00	25.00	25.00	25.00	25.00	25.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	56.00	56.00	63.00	70.00	70.00	70.00	70.00	70.00	70.00

Cylinder With End Cut

B



Code	SB-41S	SB-41D	SB-42S	SB-42D	SB-43S	SB-43D	SB-51S	SB-51D
Cut	S	D	S	D	S	D	S	D
D1(In.)	1/16	1/16	3/32	3/32	1/8	1/8	1/4	1/4
L2(In.)	1/4	1/4	7/16	7/16	9/16	9/16	3/16	3/16
D2(In.)	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 9/16"	1 9/16"
D1(mm)	1.60	1.60	2.38	2.38	3.18	3.18	6.00	6.00
L2(mm)	6.00	6.00	11.00	11.00	14.00	14.00	5.00	5.00
D2(mm)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	40.00	40.00



Code	SB-11S	SB-11D	SB-12S	SB-12D	SB-13S	SB-13D	SB-14S	SB-14D
Cut	S	D	S	D	S	D	S	D
D1(In.)	1/8	1/8	1/8	1/8	5/32	5/32	3/16	3/16
L2(In.)	1/2	1/2	5/8	5/8	5/8	5/8	5/8	5/8
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2"	2"	2"	2"	2"
D1(mm)	3.00	3.00	3.00	3.00	4.00	4.00	6.00	6.00
L2(mm)	13.00	13.00	16.00	16.00	16.00	16.00	16.00	16.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80

Cylinder With End Cut



Code	SB-1S	SB-1D	SB-1N	SB-1LS	SB-1LD	SB-2S	SB-2D	SB-3S
Cut	S	D	N	S	D	S	D	S
D1(In.)	1/4	1/4	1/4	1/4	1/4	5/16	5/16	3/8
L2(In.)	5/8	5/8	5/8	1"	1"	3/4	3/4	3/4
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2"	2"	2 15/32"	2 15/32"	2 15/32"
D1(mm)	6.00	6.00	6.00	6.00	6.00	8.00	8.00	10.00
L2(mm)	16.00	16.00	16.00	25.00	25.00	19.05	19.05	19.05
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	50.80	50.80	50.80	62.71	62.71	62.71

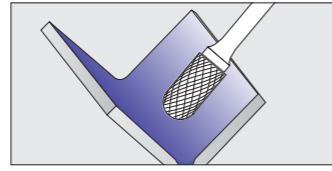
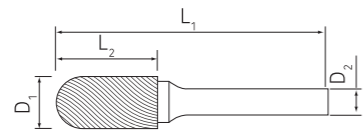


Code	SB-3D	SB-4S	SB-4D	SB-5S	SB-5D	SB-6S	SB-6D	SB-7S
Cut	D	S	D	S	D	S	D	S
D1(In.)	3/8	7/16	7/16	1/2	1/2	5/8	5/8	3/4
L2(In.)	3/4	1"	1"	1"	1"	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 15/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	10.00	11.00	11.00	12.00	12.00	16.00	16.00	19.05
L2(mm)	19.05	25.40	25.40	25.40	25.40	25.40	25.40	25.40
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	63.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00



Code	SB-7D	SB-15S	SB-15D	SB-16S	SB-16D	SB-9S	SB-9D
Cut	D	S	D	S	D	S	D
D1(In.)	3/4	3/4	3/4	3/4	3/4	1"	1"
L2(In.)	1"	1/2	1/2	3/4	3/4	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 23/32"	2 7/32"	2 7/32"	2 15/32"	2 15/32"	2 23/32"	2 23/32"
D1(mm)	19.05	19.05	19.05	19.05	19.05	25.40	25.40
L2(mm)	25.40	12.70	12.70	19.05	19.05	25.40	25.40
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	69.06	56.36	56.36	62.71	62.71	69.06	69.06

Cylinder With Radius End



Code	SC-61S	SC-61D	SC-41S	SC-41D	SC-42S	SC-42D	SC-52S	SC-52D	SC-53S	SC-53D	SC-51S	SC-51D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/32	3/32	3/32	3/32	1/8	1/8	5/32	5/32	3/16	3/16	1/4	1/4
L2(In.)	3/8	3/8	7/16	7/16	9/16	9/16	1/2	1/2	1/2	1/2	1/2	1/2
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 7/8"	1 7/8"	1 7/8"	1 7/8"	1 7/8"	1 7/8"
D1(mm)	2.38	2.38	2.38	2.38	3.18	3.18	3.97	3.97	5.00	5.00	6.00	6.00
L2(mm)	10.00	10.00	11.00	11.00	14.00	14.00	12.00	12.00	12.00	12.00	12.00	12.00
D2(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	48.00	48.00	48.00	48.00	48.00	48.00



Code	SC-81S	SC-81D	SC-11S	SC-11D	SC-12S	SC-12D	SC-13S	SC-13D	SC-14S	SC-14D	SC-1S	SC-1D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/16	3/16	1/8	1/8	1/8	1/8	5/32	5/32	3/16	3/16	1/4	1/4
L2(In.)	1/2	1/2	1/2	1/2	5/8	5/8	5/8	5/8	5/8	5/8	5/8	5/8
D2(In.)	3/16	3/16	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"	2"
D1(mm)	5.00	5.00	3.00	3.00	3.00	3.00	4.00	4.00	5.00	5.00	6.00	6.00
L2(mm)	13.00	13.00	13.00	13.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00	16.00
D2(mm)	4.76	4.76	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80	50.80

Cylinder With Radius End



Code	SC-1N	SC-1LS	SC-1LD	SC-2S	SC-2D	SC-3S	SC-3D	SC-3N	SC-3LS	SC-3LD
Cut	N	S	D	S	D	S	D	N	S	D
D1(In.)	1/4	1/4	1/4	5/16	5/16	3/8	3/8	3/8	3/8	3/8
L2(In.)	5/8	1"	1"	3/4	3/4	3/4	3/4	3/4	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2 15/32"	2 15/32"	2 15/32"	2 15/32"	2 15/32"	2 23/32"	2 23/32"
D1(mm)	6.00	6.00	6.00	8.00	8.00	10.00	10.00	10.00	10.00	10.00
L2(mm)	16.00	25.40	25.40	19.05	19.05	19.05	19.05	19.05	25.40	25.40
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	51.00	51.00	51.00	63.00	63.00	63.00	63.00	63.00	70.00	70.00

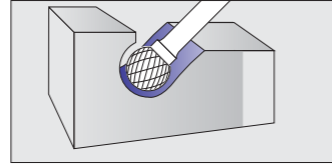
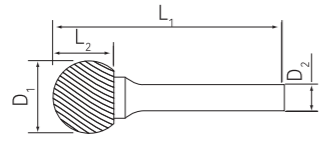


Code	SC-3XS	SC-3XD	SC-4S	SC-4D	SC-5S	SC-5D	SC-5N	SC-6S	SC-6D	SC-6N
Cut	S	D	S	D	S	D	N	S	D	N
D1(In.)	3/8	3/8	7/16	7/16	1/2	1/2	1/2	5/8	5/8	5/8
L2(In.)	1 1/2"	1 1/2"	1"	1"	1"	1"	1"	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	3 7/32"	3 7/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	9.53	10.00	11.00	11.00	12.00	12.00	12.00	16.00	16.00	16.00
L2(mm)	38.10	38.10	25.40	25.40	25.40	25.40	25.40	25.40	25.40	25.40
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	82.00	82.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00



Code	SC-15S	SC-15D	SC-16S	SC-16D	SC-7S	SC-7D	SC-7N	SC-9S	SC-9D
Cut	S	D	S	D	S	D	N	S	D
D1(In.)	3/4	3/4	3/4	3/4	3/4	3/4	3/4	1"	1"
L2(In.)	1/2	1/2	3/4	3/4	1"	1"	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 7/32"	2 7/32"	2 15/32"	2 15/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	19.05	19.05	19.05	19.05	19.05	19.05	19.05	25.40	25.40
L2(mm)	12.70	12.70	19.05	19.05	25.40	25.40	25.40	25.40	25.40
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	56.36	56.36	63.00	63.00	69.00	69.00	69.00	69.00	69.00

Ball



Code	SD-61S	SD-61D	SD-41S	SD-41D	SD-42S	SD-42D	SD-52S	SD-52D
Cut	S	D	S	D	S	D	S	D
D1(In.)	3/32	3/32	3/32	3/32	1/8	1/8	5/32	5/32
L2(In.)	3/32	3/32	3/32	3/32	1/8	1/8	5/32	5/32
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 17/32"	1 17/32"
D1(mm)	2.38	2.38	2.38	2.38	3.00	3.00	4.00	4.00
L2(mm)	2.38	2.38	2.38	2.38	3.00	3.00	4.00	4.00
D2(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	38.89	38.89



Code	SD-53S	SD-53D	SD-51S	SD-51D	SD-81S	SD-81D	SD-11S	SD-11D
Cut	S	D	S	D	S	D	S	D
D1(In.)	3/16	3/16	1/4	1/4	3/16	3/16	1/8	1/8
L2(In.)	3/16	3/16	1/4	1/4	3/16	3/16	3/32	3/32
D2(In.)	1/8	1/8	1/8	1/8	3/16	3/16	1/4	1/4
L1(In.)	1 9/16"	1 9/16"	1 5/8"	1 5/8"	2"	2"	2"	2"
D1(mm)	5.00	5.00	6.00	6.00	5.00	5.00	3.18	3.18
L2(mm)	5.00	5.00	6.00	6.00	5.00	5.00	2.38	2.38
D2(mm)	3.00	3.00	3.00	3.00	4.76	4.76	6.00	6.00
L1(mm)	40.00	40.00	41.00	41.00	50.80	50.80	50.80	50.80

Ball



Code	SD-14S	SD-14D	SD-1S	SD-1D	SD-1N	SD-2S	SD-2D	SD-3S
Cut	S	D	S	D	N	S	D	S
D1(In.)	3/16	3/16	1/4	1/4	1/4	5/16	5/16	3/8
L2(In.)	1/8	1/8	3/16	3/16	3/16	1/4	1/4	5/16
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2"	2"	1 31/32"	1 31/32"	2 1/32"
D1(mm)	5.00	5.00	6.00	6.00	6.00	8.00	8.00	10.00
L2(mm)	3.00	3.00	5.00	5.00	5.00	6.00	6.00	8.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	50.80	50.80	50.80	50.01	50.01	50.01



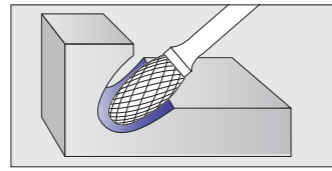
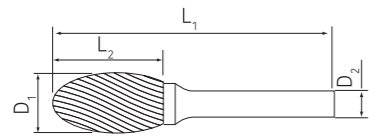
Code	SD-3D	SD-3N	SD-4S	SD-4D	SD-5S	SD-5D	SD-5N	SD-6S
Cut	D	N	S	D	S	D	N	S
D1(In.)	3/8	3/8	7/16	7/16	1/2	1/2	1/2	5/8
L2(In.)	5/16	5/16	3/8	3/8	7/16	7/16	7/16	9/16
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 1/32"	2 1/32"	2 3/32"	2 3/32"	2 5/32"	2 5/32"	2 5/32"	2 9/32"
D1(mm)	10.00	10.00	11.00	11.00	12.00	12.00	12.00	16.00
L2(mm)	8.00	8.00	10.00	10.00	11.11	11.11	11.11	14.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	51.59	51.59	53.18	53.18	54.77	54.77	54.77	57.94



Code	SD-6D	SD-6N	SD-7S	SD-7D	SD-7N	SD-9S	SD-9D
Cut	D	N	S	D	N	S	D
D1(In.)	5/8	5/8	3/4	3/4	3/4	1"	1"
L2(In.)	9/16	9/16	11/16	11/16	11/16	15/16	15/16
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 9/32"	2 9/32"	2 13/32"	2 13/32"	2 13/32"	2 21/32"	2 21/32"
D1(mm)	16.00	16.00	19.05	19.05	19.05	25.40	25.40
L2(mm)	14.00	14.00	17.00	17.00	17.00	24.00	24.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	58.00	58.00	62.00	61.12	61.12	67.00	67.00

Oval

E



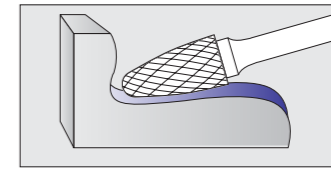
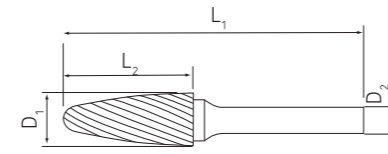
Code	SE-61S	SE-61D	SE-41S	SE-41D	SE-53S	SE-53D	SE-51S	SE-51D	SE-11S	SE-11D	SE-1S	SE-1D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/32	3/32	1/8	1/8	3/16	3/16	1/4	1/4	3/16	3/16	1/4	1/4
L2(In.)	1/8	1/8	7/32	7/32	9/32	9/32	3/8	3/8	5/16	5/16	3/8	3/8
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/4	1/4	1/4	1/4
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 5/8"	1 5/8"	1 3/4"	1 3/4"	2"	2"	2"	2"
D1(mm)	2.38	2.38	3.18	3.18	5.00	5.00	6.00	6.00	5.00	5.00	6.00	6.00
L2(mm)	3.00	3.00	6.00	6.00	8.00	8.00	10.00	10.00	8.00	8.00	10.00	10.00
D2(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	6.00	6.00	6.00	6.00
L1(mm)	38.10	38.10	38.10	38.10	42.00	42.00	45.00	45.00	51.00	51.00	51.00	51.00



Code	SE-3S	SE-3D	SE-3N	SE-5S	SE-5D	SE-5N	SE-6S	SE-6D	SE-6N	SE-7S	SE-7D	SE-7N
Cut	S	D	N	S	D	N	S	D	N	S	D	N
D1(In.)	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8	3/4	3/4	3/4
L2(In.)	5/8	5/8	5/8	7/8	7/8	7/8	1"	1"	1"	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 11/32"	2 11/32"	2 11/32"	2 19/32"	2 19/32"	2 19/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	10.00	10.00	10.00	12.00	12.00	12.00	16.00	16.00	16.00	19.05	19.05	19.05
L2(mm)	16.00	16.00	16.00	22.00	22.00	22.00	25.4	25.4	25.4	25.4	25.4	25.4
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	60.00	60.00	60.00	66.00	66.00	66.00	70.00	70.00	70.00	70.00	70.00	70.00

Tree With Radius End

F



Code	SF-61S	SF-61D	SF-41S	SF-41D	SF-42S	SF-42D	SF-53S	SF-53D	SF-51S	SF-51D	SF-81S	SF-81D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/32	3/32	1/8	1/8	1/8	1/8	3/16	3/16	1/4	1/4	3/16	3/16
L2(In.)	1/4	1/4	1/4	1/4	1/2	1/2	1/2	1/2	1/2	1/2	1/2	1/2
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	3/16	3/16
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 7/8"	1 7/8"	1 7/8"	1 7/8"	2"	2"
D1(mm)	2.38	2.38	3.18	3.18	3.18	3.18	5.00	5.00	6.00	6.00	5.00	5.00
L2(mm)	6.00	6.00	6.00	6.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00	13.00
D2(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	4.76	4.76
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	48.00	48.00	48.00	48.00	51.00	51.00



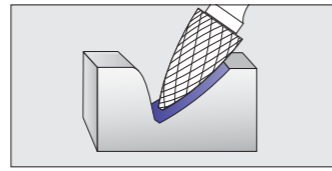
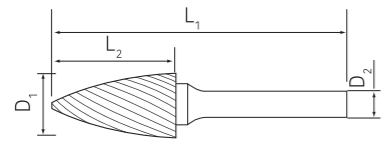
Code	SF-11S	SF-11D	SF-1S	SF-1D	SF-1N	SF-2D	SF-3S	SF-3D	SF-3N	SF-4S	SF-4D	SF-13S	SF-13D
Cut	S	D	S	D	N	D	S	D	N	S	D	S	D
D1(In.)	1/8	1/8	1/4	1/4	1/4	5/16	3/8	3/8	3/8	7/16	7/16	1/2	1/2
L2(In.)	1/2	1/2	5/8	5/8	5/8	3/4	3/4	3/4	3/4	1"	1"	3/4	3/4
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2"	2"	2"	2 15/32"	2 15/32"	2 15/32"	2 15/32"	2 23/32"	2 23/32"	2 15/32"	2 15/32"
D1(mm)	3.18	3.18	6.00	6.00	6.00	8.00	10.00	10.00	10.00	11.00	11.00	12.00	12.00
L2(mm)	12.70	12.70	16.00	16.00	16.00	19.05	19.05	19.05	19.05	25.40	25.40	19.05	19.05
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	50.80	50.80	50.80	63.00	63.00	63.00	63.00	70.00	70.00	63.00	63.00



Code	SF-5S	SF-5D	SF-5N	SF-6S	SF-6D	SF-6N	SF-7S	SF-7D	SF-8S	SF-8D	SF-8N	SF-15S	SF-15D
Cut	S	D	N	S	D	N	S	D	S	D	N	S	D
D1(In.)	1/2	1/2	1/2	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4	3/4	3/4
L2(In.)	1"	1"	1"	1"	1"	1"	1"	1"	1 1/4"	1 1/4"	1 1/4"	1 1/2"	1 1/2"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 31/32"	2 31/32"	2 31/32"	3 7/32"	3 7/32"
D1(mm)	12.00	12.00	12.00	16.00	16.00	16.00	19.05	19.05	19.05	19.05	19.05	19.05	19.05
L2(mm)	25.40	25.40	25.40	25.40	25.40	25.40	25.40	25.40	31.75	31.75	31.75	38.1	38.1
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	70.00	70.00	70.00	70.00	70.00	70.00	70.00	70.00	75.00	75.00	75.00	82.00	82.00

Tree With Pointed End

G



Code	SG-61S	SG-61D	SG-41S	SG-41D	SG-44S	SG-44D	SG-42S	SG-42D	SG-43S	SG-43D	SG-53S	SG-53D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	3/16	3/16
L2(In.)	1/4	1/4	1/4	1/4	1/2	1/2	5/16	5/16	3/8	3/8	1/2	1/2
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 7/8"	1 7/8"
D1(mm)	2.38	2.38	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	5.00	5.00
L2(mm)	6.35	6.35	6.35	6.35	13.00	13.00	8.00	8.00	10.00	10.00	13.00	13.00
D2(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	38.10	38.10	38.10	38.10	47.63	47.63



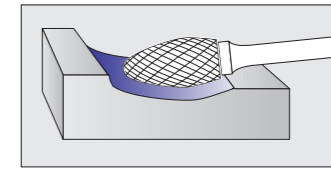
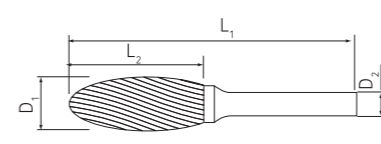
Code	SG-51S	SG-51D	SG-81S	SG-81D	SG-1S	SG-1D	SG-1N	SG-2S	SG-2D	SG-3S	SG-3D	SG-3N
Cut	S	D	S	D	S	D	N	S	D	S	D	N
D1(In.)	1/4	1/4	3/16	3/16	1/4	1/4	1/4	5/16	5/16	3/8	3/8	3/8
L2(In.)	1/2	1/2	1/2	1/2	5/8	5/8	5/8	3/4	3/4	3/4	3/4	3/4
D2(In.)	1/8	1/8	3/16	3/16	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	1 7/8"	1 7/8"	2"	2"	2"	2"	2"	2 15/32"	2 15/32"	2 15/32"	2 15/32"	2 15/32"
D1(mm)	6.00	6.00	5.00	5.00	6.00	6.00	6.00	8.00	8.00	10.00	10.00	10.00
L2(mm)	13.00	13.00	13.00	13.00	16.00	16.00	16.00	19.05	19.05	19.05	19.05	19.05
D2(mm)	3.00	3.00	4.76	4.76	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	48.00	48.00	51.00	51.00	51.00	51.00	51.00	63.00	63.00	63.00	63.00	63.00



Code	SG-13S	SG-13D	SG-5S	SG-5D	SG-5N	SG-6S	SG-6D	SG-7S	SG-7D	SG-15S	SG-15D
Cut	S	D	S	D	N	S	D	S	D	S	D
D1(In.)	1/2	1/2	1/2	1/2	1/2	5/8	5/8	3/4	3/4	3/4	3/4
L2(In.)	3/4	3/4	1"	1"	1"	1"	1"	1"	1"	1 1/2"	1 1/2"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 15/32"	2 15/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	2 23/32"	3 7/32"	3 7/32"
D1(mm)	12.00	12.00	12.00	12.00	12.00	16.00	16.00	19.05	19.05	19.05	19.05
L2(mm)	19.05	19.05	25.40	25.40	25.40	25.40	25.40	25.40	25.40	38.10	38.10
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	62.71	62.71	69.06	69.06	69.06	69.06	69.06	69.06	69.06	81.76	81.76

Flame

H



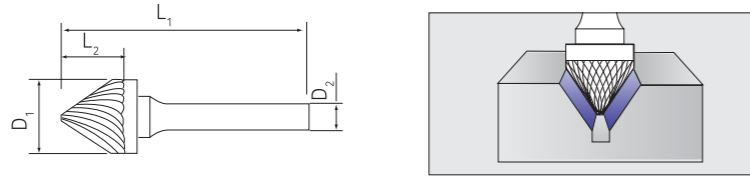
Code	SH-41S	SH-41D	SH-53S	SH-53D	SH-1S	SH-1D	SH-2S
Cut	S	D	S	D	S	D	S
D1(In.)	1/8	1/8	3/16	3/16	1/4	1/4	5/16
L2(In.)	1/4	1/4	3/8	3/8	5/8	5/8	3/4
D2(In.)	1/8	1/8	1/8	1/8	1/4	1/4	1/4
L1(In.)	1 1/2"	1 1/2"	1 3/4"	1 3/4"	2"	2"	2 15/32"
D1(mm)	3.00	3.00	5.00	5.00	6.00	6.00	8.00
L2(mm)	6.00	6.00	10.00	10.00	16.00	16.00	19.05
D2(mm)	3.00	3.00	3.00	3.00	6.00	6.00	6.00
L1(mm)	38.10	38.10	45.00	45.00	51.00	51.00	63.00



Code	SH-2D	SH-5S	SH-5D	SH-6S	SH-6D	SH-7S	SH-7D
Cut	D	S	D	S	D	S	D
D1(In.)	5/16	1/2	1/2	5/8	5/8	3/4	3/4
L2(In.)	3/4	1 1/4"	1 1/4"	1 7/16"	1 7/16"	1 5/8"	1 5/8"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 15/32"	2 31/32"	2 31/32"	3 5/32"	3 5/32"	3 11/32"	3 11/32"
D1(mm)	8.00	12.00	12.00	16.00	16.00	19.05	19.05
L2(mm)	19.05	32.00	32.00	36.00	36.00	42.00	42.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	63.00	75.00	75.00	81.00	81.00	85.00	85.00

Cone 60°

J



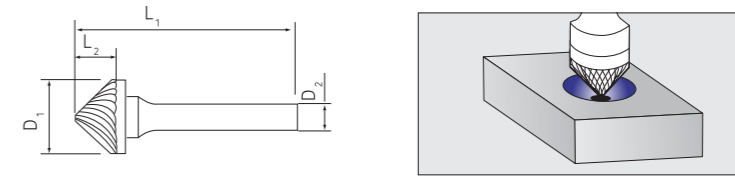
Code	SJ-42S	SJ-42D	SJ-1S	SJ-1D	SJ-3S	SJ-3D	SJ-5S
Cut	S	D	S	D	S	D	S
D1(In.)	1/8	1/8	1/4	1/4	3/8	3/8	1/2
L2(In.)	1/8	1/8	3/16	3/16	5/16	5/16	7/16
D2(In.)	1/8	1/8	1/4	1/4	1/4	1/4	1/4
L1(In.)	1 1/2"	1 1/2"	2"	2"	2 7/32"	2 7/32"	2 5/16"
D1(mm)	3.00	3.00	6.00	6.00	10.00	10.00	12.00
L2(mm)	3.00	3.00	5.00	5.00	8.00	8.00	11.00
D2(mm)	3.00	3.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	38.10	38.10	50.8	50.8	56.36	56.36	58.74
ANGLE	60°	60°	60°	60°	60°	60°	60°



Code	SJ-5D	SJ-6S	SJ-6D	SJ-7S	SJ-7D	SJ-9S	SJ-9D
Cut	D	S	D	S	D	S	D
D1(In.)	1/2	5/8	5/8	3/4	3/4	1"	1"
L2(In.)	7/16	1/2	1/2	11/16	11/16	15/16	15/16
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 5/16"	2 3/8"	2 3/8"	2 9/16"	2 9/16"	2 13/16"	2 13/16"
D1(mm)	12.00	16.00	16.00	19.05	19.05	25.40	25.40
L2(mm)	11.00	13.00	13.00	18.00	17.00	24.00	24.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	58.74	60.33	60.33	65.09	65.09	71.44	71.44
ANGLE	60°	60°	60°	60°	60°	60°	60°

Cone 90°

K



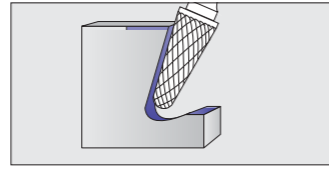
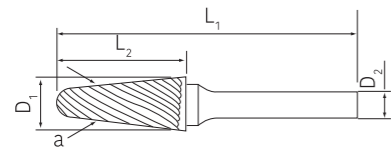
Code	SK-42S	SK-42D	SK-1S	SK-1D	SK-3S	SK-3D	SK-5S
Cut	S	D	S	D	S	D	S
D1(In.)	1/8	1/8	1/4	1/4	3/8	3/8	1/2
L2(In.)	1/16	1/16	1/8	1/8	3/16	3/16	1/4
D2(In.)	1/8	1/8	1/4	1/4	1/4	1/4	1/4
L1(In.)	1 1/2"	1 1/2"	2"	2"	2 1/8"	2 1/8"	2 3/16"
D1(mm)	3.00	3.00	6.00	6.00	10.00	10.00	12.00
L2(mm)	2.00	2.00	3.00	3.00	5.00	5.00	6.00
D2(mm)	3.00	3.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	38.10	38.10	50.80	50.80	53.98	53.98	55.56
ANGLE	90°	90°	90°	90°	90°	90°	90°



Code	SK-5D	SK-6S	SK-6D	SK-7S	SK-7D	SK-9S	SK-9D
Cut	D	S	D	S	D	S	D
D1(In.)	1/2	5/8	5/8	3/4	3/4	1"	1"
L2(In.)	1/4	5/16	5/16	3/8	3/8	1/2	1/2
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 3/16"	2 1/4"	2 1/4"	2 5/16"	2 5/16"	2 7/16"	2 7/16"
D1(mm)	12.00	16.00	16.00	19.00	19.05	25.00	25.00
L2(mm)	6.00	8.00	8.00	10.00	10.00	12.00	12.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	55.56	57.15	57.15	58.74	58.74	61.91	61.91
ANGLE	90°	90°	90°	90°	90°	90°	90°

Taper Radius

L



Code	SL-41S	SL-41D	SL-42S	SL-42D	SL-53S	SL-53D	SL-51D	SL-81S	SL-81D	SL-1S
Cut	S	D	S	D	S	D	D	S	D	S
D1(In.)	1/8	1/8	1/8	1/8	3/16	3/16	1/4	3/16	3/16	1/4
L2(In.)	3/8	3/8	1/2	1/2	1/2	1/2	1/2	7/16	7/16	5/8
D2(In.)	1/8	1/8	1/8	1/8	1/8	1/8	3/16	3/16	3/16	1/4
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 7/8"	1 7/8"	1 7/8"	2"	2"	2"
D1(mm)	3.00	3.00	3.00	3.00	6.00	6.00	6.00	5.00	5.00	6.00
L2(mm)	10.00	10.00	13.00	13.00	13.00	13.00	13.00	11.00	11.00	16.00
D2(mm)	3.00	3.00	3.00	3.00	3.00	3.00	3.00	5.00	5.00	6.00
L1(mm)	38.10	38.10	38.10	38.10	47.63	47.63	47.63	50.80	50.80	50.80
ANGLE	8°	8°	8°	8°	14°	14°	14°	14°	14°	14°



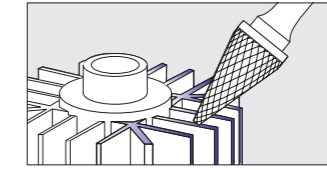
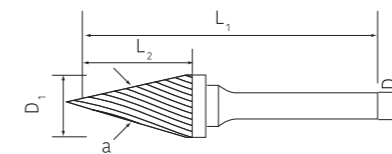
Code	SL-1D	SL-1N	SL-2S	SL-2D	SL-3S	SL-3D	SL-3N	SL-4S	SL-4D
Cut	D	N	S	D	S	D	N	S	D
D1(In.)	1/4	1/4	5/16	5/16	3/8	3/8	3/8	1/2	1/2
L2(In.)	5/8	5/8	7/8	7/8	1 1/16"	1 1/16"	1 1/16"	1 1/8"	1 1/8"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2 19/32"	2 19/32"	2 25/32"	2 25/32"	2 25/32"	2 27/32"	2 27/32"
D1(mm)	6.00	6.00	8.00	8.00	10.00	10.00	10.00	12.00	12.00
L2(mm)	16.00	16.00	22.00	22.00	27.00	27.00	27.00	28.00	28.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	65.88	65.88	70.64	70.64	70.64	72.23	72.23
ANGLE	14°	14°	14°	14°	14°	14°	14°	14°	14°



Code	SL-4N	SL-5S	SL-5D	SL-5N	SL-6S	SL-6D	SL-6N	SL-7S	SL-7D	SL-7N
Cut	N	S	D	N	S	D	N	S	D	N
D1(In.)	1/2	5/8	5/8	5/8	5/8	5/8	5/8	3/4	3/4	3/4
L2(In.)	1 1/8"	1 3/16"	1 3/16"	1 3/16"	1 5/16"	1 5/16"	1 5/16"	1 1/2"	1 1/2"	1 1/2"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2 27/32"	2 29/32"	2 29/32"	2 29/32"	3 1/32"	3 1/32"	3 1/32"	3 7/32"	3 7/32"	3 7/32"
D1(mm)	12.00	16.00	16.00	16.00	16.00	16.00	16.00	19.05	19.05	19.05
L2(mm)	28.00	30.00	30.00	30.00	33.00	33.00	33.00	38.10	38.10	38.10
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	72.23	73.82	73.82	73.82	76.99	76.99	76.99	81.76	81.76	81.76
ANGLE	14°	14°	14°	14°	14°	14°	14°	14°	14°	14°

Cone

M



Code	SM-61S	SM-61D	SM-41S	SM-41D	SM-42S	SM-42D	SM-43S	SM-43D	SM-53S
Cut	S	D	S	D	S	D	S	D	S
D1(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	3/16
L2(In.)	1/4	1/4	11/32	11/32	7/16	7/16	5/8	5/8	1/2
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 7/8"
D1(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	5.00
L2(mm)	6.00	6.00	8.00	8.00	11.00	11.00	16.00	16.00	13.00
D2(mm)	2.38	2.38	3.00	3.00	3.00	3.00	3.00	3.00	3.00
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	38.10	38.10	47.63
ANGLE	10°	10°	12°	12°	14°	14°	7°	7°	16°



Code	SM-53D	SM-51S	SM-51D	SM-1S	SM-1D	SM-1N	SM-2S	SM-2D	SM-3S
Cut	D	S	D	S	D	N	S	D	S
D1(In.)	3/16	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L2(In.)	1/2	1/2	1/2	1/2	1/2	1/2	3/4	3/4	1"
D2(In.)	1/8	1/8	1/8	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	1 7/8"	1 7/8"	1 7/8"	2"	2"	2"	2"	2"	2"
D1(mm)	5.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L2(mm)	13.00	13.00	13.00	13.00	13.00	13.00	19.05	19.05	25.40
D2(mm)	3.00	3.00	3.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	47.63	47.63	47.63	50.80	50.80	50.80	50.80	50.80	50.80
ANGLE	16°	22°	22°	22°	22°	22°	14°	14°	10°

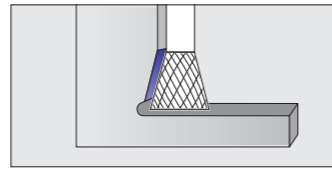
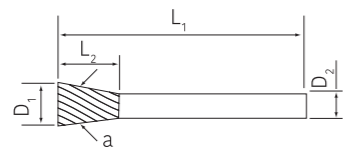


Code	SM-3D	SM-4S	SM-4D	SM-4N	SM-5S	SM-5D	SM-5N	SM-6S	SM-6D	SM-6N
Cut	D	S	D	N	S	D	N	S	D	N
D1(In.)	1/4	3/8	3/8	3/8	1/2	1/2	1/2	5/8	5/8	5/8
L2(In.)	1"	5/8	5/8	5/8	7/8	7/8	7/8	1"	1"	1"
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2 11/32"	2 11/32"	2 11/32"	2 19/32"	2 19/32"	2 19/32"	2 23/32"	2 23/32"	2 23/32"
D1(mm)	6.00	10.00	10.00	10.00	12.00	12.00	12.00	16.00	16.00	16.00
L2(mm)	25.40	16.00	16.00	16.00	22.00	22.23	22.23	25.40	25.40	25.40
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	59.53	59.53	59.53	65.88	65.88	65.88	69.06	69.06	69.06
ANGLE	10°	28°	28°	28°	28°	28°	28°	31°	31°	31°



Inverted Cone

N



Code	SN-61S	SN-61D	SN-41S	SN-41D	SN-42S	SN-42D	SN-53S	SN-53D	SN-51S	SN-51D	SN-81S	SN-81D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	3/32	3/32	3/32	3/32	1/8	1/8	3/16	3/16	1/4	1/4	3/16	3/16
L2(In.)	1/8	1/8	1/8	1/8	3/16	3/16	1/4	1/4	1/4	1/4	1/4	1/4
D2(In.)	3/32	3/32	1/8	1/8	1/8	1/8	1/8	1/8	1/8	1/8	3/16	3/16
L1(In.)	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 1/2"	1 5/8"	1 5/8"	1 5/8"	1 5/8"	2"	2"
D1(mm)	2.38	2.38	2.38	2.38	3.00	3.00	5.00	5.00	6.00	6.00	5.00	5.00
L2(mm)	3.00	3.00	3.00	3.00	5.00	5.00	6.00	6.00	6.00	6.00	6.00	6.00
D2(mm)	2.38	2.38	3.18	3.18	3.18	3.18	3.18	3.18	3.18	3.18	4.76	4.76
L1(mm)	38.10	38.10	38.10	38.10	38.10	38.10	41.28	41.28	41.28	41.28	50.80	50.80
ANGLE	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°	10°



Code	SN-1S	SN-1D	SN-3S	SN-3D	SN-4S	SN-4D	SN-5S	SN-5D	SN-6S	SN-6D	SN-7S	SN-7D
Cut	S	D	S	D	S	D	S	D	S	D	S	D
D1(In.)	1/4	1/4	3/8	3/8	1/2	1/2	1/2	1/2	5/8	5/8	3/4	3/4
L2(In.)	5/16	5/16	3/8	3/8	1/2	1/2	1/2	1/2	3/4	3/4	5/8	5/8
D2(In.)	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4	1/4
L1(In.)	2"	2"	2 3/32"	2 3/32"	2 7/32"	2 7/32"	2 7/32"	2 7/32"	2 15/32"	2 15/32"	2 11/32"	2 11/32"
D1(mm)	6.00	6.00	10.00	10.00	12.00	12.00	12.00	12.00	16.00	16.00	19.00	19.00
L2(mm)	8.00	8.00	10.00	10.00	12.00	12.00	12.00	12.00	19.00	19.00	16.00	16.00
D2(mm)	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00
L1(mm)	50.80	50.80	53.18	53.18	56.36	56.36	56.36	56.36	62.71	62.71	59.53	59.53
ANGLE	10°	10°	13°	13°	28°	28°	16°	16°	18°	18°	30°	30°



R-1

Shank Diameter: 1/4"
Cut: Double
CutIncluding: SA-3, SG-3, SD-3



R-5

Shank Diameter: 1/8"
Cut: Single Cut
Including: SL-2, SM-5, SC-5, SE-5, SD-5, SE-2, SA-1, SH-2



R-6

Shank Diameter: 1/4"
Cut: Double Cut
Including: SD-2, SC-1, SG-2, SF-3, SA-3, SC-3, SE-5, SM-5, SL-3, SH-5



R-7

Shank Diameter: 1/8"
Cut: Single Cut
CutIncluding: SC-3, SA-3, SG-3, SD-2, SE-3, SC-2, SH-2, SL-3



R-8

Shank Diameter: 1/4"
Cut: Double Cut
Including: SD-3, SF-1, SB-2, SA-3, SM-5, SF-5, SG-5, SB-5



R-9

Shank Diameter: 1/4"
Cut: Double Cut
Including: SF-5, SF-3, SD-5, SD-3, SC-1, SC-3, SA-3, SA-5

Bi-metal Strips

TYPE
one

Bi-metal strip is the ideal raw material for the manufacture of superior high-performance saws.

- Two different steel grades-- high speed steel on the cutting edge and "temper-resistant spring steel" for the backing--are welded together in machine direction without the use of filler metals
- Our rolling technology makes it possible to produce strip to close tolerance, with optimum flatness and outstanding surface finish and excellent material characteristics
- Uncompromising implementation of customer requirements, careful tracking of the market at home and abroad, and a fair spirit of competition are the key factors driving the quality of our cold rolled strip.

FEATURES

TDC cold rolled strip has particular advantages for mass production, such as:

- Close tolerance
- Reduction of processing costs by excellent tool service life, and precision blanking characteristics
High repeatability due to uniform material characteristics, especially outstanding spheroidized microstructure



Standard Dimension & Sizes

Bi-metal hand hacksaw strips		Bi-metal Air Saw strips	
INCH	MM	INCH	MM
1/2"x0.025"	12.70x0.60	1/2"x0.025"	12.70x0.60
Bi-metal Bandsaw strips		Bi-metal Reciprocating Saw strips	
INCH	MM	INCH	MM
3/4"x0.035"	19x0.90	3/4"x0.035"	19x0.90
1.063"x0.035"	27x0.90	3/4"x0.050"	19x1.30
1.350"x0.042"	34x1.10	1"x0.042"	25x1.06
1.614"x0.050"	41x1.30	7/8"x0.062"	22x1.57
2-1/8"x0.063"	54x1.60		
2-5/8"x0.063"	67x1.60		

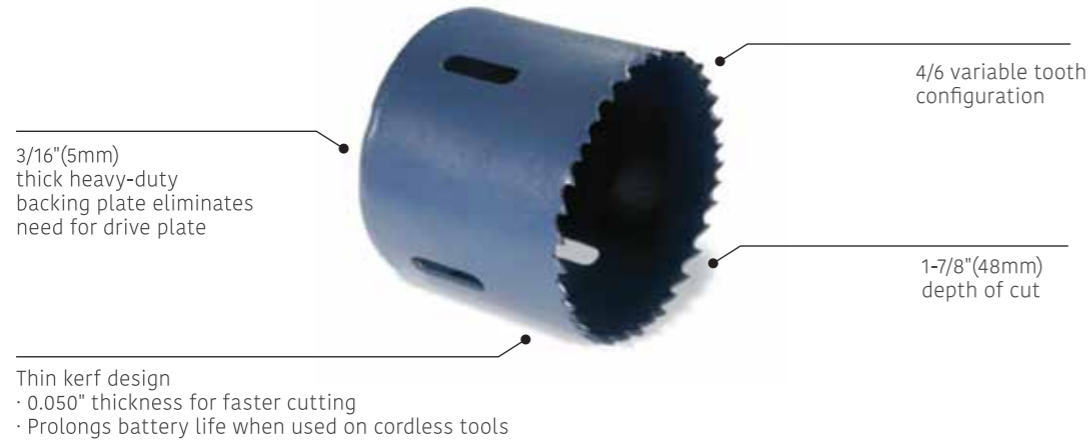
- Other sizes are available on request

Hole Saws



Traditional Hole Saws

TYPE
two



Bi-Metal [clamshell/boxed]

DIAMETER				ARTICLE#				DIAMETER				ARTICLE#				DIAMETER				ARTICLE#																																																																																																																																																																																																																											
INCHES		MM		M3		M42		INCHES		MM		M3		M42		INCHES		MM		M3		M42		INCHES		MM		M3		M42																																																																																																																																																																																																																	
9/16"	14	91201	91301	1-7/16"	37	91216	91316	2-5/16"	59	91231	91331	3-3/4"	95	91246	91346	5/8"	16	91202	91302	1-1/2"	38	91217	91317	2-3/8"	60	91232	91332	3-7/8"	98	91247	91347	11/16"	17	91203	91303	1-9/16"	40	91218	91318	2-1/2"	64	91233	91333	-	100	91248	91348	3/4"	19	91204	91304	1-5/8"	41	91219	91319	2-9/16"	65	91234	91334	4"	102	91249	91349	-	20	91205	91305	1-11/16"	43	91220	91320	2-5/8"	67	91235	91335	4-1/8"	105	91250	91350	13/16"	21	91206	91306	1-3/4"	44	91221	91321	-	68	91236	91336	4-1/4"	108	91251	91351	7/8"	22	91207	91307	-	45	91222	91322	2-3/4"	70	91237	91337	4-3/8"	111	91252	91352	15/16"	24	91208	91308	1-13/16"	46	91223	91323	2-7/8"	73	91238	91338	4-1/2"	114	91253	91353	1"	25	91209	91309	1-7/8"	48	91224	91324	-	75	91239	91339	4-3/4"	121	91254	91354	1-1/16"	27	91210	91310	-	50	91225	91325	3"	76	91240	91340	5"	127	91255	91355	1-1/8"	29	91211	91311	2"	51	91226	91326	3-1/8"	79	91241	91341	5-1/2"	140	91256	91356	1-3/16"	30	91212	91312	2-1/16"	52	91227	91327	3-1/4"	83	91242	91342	5-3/4"	146	91257	91357	1-1/4"	32	91213	91313	2-1/8"	54	91228	91328	3-3/8"	86	91243	91343	6"	152	91258	91358	1-5/16"	33	91214	91314	-	55	91229	91329	3-1/2"	89	91244	91344					1-3/8"	35	91215	91315	2-1/4"	57	91230	91330	3-5/8"	92	91245	91345				

FEATURES

- High Speed cutting edge
- 4/6 Variable tooth configuration
- 1 7/8" (48mm) Cutting depth
- 3/16" (5mm) thick heavy-duty backing plate eliminates need for drive plate

ADVANTAGES

- Shock resistant teeth
- Resists tooth strippage
- Less vibration

APPLICATION INFORMATION

- Creates holes for pipe, tubing installations, door lock installations, electrical conduit, hoses and antennas
- Ideal for plumbing, construction, aircraft, electrical, maintenance and automotive applications
- Use in steel, aluminum, brass, cast iron, plastic or wood

Traditional Hole Saws











- Hole Saw Kits are available for cutting almost any material. Each kit consist of assorted hole saws and accessories that are specially designed for use in the electrical, plumbing, manufacturing ect.
- The standard kits have in them Bi-Metal 8% Cobalt hole saws of 4/6 variable pitch however these can be supplied in Bi-Metal M3 holesaw and in constant pitch of 6 tpi and 10 tpi.

Kit Type	5/8" 16mm	3/4" 19mm	13/16" 21mm	7/8" 22mm	1" 25mm	1-1/8" 29mm	1-1/4" 32mm	1-3/8" 35mm	1-1/2" 38mm	1-9/16" 40mm	1-3/4" 44mm	2" 51mm	2-1/8" 54mm	2-1/4" 57mm	2-1/2" 64mm	3" 76mm	3-1/4" 83mm	3-5/8" 92mm	3-3/4" 95mm	4-1/8" 105mm	4-1/2" 114mm	ARTICLE#	
Handyman's - 7 piece (includes 1 mandrel and 1 adaptor)				✓	✓	✓	✓		✓														913K01
Locksmith's - 9 piece (includes 2 mandrels and 1 adaptor)				✓	✓		✓		✓		✓		✓										913K02
Plumber's - 9 piece (includes 2 mandrels and 1 adaptor)		✓		✓		✓			✓		✓			✓									913K03
Electrician's - 9 piece (includes 2 mandrels and 1 adaptor)				✓		✓		✓			✓	✓				✓							913K04
Electrician's - metric - 9 piece (includes 2 mandrels and 1 adaptor)	✓		✓		✓		✓			✓		✓											913K05
Journeyman's - 13 piece (includes 2 mandrels, 1 pilot hole drill, and 1 adaptor)		✓		✓		✓		✓	✓		✓	✓		✓	✓								913K06
Industrial's - 20 piece (includes 2 mandrels, 1 adaptor, 1 pilot drill and 12" extension)		✓		✓		✓		✓	✓		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	913K07



Accessories

Arbor			
Code#	Description	Suitable For	
ACA01	Round Shank-6mm(1/4")	14 to 30mm(9/16" - 1 3/16")	
ACA02	Hex Shank-6mm(1/4")	14 to 30mm(9/16" - 1 3/16")	
ACA03	Hex Shank-9mm(3/8")	14 to 30mm(9/16" - 1 3/16")	
ACA04	Hex Shank-11mm(7/16")	14 to 30mm(9/16" - 1 3/16")	
ACA05	Hex Shank Pinned-9mm(3/8")	32 to 152mm(1 1/4"-6")	
ACA06	Hex Shank Pinned-11(7/16")	32 to 152mm(1 1/4"-6")	
ACA07	Quick Release & Nut	14 to 152mm(9/16"-6")	
ACA08	Hex Shank-9mm(3/8")	32 to 152mm(1 1/4"-6")	
Adaptor			
Code#	Description		
ACA09	32 to 152mm(1 1/4"-6")		
Pilot Drill			
Code#	Description		
ACD01	83mm(3 1/4"x1/4")		
ACD02	102mm(4"x1/4")		
Extensions			
Code#	Description		
ACE01	300mm(3/8"x12")		

Tech Tips for Hole Saws

Recommended Operating Speeds for Hole Saws

- Guidelines on generally recommended operating speeds.
- Always follow the recommendations of the hole saw manufacturer concerning use and operating speeds.

Bi-Metal Hole Saw Operating Speeds (RPM Table)

inches	mm	length	mild steel	tool steel & stainless	cast iron	brass	aluminum	wood
9/16	14	0.147	580	300	400	790	900	3000
5/8	16	0.164	550	275	365	730	825	3000
11/16	17	0.180	500	250	330	665	750	3000
3/4	19	0.196	460	230	300	600	690	3000
-	20	0.213	440	220	290	580	660	3000
7/8	22	0.229	390	195	260	520	585	3000
1	25	0.262	350	175	235	470	525	2700
1-1/16	27	0.278	320	160	215	435	480	2700
1-1/8	29	0.295	300	150	200	400	450	2700
1-3/16	30	0.311	285	145	190	380	425	2400
1-1/4	32	0.327	275	140	180	360	410	2400
1-5/16	33	0.344	260	135	175	345	390	2400
1-3/8	35	0.360	250	125	165	330	375	2400
1-7/16	37	0.376	240	120	160	315	360	2400
1-1/2	38	0.393	230	115	150	300	345	2400
1-9/16	40	0.409	220	110	145	290	330	2100
1-5/8	41	0.425	210	105	140	280	315	2100
1-11/16	43	0.442	205	100	135	270	305	2100
1-3/4	44	0.458	195	95	130	260	295	2100
1-13/16	46	0.475	190	95	125	250	285	2100
1-7/8	48	0.491	180	90	120	240	270	2100
2	51	0.524	170	85	115	230	255	2000
2-1/16	52	0.540	165	80	110	220	245	2000
2-1/8	54	0.556	160	80	105	210	240	2000
2-1/4	57	0.589	150	75	100	200	225	2000
2-5/16	59	0.605	145	75	95	195	225	2000
2-3/8	60	0.622	140	70	90	190	220	2000
2-1/2	64	0.655	135	65	85	180	205	1850
2-9/16	65	0.671	130	65	85	175	200	1850
2-5/8	67	0.687	130	65	85	170	195	1800
-	68	0.704	130	65	80	170	190	1800
2-3/4	70	0.720	125	60	80	160	185	1800
2-7/8	73	0.753	120	60	75	160	180	1800
3	76	0.785	115	55	70	150	170	1800
3-1/8	79	0.818	110	55	70	140	165	1500
3-1/4	83	0.851	105	50	65	140	155	1500
3-3/8	86	0.884	100	50	65	130	150	1500
3-1/2	89	0.916	95	45	60	130	145	1200
3-5/8	92	0.949	90	45	60	120	140	1200
3-3/4	95	0.982	90	45	60	120	135	1200
3-7/8	98	1.014	90	45	60	120	135	1200
4	102	1.047	85	40	55	110	130	1000
4-1/8	105	1.080	80	40	55	110	120	1000
4-1/4	108	1.113	80	40	55	110	120	900
4-3/8	111	1.145	80	40	50	100	120	900
4-1/2	114	1.178	75	35	50	100	105	900
4-3/4	121	1.244	75	35	50	92	95	900
5	127	1.309	65	30	45	90	90	800
5-1/2	140	1.440	60	25	40	85	85	800
5-3/4	146	1.505	55	25	35	75	75	800
6	152	1.571	55	25	35	75	75	800

Hole Saw Operating Speeds (RPM Table)

inches	mm	brick ceramic	slate	reinforced plastics	fiberglass
5/8	16	620	1540	2140	920
3/4	19	510	1280	1790	770
-	20	470	1180	1660	715
7/8	22	430	1090	1530	660
1	25	380	960	1340	580
1-1/8	29	340	850	1190	510
1-1/4	32	310	770	1070	460
1-3/8	35	280	700	980	420
1-1/2	38	260	640	890	390
1-3/4	44	220	550	770	330
1-7/8	48	200	510	720	310
2	51	190	480	670	290
2-1/8	54	180	450	630	280
2-1/4	57	170	430	600	270
2-3/8	60	160	400	570	250
2-1/2	64	150	380	540	230
2-3/4	70	140	350	500	210
3	76	130	320	450	190
3-1/4	83	120	295	415	180
3-3/8	86	115	285	400	175
3-3/4	95	102	255	350	160
4	102	95	240	330	150
4-1/2	114	82	215	290	125

Hole Saw Size Reference Chart

diameter		pipe tap dia.		pipe entrance dia		order number	
inch	mm	inch	mm	inch	mm	M3	M42
9/16	14	-	-	-	-	91301	91601
5/8	16	-	-	-	-	91302	91602
11/16	17	-	-	-	-	91303	91603
3/4	19	1/2	13	3/8	10	91304	91604
-	20	-	-	-	-	91305	91605
13/16	21	-	-	-	-	91306	91606
7/8	22	3/4	19	1/2	13	91307	91607
15/16	24	-	-	-	-	91308	91608
1	25	-	-	-	-	91309	91609
1-1/16	27	-	-	-	-	91310	91610
1-1/8	29	1	25	3/4	19	91311	91611
1-3/16	30	-	-	-	-	91312	91612
1-1/4	32	-	-	-	-	91313	91613
1-5/16	33	-	-	-	-	91314	91614
1-3/8	35	-	-	1	25	91315	91615
1-7/16	37	-	-	-	-	91316	91616
1-1/2	38	1-1/4	32	-	-	91317	91617
1-9/16	40	-	-	-	-	91318	91618
1-5/8	41	-	-	-	-	91319	91619
1-11/16	43	-	-	-	-	91320	91620
1-3/4	44	1-1/2	38	1/2	38	91321	91621
-	45	-	-	-	-	91322	91622
1-13/16	46	-	-	-	-	91323	91623
1-7/8	48	-	-	-	-	91324	91624
-	50	-	-	-	-	91325	91625
2	51	-	-	1-1/2	38	91326	91626
2-1/16	52	-	-	-	-	91327	91627
2-1/8	54	-	-	-	-	91328	91628
-	55	-	-	-	-	91329	91629
2-1/4	57	2	51	-	-	91330	91630
2-5/16	59	-	-	-	-	91331	91631
2-3/8	60	-	-	-	-	91332	91632
2-1/2	64	-	-	2	51	91333	91633
2-9/16	65	-	-	-	-	91334	91634
2-5/8	67	2-1/2	64	-	-	91335	91635
-	68	-	-	-	-	91336	91636
2-3/4	70	-	-	-	-	91337	91637
2-7/8	73	-	-	-	-	91338	91638
-	75	-	-	-	-	91339	91639
3	76	-	-	2-1/2	64	91340	91640
3-1/8	79	-	-	-	-	91341	91641
3-1/4	83	3	76	-	-	91342	91642
3-3/8	86	-	-	-	-	91343	91643
3-1/2	89	-	-	-	-	91344	91644
3-5/8	92	-	-	3	76	91345	91645
3-3/4	95	3-1/2	89	-	-	91346	91646
3-7/8	98	-	-	-	-	91347	91647
-	100	-	-	-	-	91348	91648
4	102	-	-	-	-	91349	91649
4-1/8	105	-	-	3-1/2	89	91350	91650
4-1/4	108	4	102	-	-	91351	91651
4-3/8	111	-	-	-	-	91352	91652
4-1/2	114	-	-	-	-	91353	91653
4-3/4	121	4-1/2	114	4	102	91354	91654
5	127	-	-	-	-	91355	91655
5-1/2	140	-	-	5	127	91356	91656
5-3/4	146	-	-	-	-	91357	91657
6	152	-	-	-	-	91358	91658

Tech Tip

- Always wear eye protection.
- Always be sure that the pilot drill extends beyond the cutting edge of the saw by at least 1/8".
- Be sure to secure the material to be cut to keep it from spinning or slipping.
- Start the cutting process with the saw square to the material being cut, this will ensure that all teeth begin to cut at the same time and will help prevent premature wear and damage to the saw.
- Following the recommended operating speed for the saw size and the material being cut.
- Operator should feed the saw in and out to allow the material shavings to clear out of the hole being cut.
- Cutting oils or lubricants should be used to extend the life of the saw, except when cutting wood or cast iron.
- Occasionally check the mandrel's drive pins to be sure they are still fully engaged in the saw and that they have not vibrated out of the drive holes in the saw.
- When sawing in wood, finish the hole from the opposite side to prevent splintering. Once the pilot drill has broken through the other side, you can use this hole to guarantee you are in line with where you have already started cutting.
- When sawing resistant and difficult to cut materials, drill a couple of small holes on the circumference to allow chip to clear.
- Keep an oil soaked sponge inside the hole saw if you:
 - Cannot lubricate in the normal way
 - Operate in stainless steel
 - Operate in a vertical position from above.

Tech Tip

Pipe and Tap Entrance

- Pipe taps are used for threading holes created by a hole saw to receive a threaded pipe. Reference the product charts for proper selection. To cut a hole for a 1" pipe tap, select a 1-1/8" hole saw.
- Pipe entrance is the diameter for the hole through which a pipe of a given diameter will pass during installation or repair.
- Pipe size is defined by the inside diameter. To cut a hole through which a 3/4" pipe may be passed, a 1-1/8" hole saw is used.
- Tubing size is defined by the outside diameter. To cut an entrance hole of a given tubing diameter, the same diameter hole saw should be used.

HSS Hole Cutter



- Adopt high class high-speed steel as material, with features of good heat resistance, rigidity and ductility.
- Used to punch holes on all types of metal plates and stainless steel plates.
- Adopt detachable design to save operating costs.

Bi-Metal [tube]

DIAMETER		ARTICLE#
INCHES	MM	M42
19/32"	15	91401
5/8"	16	91402
11/16"	17	91403
23/32"	18	91404
3/4"	19	91405
-	20	91406
13/16"	21	91407
7/8"	22	91408
29/32"	23	91409
15/16"	24	91410
1"	25	91411
1-1/32"	26	91412
1-3/32"	28	91413
1-3/16"	30	91414
1-1/4"	32	91415
1-3/8"	35	91416

DIAMETER		ARTICLE#
INCHES	MM	M42
1-1/2"	38	91417
1-9/16"	40	91418
1-21/32"	42	91419
1-25/32"	45	91420
1-15/16"	50	91421
2-3/16"	55	91422
2-3/8"	60	91423
2-9/16"	65	91424
2-3/4"	70	91425
2-15/16"	75	91426
3-5/32"	80	91427
3-11/32"	85	91428
3-9/16"	90	91429
3-3/4"	95	91430
3-15/16"	100	91431

TCT Hole Cutter



- 3-ply cutters reduces tip crack even with hard use, and the edge of knife adopts super quality alloy material, which is applied to drilling in cold/hard metal stainless steel plate;
- The 25mm effective length enables this hole-saw to drill thick steel plate as well as curved face material like thick-wall metal pipesetc.
- The abrasion reducing design heightens durability of hole-saw to great degree, besides, with lighter and faster drilling compared with previous Tcat-edge products.

Bi-Metal [tube]

DIAMETER		ARTICLE#
INCHES	MM	M42
19/32"	15	91501
5/8"	16	91502
11/16"	17	91503
23/32"	18	91504
3/4"	19	91505
-	20	91506
13/16"	21	91507
7/8"	22	91508
29/32"	23	91509
15/16"	24	91510
1"	25	91511
1-1/32"	26	91512
1-3/32"	28	91513
1-3/16"	30	91514
1-1/4"	32	91515
1-3/8"	35	91516
1-1/2"	38	91517
1-9/16"	40	91518
1-21/32"	42	91519
1-25/32"	45	91520

DIAMETER		ARTICLE#
INCHES	MM	M42
1/7/8"	48	91521
1-15/16"	50	91522
2-3/32"	53	91523
2-3/16"	55	91524
2-3/8"	60	91525
2-9/16"	65	91526
2-3/4"	70	91527
2-15/16"	75	91528
3-5/32"	80	91529
3-11/32"	85	91530
3-9/16"	90	91531
3-3/4"	95	91532
3-15/16"	100	91533
4-1/8"	105	91534
4-5/16"	110	91535
4-17/32"	115	91536
4-13/16"	120	91537
4-15/16"	125	91538
5"	127	91539

Reciprocating Saw Blade



Demolition Reciprocating Saw Blades

TYPE
one

- These saw blades are wider and thicker and have been engineered for heavy-duty applications
- Designed for tough, heavy duty cutting jobs and are built to last longer
- Make your mark with these demolition reciprocating saw blades.

6 TPI Wood

- Wider(7/8")and thicker(.062)blades for demolition work • Available in 6" 9"and 12" lengths with 1/2" universal shanks



SIZE LENGTH		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
6*7/8*.062	150*22*1.60	6	93101	For cutting nail embedded wood, railroad ties and other tough materials
9*7/8*.062	225*22*1.60	6	93102	
12*7/8*.062	300*22*1.60	6	93103	

14 TPI Metal

- Wider(1")and thicker(.042) blades for demolition work • Available in 6" 9" and 12" lengths with 1/2"universal shanks



SIZE LENGTH		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
6*1*.042	150*25*1.10	14	93201	For cutting pipe, angle iron, nail embedded wood and structural steel
9*1*.042	225*25*1.10	14	93202	
12*1*.042	300*25*1.10	14	93203	

Pallet Reciprocating Saw Blades

TYPE
two

- M42 cutting edge with 8% cobalt for longer life
- Unique tooth design for fast cutting
- Special heat treat for increased tooth life
- Rounded nose for easy cutting and safe operation
- Special blade backer for greater flexibility when cutting block pallets



SIZE		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
8*3/4*.035	200*19*.90	10	93301	High performance cutting for pallet dismantling

Bi-Metal Reciprocating Saw Blades

TYPE
three

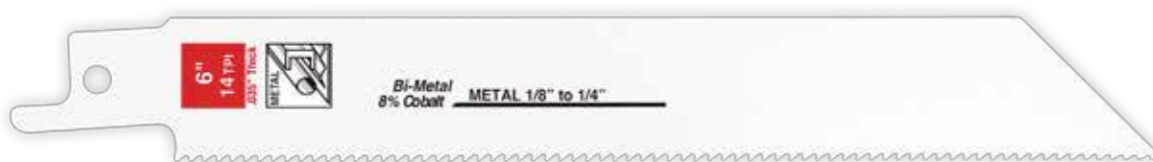
- These Reciprocating saw blades are designed for efficient cutting in a wide variety of materials including wood, metal and plastic
- All have the 1/2" universal shank that fits all standard 1/2" shank reciprocating saws
- Made for quick and accurate cutting

Wood Cutting



SIZE		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
6*3/4*.050	150*19*1.30	5/7	93401	General roughing-in work in wood and nail-embedded woods. Fast cutting
6*3/4*.050	150*19*1.30	6	93402	
6*3/4*.050	150*19*1.30	10	93403	
9*3/4*.050	225*19*1.30	6	93404	
12*3/4*.050	300*19*1.30	6	93405	

Metal Cutting



Bi-Metal Reciprocating Saw Blades

SIZE		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
3*5/16*.035 scroll	75*8*0.90	14	93501	For scroll cutting heavy gauge metal, fiberglass, Masonite
6*3/4*.035	150*19*0.90	14	93502	For metals heavier than 1/8", bar stock, angles, etc. also rubber, Masonite, fiberglass, etc
9*3/4*.035	225*19*0.90	14	93503	
6*3/4*.035	150*19*0.90	18	93504	For heavy gauge sheet metal, conduit, pipe, tubing, thin fiberglass
8*3/4*.035	200*19*0.90	18	93505	
12*3/4*.035	300*19*0.90	18	93506	
6*3/4*.035	150*19*0.90	24	93507	For metals lighter than 18-gauge, thin wall tubing, formed sheet, trim, etc

All-Purpose Cutting



SIZE		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
8*3/4*.035	200*19*0.90	10/14	93601	Heavy gauge metals, compositions, masonite, wood .etc
12*3/4*.050	300*19*1.30	10/14	93602	
12*3/4*.050 taper	300*19*1.30	10/14	93603	

Bi-Metal Reciprocating Saw Blades

Plaster Cutting



SIZE		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
6*3/4*.050	150*19*1.3	6	93701	High performance cutting for Plaster. Fast cutting

Air Saw Blades

- Specially designed blades for use in pneumatic saws. Air Saw blades have fine teeth for cutting metal



SIZE		TEETH PER INCH	ARTICLE#	RECOMMENDED USES
INCH	MM			
3*1/2*.025	75*12.5*0.64	18	93801	For scroll cutting metals lighter than 14 gauge
4*1/2*.025	100*12.5*0.64	18	93804	
5*1/2*.025	125*12.5*0.64	18	93806	
3*1/2*.025	75*12.5*0.64	24	93802	For scroll cutting metals lighter than 18 gauge, thin tubing, formed sheet, trim, etc
3*1/2*.025	75*12.5*0.64	32	93803	For scroll cutting metals very thin gauge metals. sheet, tubing, trim, etc
4*1/2*.025	100*12.5*0.64	32	93805	

Tech Tip for Reciprocating Saw Blades



- First decide on the length of saw blade you need for your application. We recommend that the blade be about 2”(50mm) more than the thickness or width of the material to be cut, to take into account the blade travel.
- Then refer to the cutting guide for the cross section you plan to cut and select the tooth pitch.
- Always wear eye protection.

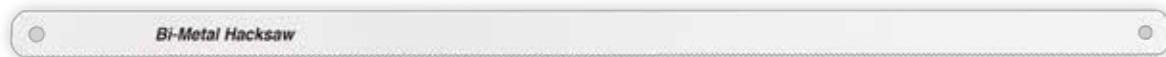
Hacksaw Blades



Bi-Metal Hacksaw Blades

TYPE
one

- Bi-Metal hacksaw blades for heavy duty cutting
- Blade is shatter resistant
- Cut medium gauge metals (1/16" to 1/4") such as sheet metal, angle iron, bolts, channels, drill rods, threaded rod, pipes and tubing



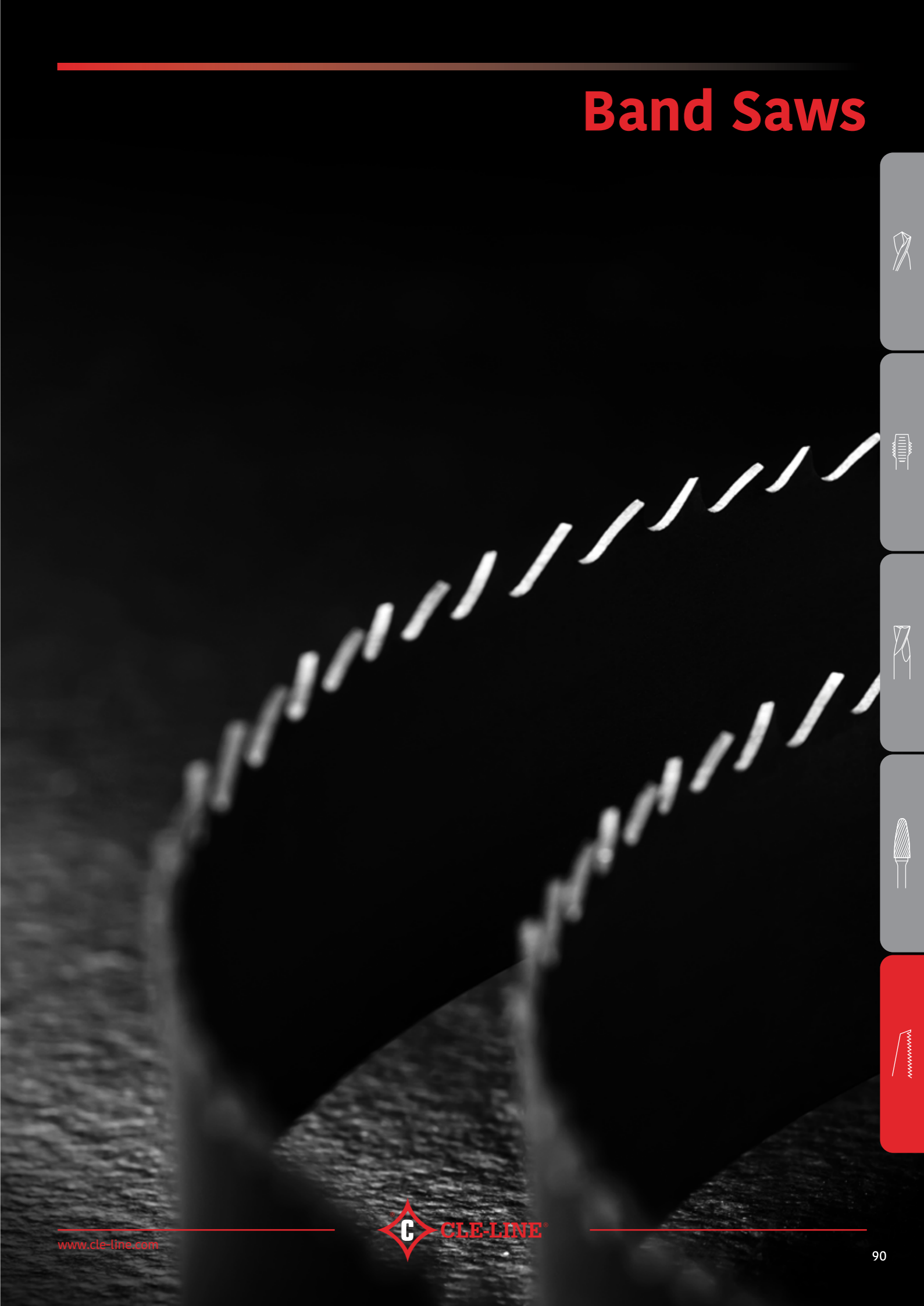
SIZE		TPI	ARTICLE#
INCH	MM		
10*1/2*.025	250*12.5*0.64	18	95101
10*1/2*.025	250*12.5*0.64	24	95102
10*1/2*.025	250*12.5*0.64	32	95103
12*1/2*.025	300*12.5*0.64	14	95104
12*1/2*.025	300*12.5*0.64	18	95105
12*1/2*.025	300*12.5*0.64	24	95106
12*1/2*.025	300*12.5*0.64	32	95107
12*1/2*.025	300*12.5*0.64	10/14	95108
12*1/2*.025	300*12.5*0.64	14/18	95109
12*1/2*.025	300*12.5*0.64	18/24	95110
12*1/2*.025	300*12.5*0.64	24/32	95111

Hacksaw Blade Selection

TECH TIPS

- **Carbon** These lades are recommended for cutting brass, copper, softer steels aluminum and similar materials
- **High speed Steel** Recommended for those materials which are difficult to cut such as stainless steel,tool and alloy steels. Use highspeed steel all hard blades when the workpiece can be held securely in a vice or clamp
- **Bi-Metal** Use on all types of materials. A highspeed steel cutting edge welded to a tough alloy steel back produces a blade with a long cutting life and high resistance to breaking

Band Saws



Portable Bandsaws(Matrix II)

TYPE
one

LENGTH*WIDTH*THICKNESS		QUANTITY PER BOX	VARIABLE PITCH			CONSTANT PITCH			
INCH	MM		10/14	14/18	18/24	10 Raker	14 Raker	18 Raker	24 Raker
44-7/8*1/2*.020	1140mm*12.5mm*.50mm	3 or 100	92101	92102	92103	92104	92105	92106	92107

FEATURES

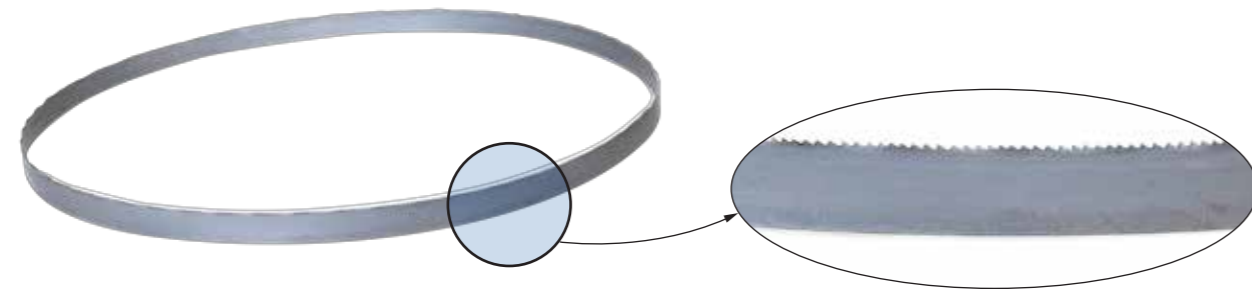
- Bi-Metal Portable Bandsaw Blades (Matrix II)
- All teeth have uniform spacing and gulleted depth

ADVANTAGES

- Improve cut quality and offer improved shock resistance
- Blades resist tooth strippage

APPLICATION INFORMATION

- Cuts aluminum, cast iron, chrome, stainless steel, tungsten steel and other problem material at low speed



BI-METAL BANDSAW BLADES(M42)

TYPE
two

- Bi-Metal Bandsaw Blades have high speed steel teeth for a sharp cut and give you a longer lasting blade.
- HSS edge contains 8% cobalt.
- Available in coils or custom-welded to length.

Narrow Width Bands M-42

WIDTH*GAUGE			VARIABLE PITCH			CONSTANT PITCH						
INCH	MM	COIL LENGTH	6/10	8/12	10/14	4 Hook	6 Positive	10 Raker	14 raker	18 Wavy	24 Raker	24 Wavy
1/2*.020	12.5*0.51	250 ft.			92205				92214	92217	92219	92220
1/2*.025	12.5*0.64	250 ft.	92201	92202	92206			92212	92215	92218		
1/2*.035	12.5*0.90	250 ft.		92203	92207	92209	92210		92216			

• Color denotes Matrix II material

Bi-metal Bandsaw Blades(M42)

FEATURES

- Solids and thick wall tubing of medium to difficult material, such as stainless steels
- Narrow width from 1/4"to 1/2"for contour and miter cutting
- Narrow width and gauge can be welded by customer for die building and internal cutting re-use
- HSS Edge contains 8% cobalt

APPLICATION INFORMATION



T-1000 M-42(Straight tooth)

WIDTH*GAUGE			VARIABLE PITCH						CONSTANT PITCH	
INCH	MM	COIL LENGTH	3/4	4/6	5/8	6/10	8/12	10/14	10 Raker	14 Wavy
3/4*.035	19.0*0.90	250ft.				92228	92231	92233	92235	92236
1*.035	27.0*0.90	250ft.	92221	92223	92226	92229	92232	92234		92237
1-1/4*.042	34.0*1.10	250ft.	92222	92224	92227	92230				
1-1/2*.050	41.0*1.27	250ft.		92225						

FEATURES

- Bi-metal construction
- M42 High Speed Steel cutting edge provides higher heat and wear durability
- Tooth hardness Rc 67-69
- 0°rake for smoother cutting and general applications

APPLICATION INFORMATION

- All-purpose band for moderate to difficult to cut materials



T-2000 M-42(Positive Rake Tooth)

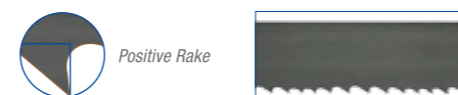
WIDTH*GAUGE			VARIABLE PITCH				CONSTANT PITCH		
INCH	MM	COIL LENGTH	2/3	3/4	4/6	5/7	2 Hook	6 Raker	8 Raker
3/4*.035	19.0*0.90	250ft.			92244	92248			
1*.035	27.0*0.90	250ft.	92238	92241	92245	92249	92251	92252	92254
1-1/4*.042	34.0*1.10	250ft.	92239	92242	92246	92250		92253	
1-1/2*.050	41.0*1.27	150ft.	92240	92243	92247				

FEATURES

- Bi-metal construction
- M42 High Speed Steel cutting edge provides higher heat and wear durability
- Tooth hardness Rc 67-69
- positive rake for easier penetration and reduced vibration

APPLICATION INFORMATION

- Ideal for production and non-production cutting of solids and thick wall tubing of medium alloy
- Recommended for work hardened materials such as stainless steel



Bi-metal Bandsaw Blades(M42)

T-3000 M-42(Reinforced Tooth)

WIDTH*GAUGE			VARIABLE PITCH		
INCH	MM	COIL LENGTH	2/3	3/4	4/6
3/4*.035	19.0*0.90	250ft.			92263
1*.035	27.0*0.90	250ft.	92255	92259	92264
1-1/4*.042	34.0*1.10	250ft.	92256	92260	92265
1-1/2*.050	41.0*1.27	250ft.	92257	92261	92266
2*.063	54.0*1.60	250ft.	92258	92262	92267

FEATURES

- Bi-metal construction
- M42 High Speed Steel cutting edge provides higher heat and wear durability
- Tooth hardness Rc 67-69
- Duplex tooth design
- High positive rake with DUPLEX tooth design for maximum strength when cutting difficult material such as super alloys
- Specially engineered relief angle
- More aggressive action for easier chip formation

APPLICATION INFORMATION

- Production sawing of exotic materials such as Inconels, Monels, Hastalloys, Hi-Alloys, Titanium, stainless and more



high positive rake with DUPLEX tooth design for maximum strength when cutting difficult material such as super alloys



T-4000 M-42 (Protective Tooth)

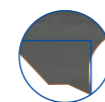
WIDTH*GAUGE			VARIABLE PITCH	
INCH	MM	COIL LENGTH	3/4	4/6
1*.035	27.0*0.90	250ft.		92280
1-1/4*.042	34.0*1.10	250ft.		92281
1-1/2*.050	41.0*1.27	250ft.		92282

FEATURES

- Special designed for tube. To prevent tooth break-age by eliminating excessive tooth stripping due to the domino effect. To withstand the shock of interrupted cuts, allowing for heavier penetration under fast cutting rate

APPLICATION INFORMATION

- Tubes, structures, small size bundles



Positive Rake



T-5000 M-42(Heavy Set)

WIDTH*GAUGE			VARIABLE PITCH			
INCH	MM	COIL LENGTH	2/3	3/4	4/6	5/7
1*.035	27.0*0.90	250ft.	92268		92273	92277
1-1/4*.042	34.0*1.10	250ft.		92270	92274	92278
1-1/2*.050	41.0*1.27	250ft.		92271	92275	92279
2*.063	54.0*1.60	250ft.	92269	92272	92276	

FEATURES

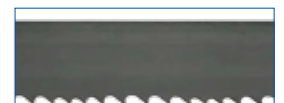
- Bi-metal construction
- M42 High Speed Steel cutting edge provides higher heat and wear durability
- Tooth hardness Rc 67-69
- Heavy Set

APPLICATION INFORMATION

- For large and bundle cutting of structural steel
- Ideal for applications where a larger kerf is needed to prevent blade pinching and stalling from material stresses and movement



Positive Rake



T-6000 (Turtle Back Tooth)

WIDTH*GAUGE			VARIABLE PITCH	
INCH	MM	COIL LENGTH	3/4	4/6
1*.035	27.0*0.90	250ft.	92283	
1-1/4*.042	34.0*1.10	250ft.	92284	
1-1/2*.050	41.0*1.27	250ft.	92285	

FEATURES

- it is suited for universal workshop operations

APPLICATION INFORMATION

- Profiles for thick wall tube, alloy steel, single, layer and bundle cutting steel girders



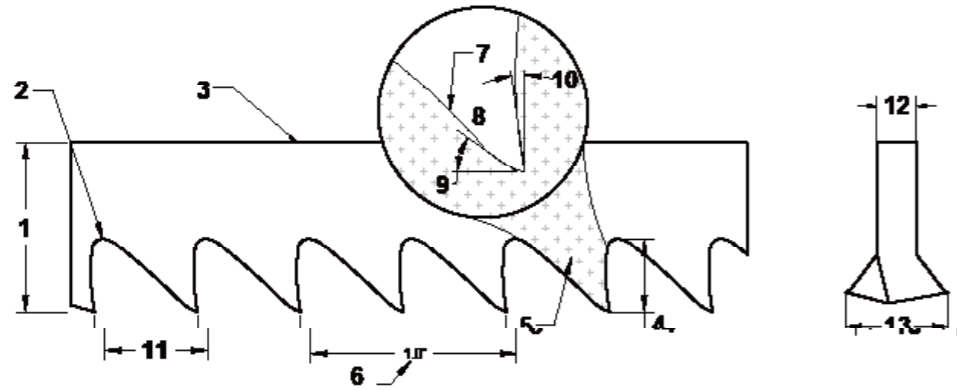
Positive Rake



Bi-metal Bandsaw Blades(M42)

Technical Information Band Saws

Terminology



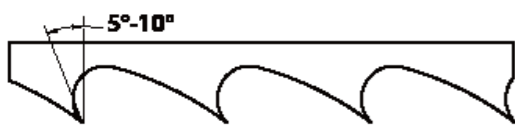
- 1) Width
The nominal dimension of a saw blade, as measured from the tip of the tooth to the back of the blade.
- 2) Gullet
The curved area at the base of the tooth.
- 3) Blade Back
The blade body, not including the tooth portion.
- 4) Gullet Depth
The distance from the tooth tip to the bottom of the gullet.
- 5) Tooth
The cutting portion of the saw blade.
- 6) TPI
The number of teeth per inch.
- 7) Tooth Back or Relief Angle
The surface of the tooth opposite the cutting edge, or tooth face.
- 8) Tooth Face or Rake Angle
The cutting surface of the tooth.
- 9) Tooth Back Clearance Angle
The angle of the tooth back measured in relation to the cutting direction of the saw.
- 10) Tooth Rake Angle
The angle of the tooth face measured with respect to a line perpendicular to the cutting direction of the saw.
- 11) Tooth Pitch
The distance from one tooth tip to the next tooth tip.
- 12) Thickness (Gage)
The thickness of the blade.
- 13) Tooth Set
The bending of the teeth from right to left to allow clearance (kerf) of the blade back through the cut.

Tooth Form

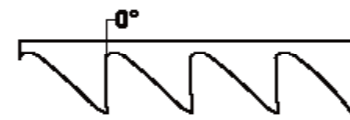
Positive Rake
A positive rake is characterized by a 5° to 10° rake angle on the tooth face, resulting in better tooth penetration and easier chip formation. This tooth form is recommended for cutting difficult to machine materials, solid cross-sections.

Standard Straight
A standard straight tooth has a 0° cutting face, and is recommended for cutting easy-to-cut, low alloy materials. This is an efficient tooth form for cutting structural materials and interrupted cuts.

Positive Rake



Standard Straight Rake



Tooth Type

Regular
This is a conventional tooth with a 0° cutting angle, ideal for a wide range of general purpose cutting applications.

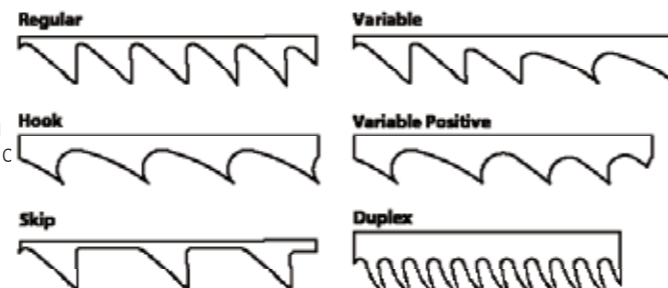
Hook
This tooth type has a 10° positive rake angle for fast cutting with less feed pressure. The rounded, deeper gullets allow for fast chip removal, and is generally used for cutting nonmetallic and non-ferrous metals.

Skip
This tooth type has a 0° rake angle with shallow gullets and evenly spaced teeth for efficient chip removal. It is used for cutting large sections of soft, non-ferrous metal and nonmetal material, such as wood, composition materials, cork, and plastic.

Variable
A traditional tooth form that offers a 0° rake angle, varying gullet depths, and tooth sizes. Designed to reduce harmonic vibration, this blade efficiently removes chips, extending blade life in solids and structurals.

Variable Positive
Variable positive tooth form offers varying gullet depth, tooth sizes, and a positive rake angle for maximum cutting speeds and better tooth penetration in harder to machine materials.

Duplex
Duplex blades offer deep, chip clearing gullets, large chip-resistant teeth, and a high positive rake angle. This results in faster sawing rates, and improved finishes. Duplex blades are recommended for production cutting of work hardened metals, tool steels, and exotic alloys.



Tooth Set

Raker Set
These are individually set teeth – first right then left – followed by an unset tooth. The unset tooth (raker tooth) allows for fast chip removal and a straight cutting actions. This tooth set is recommended for general purpose cutting applications.

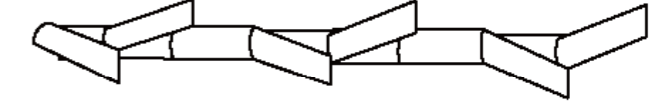
Wavy Set
Wavy set teeth are set in groups, right and left, in varying degrees. Wavy set teeth are recommended for cutting light metal sections, such as sheet, tubing, and small solid shapes.

Alternate Set
In an alternate tooth set, every tooth is set – one left, one right – throughout the blade length. This tooth set is primarily used for cutting wood.

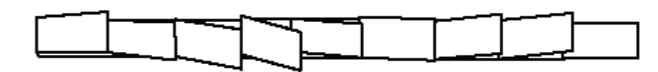
Variable Set
Variable set teeth are set in alternating groups with a single unset tooth (raker tooth). When these are combined with the varying set angles of the teeth, a faster, smoother, quieter cutting action is achieved. Variable tooth blades perform extremely well on most applications and provide fast cutting on solids, shapes, structurals, and piping.

Technical Information Band Saws

Raker Set



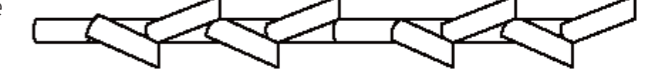
Wavy Set



Alternate Set



Variable Set



Guidelines

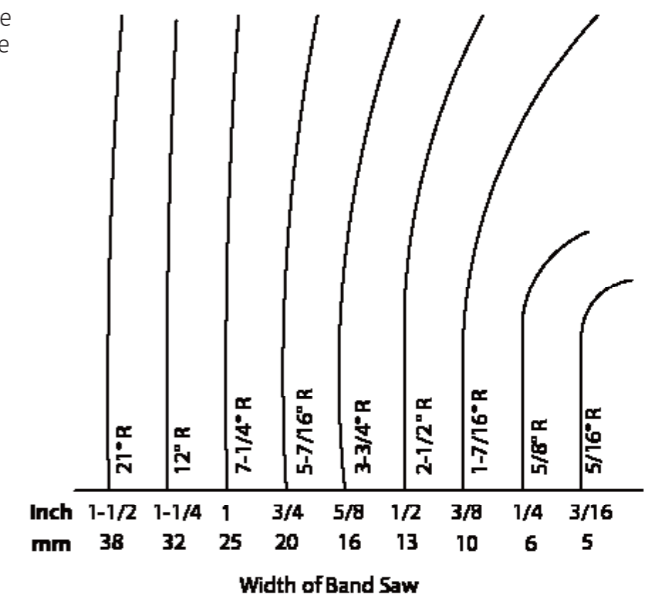
Blade Width Selection

The dimension from tooth tip to back edge of the blade is the blade width. The greater the width, the greater the resistance to deflection while cutting. For straight cutting applications, use the widest blade the machine can accept. For contour cutting use the widest blade that the contour radius will permit, see Minimum Radii Cutting Chart to the right.

Radii in this chart are based on manual feeding of one-inch thick milled steel. To cut close tolerance radii the following factors must be considered:

- Blade width
- Material thickness
- Machinability
- Feed force
- Location of pivot point

Minimum Radii Cut Chart



Successful Bandsaw Operation

Teeth Per Inch

The pitch of the blade is defined by the number of TPI (Teeth Per Inch). Non-ferrous materials such as brass, bronze, and aluminum require a large chip area. A low TPI, or "course" pitch, prevents the chips from clogging and binding together in the gullets, which can diminish sawing and damage the blade.

On thin walled pipe, tubing, and sheet, many teeth per inch are required in order to avoid damaging or breaking the teeth. A low TPI blade is the best blade for cutting large cross-sections. The ability of each tooth to cut into the workpiece is increased because the saw's feed pressure is distributed over fewer teeth. A coarse pitch blade increases productivity and provides large chip clearing gullets.

Blade Break-In

Set Bandsaw machine at recommended speed for material to be cut. When cutting easily machined metals, cutting rate should be set at 1/3 to 1/2 the recommended rate for the first 50 to 75 square inches.













When cutting difficult to machine metals, such as tool steels or workhardened alloys, set cutting rate at 3/4 of the recommended rate for the first 25 square inches. Gradually increase the feed until you achieve the recommended cutting rate after 50 to 60 square inches.

Technical Information Band Saws

Tooth Selection

Tooth selection is based on the principle that there is a tooth pitch best suited for the cutting job. Blade selections should be based on the size, shape, accuracy, materials, and cutting rate expected. The chart below will help you select the correct pitch for cutting solids, tubes, and structurals.

Keep in mind these numbers: 3, 6, 12, and 24. There should be a minimum of three teeth in the work at all times for bi-metal bands. Ideally, 6-12 teeth should be in contact with the work; 24 teeth in the work is too many.

Solids		Structural		Tubing	
Cross-section	Pitch	Cross-section	Pitch	Wall Thickness	Pitch
	1/4"		1/4" - 1/2"		1/4" - 1/2"
	10/14 TPI 14 TPI		10/14 TPI 10 TPI 8/12 TPI		10 TPI 10/14 TPI 8/12 TPI
	3/8" - 3/4"		1/2" - 3/4"		1/2" - 3/4"
	8/12 TPI 10 TPI 8 TPI		8 TPI 6/10 TPI 5/8 TPI		8 TPI 6/10 TPI 5/8 TPI
	3/4"-1-1/2"		3/4" - 1"		3/4" - 1"
	4/6 TPI 6 TPI 5/8 TPI		4/6 TPI 5/8 TPI 6 TPI		4/6 TPI 6/10 TPI 6 TPI
	1-1/2" - 3"				
	4/6 TPI 4 TPI 3/4 TPI				
	3" - 6"				
	2/3 TPI 3/4 TPI 3 TPI				
	6" - 10"				
	2 TPI 2/3 TPI				
	10" - 14"				
	.75 TPI .8/1.5 TPI				

Feed Pressure

Chips tell you what is happening with your feed pressure and your blade. Powdery or fine chips indicated not enough feed pressure is being applied. Loosely curled chips tell you everything is going well. Heavy or thick / blue burned chips mean you're pushing the blade to hard, creating too much heat and load for the teeth. If a change in feed or speed rates is required, change one at a time and observe the

Correct
Loosely Curled Chip
Correct feed speed



Incorrect

Thin or powdery chips
Increase feed speed



Heavy, thick, blue chips
Reduce feed speed



Tech Tip



Tips On Bandsaw Cutting

Machine Checklist

- The blade tension on the tension meter.
- The performance of the chip brush.
- The wear and alignment of the blade guides.
- The band speed with a tachometer.
- The cutting fluid concentration with a refractometer.

Cutting Fluid

The cutting fluid keeps the blade teeth cool; it prevents the chips from welding to the tooth; it also lubricates the chips, allowing them to move through the cut.

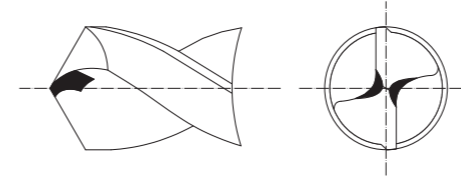
- Use a high quality cutting fluid.
- Make sure the cutting fluid is distributed throughout the cut.

Technical Information Band Saws

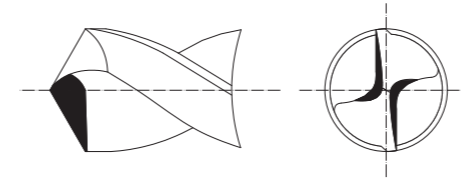
Problem	Reason	Solution
Premature and excessive tooth wear	Feed pressure too light	Increase feed pressure
	Band saw too slow	Adjust band speed
	Insufficient coolant, improper coolant mix, or wrong coolant	Apply proper coolant for type material being cut, check flow of coolant
	Improper tooth selection	Call Greenfield Industries for additional information
	Feed pressure too high	Call Greenfield Industries for additional information
Tooth Strippage	Guides hitting teeth alignment	Check blade
	Improper break-in with new band	Feed should be reduced for first few cuts
	Teeth too coarse for material thickness	Select finer pitch
	Material not securely vised	Adjust clamping pressure
	Insufficient or improper coolant	Apply proper coolant for type material begin cut, check flow of coolant
Finished Surface too Rough	Excessive feed pressure	Reduce feed pressure
	Band speed too slow	Increase band speed
	Chips loaded in gullet	Replace or adjust chip brush
	Improper blade selection	Select finer pitch
	Band speed too slow	Adjust band speed
Premature Blade Breakage	Feed rate too high	Slow down feed rate
	Improper coolant for type of material being cut	Apply proper coolant
	Thickness of blade too heavy for diameter of wheels	Select thinner blade
	Band tension too high	Adjust tension
	Improper speed	Call Greenfield Industries for additional information
Cutting Rate too Slow	Excessive feed pressure	Reduce feed pressure
	Brittle weld	Increase annealing period, decreasing heat gradually
	Saw out of alignment	Get machine properly re-aligned
	Improper coolant	Apply proper coolant for type of material being cut
	Band wheels worn	Replace wheels
Gullets Loading with Chips	Incorrect band speed	Adjust band speed
	Incorrect feed pressure	Adjust feed pressure
	Blade pitch too fine	Select coarser pitch blade
	Excessive cutting speed	Reduce cutting rate
	Blade pitch too fine	Select coarse pitch
Band Squeals	Chip brush not working	Replace or adjust chip brush
	Insufficient coolant, improper coolant mix, or improper coolant	Apply proper coolant for type of material being cut, check flow of coolant
	Feed rate too slow	Increase feed rate
	Insufficient coolant flow	Check coolant flow
	Blade tension	Check blade tension with tension meter
Belly Shaped Cuts	Guide arm is too far from work piece	Adjust guides closer to work piece
	Blade pitch too fine	Select coarser pitch blade
	Excessive feed force	Reduce feed force or feed rate
	Excessive feed force or feed rate	Reduce feed force or feed rate
	Possible hard inclusion	Use cutting oil to reduce leading
Blade Leading in Cut	Chip brush not working	Replace or adjust chip brush
	Blade tension too low	Check blade tension with tension meter
	Wrong width for radius being cut	Select a narrower blade
	Binding in cut	Adjust blade tension
	Saw guides too close to work piece	Adjust saw guides further from work
Band Develops Twist	Feed pressure too great	Reduce feed pressure
	Improper blade tension	Adjust blade tension
	Blade pitch too coarse for material being cut	Select finer pitch blade
	Improper blade tension	Adjust blade tension
	Excessive feed pressure	Reduce feed pressure
Band Stalls in Work	Blade pitch too fine	Select coarser pitch blade
	Improper guide adjustments	Adjust guides
	Band has side wear or grooving	Check saw guide inserts for wear and replace
	Improper alignment of saw guides	Adjust guides so they are square to front vise
	Worn guides	Replace guides
Burring or Mushrooming of Back Edge	Clicking noise against the saw guide backup bearing indicates there is a burr on the back edge of the band	Remove burr on the band
	Weld not in proper alignment	Reweld blade straight and true
	Saw guide backup bearing worn	Replace
	Improper blade tracking	Check band wheel alignment
	Band is riding on saw guide backup bearing too heavily	Adjust band alignment on top and bottom wheels
Band Develops Negative Camber	Excessive feed force	Reduce feed force
	Poor tooth penetration	Select a coarser pitch blade for increased tooth penetration
	Saw guide is too far from work piece or no locked	Adjust saw guides closer to work piece
	Guides poorly adjusted	Check guide adjustments
	Improper band speed	Increase or decrease band speed
Band Develops Positive Camber	Low blade tension	Increase blade tension
	Feed rate too low	Increase feed rate
	Blade pitch too coarse for material being cut	Select variable pitch blade
	Work piece not properly secured	Adjust clamping pressure
	Excessive feed pressure	Reduce feed pressure
Blade Vibration	Excessive cutting speed	Reduce blade speed
	Chip brush not working	Replace or adjust chip brush
	Insufficient or improper coolant	Apply proper coolant for the type of material being cut, check coolant flow
	Excessive feed pressure	Reduce feed pressure
	Excessive cutting speed	Reduce blade speed
Chip Welding	Chip brush not working	Replace or adjust chip brush
	Insufficient or improper coolant	Apply proper coolant for the type of material being cut, check coolant flow
	Excessive feed pressure	Reduce feed pressure
	Excessive cutting speed	Reduce blade speed
	Chip brush not working	Replace or adjust chip brush

Technical knowledge and common problems

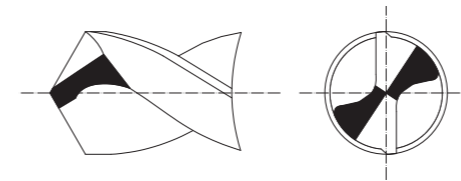
Point Thinning according to DIN 1412



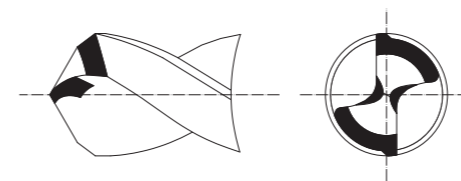
Form A - Web thinned



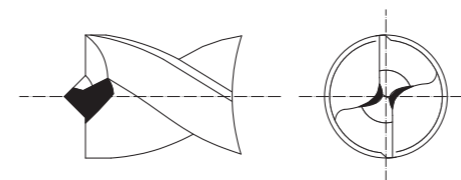
Form B - Web thinned with lip correction



Form C - Split Point



Form D - Double Angle for Cast Iron



Form E - Spot Weld Point

average cutting speed Vc in m/min	Diameter in mm							
	2.5	4.0	6.3	10.0	16.0	25.0	40.0	63.0
	Speed in r.p.m							
180	23,000	14,000	9,000	5,700	3,600	2,300	1,400	900
140	18,000	11,000	7,000	4,500	2,800	1,800	1,100	710
110	14,000	8,700	5,500	3,500	2,200	1,400	880	550
90	11,000	7,200	4,500	2,900	1,800	1,100	710	450
70	8,900	5,600	3,500	2,200	1,400	890	550	350
60	7,600	4,800	3,000	1,900	1,200	760	450	300
50	6,400	4,000	2,500	1,600	1,000	630	400	250
40	5,100	3,200	2,000	1,300	800	500	320	200
30	3,800	2,400	1,500	950	600	380	240	150
25	3,200	2,000	1,250	800	500	320	200	125
20	2,500	1,600	1,000	630	400	250	150	100
15	1,900	1,200	750	475	300	190	125	75
10	1,250	800	500	320	200	125	75	50
9	1,150	710	450	280	180	110	70	45
8	1,000	630	400	250	150	100	63	40
6	750	475	300	190	120	75	45	30
5	630	400	250	150	100	63	40	25
4	500	320	200	125	75	50	30	20
3	380	250	150	100	63	40	25	15

Drills

Taps

End Mills

Carbide Rotary Burrs

Saws

The Formula of working Conditions

$$V = \frac{\pi DN}{1,000}$$

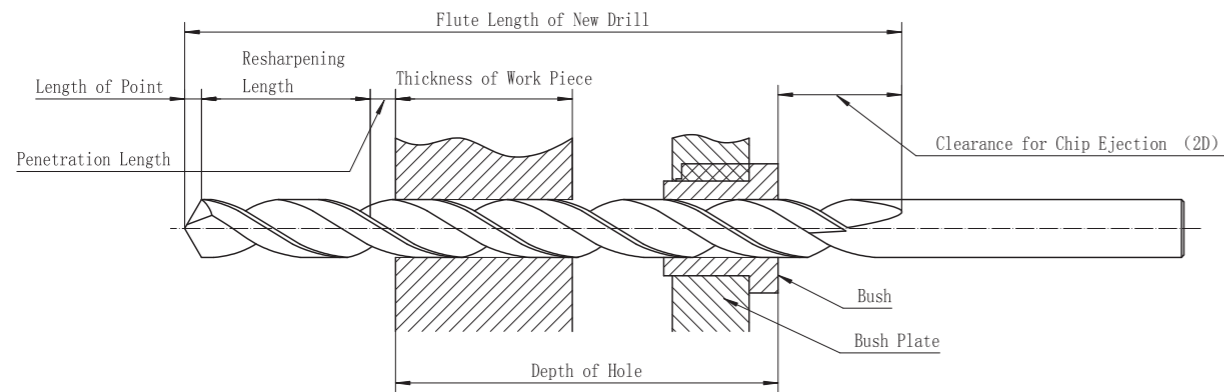
$$F = f \cdot N$$

- V: Cutting Speed (m/min)
- F: Feed/min (mm/min)
- D: Diameter (mm)
- N: Speed (min-1)
- π : the ratio of the circumference of a circle
- f: Feed rate/rev. (mm/rev)

The Calculation of Flute Length

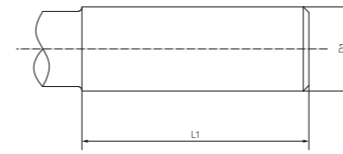
Similar to cutting speed, feed and cutting fluid, flute length is a critical determinant of tool life. Considering drilling depth, bush and resharpening requirements, flute length should usually be as short as possible. Unnecessarily long flute length can cause instability because of lower rigidity and possible twisting or/and deflection (depending on the holder). For most operations, suitable flute length can be calculated by using the following formula.

$$\text{Flute Length} = \text{Depth of Hole} + 2 \times D + \text{Resharpening Length} + \text{Penetration Length}$$



Straight Shanks according to DIN 6535

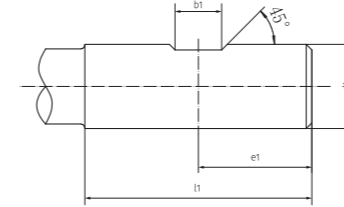
Form HA (Straight Shank)



Measurements Form HA (Straight Shank)

d_1	2	3	4	5	6	8	10	12	14	16	18	20	25	32
$l_1 \begin{smallmatrix} +2 \\ 0 \end{smallmatrix}$			28		36	40	45	48	50	56	60			

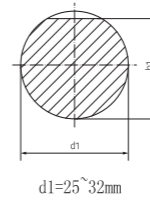
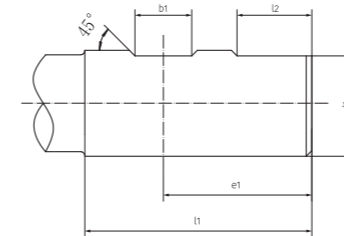
Form HB (Weldon)



Measurements Form HB (Weldon)

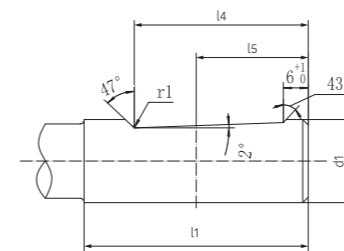
d_1	b_1	e_1	h_1	l_1	l_2
	+0.05	0		+2	+1
h_6	0	-1	h_{11}	0	0
6	4.2	18.0	5.1	36.0	
8	5.5		6.9		
10	7.0	20.0	8.5	40.0	
12			10.4		
14	8.0	22.5	12.7	45.0	
16			14.2		
18	10.0	24.0	16.2	48.0	
20	11.0	25.0	18.2	50.0	
25	12.0	32.0	23.0	56.0	17.0
32	14.0	36.0	30.0	60.0	19.0

$d_1 = 6 \sim 20 \text{ mm}$



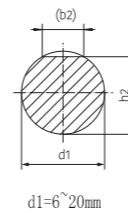
$d_1 = 25 \sim 32 \text{ mm}$

Form HE (Whistle Notch)

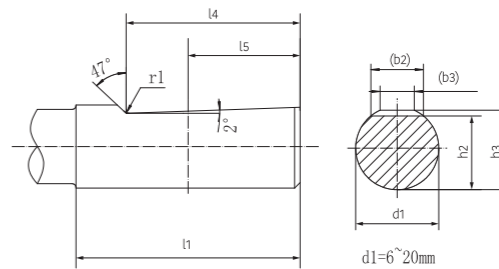


Measurements Form HE (Whistle Notch)

d_1	(b2)	(b3)	(h2)	(h3)	l_1	l_4	l_5	r_1	
6	4.3	--	5.1	--	36.0	25.0	18.0	1.2	
8	5.5	--	6.9	--	40.0	28.0	20.0		
10	7.1	--	8.5	--	45.0	33.0	22.5		
12	8.2	--	10.4	--	48.0	36.0	24.0		
14	9.1	--	12.7	--	50.0	38.0	25.0		
16	10.1	--	14.2	--	56.0	44.0	32.0		
18	10.8	--	16.2	--	60.0	48.0	35.0		
20	11.4	--	18.2	--					
25	13.6	9.3	23.0	24.1					1.6
32	15.5	9.9	30.0	31.2					



$d_1 = 6 \sim 20 \text{ mm}$



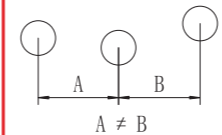
$d_1 = 6 \sim 20 \text{ mm}$

Tapping Drill sizes - Taps

ISO Coarse Thread		ISO Fine Thread		Size		Tapping Hole-Φ mm	
Size	Tapping Hole-Φ mm	Size	Tapping Hole-Φ mm	Size	Tapping Hole-Φ mm	Size	Tapping Hole-Φ mm
M1 × 0.25	0.75	M1 × 0.2	0.80	M20 × 2.0	18.0	M42 × 3.0	39.0
M1.1 × 0.25	0.85	M1.1 × 0.2	0.90	M20 × 1.5	18.5	M42 × 2.0	40.0
M1.2 × 0.25	0.95	M1.2 × 0.2	1.00	M20 × 1.0	19.0	M42 × 1.5	40.5
M1.4 × 0.3	1.10	M1.4 × 0.2	1.20	M22 × 2.0	20.0	M45 × 4.0	41.0
M1.6 × 0.35	1.25	M1.6 × 0.2	1.40	M22 × 1.5	20.5	M45 × 3.0	42.0
M1.7 × 0.35	1.35	M1.8 × 0.2	1.60	M22 × 1.0	21.0	M45 × 2.0	43.0
M1.8 × 0.35	1.45	M2 × 0.25	1.75	M24 × 2.0	22.0	M45 × 1.5	43.5
M2 × 0.4	1.60	M2.2 × 0.25	1.95	M24 × 1.5	22.5	M48 × 4.0	44.0
M2.2 × 0.45	1.75	M2.5 × 0.35	2.20	M24 × 1.0	23.0	M48 × 3.0	45.0
M2.3 × 0.4	1.90	M3 × 0.35	2.70	M25 × 2.0	23.0	M48 × 2.0	46.0
M2.5 × 0.45	2.10	M3.5 × 0.35	3.20	M25 × 1.5	23.5	M48 × 1.5	46.5
M2.6 × 0.45	2.15	M4 × 0.5	3.50	M25 × 1.0	24.0	M50 × 3.0	47.0
M3 × 0.5	2.50	M4.5 × 0.5	4.00	M26 × 1.5	24.5	M50 × 2.0	48.0
M3.5 × 0.6	2.90	M5 × 0.5	4.50	M27 × 2.0	25.0	M50 × 1.5	48.5
M4 × 0.7	3.30	M5.5 × 0.5	5.00	M27 × 1.5	25.5		
M4.5 × 0.75	3.80	M6 × 0.75	5.30	M27 × 1.0	26.0		
M5 × 0.8	4.20	M7 × 0.75	6.30	M28 × 2.0	26.0		
M6 × 1.0	5.00	M8 × 1.0	7.00	M28 × 1.5	26.5		
M7 × 1.0	6.00	M8 × 0.75	7.30	M28 × 1.0	27.0		
M8 × 1.25	6.80	M9 × 1.0	8.00	M30 × 3.0	27.0		
M9 × 1.25	7.80	M9 × 0.75	8.30	M30 × 2.0	28.0		
M10 × 1.5	8.50	M10 × 1.25	8.80	M30 × 1.5	28.5		
M11 × 1.5	9.50	M10 × 1.0	9.00	M30 × 1.0	29.0		
M12 × 1.75	10.3	M10 × 0.75	9.30	M32 × 2.0	30.0		
M14 × 2.0	12.0	M11 × 1.0	10.0	M32 × 1.5	30.5		
M16 × 2.0	14.0	M11 × 0.75	10.3	M33 × 3.0	30.0		
M18 × 2.5	15.5	M12 × 1.5	10.5	M33 × 2.0	31.0		
M20 × 2.5	17.5	M12 × 1.25	10.8	M33 × 1.5	31.5		
M22 × 2.5	19.5	M12 × 1.0	11.0	M35 × 1.5	33.5		
M24 × 3.0	21.0	M14 × 1.5	12.5	M36 × 3.0	33.0		
M27 × 3.0	24.0	M14 × 1.0	13.0	M36 × 2.0	34.0		
M30 × 3.5	26.5	M15 × 1.5	13.5	M36 × 1.5	34.5		
M33 × 3.5	29.5	M15 × 1.0	14.0	M38 × 1.5	36.5		
M36 × 4.0	32.0	M16 × 1.5	14.5	M39 × 3.0	36.0		
M39 × 4.0	35.0	M16 × 1.0	15.0	M39 × 2.0	37.0		
M42 × 4.5	37.5	M17 × 1.5	15.5	M39 × 1.5	37.5		
M45 × 4.5	40.5	M17 × 1.0	16.0	M40 × 3.0	37.0		
M48 × 5.0	43.0	M18 × 2.0	16.0	M40 × 2.0	38.0		
		M18 × 1.5	16.5	M40 × 1.5	38.5		
		M18 × 1.0	17.0	M42 × 4.0	38.0		

Trouble Shooting

Type of Trouble	Problem	Problem Origin / Solution (S)
Hole expansion	Large run out after attachment to the machine	1. Check holder and collect or select another suitable one
	Large spindle run out	2. Check the spindle
		3. Check run out after fix to the chuck
Irregular hole size	1. Non-symmetric point angle	1. Regrind correctly
	2. Large lip height	2. Check precision after regrinding
	3. Run out of chisel edge	
	4. Major margin wear	
Poor accuracy Irregular pitch	1. Large run out after attachment to the machine	1. Check holder and collect or select another suitable one
	Large spindle run out	2. Check the spindle
	2. Low work holding rigidity	3. Check run out after fix to the chuck
	Feed rate is too high	Decrease the feed rate
Not enough coolant liquid	Change method of coolant supply , or increase liquid's volume	
Poor alignment accuracy (lathing)	Large run out after attachment to the machine	1. Check holder and collect or select another suitable one
	Large spindle run out	2. Check the spindle
		3. Check run out after fix to the chuck
	Run out when cutting	1. Increase rigidity of tools and machines
		2. Increase work clamping rigidity
	3. Select a thinning for low cutting resistance	
	4. Use centering	
	5. Double-check that the work piece is horizontal use a drill bush	
	Poor alignment accuracy (lathing)	Re-check before working



Type of Trouble	Problem	Problem Origin / Solution (S)
Bad hole Perpendicularity	Excessive tool wear	Regrind correctly
	Poor position accuracy	Excessive tool wear
	1. Non-symmetric point angle	1. Regrind correctly
Bad cylindrical	2. Large lip height	2. Check precision after regrinding
	3. Run out of chisel edge	
	Not enough drill rigidity	Use rigidity drill
Poor alignment accuracy (lathing)	1. Drilling surface is not horizontal	1. The work piece must be horizontal or pre-drilled
	2. Poor alignment accuracy (lathing)	2. Use centering
	1. Non-symmetric point angle	1. Regrind correctly
	2. Large lip height	2. Check precision after regrinding
	3. Run out of chisel edge	
Run out when cutting	1. Large run out after attachment to the machine	1. Check holder and collect or select another suitable one
	Large spindle run out	2. Check the spindle
	2. Low work holding rigidity	3. Check run out after fix to the chuck
	Relief angle is too large	Regrind correctly
Not enough coolant liquid	Change method of coolant supply , or increase liquid's volume	


Trouble Shooting

Type of Trouble	Problem	Problem Origin / Solution (S)
Poor surface finish	Poor grinding	Regrind correctly
	Not suitable coolant for the material	1. Change method of coolant supply , or increase liquid's volume
	Not enough coolant liquid	2. Select higher quality coolant liquid
	Large run out after attachment to the machine	1. Check holder and collect or select another suitable one
	Large spindle run out	2. Check the spindle
Bad cylindrical shape	Feed rate is too high	Decrease the feed rate
	1. Excessive wear on cutting edge	1. Regrind correctly
	2. Build up on margin is too large	2. Use a coated tool
	Chip packing	1. Use the most suitable drill (consider flute form & helix angle) 2. Change cutting conditions (feed rate , try step feed)
Breakage	1. Non-symmetric point angle	1. Regrind correctly
	2. Large lip height	2. Check precision after regrinding
	3. Run out of chisel edge	
Difficulty entering the material	4. Major margin wear	Increase feed rate
	Feed rate is too low	
	Deflection and recess of machine and work material	Increase the rigidity of machine , drill and work clamping
	Relief angle is too small	Regrind correctly
	Feed rate is too high	Decrease the feed rate
	Excessive tool wear	Regrind
	Chip packing	1. Use the most suitable drill (consider flute form & helix angle) 2. Change cutting conditions (feed rate , try step feed)
Difficulty entering the material		1. Increase rigidity of tools and machines
		2. Increase work clamping rigidity
		3. Select a thinning for low cutting resistance
		4. Use centering
		5. Double-check that the work piece is horizontal Use a drill bush

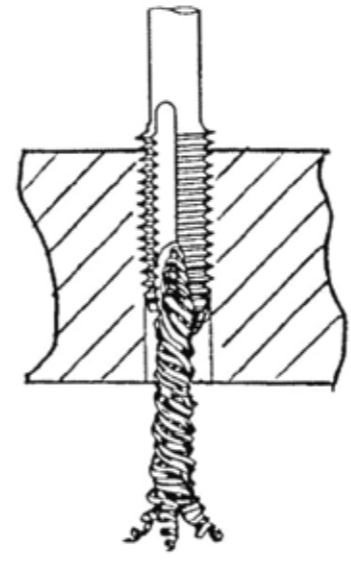
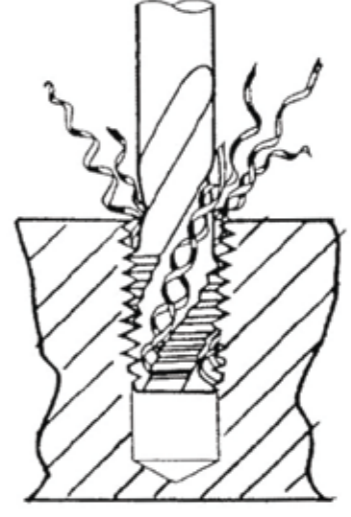
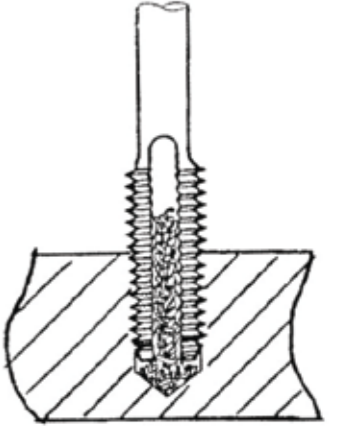
Trouble Shooting

Type of Trouble	Problem	Problem Origin / Solution (S)
Chipping of corner edge	Inappropriate tool material	Change tool's material
	Uneven hardness distribution on the work material	1. Use the most suitable too material 2. Change cutting conditions (feed rate , drilling speed) or machining method
	Drilling speed or feed rate too high	Reduce drilling speed or feed rate
Large run out after attachment to the machine	Not enough coolant	Change method of coolant supply , or increase liquid's volume
	Large spindle run out	1. Check holder and collect or select another suitable one
	Large spindle run out	2. Check the spindle
	Large spindle run out	3. Check run out after fix to the chuck
Abnormal wear on the cornerpart	Drilling speed or feed rate too high	Reduce drilling speed or feed rate
	Relief angle is too small	Regrind correctly
	Inappropriate tool material	Change tool's material
	Too wear of the drill	Regrinding should have occurred earlier
Wear, chipping and crushing of the chisel edge	Poor alignment accuracy (lathing)	Re-check before working
	Drilling speed or feed rate is too high	Reduce drilling speed or feed rate
	Point shape is inappropriate	Select correct point dimensions
	Inappropriate tool material	Change tool's material
	Inappropriate coolant type	Change coolant
Chipping of the margin	Feed rate is too high	Decrease the feed rate
	Point shape is inappropriate	Select correct point dimensions
	Inappropriate tool material	Change tool's material
Chipping of the margin	Relief angle is too small	Regrind correctly
	Bush size is too large	Select correct bush size

Trouble Shooting

Type of Trouble	Problem	Problem Origin / Solution (S)
Margin build-up	High heat generation due to large wear on the cutting edge	Regrind correctly
	Not enough coolant	Change method of coolant supply , or increase volume
	Coolant is not suitable	Change coolant
	Bad chip discharging ductile material	Change drills or cutting conditions
Tang breakage 	Shank slippage due to defect	Eliminate the defect
	Defective inner surface of morse taper holder	Change holders or correct the surface of the morse taper holder
	Inaccurate regrinding	Regrind correctly
Chattering sounds	Relief angle is too large	Regrind correctly
	Low tool rigidity	Use a more rigid drill
Chips roll around the drill	1. Long chips	Change drill and cutting conditions
	2. Chips are stuck in the flute	
One-sided wear	Poor alignment accuracy (lathing)	Re-check before working
	Large run out after attachment to machine	Decrease run out when fixing to the chunk

Flute forms and chip evacuation

Through Holes	Blind Holes	Blind Holes
<p>Taps with spiral point of left hand threads (right hand cutting) force the chips forward in the cutting direction and are particularly recommended for through hole tapping.</p> 	<p>Taps with spiral flute force the chips back out along the flutes and are recommended for blind holes.</p> 	<p>Straight flute taps are all round tools , producing short chips in brittle materials. They produce excellent results in Cast Iron and Brass.</p> 



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