

PANTOGRAPH PUNCHCUTTING - TABLES FOR WIDTH OF CUT

In punchcutting, only the effective $\frac{1}{2}$ -cut is important, since only the distance from cutting edge to centerline is removed from punch.

ANGLE WITH CENTERLINE	TOTAL INCLUDED ANGLE	WHEN CUTTER LENGTH IS					Coefficient (tan of α)
		.010"	.020"	.030"	.040"	.050"	
3°45'	7°30'	.0006	.0013	.0019	.0026	.0032	.06554
7°	14°	.0012	.0024	.0036	.0048	.0060	.12278
10°	20°	.0017	.0034	.0052	.0070	.0088	.17633
15°	30°	.0026	.0053	.0080	.0107	.0133	.26795
22°30'	45°	.0041	.0082	.0124	.0165	.0207	.41421
30°	60°	.0057	.0115	.0173	.0230	.0288	.57735



FIRST CUT



FOURTH CUT



FINAL CUT

$\alpha = \frac{1}{2} \tan \alpha$

In the first cut, the distance of the cutting edge from the true (final) image is "3". If a constant-sized tracer or stylus is used, for a 10° angle with the center line, the distance would be .0070". The point of the cutter would be .0038" away from the image on all cuts, but the distances "1" "2" "3" diminish with the greater depth of cut.



cross-section of cutter

Although the cutter is ground on the face (s) for a given angle, it actually the edge (o) formed by two faces which does the cutting. For a 3-sided cutter, the side angle (s) = $\tan^{-1}(\frac{1}{2} \tan \theta)$ where θ is the $\frac{1}{2}$ angle of the groove cut.

included angle of groove	angle with centerline	3-facet angle or grinder setting	4-facet angle
60°	30°	16°6'	22°12'
45°	22°30'	11°42'	16°23'
30°	15°	7°33'	10°04'
20°	10°	5°2'	
15°	7°30'	3°46'	5°19'
7°30'	3°45'	1°53'	2°39'

For most practical purposes, then, the facet and edge angles are proportional 1:2, or the facet angle is half the edge angle. The $\frac{1}{2}$ -angle of groove cut is equal to the radius(R) at the given depth.

The preceding tables do not take into account the Reduction Ratios needed for computing follower or stylus size. The largest follower is used on cuts 1 to 5, when maximum depth of .050" is attained, including a slight safety margin. Thus (10° angle, 5:1 ratio) a follower of .100" diameter or .050" radius would be used for cuts 1 to 5. At cut 5, this would put the edge of the image or letter $\frac{1}{2}$.010" away from the edge of the cut. At the next cut (6), a follower of .090 diameter or .045 radius puts the image .0090 away from the cut and this is only .0002 short of the theoretical ideal of .0088.

To cut a counter .020" deep with a 7° cutter at 5:1 ratio, the centerline must be .0024 away from the image, and the stylus $\frac{1}{2}$ this amount, or .0120". This is the radius of the follower (the distance the stylus centerline must be held away from the pattern) so the follower diameter must be .0240 or, practically, .025.

Bear in mind always that the follower Radius computed must be doubled for the follower diameter.

STYLUS SIZES IN POINTS

STYLUS	SIZE IN POINTS	APPROXIMATE SIZE IN POINTS
.075"	5.44	5.5
.060"	4.35	4.25
.050"	3.62	3.5
.040"	2.9	3
.030"	2.17	2
.025"	1.83	1.75
.015"	1.08	1

STANDARD REDUCTION RATIOS (47 point MASTER)

size	10	12	(14)	18	24	30
master	47	47	47	47	47	47
ratio 1:	5	4	3.6	2.75	2	1.6
matrix	9.5	11.75	13	17	23.5	29.3

SPECIAL DISPLAY RATIOS (70 point MASTER)

size	14	18	24	30	36
master	70	70	70	70	70
ratio 1:	5	4	3	2.4	2
matrix	14	17.5	23.3	29.1	35

Depth of Drive: .050"



Chamfer: 30°

Thickness: 7 points

(.096")

Side bearing: 8 points
(.1107")



Head bearing

Length: 80 points

Width:
54 pts.

SIZE PTS.	STANDARD MONOTYPE		THOMPSON	
	HEAD BEARING	FOOT BEARING	HEAD BEARING	FOOT BEARING
12	32 pts.	36 pts	18 pts.	50 pts.
14	30	36	18	48
18	24	36	18	44
24	32	24	18	38
30	26	24	18	32
36	20	24	18	26
42			18	20
48			18	14

Thompson style matrices are used for 42 point and 48 point.

Monotype Thompson: Length 1.186" Width: .875" Thickness: .119"

Iwata-B-S Thompson: Length 1.125" Width: .875" Thickness: .125"