

TIPS FOR CLUSTER PUNCHING

THE PROBLEM:

Cluster tooling is an ideal way to produce repeat holes or patterns in sheet metal. By increasing the number of holes per hit, clusters are efficient, reduce costs and can help reduce machine wear and tear. Many different punch designs and cluster areas are available, providing a wide variety of punching choices. Here are techniques you can use to ensure you get the results you require.

THE MATE SOLUTION:

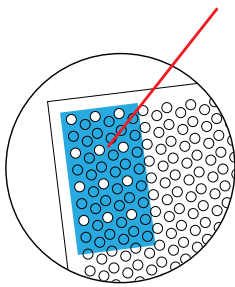
Punching Force Formula:

For cluster punching, the maximum recommended punching force SHOULD NOT EXCEED 75% of press capacity. Use the following formula to estimate the required punching force:

Linear Length of Cut X Material Thickness x Shear Strength = Punching Force in Tons (Metric Tons)

“Linear Length of Cut” = Hole Perimeter X Number of Punches in the Cluster

- o “Hole Perimeter,” Round Hole = 3.14 X diameter
- o “Hole Perimeter,” Shaped Hole = Sum of the lengths of the sides



Let's look at an example:

In the illustration at left, the punch (represented by the blue rectangle) is a 12-hole round cluster, with the holes being .250(6,35) in diameter. The area of the cluster punch covers 48 holes, which is punched every fourth hole (12 holes, 4 times). The material is mild steel .060(1,52) thick.

12-Round Hole Cluster:

		Linear Length of cut									
	Hole Perimeter	X	Number of Punches in cluster	=	Linear Length of Cut	X	Material Thickness	X	Shear Strength	=	Punching Force Tons/Metric Tons
Inch	3.14 X .250 = .785	X	12	=	9.42	X	.060	X	25	=	14.1 tons
Metric	3.14 X 6,35 = 19,94	X	12	=	239,26	X	1,52	X	0,345	=	12.8 metric tons

SOLUTION BULLETIN

12- Square Hole Cluster

Linear Length of cut											
	Hole Perimeter	X	Number of Punches in cluster	=	Linear Length of Cut	X	Material Thickness	X	Shear Strength	=	Punching Force Tons/Metric Tons
Inch	4 X .250 = 1.00	X	12	=	12.00	X	.060	X	25	=	18.0 tons
Metric	4 X 6,35 = 25,40	X	12	=	304.80	X	1,52	X	0,345	=	16,3 metric tons

Minimum Punch Size:

When punching small diameter or narrow holes, check that the tools are properly sharpened and maintained. Use the following recommendations as guidelines to determine the smallest punch diameter to eliminate machine or tooling complications:

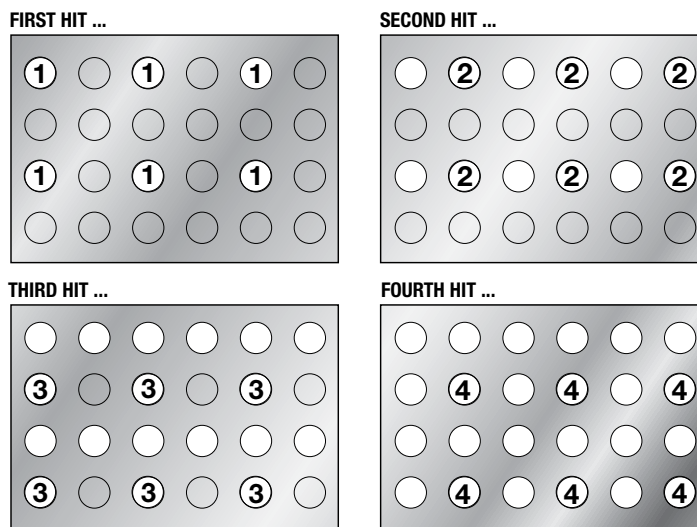
Material	Punch-to-Material, Ratio Standard Tooling	Punch-to-Material Ratio, Fully Guided Tooling
Aluminum	.75 to 1	.5 to 1
Mild Steel	1 to 1	.75 to 1
Stainless Steel	2 to 1	1 to 1

The following example applies the above ratios to materials that are .078(2,0) thick to get the smallest recommended diameter punch:

Material and Thickness	Smallest Punch, Standard Tooling	Smallest Punch, Fully Guided Tooling
Aluminum, .078(2,0)	.059(1,5) diameter	.039(1,0) diameter
Mild Steel, .078(2,0)	.078(2,0) diameter	.059(1,5) diameter
Stainless Steel, .078(2,0)	.157(4,0) diameter	.078(2,0) diameter

Hole Uniformity and Flatter Sheets:

For greater hole uniformity and flatter sheets, spread the punches to avoid punching adjacent holes in the same hit. Repeat for the necessary number of times to complete the desired pattern.



- **Use Fully-Guided Clusters in Challenging Applications:**

In challenging applications or high production environments, fully-guided cluster punches are extremely helpful. The design suits small punches that benefit guiding at the tip to ensure accuracy. Fully-guided also works well for punch clusters with too few punches to provide a good punch-to-stripper guiding surface. Fully-guided cluster punches are ideal for heavy-duty service or long production runs.

- **Maxima™ Coating for Long Punch Life:**

Mate's optional Maxima™ coating increases the lubricity of the punch points, helping to resist wear and ensure cleanly punched holes. In fact one Mate customer achieved over 4.1 million hits with a Mate cluster punch treated with Maxima without sharpening or maintenance!

- **Lubricate the Cluster Punches:**

Use a good lubricant, such as vanishing oil, to reduce heat build up and prevent galling.

WATCH THE VIDEOS:

See how one Mate customer achieved over 4.1 million hits with a Maxima-treated cluster punch without sharpening or maintenance:

<http://www.youtube.com/watch?v=vkQHeZru6zE>

View an animation of a Trumpf-style cluster punch in operation:

<http://www.youtube.com/watch?v=l3NBrp0jqag>

AVAILABLE TOOLING STYLES AND STATION SIZES:

- All tooling styles and station sizes

MATERIAL AND OTHER RESTRICTIONS:

- Contact your Mate Applications Specialist

OTHER MATE PRODUCTS TO CONSIDER:

- Mate special applications tooling
- Mate fully-guided tooling
- Maxima coating

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