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WHIT

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# DATHAN

TOOL & GAUGE CO. LTD



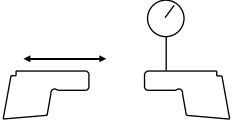
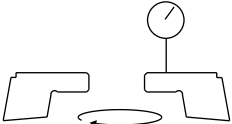
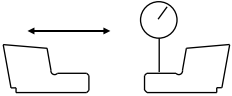
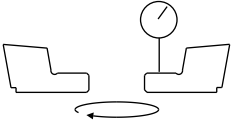
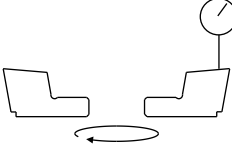
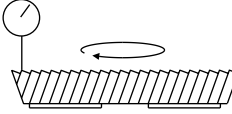
BS EN ISO 9002 1994  
Certificate No. FM 14642

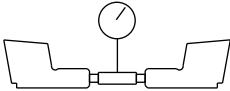
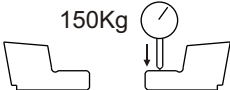
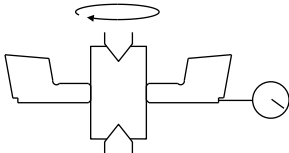
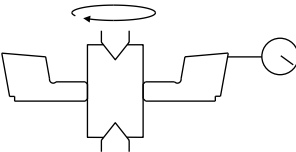
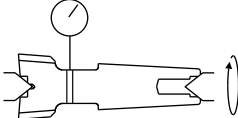
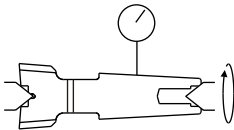
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PAGE No.	DESCRIPTION
4, 5	Tolerances for shaper cutter bodies.
6, 7	Tolerances for tooth errors.
8	Circular Pitch. Standard gear tooth proportion, full depth involute form.
9	Diametral Pitch. Standard Fellows stub.
10, 11	Module. Standard gear tooth proportion, full depth involute form.
12, 13	Diametral Pitch. Standard gear tooth proportion, full depth involute form.
14, 15	Cutters for internal gears - maximum number of teeth in cutter.
16, 17	Tangential measurements 14.5° P.A.
18, 19	Tangential measurements 20° P.A.
20, 21	Tangential measurements 25° P.A.

- 22, 23            Tangential measurements  $30^\circ$  P.A.
- 24                Formulae for spur gear teeth.
- 25                Formulae for helical gear teeth.
- 26, 27           Information required when ordering cutters.
- 28                Generation and life of Dathan gear shaper cutters.
- 29                Shaper cutter adaptors and sleeves.

# Tolerances For Gear Shaper Cutter Bodies

Tolerances are expressed in 0.001mm	Inspection elements	Symbol	Tolerance		
	Flatness of back radial	fn	AA	3	
			A	5	
	Flatness of back axial	fp1	<100 mm	AA	3
				A	5
			>100 mm	AA	5
				A	8
	Parallelism of clamping face to back radial	fp2	AA	3	
			A	5	
	Parallelism of clamping face to back axial	fp2	AA	3	
			A	5	
	Sharpening axial runout (Spur cutters)	fp3	<100 mm	8	
			>100 mm	10	
	Axial runout over cutting edge of helical teeth	fp3	30		

	Bore measurement	fc	H3
	Rockwell hardness	Hr.c.	See material spec.
	Runout of Ref. circle to bore	fr1	4
	Outside Dia. runout over tops of teeth	Fra	See chart on next page
	Runout of ref. circle to centres	fr1	3
	Runout of shank fitting to centres		3

# Tolerances For Tooth Errors

Tolerances are expressed in 0.001mm

	DIN 1829	Module >25 - 40				Module >16 - 25			
Ref. Dia. (mm)	Dia.	125-280		>280-560		125-280		>280-560	
Cutter Grade	Symbol	AA	A	AA	A	AA	A	AA	A
Profile angle error	ff	11	16	11	16	8	12	8	12
Profile form error	fha	8	10	8	10	5.5	8	5.5	8
Total profile error	Ff	14	20	14	20	10	14	10	14
Adjacent pitch error	fpfpe	8	11	8	11	6	8	6	8
Diff. between adjacent pitches	fu	10	14	10	14	8	10	8	10
Accumulative pitch error	Fp	16	22	18	28	16	22	18	25
Radial runout PCD / tip	FrFra	17	25	20	27	15	22	17	25
Tooth thickness error range	Rs	9	12	10	14	8	11	9	12

DIN 1829	Module >10 - 16						Module >6 - 10					
Dia.	50-125		>125-280		>280-560		50-125		>125-280		>280-560	
Symbol	AA	A	AA	A	AA	A	AA	A	AA	A	AA	A
ff	6	9	6	9	6	9	5	7	5	7	5	7
fha	4	6	4	6	4	6	3.5	5	3.5	5	6	4
Ff	8	11	8	11	8	11	6	8	6	8	6	8
fpfpe	4.5	6	6	9	7	10	3.6	5	4	5.5	4	6
fu	5.5	8	5.5	8	6	9	4.5	6	5	6.5	5	8
Fp	12	18	14	20	16	22	11	16	14	20	16	22
FrFra	12	17	14	19	15	22	11	15	12	17	14	19
Rs	6	9	7	10	8	11	5.5	8	6	9	7	10

DIN 1829	Module >3.55 - 6						Module >2 - 3.55					
	10-50		>50-125		>125-280		10-50		>50-125		>125-280	
Symbol	AA	A	AA	A	AA	A	AA	A	AA	A	AA	A
ff	4	5	4	5	4	5	3	4	3	4	3	4
fha	2	3	3	4	3	4	3	4	2	3	2	3
Ff	5	7	5	7	5	7	4	5	4	5	4	5
fpfpe	3	4	3	4	3.5	4.5	2.5	3.5	2.5	3.5	3	4
fu	4	5	4	5	4	5.5	3	4.5	3	4.5	3.5	5
Fp	8	12	10	16	12	18	8	11	10	14	12	16
FrFra	9	11	10	12	10	14	8	10	9	11	10	12
Rs	4	6	5	7	5.5	8	3.5	5	4.5	6	5	7

DIN 1829	Module >1 - 2						Module 0 - 1					
	10-50		>50-125		>125-280		10-50		>50-125		>125-280	
Symbol	AA	A	AA	A	AA	A	AA	A	AA	A	AA	A
ff	2	3	2	3	2	3	2	2.5	2	2.5	2	2.5
fha	2	3	2	3	2	3	2	2.5	2	2.5	2	2.5
Ff	3	4	3	4	3	4	2.5	3.5	2.5	3.5	2.5	3.5
fpfpe	2.5	3.5	2.5	4	3	4	2.5	3.5	2.5	3.5	3	4
fu	3	4.5	3	5	3.5	5	3	4.5	3.5	4.5	3.5	5
Fp	7	10	9	14	11	16	6.5	9	9	12	10	14
FrFra	7	10	8	10	9	11	6	9	7	10	8	10
Rs	3	4.5	3.5	5	4.5	6	2.5	4	3.5	4.5	4.5	6

# Standard Gear Tooth Proportion

## Full Depth involute form

inches

CIRCULAR PITCH

Circular Pitch	Circular Tooth Thickness	Addendum	Dedendum	Whole Depth
1/16	0.0312	0.0199	0.0249	0.0448
1/8	0.0625	0.0398	0.0497	0.0895
3/16	0.0937	0.0597	0.0746	0.1343
1/4	0.1250	0.0796	0.0995	0.1791
5/16	0.1562	0.0995	0.1243	0.2238
3/8	0.1875	0.1194	0.1492	0.2686
7/16	0.2187	0.1392	0.1741	0.3133
1/2	0.2500	0.1592	0.1989	0.3581
9/16	0.2812	0.1790	0.2238	0.4028
5/8	0.3125	0.1989	0.2487	0.4476
11/16	0.3437	0.2188	0.2736	0.4924
3/4	0.3750	0.2387	0.2984	0.5371
13/16	0.4062	0.2586	0.3233	0.5819
7/8	0.4375	0.2785	0.3482	0.6267
15/16	0.4687	0.2984	0.3730	0.6714
1	0.5000	0.3183	0.3979	0.7162
1 1/8	0.5625	0.3581	0.4476	0.8057
1 1/4	0.6250	0.3979	0.4974	0.8953
1 1/2	0.7500	0.4775	0.5968	1.0743



# Standard Fellows Stub Tooth Proportions

inches

DIAMETRAL PITCH

Diametral Pitch  Stub	Circular Tooth Thickness	Fellows Stub Teeth		
		Addendum	Dedendum	Full Depth
3/4	0.5236	0.2500	0.3125	0.5625
4/5	0.3927	0.2000	0.2500	0.4500
5/7	0.3142	0.1429	0.1786	0.3125
6/8	0.2618	0.1250	0.1563	0.2813
7/9	0.2244	0.1111	0.1389	0.2500
8/10	0.1964	0.1000	0.1250	0.2250
10/12	0.1571	0.0833	0.1042	0.1875
12/14	0.1309	0.0714	0.0893	0.1607
14/18	0.1122	0.0556	0.0694	0.1250
16/21	0.0982	0.0476	0.0591	0.1067
18/24	0.0873	0.0417	0.0520	0.0937
20/26	0.0785	0.0385	0.0482	0.0867
24/32	0.0655	0.0313	0.0395	0.0708

# Standard Gear Tooth Proportions

## Full Depth Involute Form

millimetres

MODULE

Module	Diametral Pitch	Circular Tooth Thickness	Addendum	Dedendum	Whole Depth
0.50	50.8000	0.7854	0.50	0.6250	1.1250
0.60	42.3333	0.9425	0.60	0.7500	1.3500
0.75	33.8666	1.1781	0.75	0.9375	1.6875
0.80	31.7500	1.2566	0.80	1.0000	1.8000
1.00	25.4000	1.5708	1.00	1.2500	2.2500
1.25	20.3200	1.9635	1.25	1.5625	2.8125
1.50	16.9333	2.3562	1.50	1.8750	3.3750
1.75	14.5142	2.7489	1.75	2.1875	3.9375
2.00	12.7000	3.1416	2.00	2.5000	4.5000
2.25	11.2888	3.5343	2.25	2.8125	5.0625
2.50	10.1600	3.9270	2.50	3.1250	5.6250
2.75	9.2363	4.3197	2.75	3.4375	6.1875
3.00	8.4666	4.7124	3.00	3.7500	6.7500
3.25	7.8153	5.1051	3.25	4.0625	7.3125
3.50	7.2571	5.4978	3.50	4.3750	7.8750
3.75	6.7733	5.8905	3.75	4.6875	8.4375
4.00	6.3500	6.2832	4.00	5.0000	9.0000
4.25	5.9764	6.6760	4.25	5.3125	9.5625
4.50	5.6444	7.0686	4.50	5.6250	10.1250
4.75	5.3473	7.4614	4.75	5.9375	10.6875
5.00	5.0800	7.8540	5.00	6.2500	11.2500
5.25	4.8380	8.2468	5.25	6.5625	11.8125
5.50	4.6181	8.6395	5.50	6.8750	12.3750

<b>Module</b>	<b>Diametral Pitch</b>	<b>Circular Tooth Thickness</b>	<b>Addendum</b>	<b>Dedendum</b>	<b>Whole Depth</b>
5.75	4.4174	9.0321	5.75	7.1875	12.9375
6.00	4.2333	9.4249	6.00	7.5000	13.5000
6.25	4.0640	9.8175	6.25	7.8125	14.0625
6.50	3.9076	10.2104	6.50	8.1250	14.6250
6.75	3.7629	10.6031	6.75	8.4375	15.1875
7.00	3.6285	10.9958	7.00	8.7500	15.7500
7.25	3.5034	11.3884	7.25	9.0625	16.3125
7.50	3.3866	11.7812	7.50	9.3750	16.8750
7.75	3.2774	12.1737	7.75	9.6875	17.4375
8.00	3.1750	12.5664	8.00	10.0000	18.0000
8.25	3.0787	12.9594	8.25	10.3125	18.5625
8.50	2.9882	13.3519	8.50	10.6250	19.1250
8.75	2.9028	13.7447	8.75	10.9375	19.6875
9.00	2.8222	14.1373	9.00	11.2500	20.2500
9.25	2.7459	14.5301	9.25	11.5625	20.8125
9.50	2.6736	14.9230	9.50	11.8750	21.3750
9.75	2.6051	15.3154	9.75	12.1875	21.9375
10.00	2.5400	15.7080	10.00	11.2500	21.2500
11.00	2.3090	17.2794	11.00	13.7500	24.7500
12.00	2.1167	18.8493	12.00	15.0000	27.0000
13.00	1.9538	20.4208	13.00	16.2500	29.2500
14.00	1.8143	21.9910	14.00	17.5000	31.5000

# Standard Gear Tooth Proportion

## Full Depth involute form

inches

DIAMETRICAL PITCH

Diametral Pitch	Circular Tooth Thickness	Addendum	Dedendum	Whole Depth
2	0.7854	0.5000	0.6250	1.1250
2¼	0.6981	0.4444	0.5555	0.9999
2½	0.6283	0.4000	0.5000	0.9000
2¾	0.5712	0.3636	0.4545	0.8181
3	0.5236	0.3333	0.4166	0.7499
3½	0.4488	0.2857	0.3571	0.6428
4	0.4270	0.2500	0.3125	0.5625
4½	0.3491	0.2222	0.2778	0.5000
5	0.3141	0.2000	0.2500	0.4500
6	0.2618	0.1666	0.2083	0.3749
7	0.2244	0.1429	0.1786	0.3215
8	0.1963	0.1250	0.1562	0.2812
9	0.1745	0.1111	0.1389	0.2500
10	0.1570	0.1000	0.1250	0.2250
11	0.1428	0.0909	0.1136	0.2045
12	0.1309	0.0833	0.1042	0.1875
13	0.1208	0.0769	0.0961	0.1730
14	0.1122	0.0714	0.0893	0.1607
15	0.1047	0.0666	0.0833	0.1499
16	0.0982	0.0625	0.0781	0.1406

Diametral Pitch	Circular Tooth Thickness	Addendum	Dedendum	Whole Depth
17	0.0924	0.0588	0.0735	0.1323
18	0.0873	0.0556	0.0694	0.1250
19	0.0827	0.0526	0.0658	0.1184
20	0.0785	0.0500	0.0625	0.1125
Pitches 24 DP And Finer To BS978 (2.4/DP) Full Depth				
24	0.0654	0.0417	0.0583	0.1000
26	0.0604	0.0385	0.0538	0.0923
28	0.0561	0.0357	0.0500	0.0857
30	0.0524	0.0333	0.0467	0.0800
32	0.0491	0.0312	0.0438	0.0750
34	0.0462	0.0294	0.0412	0.0706
36	0.0436	0.0278	0.0389	0.0667
38	0.0413	0.0263	0.0368	0.0631
40	0.0393	0.0250	0.0350	0.0600
42	0.0374	0.0238	0.0333	0.0571
44	0.0357	0.0227	0.0318	0.0545
46	0.0341	0.0217	0.0304	0.0521
48	0.0327	0.0208	0.0292	0.0500
50	0.0314	0.0200	0.0280	0.0480
60	0.0262	0.0167	0.0233	0.0400
64	0.0245	0.0156	0.0219	0.0375
72	0.0218	0.0139	0.0194	0.0333

# Maximum Number Of Teeth In Cutter For Internal Gears

No. Teeth In Gear	No. Teeth In Cutter											
	14.5°P.A.			20°P.A.			25°P.A.			30°P.A.		
	Full Depth Tooth	80% Stub	60% Stub	Full Depth Tooth	80% Stub	60% Stub	Full Depth Tooth	80% Stub	60% Stub	Full Depth Tooth	80% Stub	60% Stub
10	1.35	1.50	2.00	2.55	2.90	3.50	3.20	3.55	4.00			4.73
11	1.55	1.90	2.45	3.05	3.45	4.00	3.65	4.05	4.55			5.73
12	1.80	2.25	2.90	3.45	3.90	4.50	4.10	4.52	5.16		4.97	6.73
13	2.15	2.60	3.40	3.90	4.40	5.10	4.60	5.10	5.85		5.97	7.73
14	2.45	3.00	3.85	4.35	4.90	5.60	5.10	5.65	6.85		6.97	8.73
15	2.75	3.50	4.40	4.90	5.40	6.25	5.65	6.25	7.85	6.21	7.97	9.73
16	3.20	3.90	4.90	5.35	6.00	6.90	6.25	6.88	8.85	7.21	8.97	10.73
17	3.60	4.40	5.40	5.85	6.50	7.50	6.80	7.50	9.85	8.21	9.97	11.73
18	4.00	4.80	6.00	6.40	7.10	8.10	7.40	8.46	10.85	9.21	10.97	12.73
19	4.40	5.30	6.50	6.90	7.70	8.70	8.00	9.46	11.85	10.21	11.97	13.73
20	4.80	5.80	7.10	7.50	8.30	9.40	8.60	10.46	12.85	11.21	12.97	14.73
21	5.30	6.30	7.65	8.00	9.00	10.40	9.20	11.46	13.85	12.21	13.97	15.73
22	5.75	6.80	8.20	8.60	9.55	11.40	10.08	12.46	14.85	13.21	14.97	16.73
23	6.25	7.40	8.80	9.15	10.15	12.40	11.08	13.46	15.85	14.21	15.97	17.73
24	6.75	7.90	9.40	9.70	10.75	13.40	12.08	14.46	16.85	15.21	16.97	18.73
25	7.25	8.50	10.00	10.20	11.40	14.40	13.08	15.46	17.85	16.21	17.97	19.73
26	7.75	9.00	10.50	10.90	12.10	15.40	14.08	16.46	18.85	17.21	18.97	20.73
27	8.30	9.50	11.20	11.50	12.80	16.40	15.08	17.46	19.85	18.21	19.97	21.73
28	8.80	10.10	11.80	12.20	13.80	17.40	16.08	18.46	20.85	19.21	20.97	22.73
29	9.35	10.70	12.50	12.85	14.80	18.40	17.08	19.46	21.85	20.21	21.97	23.73
30	9.90	11.25	13.10	13.50	15.80	19.40	18.08	20.46	22.85	21.21	22.97	24.73
31	10.40	11.90	12.75	14.15	16.80	20.40	19.08	21.46	23.85	22.21	23.97	25.73
32	11.00	12.50	14.40	14.80	17.80	21.40	20.08	22.46	24.85	23.21	24.97	26.73
Note: For 30°P.A. flat root internal splines min difference = 5												
For 30°P.A. fillet root internal splines min difference = 7												

No. Teeth In Gear	No. Teeth In Cutter											
	14.5°P.A.			20°P.A.			25°P.A.			30°P.A.		
	Full Depth Tooth	80% Stub	60% Stub	Full Depth Tooth	80% Stub	60% Stub	Full Depth Tooth	80% Stub	60% Stub	Full Depth Tooth	80% Stub	60% Stub
33	11.50	13.10	15.10	15.40	18.80	22.40	21.08	23.46	25.85	24.21	25.97	27.73
34	12.10	13.70	15.75	16.27	19.80	23.40	22.08	24.46	26.85	25.21	26.97	28.73
35	12.65	14.30	16.50	17.27	20.80	24.40	23.08	25.46	27.85	26.21	27.97	29.73
36	13.25	14.90	17.20	18.27	21.80	25.40	24.08	26.46	28.85	27.21	28.97	30.73
37	13.80	15.50	17.90	19.27	22.80	26.40	25.08	27.46	29.85	28.21	29.97	31.73
38	14.40	16.20	18.68	20.27	23.80	27.40	26.08	28.46	30.85	29.21	30.97	32.73
39	15.00	16.80	19.68	21.27	24.80	28.40	27.08	29.46	31.85	30.21	31.97	33.73
40	15.65	17.50	20.68	22.27	25.80	29.40	28.08	30.46	32.85	31.21	32.97	34.73
42	16.85	18.75	22.68	24.27	27.80	31.40	30.08	32.46	34.85	33.21	34.97	36.73
44	18.15	20.10	24.68	26.27	29.80	33.40	32.08	34.46	36.85	35.21	36.97	38.73
46	19.40	21.50	26.68	28.27	31.80	35.40	34.08	36.46	38.85	37.21	38.97	40.73
48	20.65	22.90	28.68	30.27	33.80	37.40	36.08	38.46	40.85	39.21	40.97	42.73
50	21.90	24.40	30.68	32.27	35.80	39.40	38.08	40.46	42.85	41.21	42.97	44.73
52	23.25	26.24	32.68	34.27	37.80	41.40	40.08	42.46	44.85	43.21	44.97	46.73
54	24.50	28.24	34.68	36.27	39.80	43.40	42.08	44.46	46.85	45.21	46.97	48.73
56	25.85	30.24	36.68	38.27	41.80	45.40	44.08	46.46	48.85	47.21	48.97	50.73
60	28.65	34.24	40.68	42.27	45.80	49.40	48.08	50.46	52.85	51.21	52.97	54.73
64	31.80	38.24	44.68	46.27	49.80	53.40	52.08	54.46	56.85	55.21	56.97	58.73
68	35.80	42.24	48.68	50.27	53.80	57.40	56.08	58.46	60.85	59.21	60.97	62.73
72	39.80	46.24	52.68	54.27	57.80	61.40	60.08	62.46	64.85	63.21	64.97	66.73
76	43.80	50.24	56.68	58.27	61.80	65.40	64.08	66.46	68.85	67.21	68.97	70.73
80	47.80	54.24	60.68	62.27	65.80	69.40	68.08	70.46	72.85	71.21	72.97	74.73
85	52.80	59.24	65.68	67.27	70.80	74.40	73.08	75.46	77.85	76.21	77.97	79.73
90	57.80	64.24	70.68	72.27	75.80	79.40	78.08	80.46	82.85	81.21	82.97	84.73

# Tangential Measurement

14½° Pressure Angle

Chordal measurements in table are for 1DP

Other pitches: C/DP or C\*Module/25.4

A = No. of teeth in gear. B = Teeth spanned.

C = Span. (Inches)

A	B	C
10	2	4.6160
11	2	4.6213
12	2	4.6267
13	2	4.6321
14	2	4.6374
15	2	4.6428
16	2	4.6482
17	2	4.6535
18	2	4.6589
19	2	4.6643
20	2	4.6697
21	2	4.6750
22	2	4.6804
23	2	4.6858
24	2	4.6911
25	3	7.7380
26	3	7.7434
27	3	7.7488
28	3	7.7541
29	3	7.7595
30	3	7.7649
31	3	7.7702
32	3	7.7756

A	B	C
33	3	7.7810
34	3	7.7863
35	3	7.7917
36	3	7.7971
37	3	7.8024
38	4	10.8493
39	4	10.8547
40	4	10.8601
41	4	10.8654
42	4	10.8708
43	4	10.8762
44	4	10.8815
45	4	10.8869
46	4	10.8923
47	4	10.8976
48	4	10.9030
49	4	10.9084
50	5	13.9553
51	5	13.9060
52	5	13.9660
53	5	13.9714
54	5	13.9767
55	5	13.9821



A	B	C
56	5	13.9875
57	5	13.9929
58	5	13.9982
59	5	14.0036
60	5	14.0090
61	5	14.0143
62	5	14.0197
63	6	17.0666
64	6	17.0720
65	6	17.0773
66	6	17.0827
67	6	17.0881
68	6	17.0934
69	6	17.0988
70	6	17.1042
71	6	17.1095
72	6	17.1149
73	6	17.1203
74	6	17.1256
75	7	20.1725
76	7	20.1779
77	7	20.1833
78	7	20.1886
79	7	20.1940
80	7	20.1994
81	7	20.2047
82	7	20.2101
83	7	20.2155

A	B	C
84	7	20.2208
85	7	20.2262
86	7	20.2316
87	8	23.2785
88	8	23.2838
89	8	23.2892
90	8	23.2946
91	8	23.2999
92	8	23.3053
93	8	23.3107
94	8	23.3161
95	8	23.8214
96	8	23.3268
97	8	23.3322
98	8	23.3375
99	8	23.3429

# Tangential Measurement

20° Pressure Angle

Chordal measurements in table are for 1DP

Other pitches: C/DP or C\*Module/25.4

A = No. of teeth in gear. B = Teeth spanned.

C = Span. (Inches)

A	B	C
10	2	4.5683
11	2	4.5823
12	2	4.5963
13	2	4.6103
14	2	4.6243
15	2	4.6383
16	2	4.6523
17	2	4.6663
18	3	7.6324
19	3	7.6464
20	3	7.6604
21	3	7.6744
22	3	7.6885
23	3	7.7025
24	3	7.7165
25	3	7.7305
26	3	7.7445
27	4	10.7106
28	4	10.7246
29	4	10.7386
30	4	10.7526
31	4	10.7666
32	4	10.7806

A	B	C
33	4	10.7946
34	4	10.8086
35	4	10.8227
36	5	13.7888
37	5	13.8028
38	5	13.8168
39	5	13.8308
40	5	13.8448
41	5	13.8588
42	5	13.8728
43	5	13.8868
44	5	13.9008
45	6	16.8670
46	6	16.8810
47	6	16.8950
48	6	16.9090
49	6	16.9230
50	6	16.9370
51	6	16.9510
52	6	16.9650
53	6	16.9790
54	7	19.9452
55	7	19.9592

A	B	C
56	7	19.9732
57	7	19.9872
58	7	20.0012
59	7	20.0152
60	7	20.0292
61	7	20.0432
62	7	20.0572
63	8	23.0233
64	8	23.0373
65	8	23.0513
66	8	23.0654
67	8	23.0794
68	8	23.0934
69	8	23.1074
70	8	23.1214
71	8	23.1354
72	9	26.1015
73	9	26.1155
74	9	26.1295
75	9	26.1435
76	9	26.1575
77	9	26.1715
78	9	26.1855
79	9	26.1996
80	9	26.2136
81	10	29.1797
82	10	29.1937
83	10	29.2077

A	B	C
84	10	29.2217
85	10	29.2357
86	10	29.2497
87	10	29.2637
88	10	29.2777
89	10	29.2917
90	11	32.2579
91	11	32.2719
92	11	32.2859
93	11	32.2999
94	11	32.3139
95	11	32.3279
96	11	32.3419
97	11	32.3559
98	11	32.3699
99	12	35.3361

# Tangential Measurement

25° Pressure Angle

Chordal measurements in table are for 1DP

Other pitches: C/DP or C\*Module/25.4

A = No. of teeth in gear. B = Teeth spanned.

C = Span. (Inches)

A	B	C
10	2	4.5425
11	2	4.5697
12	2	4.5969
13	2	4.6240
14	2	4.6512
15	3	7.5256
16	3	7.5528
17	3	7.5800
18	3	7.6071
19	3	7.6343
20	3	7.6615
21	3	7.6886
22	4	10.5630
23	4	10.5902
24	4	10.6174
25	4	10.6445
26	4	10.6717
27	4	10.6989
28	4	10.7260
29	5	13.6005
30	5	13.6276
31	5	13.6548
32	5	13.6820

A	B	C
33	5	13.7091
34	5	13.7363
35	5	13.7635
36	6	16.6379
37	6	16.6650
38	6	16.6922
39	6	16.7194
40	6	16.7465
41	6	16.7737
42	6	16.8009
43	6	16.8281
44	7	19.7025
45	7	19.7296
46	7	19.7568
47	7	19.7840
48	7	19.8111
49	7	19.8383
50	7	19.8655
51	8	22.7399
52	8	22.7671
53	8	22.7942
54	8	22.8214
55	8	22.8486

A	B	C
56	8	22.8757
57	8	22.9029
58	9	25.7773
59	9	25.8045
60	9	25.8316
61	9	25.8588
62	9	25.8860
63	9	25.9131
64	9	25.9403
65	10	28.8147
66	10	28.8419
67	10	28.8691
68	10	28.8962
69	10	28.9234
70	10	28.9506
71	10	28.9777
72	11	31.8521
73	11	31.8793
74	11	31.9065
75	11	31.9336
76	11	31.9608
77	11	31.9880
78	11	32.0151
79	11	32.0423
80	12	34.9167
81	12	34.9439
82	12	34.9711
83	12	34.9982

A	B	C
84	12	35.0254
85	12	35.0526
86	12	35.0797
87	13	37.9541
88	13	37.9813
89	13	38.0085
90	13	38.0356
91	13	38.0628
92	13	38.0900
93	13	38.1171
94	14	40.9916
95	14	41.0187
96	14	41.0459
97	14	41.0731
98	14	41.1002
99	14	41.1274

# Tangential Measurement

30° Pressure Angle

Chordal measurements in table are for 1DP

Other pitches: C/DP or C\*Module/25.4

A = No. of teeth in gear. B = Teeth spanned.

C = Span. (Inches)

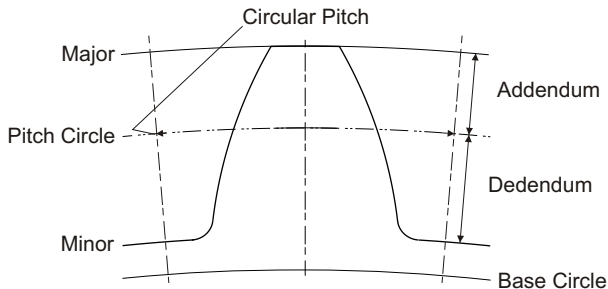
A	B	C
10	2	4.5466
11	2	4.5931
12	3	7.3603
13	3	7.4069
14	3	7.4534
15	3	7.5000
16	3	7.5466
17	3	7.5931
18	4	10.3603
19	4	10.4069
20	4	10.4534
21	4	10.5000
22	4	10.5466
23	4	10.5931
24	5	13.3603
25	5	13.4069
26	5	13.4534
27	5	13.5000
28	5	13.5466
29	5	13.5931
30	6	16.3603
31	6	16.4069
32	6	16.4534

A	B	C
33	6	16.5000
34	6	16.5466
35	6	16.5931
36	7	19.3603
37	7	19.4069
38	7	19.4534
39	7	19.5000
40	7	19.5466
41	7	19.5931
42	8	22.3603
43	8	22.4069
44	8	22.4534
45	8	22.5000
46	8	22.5466
47	8	22.5931
48	9	25.3603
49	9	25.4069
50	9	25.4534
51	9	25.5000
52	9	25.5466
53	9	25.5931
54	10	28.3603
55	10	28.4069

A	B	C
56	10	28.4534
57	10	28.5000
58	10	28.5466
59	10	28.5931
60	11	31.3603
61	11	31.4069
62	11	31.4534
63	11	31.5000
64	11	31.5466
65	11	31.5931
66	12	34.3603
67	12	34.4069
68	12	34.4534
69	12	34.5000
70	12	34.5466
71	12	34.5931
72	13	37.3603
73	13	37.4069
74	13	37.4534
75	13	37.5000
76	13	37.5466
77	13	37.5931
78	14	40.3603
79	14	40.4069
80	14	40.4534
81	14	40.5000
82	14	40.5466
83	14	40.5931

A	B	C
84	15	43.3603
85	15	43.4069
86	15	43.4534
87	15	43.5000
88	15	43.5466
89	15	43.5931
90	16	46.3603
91	16	46.4069
92	16	46.4534
93	16	46.5000
94	16	46.5466
95	16	46.5931
96	17	49.3603
97	17	49.4069
98	17	49.4534
99	17	49.5000

# FORMULAE FOR SPUR GEAR TEETH



## IMPERIAL (inch)

$$\text{Diametral Pitch (DP)} = 25.4 / \text{Mod}$$

$$\text{Pitch Circle Diameter (PCD)} = \text{No. of teeth} / \text{DP}$$

$$\text{Circular Pitch (CP)} = \text{PCD} / \text{No. of teeth}$$

$$\text{Base Circle Diameter (BCD)} = \text{PCD} \times \cos \text{Pressure Angle (PA)}$$

## METRIC (mm)

$$\text{Module (Mod)} = 25.4 / \text{DP}$$

$$\text{Pitch Circle Diameter (PCD)} = \text{No. of teeth} \times \text{Mod}$$

$$\text{Circular Pitch (CP)} = \text{PCD} / \text{No. of teeth}$$

$$\text{Base Circle Diameter (BCD)} = \text{PCD} \times \cos \text{PA}$$



# FORMULAE FOR HELICAL GEARS

## IMPERIAL (inch)

$$\text{Transverse DP (TDP)} = \text{NDP} \times \text{Cos Helix Angle (HA)}$$

$$\text{PCD} = \frac{\text{No. Of teeth}}{\text{TDP}}$$

$$\text{Transverse Pressure Angle (TPA)} = \text{Tan}^{-1}(\text{Tan NPA} / \text{Cos HA})$$

$$\text{Lead} = \frac{\text{PCD} \times \text{ }}{\text{Tan Helix Angle}}$$

$$\text{Base Circle Diameter} = \text{PCD} \times \text{Cos TPA}$$

$$\text{Base Helix Angle} = \text{Tan}^{-1}(\text{Tan HA} / \text{Cos TPA})$$

$$\text{Transverse Circular Pitch (TCP)} = \text{ } / \text{TDP}$$

$$\text{Normal Circular Pitch (NCP)} = \text{ } / \text{NDP}$$

## METRIC (mm)

$$\text{Transverse Module (TMod)} = \text{NMod} / \text{Cos Helix Angle (HA)}$$

$$\text{PCD} = \text{No. Of teeth} \times \text{Mod}$$

$$\text{Lead} = \frac{\text{PCD} \times \text{ }}{\text{Tan Helix Angle}}$$

$$\text{Base Circle Diameter} = \text{PCD} \times \text{Cos TPA}$$

$$\text{Transverse Circular Pitch (TCP)} = \text{ } \times \text{TMod}$$

# INFORMATION REQUIRED WHEN ORDERING SHAPER CUTTERS

## BASIC INFORMATION

1. Quantity.
2. Type of cutter - Disc, EBB, Shank or Hub with Bore diameter or type of shank fitting required.
3. Pitch - (DP, CP or Module)
4. Pressure Angle.
5. PCD - Approximate pitch circle diameter or number of teeth.
6. Material.
7. Coating.

## STANDARD CUTTERS

8. Standard to which tooth proportions apply.

## NON-STANDARD CUTTERS

8. Where possible detailed component drawings must be supplied to allow our designers to consider any possible problems in the use of the designed tools.

## PART DETAILS (with tolerances)

9. Outside diameter.
10. Root diameter.
11. Circular tooth thickness, measurement over pins or span .
12. Start of active profile. (SAP)
13. State whether teeth are finish cut, shaved or ground.
14. Details of chamfer if required.

## HELICAL GEARS & WORMS

Further information required where cutters are required to cut single or double helical gears or worms.

16. Pitch. (normal or transverse)
17. Pressure angle. (normal or transverse)
18. Helix angle.
19. Lead of machine guides available.
20. Type of sharpening required. (normal, lip and chamfer, chip flow or cone)

In the case of double helicals, matched pairs of cutters will be supplied.

# RACK TYPE AND STRAIGHT BEVEL GENERATING CUTTERS

## BASIC INFORMATION

1. Quantity.
2. Pitch - (DP, CP or Module)
3. Pressure Angle.
4. Any none standard tooth proportions.
5. In all cases except for standard tools the detail drawings of the component must be supplied.
6. Type and make of machine for which the cutter is required.
7. Material.
8. Coating.

## STRAIGHT BEVEL GENERATING TOOLS

9. Roughing, finishing or completing.
  10. Double index type (for roughing only) and all special tools.
- If detailed component drawings are not available, the following information should also be given. Addendum, dedendum, circular thickness, face width, number of teeth and pitch angle.

## RACK TYPE CUTTERS

9. Standard to which gears are to be manufactured e.g. BS436 with a working depth of  $2.25/DP$  or Brown and Sharpe with a total working depth  $2.157/DP$ .
10. Any non-standard tooth proportions.
11. Method of cutting e.g. Single acting, double acting, double cutting or where necessary the use of upset cutters. (With or without bolt holes)

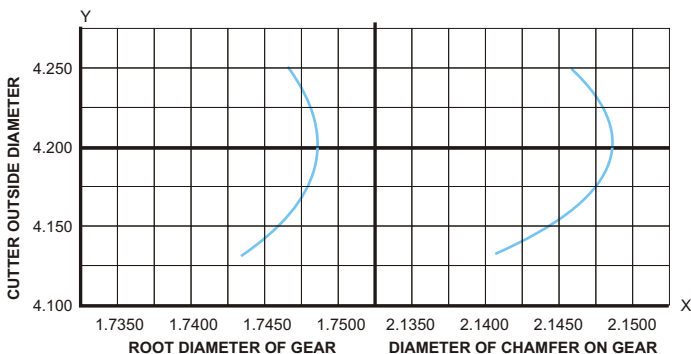
## HELICAL RACKS EXTRA INFORMATION

12. Helix angle. (RH or LH)
13. Pitch. (normal or transverse)
14. Pressure angle. (normal or transverse)
15. Type of sharpening required, e.g. Normal or lip and chamfer.

# GENERATION & LIFE OF DATHAN GEAR SHAPER CUTTERS

## GENERATION

All Dathan gear shaper cutters are FULLY generated to give maximum cutting performance and to maintain the accuracy of the profile generated throughout the life of the tool. This generation also allows Dathan's designers to optimise the design of the tool to keep a tighter tolerance on certain areas of the profile as required by the customer. (Start of active profiles, chamfers, fillets etc.)



## LIFE OF THE CUTTER

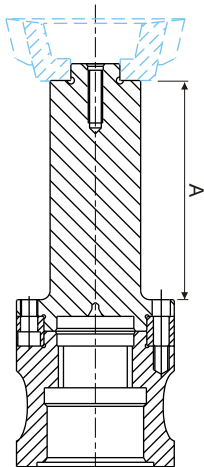
The above graph shows a typical root diameter and chamfer curve throughout the life of a shaper cutter.

The 'y' axis shows the outside diameter of the cutter as it reduces through re-sharpening. The 'x' axis shows the root diameter and chamfer diameter that are achieved corresponding to the amount of cutter re-sharpening.

These curves show higher variation for lower pressure angles e.g.  $14.5^\circ$  and reduces for higher pressure angles such as  $45^\circ$ . This variation of root diameter is usually the limiting factor on the life of lower pressure angle shaper cutters.

# SHAPER CUTTER ADAPTORS & SLEEVES

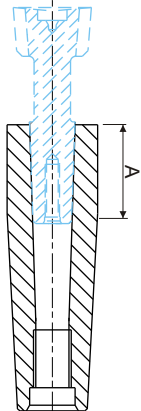
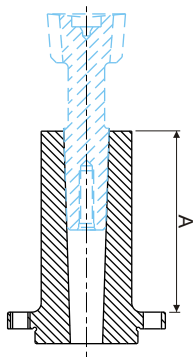
Dathan adaptors & sleeves are available to convert a hollow spindle machine to mount small bore or shank cutters with various tapers. Also to convert a fixed spindle with 1.25" bore and 1"X10 T.P.I. to mount shank or small bore type cutters.



Modular adaptor using a common body with 1.25" & 1"X10 T.P.I. Internal thread.

*Left:* Cutter mount 0.5", 0.625" or 0.75" bore.  
A' length 1" to 5".

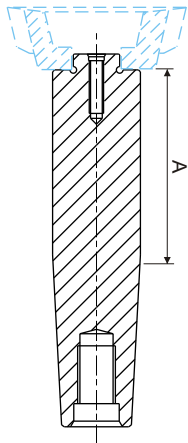
*Right:* Internal taper-Mikron, Nos. 1-4 Morse tapers and 11/16"-7/8" parallel fittings.



Fellows external taper adaptors.

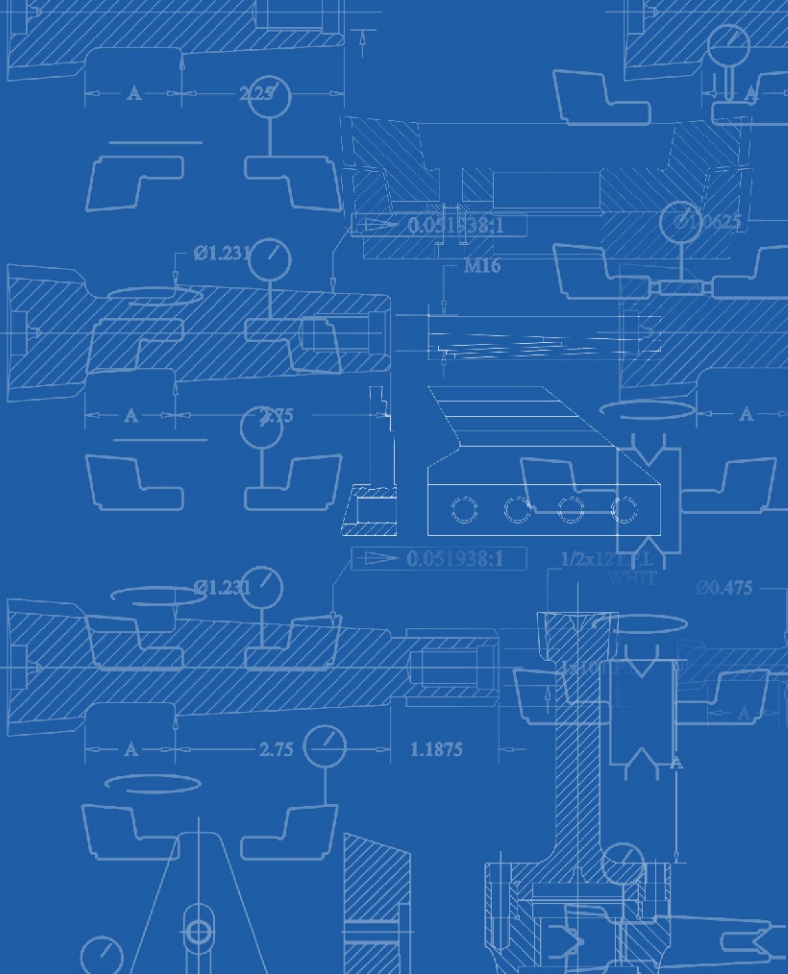
*Left:* Fellows external to No.1 or 2 Morse or Mikron taper.

*Right:* Fellows external to 0.5", 0.625" or 0.75" bore.









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