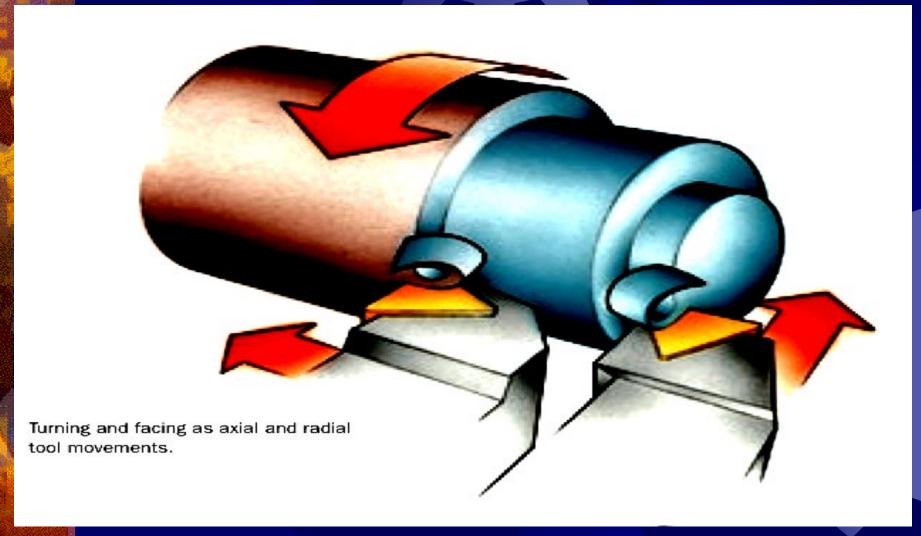
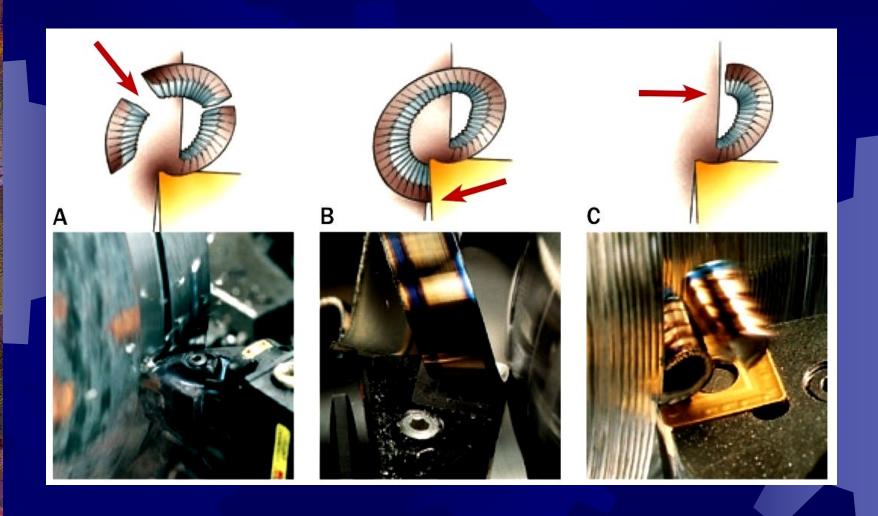
Beginning Machining

 Cutting Tools & Chip Formation

Basic Turning Concepts



Three Methods of Chip Breaking



Sample Lathe Cutting Tools







Common Types of Tool Bits

- High Speed Steel (Hand Ground)
- Sintered Carbide
- Indexible Carbide

Basic Carbide Insert Shapes

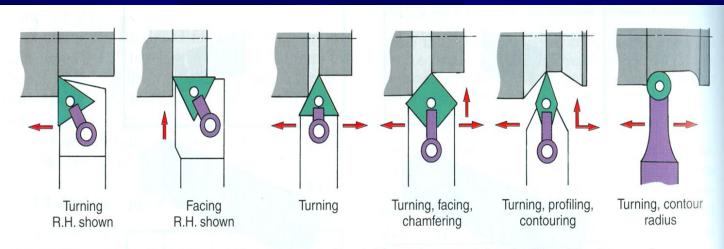
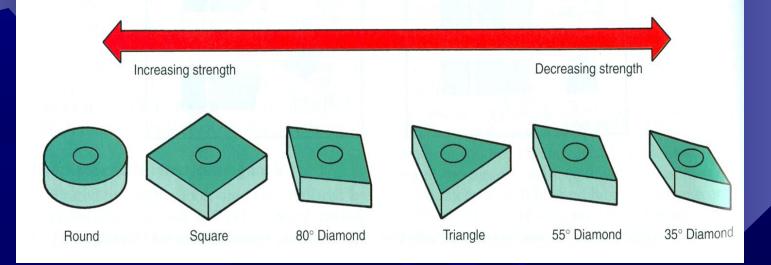


Figure 13-42. Indexable inserts are manufactured in a number of different shapes and sizes for different turning operations.



Carbide Identification

Identification chart

S	N		C				N	4
1	2	3					4	5
SHAPE	CLEARANCE	TOLERANCE CLASS					TYPE	SIZE (I.C.)
Parallelogram	N d		B A B	A	†	† A	\	
Parallelogram	0° ↓	Tolerance on Dimensions (± from nominal) Tolerance Dimension					}	
Diamond	3° ,	Tolerance Letter A B	B 0.0002 0.0002	0.0010 0.0010	0.00°		70°	→ 1.C.
Diamond Diamond	В	C D E F G	0.0005 0.0005 0.0010 0.0002 0.0010	0.0010 0.0010 0.0010 0.0005 0.0010	0.00° 0.00° 0.00° 0.00°	F		For equal sided inserts this indicates the inscribed circle
Diamond	5° 📜	H J K M	0.0005 0.0002 0.0005 0.0010	0.0005 * * * *	0.00° 0.00° 0.00°	C		(I.C.) in 1/8 of an inch. Examples:
Hexagon 120°	7°	U		<u></u> ⊢	90°	1/8" = 1 5/32" = 1.2		
Parallelogram	P	A E		B Class	J	90°	3/16" = 1.5 7/32" = 1.8 1/4" = 2	

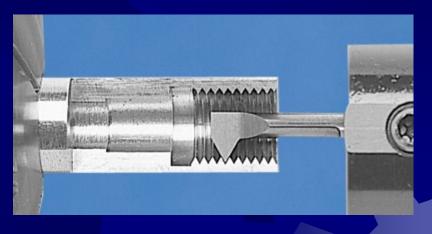
Insert Package

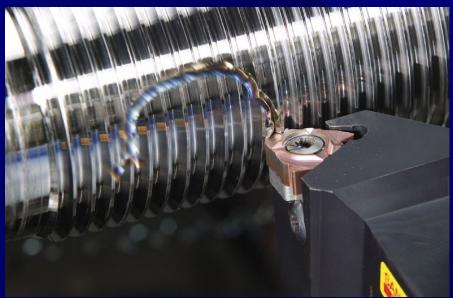




Additional Tools







Mill Tooling



Roughing Mill



2 Flue High Speed Steel Ball Mill

DATRON

Single Flute H.S.S. End Mill

Indexible End mills





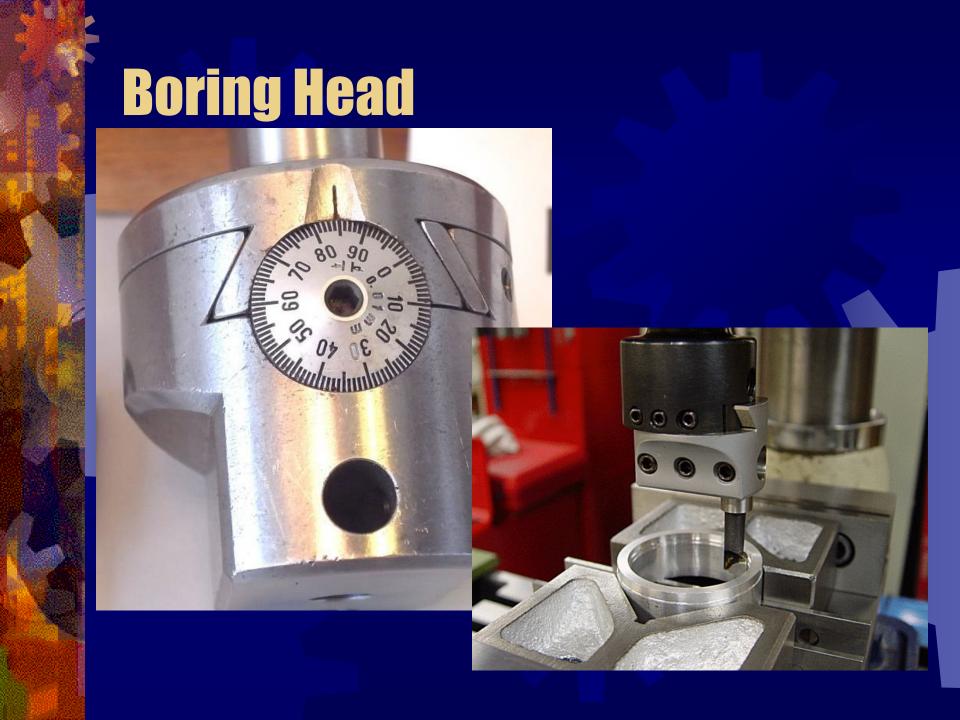
Face Mills/Fly Cutters











Drills







Drill Chart

		4	1420	
		56	.0430	
		56	.0465	0 - 80
		55	.0520	0 - 00
		54	.0550	
		1 53	.0595	1 - 64, 72
		16 52	.0625	
		51	.0670	
		50	.0700	2 - 56, 64
		49	.0730	
64		48	.0760 .0781	
64		47	.0785	3 - 48
		46	.0810	
		45	.0820	3 - 56
		44	.0860	4 - 40
	•	42	.0935	4 - 48
	32		.0938	
	32	41	.0960	
		40	.0980	
		39 38	.1015	5 - 40
		37	.1040	5 - 44
7		36	.1065	6 - 32
		35	.1094 .1100	
			.1110	
		34	.1130	6 - 40
			.1160	

	9	K		
19 64	12	M	.2900 .2950	
64	5	N	.2969 .3020 .3125	3/8 - 10
21	16	O _P	.3160	9/8 - 10
21 64 1	1	Q	.3281 .3320 .3390	3/8 - 24
11 32 23	2	S	.3438 .3480 .3580	
23 64	3	U	.3594 .3680	7/16 - 14
25 64	8	v	.3750 .3770 .3860	⁷ /16 - 20
	3	X	.3906 .3970 .4040	116 - 20
64	7	Z	.4062 .4130 .4219	1/2 - 13
29 64 1	16 5 2		.4375 .4531 .4688 .4844	1/2
33	1 2		.500	

Starrett

Precision, Quality and Innovation..

INCH/METRIC TAP DRILL SIZES & DECIMAL EQUIVALENTS

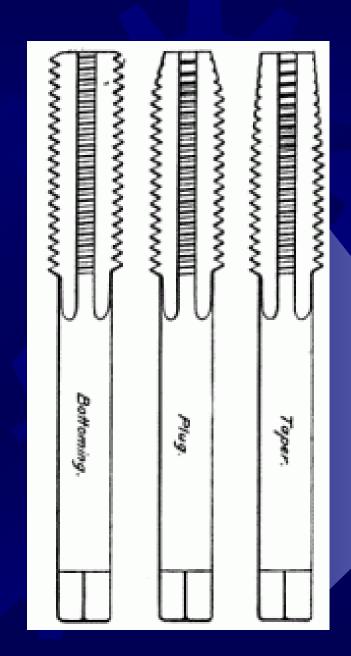
		1110 1711	DITIEL O		W DEG!	WILL EGG	,,,,,,,	
DRILL SIZE	DECIMAL EQUIVALENT	TAP SIZE	DRILL SIZE	DECIMAL EQUIVALENT	TAP SIZE	DRILL SIZE	DECIMAL EQUIVALENT	TAP SEE
1 7	0 .0135 9 .0145 .0156		10 9 8	.1935 .1960 .1990		59 64 15 61 16	.9219	1 - 12
7	8 .0160		13 7	.2010	1/4 - 20	64 31	.9531 .9688	1 - 14
7	7 .0180 6 .0200 5 .0210 4 .0225 3 .0240 2 .0250 1 .0260		6	.2031 .2040 .2055		63 32 64 1 -	.9844 1.0000	11/8 - 7
7	4 .0225 3 .0240		5 4 7 3	.2090	1/4 - 28	13/64 17/64	1.0469	11/8 - 12 11/4 - 7
7	2 .0250 1 .0260		32 2	.2130 .2188 .2210		111/64	1.1250	11/4 - 12
6	0 .0280 9 .0292		15 A	.2280		17/32 11/4-	1.2188 1.2500	13/8 - 6
20	8 .0310		64 B	.2344		1 ¹⁹ /64 1 ¹¹ /32	1.2969 1.3438	1 ³ /8 - 12 1 ¹ /2 - 6
6	7 .0320 6 .0330 5 .0350		1 0	.2420		127/64	1.3750 1.4219	11/2 - 12
6	4 .0360		4 F G	.2570	5/16 - 18	11/2-	1.5000	
ě	3 .0370 2 .0380 1 .0390		64 H	.2610 .2656 .2660		METRIC TAP	TAP DRILL (mm	IZES DECIMAL (Inch)
5	0 .0400		ij	.2720	5/16 - 24	M1.6 x 0.35 M1.8 x 0.35	1.25 1.45	.0492
5	8 .0420		9 K	.2810		M2 x 0.4 M2.2 x 0.45	1.60 1.75	.0630 .0689
3 5	0465	0 - 80	i i	.2900		M2.5 x 0.45	2.05	.0807
5	5 .0520 4 .0550 3 .0595	4 64 70	64 ₅ N	.2969 .3020		M3 x 0.5 M3.5 x 0.6	2.50 2.90	.0984 .1142
46	3 .0595 .0625 2 .0635	1 - 64, 72	5 N 16 O	.3125	3/8 - 16	M4 x 0.7 M4.5 x 0.75	3.30 3.70	.1299 .1457
5	0 .0670	2 - 56, 64	64 Q	.3230 .3281	3/8 - 24	M5 x 0.8 M6 x 1	4.20 5.00	.1654 .1968
_ 4	9 .0730 8 .0760	2 00,01	11 R	.3320 .3390 .3438	-70 - 24	M7 x 1 M8 x 1.25	6.00	.2362
64	7 .0781	3 - 48	, P	.3480 .3580		M8 x 1	7.00	.2756
4	6 .0810 5 .0820	3 - 56	64 ₃ U	.3594 .3680	7/16 - 14	M10 x 1.5 M10 x 1.25	8.50 8.70	.3346 .3425
4	4 .0860 3 .0890 2 .0935	4 - 40 4 - 48	8 V	.3750 .3770		M12 x 1.75 M12 x 1.25	10.20 10.80	.4016 .4252
32	.0938	4-40	25 W	.3860 .3906 .3970	7/16 - 20	M14 x 2 M14 x 1.5	12.00 12.50	.4724 .4921
4	0 .0980 9 .0995 8 .1015		13 Y	.4040		M16 x 2 M16 x 1.5	14.00 14.50	.5512 .5709
3	7 .1040	5 - 40 5 - 44	27 32 Z	.4130 .4219	1/2 - 13	M18 x 2.5	15.50	.6102
64	6 .1065 .1094 5 .1100	6 - 32	29 16	.4375	1/2 - 20	M18 x 1.5 M20 x 2.5	16.50 17.50	.6496 .6890
3	5 .1100 4 .1110 3 .1130 2 .1160 1 .1200	6 - 40	64 1	.4688	9/16 - 12	M20 x 1.5 M22 x 2.5	18.50 19.50	.7283 .7677
3	2 .1160 1 .1200	0 - 40	33 2 64 17	.5000 .5156	9/16 - 18	M22 x 1.5 M24 x 3	20.50 21.00	.8071 .8268
8 3	0 .1250 0 .1285		35 32 64 9	.5312 .5469	5/8 - 11	M24 x 2 M27 x 3	22.00 24.00	.8661 .9449
9 2	9 .1360 8 .1405	8 - 32, 36	37 16 64 19	.5625 .5781 .5938	5/8 - 18	M27 x 2	25.00	.9843
64 2	.1406 7 .1440 6 .1470		39 32 64 5	.6094 .6250		M30 x 3.5 M30 x 2	26.50 28.00	1.0433 1.1024
2	5 .1495 4 .1520 3 .1540	10 - 24	41 8 64 21 43 32	.6406 .6562	3/4 - 10	M33 x 3.5 M33 x 2	29.50 31.00	1.1614 1.2205
20	.1562		64 11	.6719 .6875	3/4 - 16	M36 x 4 M36 x 3	32.00 33.00	1.2598 1.2992
	2 .1570 1 .1590	10 - 32	64 23	.7031 .7188		M39 x 4 M39 x 3	35.00 36.00	1.3780
1	9 .1660		64 3	.7344 .7500			HREAD SIZES (
	8 .1695 .1719 7 .1730		49 4 64 25 51 32	.7656 .7812	⁷ /s - 9	1/8 - 27	DRILL THE	EAD DRILL - 111/2 13/4
1	7 .1730 6 .1770 5 .1800	12 - 24	64 13 53 16	.7969 .8125	⁷ /s - 14	1/4 - 18 3/8 - 18		- 111/2 27/32
1	4 .1820 3 .1850	12 - 28	53 16 64 27 55 32 64 7	.8281 .8438 .8594		1/2 - 14 3/4 - 14	23/32 3 59/64 31/2	-8 31/4
3	.1875 2 .1890		64 7 57 8	.8594 .8750 .8906	1 - 8	1 - 111/2	15/32 4 ·	-8 41/4

Bulletin 1214-SM/S 05/10

tarrett.com

Taps/Threading





Misc Cutters

