

Technical Resources from Trick-Tools.com

Punching tonnages and die clearance.

Tons of Pressure Required to Punch Mild Steel

Round Hole Diameter	Ga.	20	18	16	14	12	11	10	3/16"	1/4"	5/16"	3/8"	1/2"
	In.	.036	.048	.062	.075	.105	.120	.135	.188	.250	.312	.375	.500
1/8"		.4	.5	.6	.7	1.0	1.2	1.3	-	-	-	-	-
3/16"		.5	.7	.9	1.1	1.5	1.8	2.0	2.8	-	-	-	-
1/4"		.7	.9	1.2	1.5	2.1	2.4	2.6	3.7	4.9	-	-	-
5/16"		.9	1.2	1.5	1.8	2.6	2.9	3.3	4.6	6.1	7.8	-	-
3/8"		1.1	1.4	1.8	2.2	3.1	3.5	4.0	5.5	7.4	9.2	11.1	-
7/16"		1.2	1.6	2.1	2.6	3.6	4.1	4.6	6.4	8.6	10.7	12.8	-
1/2"		1.4	1.9	2.3	2.9	4.1	4.7	5.3	7.4	9.8	12.3	14.8	19.7
9/16"		1.6	2.1	2.6	3.3	4.6	5.1	5.9	8.3	11.1	13.9	16.5	22.0
5/8"		1.8	2.4	2.9	3.7	5.1	5.9	6.6	9.2	12.3	15.4	18.5	24.6
11/16"		1.9	2.6	3.2	4.0	5.7	6.2	7.3	10.1	13.5	17.0	20.2	26.9
3/4"		2.1	2.8	3.5	4.4	6.2	7.1	7.9	11.0	14.7	18.5	22.1	29.5
13/16"		2.3	3.1	3.8	4.8	6.7	7.6	8.6	12.0	16.0	20.0	23.8	31.8
7/8"		2.5	3.3	4.1	5.1	7.2	8.3	9.2	12.9	17.2	21.5	25.8	34.4
15/16"		2.6	3.5	4.4	5.5	7.7	8.8	9.9	13.8	18.4	23.0	27.5	36.8
1"		2.8	3.8	4.7	5.9	8.2	9.4	10.6	14.8	19.7	24.6	29.5	39.4
1 1/2"		4.2	5.5	7.0	8.8	12.3	14.0	25.9	22.0	34.4	43.0	51.5	68.8
2"		5.6	7.5	9.5	11.7	16.4	18.8	21.0	29.5	39.3	49.0	59.0	78.5
2 1/2"		7.0	9.4	11.7	14.7	20.5	23.5	26.5	36.8	49.0	61.5	73.6	98.2
3"		8.5	11.3	14.0	17.6	24.5	28.2	31.7	44.2	60.0	76.5	88.4	118.0
3 1/2"		9.9	13.0	16.5	20.5	28.8	32.7	37.0	51.5	68.7	86.0	103.0	137.0
4"		11.3	15.0	18.8	23.5	32.8	37.6	42.2	60.0	78.5	98.0	188.0	157.0

METAL TYPE	MULTIPLIER
Aluminum (2024-0)	.36
Brass (1/4 Hard)	.70
Copper (1/2 Hard)	.52
Steel (50% Carbon)	1.60
Steel Cold Drawn (1018)	1.24
Steel Stainless (303)	1.50

EXAMPLE: 1" Round Hole thru 1/2" thick Aluminum.
First we obtain 39.4 tons from the ROUND SCALE for Steel, $39.4 \times .36 = 14.2$ tons.

Die Clearance

The relationship of the larger die hole size to the punch size is die clearance and is stated as a percentage of the thickness of the material being punched. The range of clearances varies from 10% for thin materials to 20% for thicker materials. For 3/4" material the total die clearance is .150". Clearance should always be specified when there is any reason for doubt.

Die Clearance has the following effects:

Too much clearance

- 1. Extra roll-in at top of the hole.
- 2. Too much burr at the bottom of the hole.

Too little clearance

- 1. More punching pressure is needed. Can reduce tool life.
- 2. High stripping force causes part distortion and extra punch wear.

Correct clearance

- 1. Straighter hole thru material.
- 2. Minimum distortion at top of hole.
- 3. Minimum burr at bottom of hole.

Effects of die clearance are more noticeable in thicker materials (such as 1/4:) than in thinner materials (such as 16 gauge).

Clearances for Mild Steel

Gauge or Size	Approx. Decimal Thickness	Overall Clearance - Add To Punch Size
30	.0120	Slip Fit
28	.0149	Slip Fit
26	.0179	
24	.0239	.003
22	.0299	.003
20	.0359	.004
18	.0478	.005
16	.0598	.005
14	.0747	.006
13	.0897	.009
12	.1046	.009
11	.1196	.011
1/8	.125	.011
10	.1345	.013
5/32	.156	.015
8	.164	.017
7	.1793	.021
3/16	.1875	.023
1/4	.250	.037
5/16	.3125	.047
3/8	.375	.057
1/2	.500	.075
5/8	.625	.125
3/4	.750	.150