
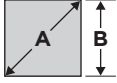
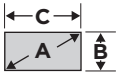
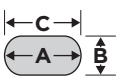
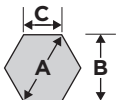
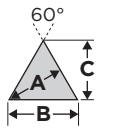
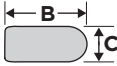
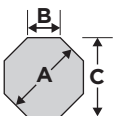
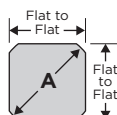


PUNCHING FORCE CHARTS

Tons = (L) Total Land Distance (in.) **x (T)** Material Thickness (in.) **x .25** **x (F)** Material Multiplication Factor **x (S)** Shear Factor (in.)
kN = (L) Total Land Distance (mm) **x (T)** Material Thickness (mm) **x .345** **x (F)** Material Multiplication Factor **x (S)** Shear Factor (mm)

1 Ton = 8.90 kN
1 kN = .112 Tons

TOTAL LAND DISTANCE (L)

"L" and "A" Dimensions		
ROUND		A = Diameter L = 3.14 x A
SQUARE		A = B x 1.414 L = 4 x B
RECTANGLE		A = $\sqrt{B^2 + C^2}$ L = 2 x (C + B)
OBROUND		A = C L = 2C + 1.14 B
HEXAGON		A = 1.155 x B or A = 2 x C L = 3 x A
EQUILATERAL		A = 1.155 x BB or A = 1.334 x C L = 3 x B
LONG "D"		A = $\sqrt{B^2 + C^2}$ L = 2C + 1.571B
OCTAGON		A = 1.082 x C or A = 2.613 x B L = 8 x B or L = 3.318 x C or L = 3.061 x A
QUAD D		A = Diameter L = 3.14 x A

MATERIAL THICKNESS (T)

Non-Ferrous		Gage No.	Steel Sheets	
Gage Decimal (mm)	Gage Decimal (in.)		Gage Decimal (in.)	Gage Decimal (mm)
5.827	.2294	3	.2391	6.073
5.189	.2043	4	.2242	5.695
4.620	.1819	5	.2092	5.314
4.115	.1620	6	.1943	4.935
3.665	.1443	7	.1793	4.554
3.264	.1285	8	.1644	4.176
2.906	.1144	9	.1495	3.797
2.588	.1019	10	.1345	3.416
2.304	.0907	11	.1196	3.030
2.052	.0808	12	.1046	2.657
1.829	.0720	13	.0897	2.278
1.628	.0641	14	.0747	1.897
1.450	.0571	15	.0673	1.709
1.290	.0508	16	.0598	1.519
1.151	.0453	17	.0538	1.367
1.024	.0403	18	.0478	1.214
0.912	.0359	19	.0418	1.062
0.813	.0320	20	.0359	0.912
0.724	.0285	21	.0329	0.836
0.643	.0253	22	.0299	0.759
0.574	.0226	23	.0269	0.683
0.511	.0201	24	.0239	0.607
0.455	.0179	25	.0209	0.531
0.404	.0159	26	.0179	0.455
0.361	.0142	27	.0164	0.417
0.320	.0126	28	.0149	0.378
0.287	.0113	29	.0135	0.343
0.254	.0100	30	.0120	0.305
0.226	.0089	31	.0105	0.267
0.203	.0080	32	.0097	0.246
0.180	.0071	33	.0090	0.229
0.160	.0063	34	.0082	0.208
0.142	.0056	35	.0075	0.191

MATERIAL MULTIPLICATION FACTOR (F)

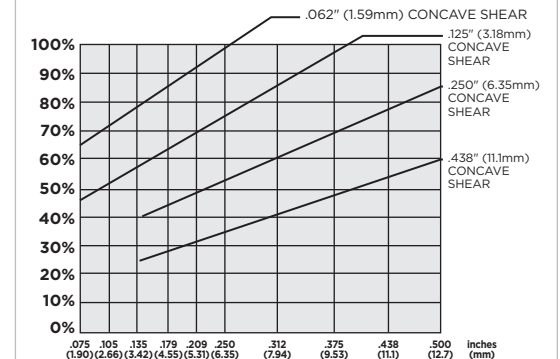
Material Description	Multiplier (F)
Aluminum-Soft Sheet	.30
Aluminum-Half Hard	.38
Aluminum-Hard	.50
Brass-Soft sheet	.60
Brass-Half Hard	.70
Copper-Rolled	.57
Steel-Mild	1.00
Steel-ASTM-A36	1.20
Steel-50 Carbon	1.40
Steel-Cold Drawn	1.20
Steel-Stainless	1.40
Spring Steel (Tempered)	4.00

Based on Mild Steel Shear Strength of 50,000 P.S.I. (345 MPa)

SHEAR FACTOR (S)

Shear Tonnage Chart

To find the actual tonnage required when using a given shear, multiply the calculated tonnage by the percentage shown below for a specied material thickness.



USEFUL DATA

MAXIMUM "C" DIMENSIONS FOR RECTANGLES

"B" Dimension	"C" Dimension		"B" Dimension	"C" Dimension	
	1/2" Station	1-1/4" Station		A Station 12.7mm	B Station 31.75mm
1/16"	.496	1.248	1mm	12.66	31.73
3/32"	.491	1.246	2mm	12.54	31.68
1/8"	.484	1.243	3mm	12.34	31.60
5/32"	.475	1.240	4mm	12.05	31.50
3/16"	.463	1.235	5mm	11.67	31.35
7/32"	.449	1.230	6mm	11.19	31.17
1/4"	.433	1.224	7mm	10.59	30.97
9/32"	.413	1.218	8mm	9.86	30.72
5/16"	.390	1.210	9mm	8.96	30.44
11/32"	.363	1.202	19mm	7.82	30.13
3/8"	.330	1.192	11mm	6.35	29.78
13/32"	.291	1.182	12mm	4.16	29.39
7/16"	.242	1.171	13mm	—	28.97
15/32"	.176	1.159	14mm	—	28.50
1/2"	—	1.145	15mm	—	27.98
17/32"	—	1.131	16mm	—	27.42
9/16"	—	1.116	17mm	—	26.82
19/32"	—	1.100	18mm	—	26.15
5/8"	—	1.082	19mm	—	25.44
21/32"	—	1.064	20mm	—	24.66
11/16"	—	1.044	21mm	—	23.81
23/32"	—	1.023	22mm	—	22.89
3/4"	—	1.000			
25/32"	—	.975			
13/16"	—	.950			
27/32"	—	.922			
7/8"	—	.892			



DECIMAL EQUIVALENTS

Fraction	Decimal	Millimeter
1/32	.03125	0.7938
—	.03937	1.0
1/16	.0625	1.5875
3/32	.09375	2.3813
1/8	.125	3.175
5/32	.15625	3.9688
3/16	.1875	4.7625
—	.1968	5.0
7/32	.21875	5.5563
1/4	.250	6.350
9/32	.28125	7.1438
5/16	.3125	7.9375
11/32	.34375	8.7313
3/8	.375	9.525
—	.3937	10.0
13/32	.40625	10.3188
7/16	.4375	11.1125
15/32	.46875	11.9063
1/2	.500	12.700
17/32	.53125	13.4938
9/16	.5625	14.2875
—	.5906	15.0
19/32	.59375	15.0813
5/8	.625	15.875
21/32	.65625	16.6688
11/16	.6875	17.4625
23/32	.71875	18.2563
3/4	.750	19.050
25/32	.78125	19.8438
—	.7874	20.0
13/16	.8125	20.6375
27/32	.84375	21.4313
7/8	.875	22.225
29/32	.90625	23.0188
15/16	.9375	23.8125
31/32	.96875	24.6063
—	.9843	25.0
1	1.000	25.40

CLEARANCES

% x Material Thickness = Total Clearance

Material	Min.	Best	Max.
Copper, 1/2 Hard	8	12	16
Brass, 1/2 Hard	6	11	16
Mild Steel	10	15	20
Steel .050C	12	18	24
Aluminum, Soft	5	10	15
Stainless Steel	15	20	25

Slug Pulling Recommendations

- Urethane Slug Ejector
- Notch the Die with a Diamond File
- Eliminate Sheet Lubrication
- Tighten Die Clearances
- Negative Tapered Dies
- Maximum Die Penetration
- Slug Hugger® Die (patented)

Most Important: Change Something

Conversion Formulas

millimeters to inches: mm x .03937

inches to millimeters: in. x 25.40

For more information, visit wilsontool.com, call our tooling technicians at 800-328-9646 or contact your sales engineer.

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