MATE®
PRECISION TOOLING

RESPECT • SUPPORT • INSPIRE

SALVAGNINI

TYPE III PUNCH PRESS TOOLING

TABLE OF CONTENTS

*All prices in this catalog are subject to change without notice.

Mate's high speed steel punches, dies and strippers compliment Salvagnini's high performance punching system like no other. Our complete range of standard, special shapes and forming assemblies available to customer specifications expand Salvagnini's complete metal fabricating system to the fullest.

Mate's Type III tooling is compatible with Salvagnini machines and is available in the following station sizes:

Salvagnini Positions	Station Size	Comments
1-20 and 41-76 (7 Ton)	6 mm Size	Rounds Only
	10.5 mm Size	Rounds Only
	33 mm Size	
	33 mm Size - diagonal up to 1.023(26.00)	Fully Guided Perforating Assembly
30-35 (12 Ton)	60 mm Size	
	60 mm Size	Auto-Index
21-24 (26 Ton)	70x90 Size	Type 70 (3.1)
	90x90 Size	Type 90 (3.0)

Punches:

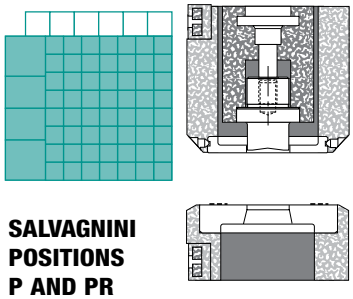
- Premium powdered metal based tool steel in 6mm, 10.5mm, all 33mm, and smaller stations. High speed steel standard on 60mm, 70x90, and 90x70 stations. Both steel types provide incredibly long tool life under even the most extreme punching conditions.
- High abrasion resistance, high anti-galling properties, plus toughness against chipping.
- Fully guided perforating tool has punch size range to 26mm.
- A punch chuck is available for punch sizes 10.5mm and under.
- Punches can be resharpened up to 0.157"(4.00mm) and dies to 0.060"(1.50mm), yielding many additional spans of production. An unlimited variety of special shape punches can be made to your specifications.

Strippers:

- Stripper openings are precise to match punch dimensions.
- Fully guided perforating stripper has unique design to support punch point throughout the punching cycle.
- The stripper is assembled into the upper cartridge.

Dies:

- High speed steel dies in 33mm stations (A, B and C).
- A wide variety of special shapes are available to a clearance of your choice, as well as standard shapes.
- Specify die clearance as punch size PLUS total clearance, NOT as clearance per side.
- Brushes in D, E and F stations prevent marking.
- SLUG FREE® dies are available as an option for all Type III stations at no additional cost.

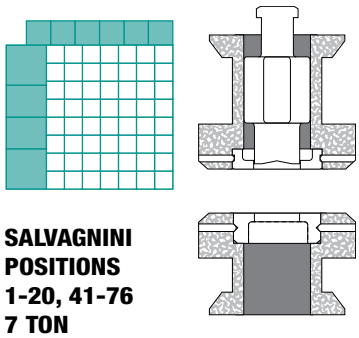


SALVAGNINI POSITIONS P AND PR 12 TON

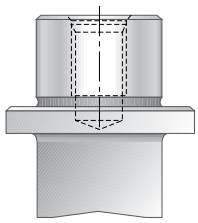
THE SALVAGNINI PUNCHING SYSTEM

The architecture of the Salvagnini press is unlike any other NC punch press on the market. It is an aggregate of independently programmable punch presses in one punching head. This allows for the modular nature of the punching tools which can be unlocked hydraulically and changed quickly.

Punching operations can be programmed to occur simultaneously, performing like a cluster punch; or in sequence, so that punching and forming operations can occur within the same punching cycle. Some stations are capable of programmable rotation. With the addition of the right angle shear and external sheet rotator, Salvagnini becomes a very flexible and productive sheet metal fabricating system.



SALVAGNINI POSITIONS 1-20, 41-76 7 TON



PUNCHES

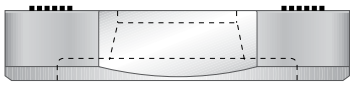
Salvagnini tool system punches are made of either premium Powder Metal Tool Steel or premium High Speed Steel which delivers incredibly long tool life under even the most extreme punching conditions. High abrasion resistance, high anti-galling properties, plus excellent hardness, means excellent punch life with little degeneration in punched part quality.

Depending which station, punch size can be inscribed up to the dimensions of a 90mm square. A punch chuck is available for diameters up to 10.5mm.

Punches can be resharpened up to .157(4.0) and dies to .060(1.5), yielding many additional spans of production. An infinite variety of special shape punches can be made to your specifications.

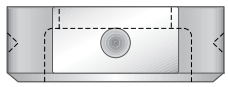
STRIPPER

The stripper is assembled into the upper cartridge.



SLUG FREE® DIES

Are available as an option for all Type III stations.



[Dimensions in Inches (mm)]

POSITIONS 1 - 20, 41 - 76
- Single action 7 ton presses with a maximum tool diameter of 33mm:
- Punches, dies and strippers to 33.0mm diameter/diagonal
- Special shapes

EI EMBOSS STATIONS (OPTIONAL)
- Some positions can be fitted for low profile forming operations (max. height 6.5 mm) where no scrap is generated.

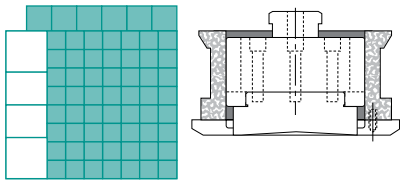
POSITIONS 21 - 24
- Single action 26 ton presses with a maximum station size of 90 x 90mm:
- Punches, strippers, dies to 70 x 90mm
- Punches, strippers, dies to 90 x 90mm
- Punch supports for positions 21-24
- Special shapes
- Cluster Punches

POSITIONS 30 - 35
BU EMBOSS OPTION
- Double action 8 + 7 ton presses that can be set up for forming operations
- Maximum form height 16mm where no scrap is generated.
- Forming tools

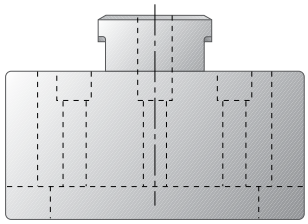
PR OPTION
- Optional auto rotation 12 ton punching units that can be installed in punching positions 30-35.
- Punches, die and strippers to 60.0mm diameter/diagonal

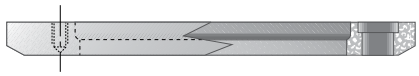
Type III
(H3 HEAD)

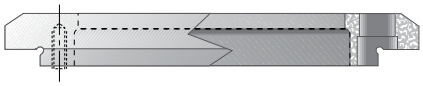
	30	31	32	33	34	35
90 x 90 24	76	68	60	56	52	48	44
	75	67	59	55	51	47	43
90 x 70 23	74	66	58	54	50	46	42
	73	65	57	53	49	45	41
90 x 70 22	72	64	20	16	12	8	4
	71	63	19	15	11	7	3
90 x 90 21	70	62	18	14	10	6	2
	69	61	17	13	9	5	1



SALVAGNINI POSITIONS 21-24 26 TON







DIES

A infinite variety of special shapes are available to a clearance of your choice, as well as standard shapes - rounds, rectangles, ovals and squares. Specify clearance as punch size PLUS clearance, NOT as clearance per side. Mate provides three options for punching corners in acute angles, reducing die wear and breakage, see special shapes page 11.

SPECIAL ASSEMBLIES

Mate special assemblies for Salvagnini complement and expand upon the capabilities of the Salvagnini punching system. Mate builds special assemblies for virtually any application such as threadform, louver, beading, embossing, stamping, knockout and cluster punch assemblies. Special assemblies also perform slitting, shearing, multiple parts on sheet (shake-and-break) and tabbing functions.

From a drawing showing your application, Mate will manufacture a special assembly to your design. The forming tool pages in this catalog will help you specify your requirements. Mate will work with you in obtaining the results you want.

In addition to special assemblies, multi-use tools are also available. Used in conjunction with the optional PR stations, the corner rounding, notching and quad radius tools are like several tools in one providing greater value for your tooling dollar.

Mate Type III tooling is compatible with Salvagnini tool types S4, P9, S6, P5, S8, S9, and SA.

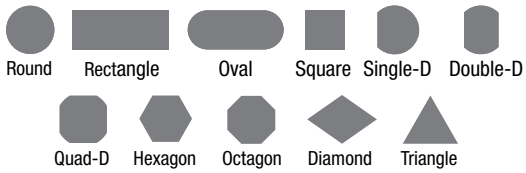
[Dimensions in Inches (mm)]

6MM/10.5MM/33MM

	30	31	32	33	34	35
90 x 90	76	68	60	56	52	48	44
24	75	67	59	55	51	47	43
70 x 90	74	66	58	54	50	46	42
23	73	65	57	53	49	45	41
70 x 90	72	64	20	16	12	8	4
22	71	63	19	15	11	7	3
90 x 90	70	62	18	14	10	6	2
21	69	61	17	13	9	5	1

SALVAGNINI POSITIONS 1-20, 41-76 7 TON AND POLI PUNCH STATION

STANDARD SHAPES



6 mm Size
>.030-.236(0.76-6,0)
ROUND ONLY

10.5mm Size
.237-.413(6.00-10,5)
ROUND ONLY

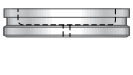
33mm Size
UP TO 1.299(33,0)
DIAMETER OR DIAGONAL

included with punch chuck

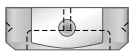
Lock Screw
VINSSS

Insert Punch
ROUND
PAPA0A

Punch Chuck
VINPS010



Stripper
ROUND
S6PA0A



Die
ROUND
DAPA00

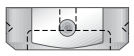
included with punch chuck

Lock Screw
VINSSS

Insert Punch
ROUND
PAPB0A

Punch Chuck
VINPS020

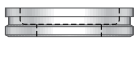
Stripper
ROUND
S6PB0A



Die
ROUND
DAPB00

Punch
ROUND
PAPC0A
SHAPES
PAPC_A

*Round strippers will be provided on narrow width punches to prevent shoulder of the punch from interfering with the stripper.



Stripper
ROUND
S6PC0A
SHAPES
***S6PC_A**

Die
ROUND
DAPC00
SHAPE
DAPC_0

Poli Punch Stripper for all sizes
ROUND
S6PP0A
SHAPES
S6PP_A

Die Shim for all sizes
MSP3
Package 6 each:
.004(0.10), .008(0.20),
.012(0.30)

Mate's 6,0mm and 10,5mm inserts are NOT compatible with Salvagnini's punch chuck.

General Add-Ons:

Radius Corner	No Charge
Special Angle Settings	Add 25% to punch, stripper, and die

Small Diameter Round Tools

Diameter 0.031(0.76) to 0.061(1.55)	Add 25% to punch, stripper and die
Diameter 0.062(1.56) to 0.092(2.34)	Add 10% to punch, stripper and die

Narrow Width Shaped Tools

Widths under 0.125(3.20)	Add 25% to punch, stripper, and die

Maxima™ or Nitride Add-Ons

6.00mm and 10.50mm size inserts	Add	to punch
33mm Size	Add	to punch
60mm Size	Add	to punch
70mm x 90mm Size or 90mm x 90mm Size	Add	to punch

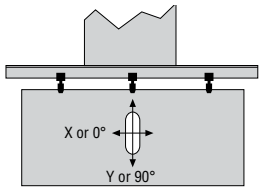
SLUG FREE® DIES AVAILABLE

[Dimensions in Inches (mm)]

	30	31	32	33	34	35
90 x 90 24	76	68	60	56	52	48	44
	75	67	59	55	51	47	43
70 x 90 23	74	66	58	54	50	46	42
	73	65	57	53	49	45	41
70 x 90 22	72	64	20	16	12	8	4
	71	63	19	15	11	7	3
90 x 90 21	70	62	18	14	10	6	2
	69	61	17	13	9	5	1

SALVAGNINI POSITIONS 30-35 12 TON

(These positions can be auto index if the press is configured for auto index)

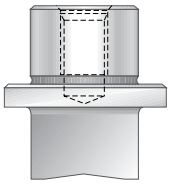


PUNCHING ORIENTATION...

For shapes other than round or square, punching orientation must be specified when ordering punches, strippers or dies.

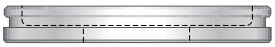
60mm Size

UP TO 2.362(60.00)
DIAMETER OR DIAGONAL



Punch

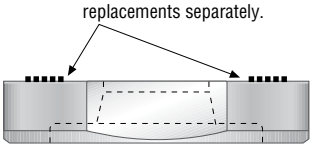
ROUND
PAPD0A
SHAPES
PAPD_A



Stripper

ROUND
S6PD0A
SHAPES
S6PD_A

Die comes with brushes already installed. Order replacements separately.



Die

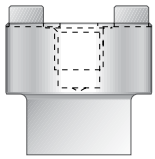
ROUND
D0PD00
SHAPES
D0PD_0

Brush

MIS61188
(3 Minimum)

60mm Size

for use in Salvagnini Blank Holder style holders
UP TO 1.669(42.40)
DIAMETER OR DIAGONAL



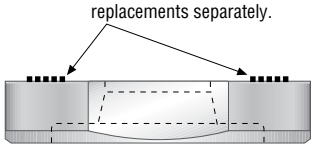
Punch

ROUND
PAPX0A
SHAPES
PAPX_A

Stripper

ROUND
S6PX0A
SHAPES
S6PX_A

Die comes with brushes already installed. Order replacements separately.



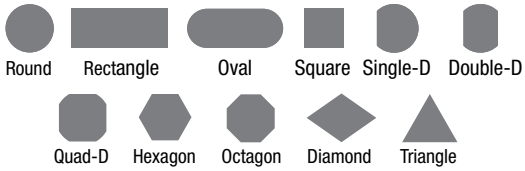
Die

ROUND
D0PD00
SHAPES
D0PD_0

Brush

MIS61188
(3 Minimum)

STANDARD SHAPES



SLUG FREE® DIES AVAILABLE

[Dimensions in Inches (mm)]

TYPE 70 & TYPE 90 CARTRIDGES

SALVAGNINI POSITIONS 21-24 26 TON

	30	31	32	33	34	35
70 x 90 24	76	68	60	56	52	48	44
	75	67	59	55	51	47	43
70 x 90 23	74	66	58	54	50	46	42
	73	65	57	53	49	45	41
70 x 90 22	72	64	20	16	12	8	4
	71	63	19	15	11	7	3
70 x 90 21	70	62	18	14	10	6	2
	69	61	17	13	9	5	1

Type 70

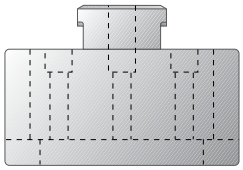
To determine if Type 3.0 or 3.1 is needed, verify what stations are in the cartridge.

Type 90 Cartridge	Type 70 Cartridge
(1) 70x90 Type 3.0	(2) 70x90 Type 3.1
(1) 90x90 Type 3.0	

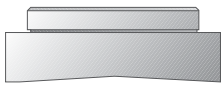
Type 90

	30	31	32	33	34	35
90 x 90 24	76	68	60	56	52	48	44
	75	67	59	55	51	47	43
70 x 90 23	74	66	58	54	50	46	42
	73	65	57	53	49	45	41
70 x 90 22	72	64	20	16	12	8	4
	71	63	19	15	11	7	3
90 x 90 21	70	62	18	14	10	6	2
	69	61	17	13	9	5	1

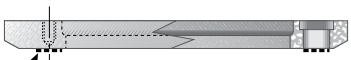
Type 70 (3.1) 70x90 mm Size	Type 90 (3.0) 70x90 mm Size	Type 90 (3.0) 90x90 mm Size
2.755x3.543(70.0x90.0)	2.755x3.543(70.0 x 90.0)	3.543x3.543(90.0 x 90.0)



Punch Support	Punch Support	Punch Support
VSPES	**VSPES**	**VSPFS**

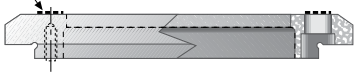


Punch	Punch	Punch
ROUND	ROUND	ROUND
PAPE0A	**PAPE0A**	**PAPF0A**
SHAPES	SHAPES	SHAPES
PAPE_A	**PAPE_A**	**PAPF_A**



Stripper and die come with brushes already installed. Order replacements separately.

Stripper	Stripper	Stripper
ROUND	ROUND	ROUND
S6QE0A	**S6PE0A**	**S6PF0A**
SHAPES	SHAPES	SHAPES
S6QE_A	**S6PE_A**	**S6PF_A**



Die*	Die*	Die*
ROUND	ROUND	ROUND
D2QE00	**D2PE00**	**D2PF00**
SHAPES	SHAPES	SHAPES
D2QE_0	**D2PE_0**	**D2PF_0**

Brush	Brush	Brush
MIS61188	**MIS61188**	**MIS61188**
(3 minimum)	(3 minimum)	(3 minimum)

*** Dies can also be ordered in A2 material. Part numbers will begin with D0 instead of D2. Prices are the same. A2 recommended for clearances <= .016(0,40).**

Die Shims for 70x90mm/90x90mm must be purchased from Salvagnini.

Small Brushes
MIS61161
(8 minimum)

Ball Plunger Ejector
BPL00005

SLUG FREE® DIES AVAILABLE!!

[Dimensions in Inches (mm)]

SALVAGNINI POSITIONS

1-20, 41-76 7 TON

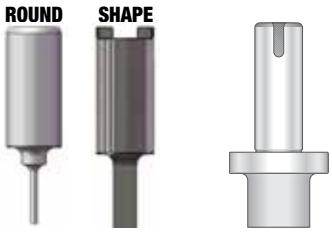
RECOMMENDED FOR POLI PUNCH STATION -

PØ — 0.492(12.50) MAXIMUM

P9 — 1.023(26.0) MAXIMUM

PØ **P9**

ROUND SHAPE



Insert Punch

Fully Guided Stripper

Die

MSP3

Package 6 each: .004(0.1), .008(0.2), .012(0.3)

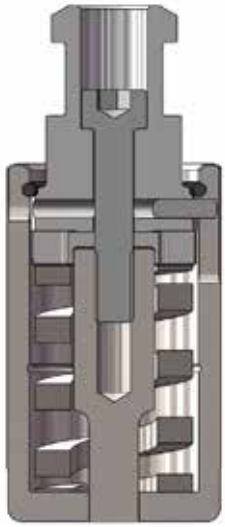
SLUG FREE® DIES AVAILABLE

	30	31	32	33	34	35
90 x 90 24	76	68	60	56	52	48	44
	75	67	59	55	51	47	43
70 x 90 23	74	66	58	54	50	46	42
	73	65	57	53	49	45	41
70 x 90 22	72	64	20	16	12	8	4
	71	63	19	15	11	7	3
90 x 90 21	70	62	18	14	10	6	2
	69	61	17	13	9	5	1

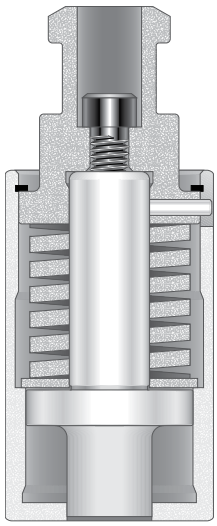
MATE02484 — ASSEMBLY FIXTURE

[Dimensions in Inches (mm)]

PØ FULLY GUIDED PERFORATING TOOL



P9 FULLY GUIDED PERFORATING TOOL



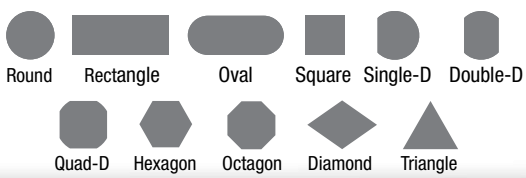
PØ ORDER GUIDE

PART NUMBER	DESCRIPTION
PUNCHES	
PAPT0A	Round
PAPT_A	Shape
FULLY GUIDED STRIPPERS	
S2PT0A	Round
S2PT_A	Shape
DIES	
DAPC0A	Round
DAPC_A	Shape
COMPLETE UPPER ASSEMBLY	
(Punch, Fully Guided Stripper, Chuck Assembly)	
Round	
Standard Shape*	
CHUCK ASSEMBLY	
(Chuck, Spring, Retaining Ring, Drawbolt)	
MATE02344	Round
MATE02345	Shape
CHUCK ASSEMBLY REPLACEMENT PARTS	
MATE02341	Chuck, Round
MATE02343	Chuck, Shape
SPR33443	Spring
SHC00033	Drawbolt
MATE02477	Retaining Ring
ASSEMBLY FIXTURE	
MATE02484	Complete Assembly

P9 ORDER GUIDE

PART NUMBER	DESCRIPTION
PUNCHES	
PAPS0A	Round
PAPS_A	Shape
FULLY GUIDED STRIPPERS	
S2PN0A	Round
S2PN_A	Shape
DIES	
DAPC0A	Round
DAPC_A	Shape
COMPLETE UPPER ASSEMBLY	
(Punch, Fully Guided Stripper, Chuck Assembly)	
Round	
Standard Shape*	
CHUCK ASSEMBLY	
(Chuck, Spring, Retaining Ring, Drawbolt)	
VCPCS	Round and Shapes
CHUCK ASSEMBLY REPLACEMENT PARTS	
VPPC00CH	Chuck
SPR00035	Spring
VPPC00SW	Spring Washer
SHC12298	Drawbolt
MIS97287	Retaining Ring
ASSEMBLY FIXTURE	
MATE02484	Complete Assembly

STANDARD SHAPES

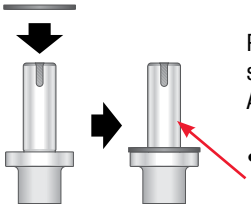


INSTRUCTIONS P9 FULLY GUIDED PERFORATING ASSEMBLY

Assembly instructions:

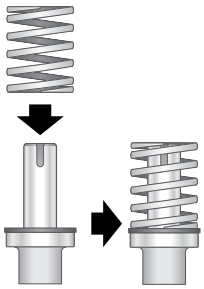
1. 

Stand punch on flat surface so that tapped hole and angle orientation slot are visible.

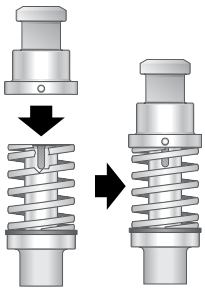
2. 

Place spring washer over punch shank onto punch shoulder. Apply lubricant to punch shank.

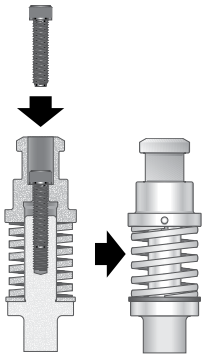
- Use Mobil grease C-MP or equivalent.

3. 

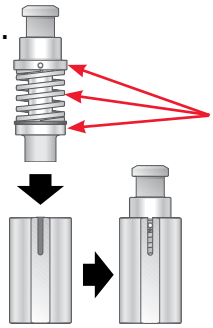
Place spring over punch shank on top of washer.

4. 

Place tang onto punch shank so that internal locating pin is visually in line with punch angle orientation slot.

5. 

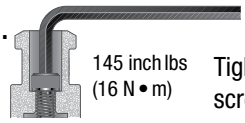
Insert 6mm socket head cap screw through tang and lightly tighten to the punch with a 5mm hex wrench - approximately 8 revolutions. Note: cap screw must not be over tightened at this step. Over tightening may result in misalignment during assembly.

6. 

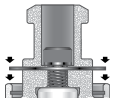
Apply lubricant to outside surfaces of punch shoulder, spring, and tang flange.

- Use Mobil grease C-MP or equivalent.

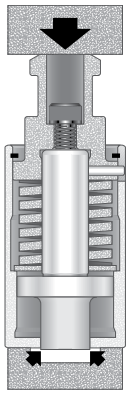
Insert assembly into the stripper so that the tang locating pin engages the vertical slot in the stripper.

7. 

Tighten 6mm socket head cap screw to 145 inch lbs (16 N•m).

8. 

Place retaining ring over tang.

9. 

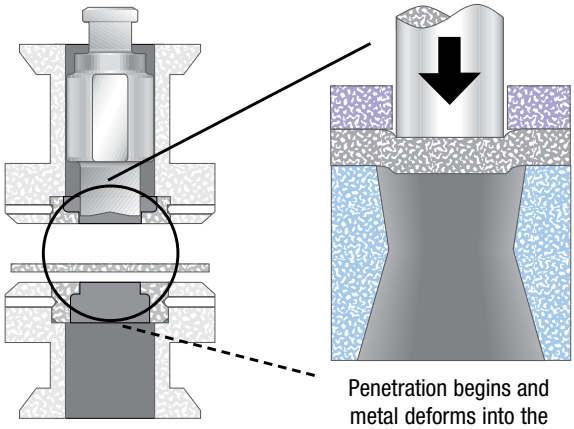
Place assembly into a vise or fixture so that it can be compressed axially approximately .040(1.0). The compression exposes the stripper body's internal retaining ring groove. Groove must be completely visible. Note: the punch point opening must not be obstructed and the punch must be able to protrude through stripper face. Insert retaining ring by slowly coiling it into the retaining ring groove. Release tang and remove assembly from the vise or fixture. When properly assembled with a new punch, the stripper lead should be .030 (0.75).

Disassembly

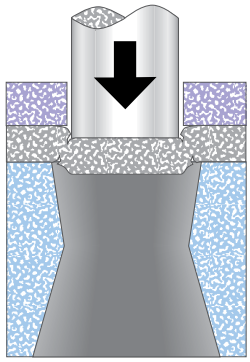
1. Place into assembly fixture (VDPC0) so that it can be compressed axially approximately .040(1.0). The compression relieves the spring pressure on the retaining ring. Note: the punch point opening must not be obstructed and the punch must be able to protrude through stripper face.
2. Remove retaining ring by slowly uncoiling it from the retaining ring groove. Clean retaining ring groove of dirt or obstructions prior to re-assembly.
3. Remove assembly from vise or fixture.
4. Loosen 6mm socket head cap screw with a 5mm hex wrench. Punch can now be sharpened or replaced.

[Dimensions in Inches (mm)]

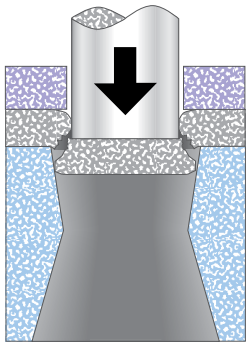
SLUG FREE® DIE OPERATION



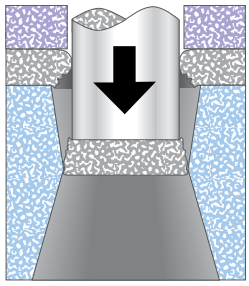
Penetration begins and metal deforms into the entry taper



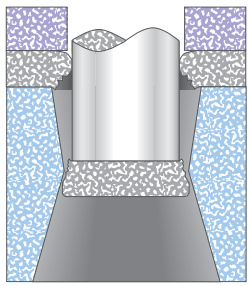
Material begins to fracture at stress points



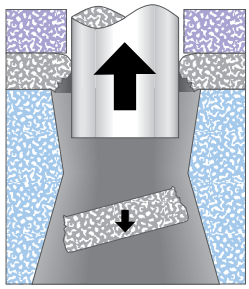
Slug fractures away from sheet



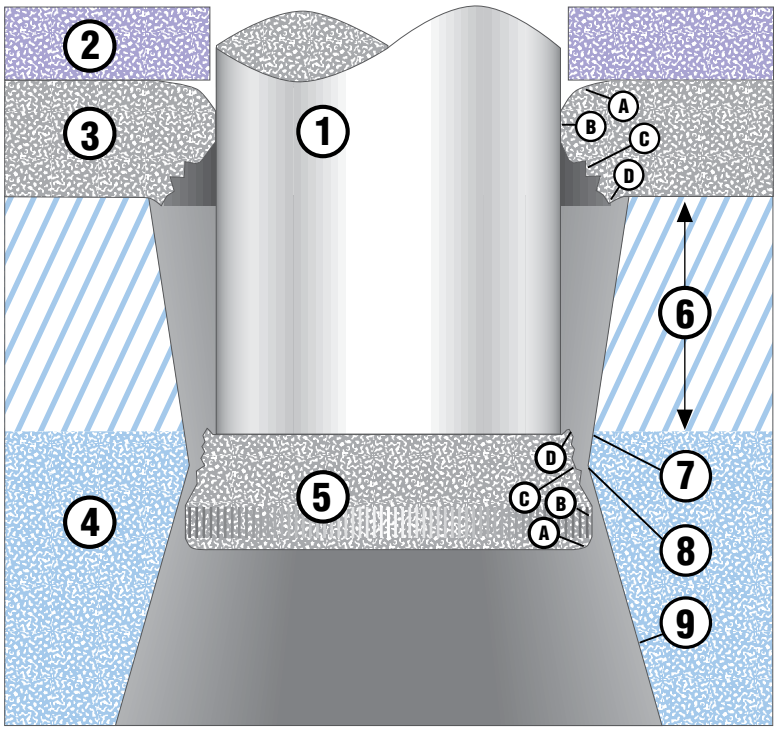
Pressure point constricts slug



Punch stroke bottoms out as slug squeezes past pressure point



Punch retracts and slug is free to fall down and away through exit taper



Slug Free® Die Components

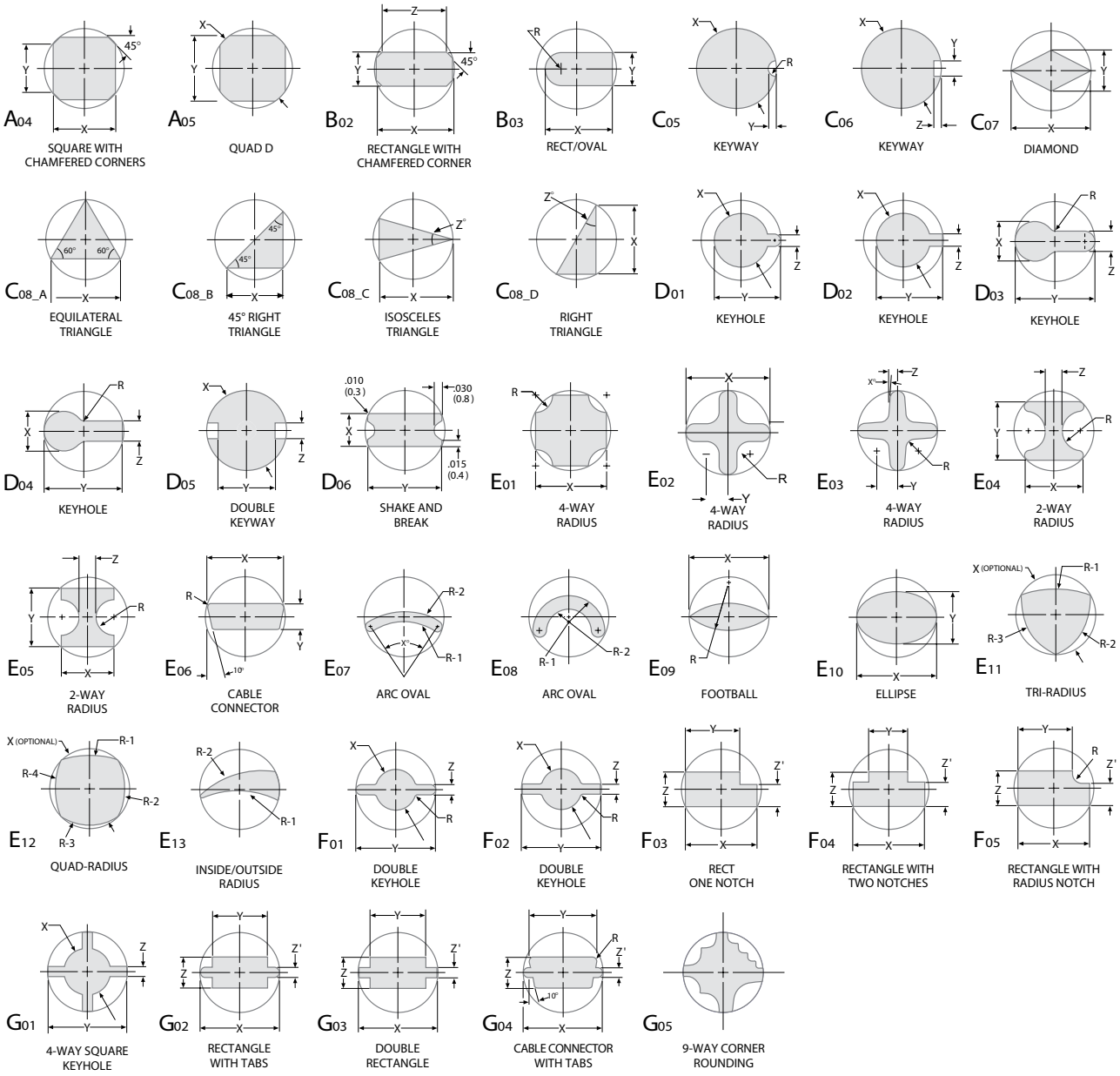
1. Punch
2. Stripper
3. Material
4. Slug Free® Die
5. Slug
6. Die Penetration
7. Entry – Constricting Taper
8. Pressure Point
9. Exit – Relief Taper

Hole/Slug Geometry

A. Rollover
B. Burnish
C. Fracture
D. Burr

[Dimensions in Inches (mm)]

COMMON SPECIAL SHAPES

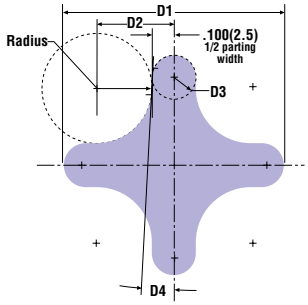


When ordering a special shape, please provide all dimensions noted above for the corresponding shape. Special shape drawings are also available on mate.com.

NOTE:
Shape possibilities are not limited to those shown on this page; Mate can manufacture any shape you require—just contact a Mate customer service representative. A detailed drawing of the shape (sent via fax or e-mail) will be required.

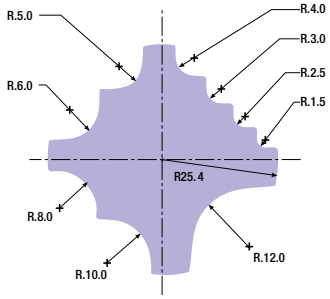
[Dimensions in Inches (mm)]

4-WAY CORNER ROUNDING



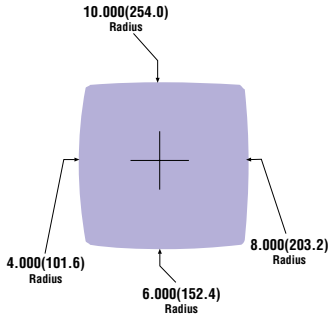
The 4-way corner rounding tool can round all four corners of a piece part without rotating the tooling - use with standard parting tools for piece part separation.

9-WAY CORNER ROUNDING



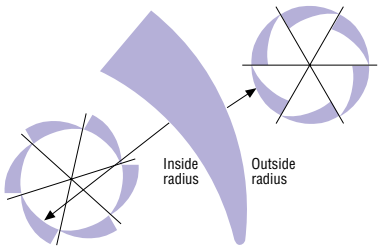
A single 9-way corner rounding tool provides nine popular radii in one tool. Auto indexing selects and rotates the desired radius to round off all corners of a piece part.

QUAD RADIUS



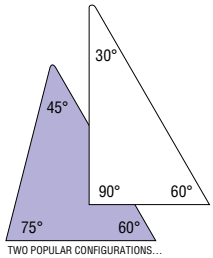
The quad radius tool nibbles large holes with smoother edges and fewer hits than using a round nibbling punch. In effect, smooth round holes not limited to station range.

INSIDE/OUTSIDE RADIUS



This tool's large radii results in blanks with smoother edges produced with fewer hits than with an ordinary radius punch. This tool can be programmed to punch holes with slugs or parts retained in the sheet, yet can be separated easily off the press.

3-WAY CORNER NOTCHING



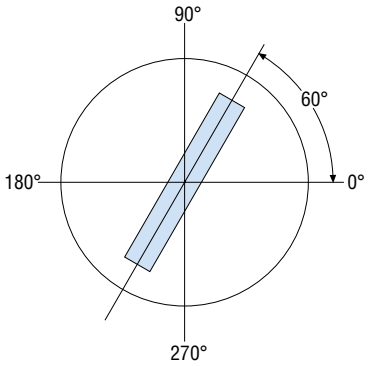
The 3-way notching tool can include angles from 150° to 15° - shown above are two popular arrangements. One tool can provide nine corner options - with auto index in two hits.

SPECIAL SHAPE SOLUTIONS TO OTHER PUNCHING PROBLEMS

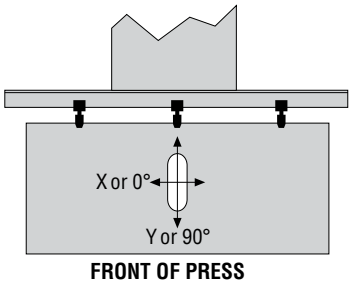
In addition to standard tooling, a few selected multi-purpose punches can fill out a very versatile tooling complement. Some very simple tools, along with auto index press capacity, can perform complex punching operations without resorting to other means to accomplish these tasks.

SPECIAL ANGLE SETTINGS

TOP DIE VIEW CARTESIAN COORDINATE SYSTEM

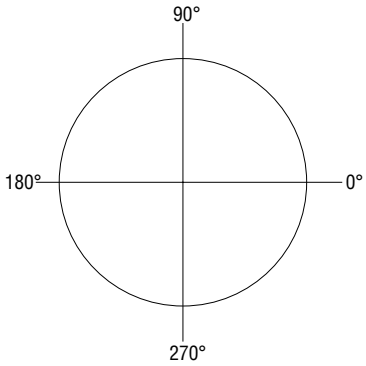


TOP VIEW OF TURRET



FRONT OF PRESS

PLEASE SKETCH IN SHAPE OF DIE OPENING AND THE ANGLE SETTING



[Dimensions in Inches (mm)]

CLUSTER PUNCH ASSEMBLY

FULLY GUIDED CLUSTER PUNCH ASSEMBLY

- Better piece part quality and longer tool life from “on the die stripping” as provided by the fully guided stripper.
- Cluster assembly and die can be set at 0°, 90° 180° and 270°.
- Greater precision and better hole accuracy.
- Also available for auto index blank holder design.

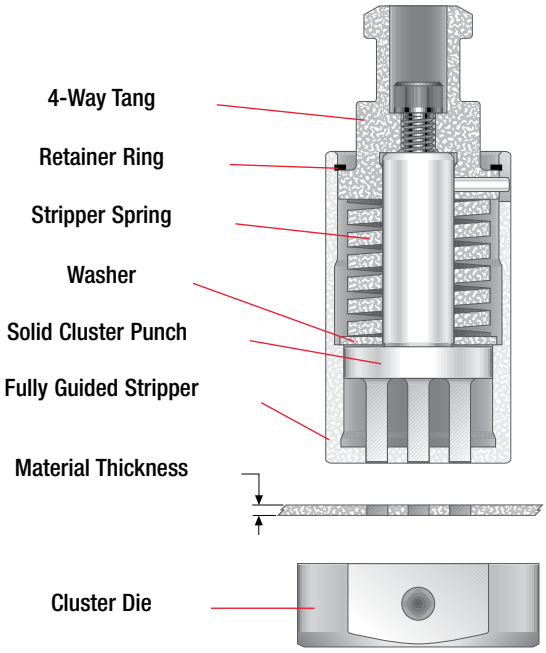
SPRING LOADED CLUSTER PUNCH ASSEMBLY

- A spring-loaded stripper with “on-the-die” performance is built into the punching assembly.
- Fully guided, spring loaded assembly with hardened and ground stripper guide posts are bolted into jig ground pockets in stripper and punch retainer for trouble free operation.
- Low cost replaceable inserts.
- Optional one-piece punch construction available for greater economy.

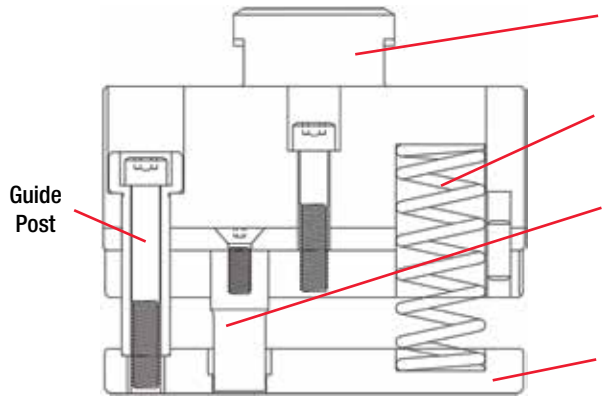
NON-SPRING LOADED CLUSTER PUNCH ASSEMBLY

- Economical design includes replaceable inserts.
- Optional one piece punch construction available for greater economy.
- Larger punching area not limited by stripper posts for more holes in fewer strokes.

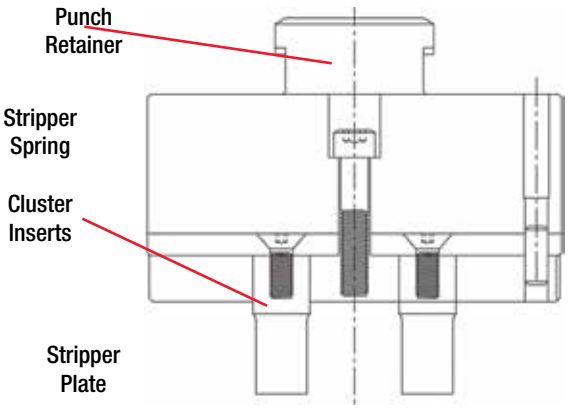
FULLY GUIDED PERFORATING CLUSTER PUNCH ASSEMBLY

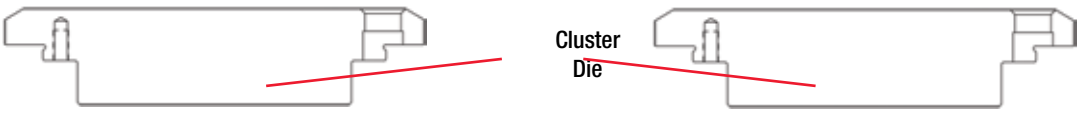


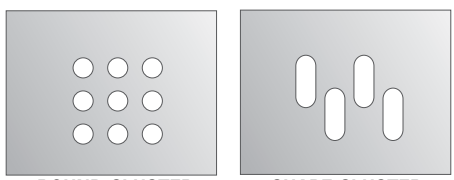
SPRING LOADED/FULLY GUIDED CLUSTER PUNCH ASSEMBLY



NON-SPRING LOADED/FULLY GUIDED CLUSTER PUNCH ASSEMBLY





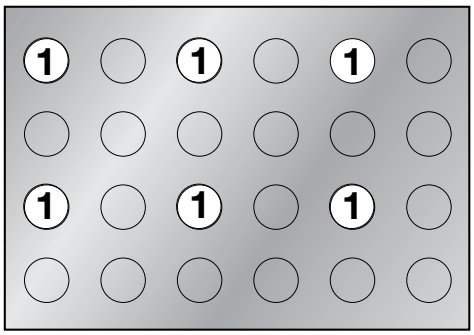


ROUND CLUSTER SHAPE CLUSTER

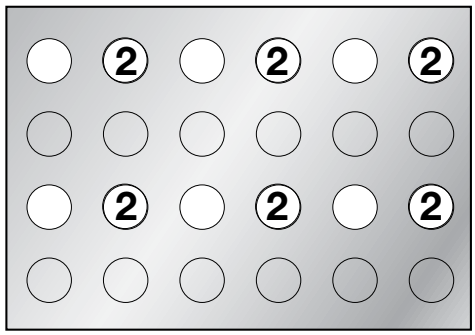
[Dimensions in Inches (mm)]

CLUSTER PUNCH ASSEMBLY / PUNCHING FORCE

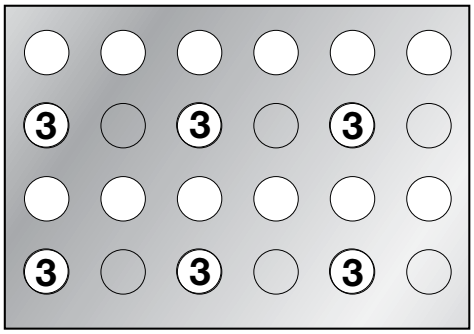
FIRST HIT ...



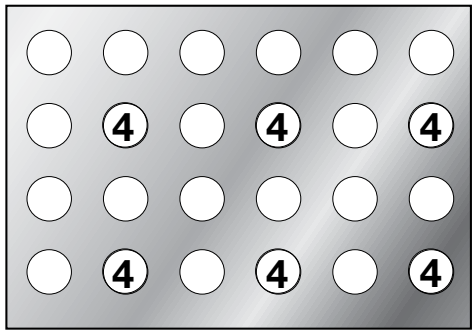
SECOND HIT ...



THIRD HIT ...

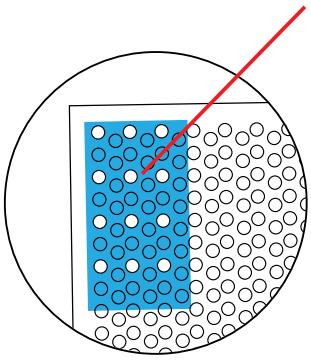


FOURTH HIT ...



For greater hole uniformity and flatter sheets, spread the punches to avoid punching adjacent holes in the same hit. Complete the desired pattern with the technique known as bridge hitting.

DO NOT DOUBLE-HIT HOLES. Using the cluster punch to finish missed holes in patterns will cause punches to shave sides of previously punched holes. The great lateral thrust from this shaving shortens punch life. Use a single-hole punch to complete the pattern.



PUNCHING FORCE FORMULA = linear length of cut x material thickness x shear strength = punching force in kilonewtons(kN).
PUNCHING FORCE SHOULD NOT EXCEED 75% PRESS CAPACITY.

EXAMPLE: Grid of .250(6.35) diameter holes spaced on .157(4.0) centers. Area of punch covers 48 holes; punch every 4th hole (12 holes, 4 times). Mild steel .060(1.52) thick. (Linear length of cut = 3.14 x diameter x number of punches)

hole perimeter inches(mm)	X	number punches in cluster	X	material thickness inches(mm)	X	shear strength tons/in^2 (kN/mm^2)	X	punching force tons(kN)
.785(19.94)	X	12	X	.06(1.52)	X	25(.345)	X	14.1(125.5)

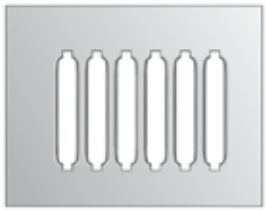
Spring pressure of the spring-loaded cluster assembly runs under a ton (9 kN) and can be ignored in calculations for machine capacity.

[Dimensions in Inches (mm)]

SPECIAL APPLICATIONS


CLUSTER - ROUND


CLUSTER - SHAPE


CARD GUIDE


CENTERPOINT


COUNTERSINK - ROUND


COUNTERSINK - SHAPE


EMBOSS - BEADING


EMBOSS - EDGEFORM


EMBOSS - FORMED

EMBOSS- COLD FORGED


EXTRUSION - TAPPING


EXTRUSION - FLANGED HOLE


GUIDED SHEARING


HINGE TOOL


KNOCKOUT


LANCE AND FORM

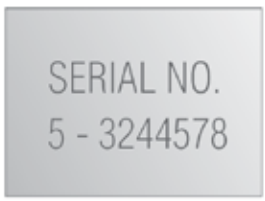

LOUVER


SCISSORTOOL™


SHEARBUTTON


ROLLERBALL™

SHEETMARKER™



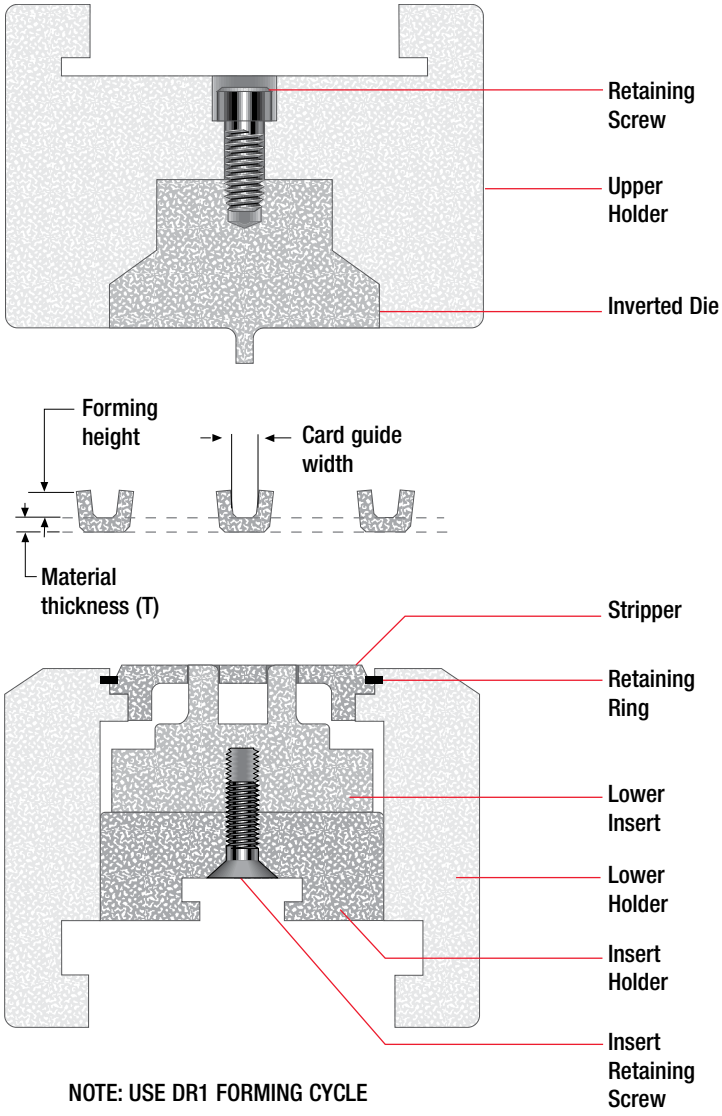
STAMPING - ALPHA/NUMERIC


STAMPING - V-LINE


THREAD FORM

[Dimensions in Inches (mm)]

BU POSITION 30-35 12 TON



NOTE: USE DR1 FORMING CYCLE

CARD GUIDE

Use:

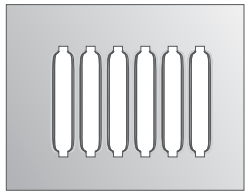
As a retainer for printed circuit boards

Typical Application:

- Material thickness from 0.040(1.00) to 0.078(2.00)
- Maximum recommended top-of-sheet to top-of-form height is 0.125(3.20)

Comments:

- Length of the card is dependent upon station size and machine tonnage
- Also available as a continuous form to increase productivity and flexibility

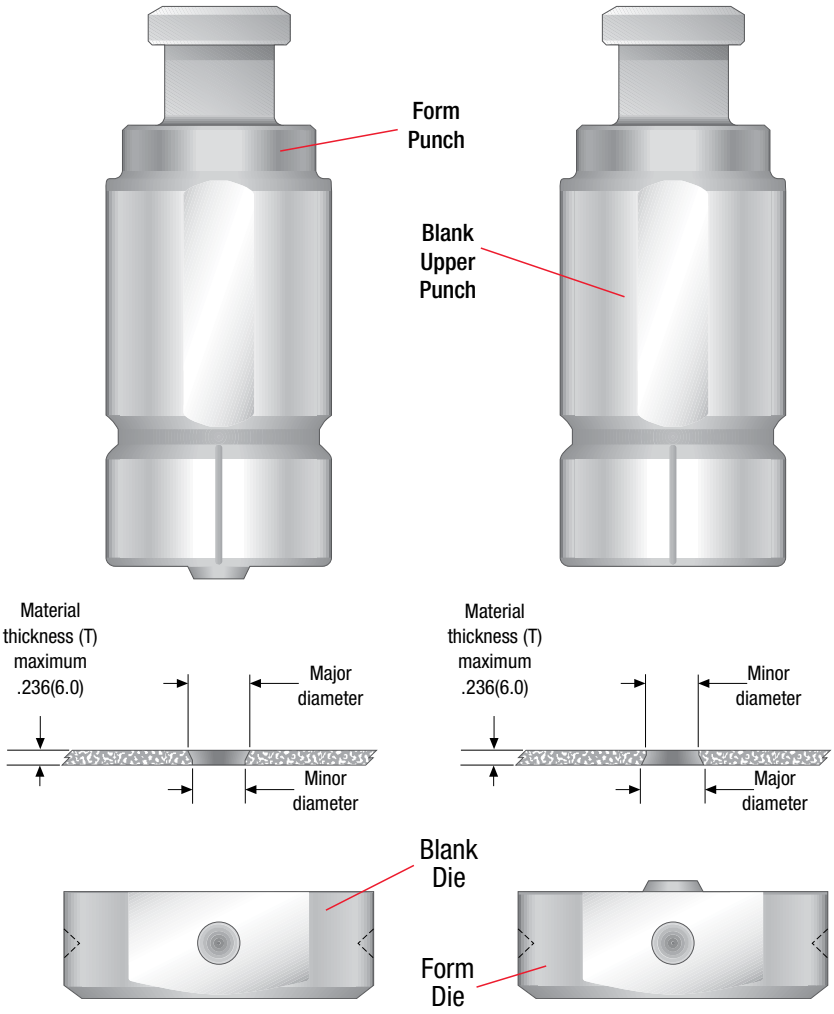


[Dimensions in Inches (mm)]

COUNTERSINK ASSEMBLY

COUNTERSINK DOWN
1-20, 41-76 7 TON

COUNTERSINK DOWN
1-20, 41-76 7 TON



COUNTERSINK

Use:

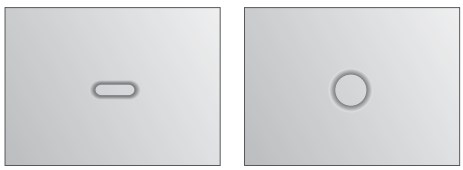
Allows screw and rivet head to sit flush or below the surface of the material

Typical Application:

- Material thickness from 0.048(1.22) to 0.250(6.35), dependent upon press tonnage capacity

Comments:

- The shoulder (dedicated) style is generally ordered for one material thickness and screw size
- The shoulder style coins the surrounding area producing a clean flat countersink with minimal burring



SHAPE ROUND

[Dimensions in Inches (mm)]

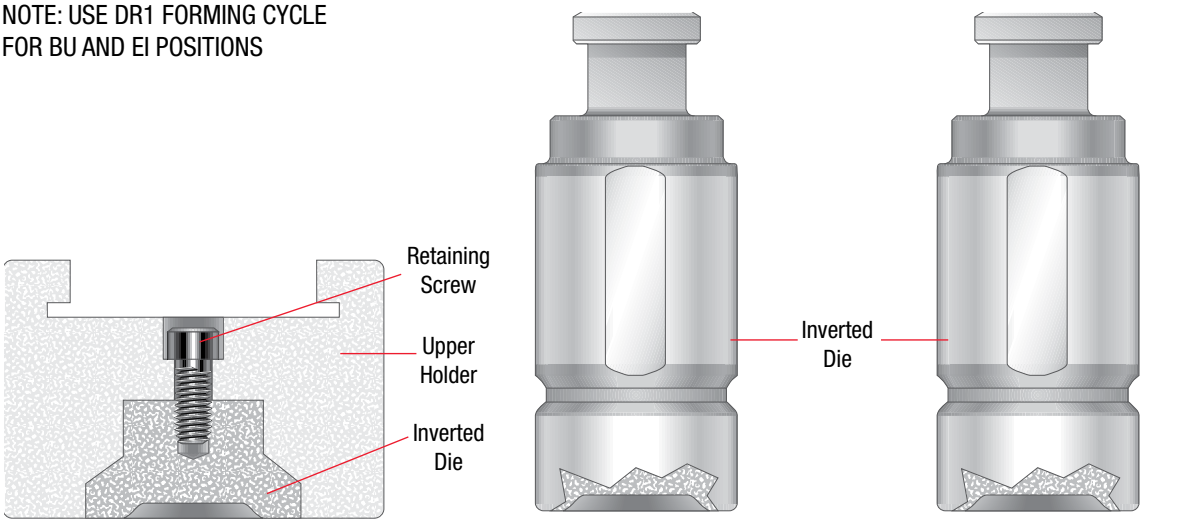
EMBOSSING ASSEMBLY

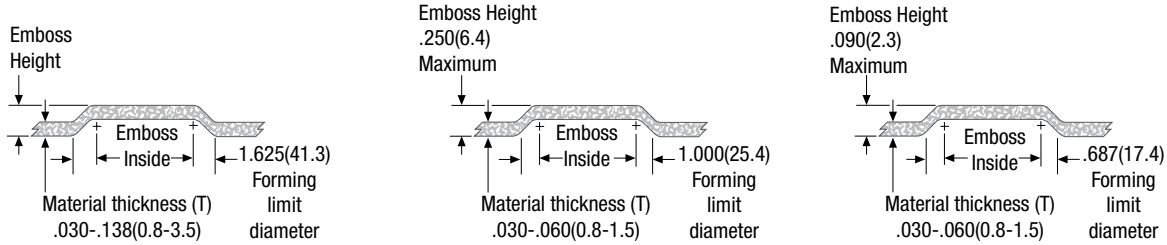
BU-POSITION
30-35 12 TON

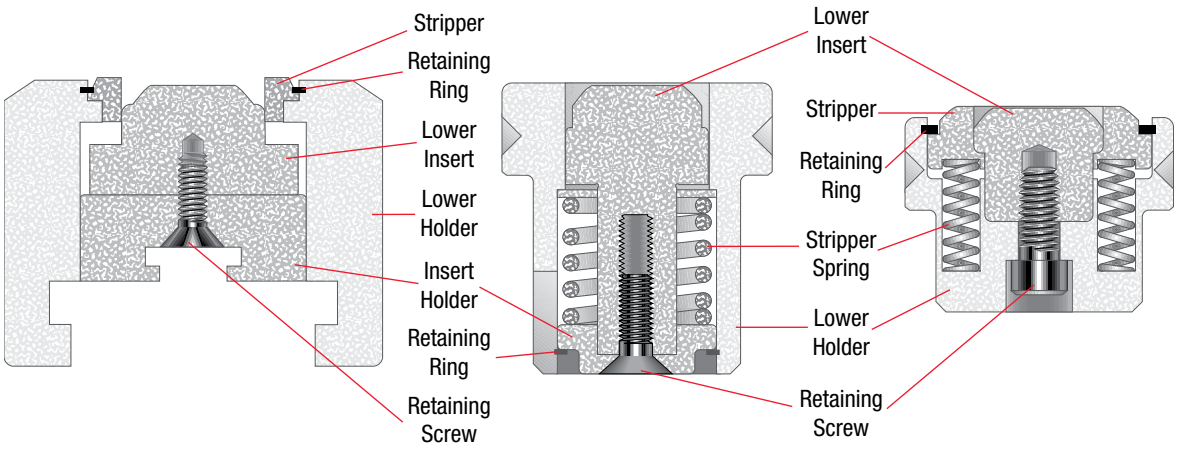
EI-POSITION
1-20, 41-76 7 TON

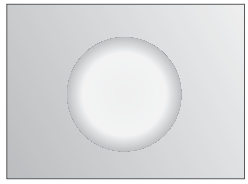
1-20, 41-76 7 TON

NOTE: USE DR1 FORMING CYCLE
FOR BU AND EI POSITIONS







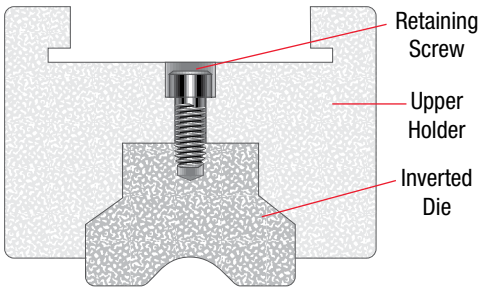


[Dimensions in Inches (mm)]

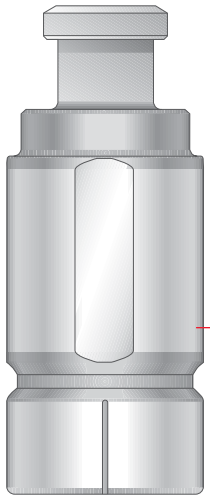
EMBOSS BEADING ASSEMBLY

BU-POSITION
30-35 12 TON

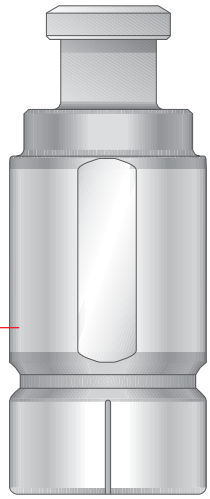
NOTE: USE DR1 FORMING CYCLE
FOR BU AND EI POSITIONS

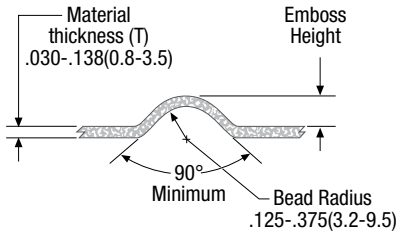


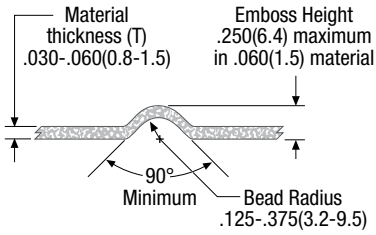
EI-POSITION
1-20, 41-76 7 TON

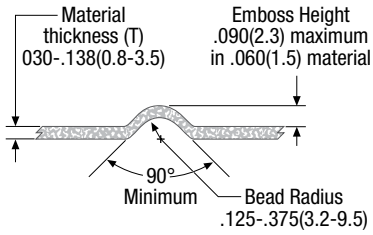


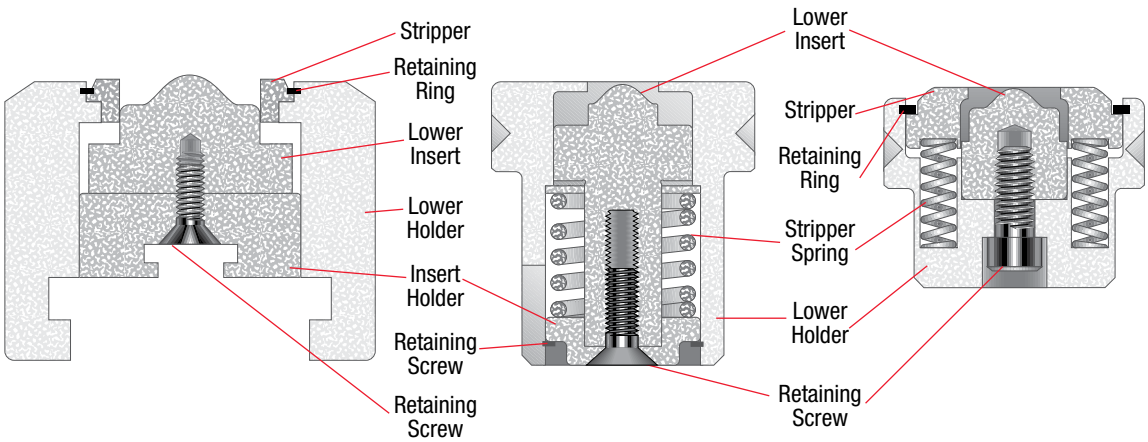
1-20, 41-76 7 TON







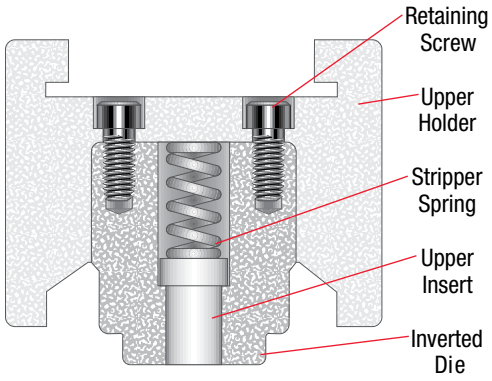




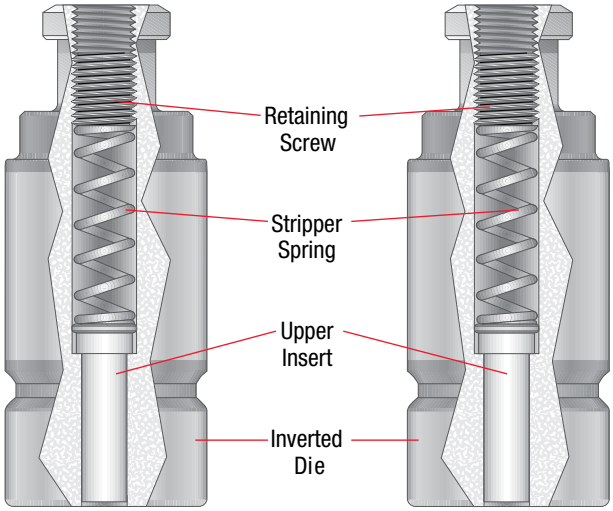
[Dimensions in Inches (mm)]

BU POSITION
30-35 12 TON

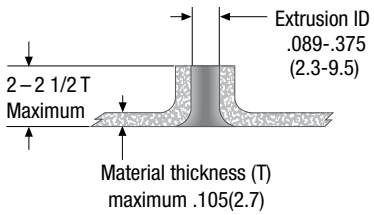
NOTE : USE DR1 FORMING CYCLE
FOR BU AND EI POSITIONS

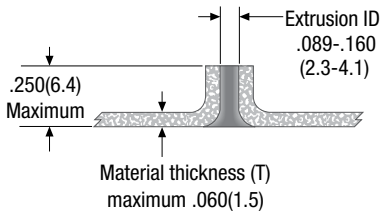


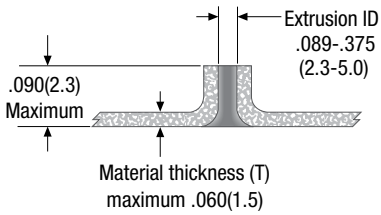
EI POSITION
1-20, 41-76 7 TON

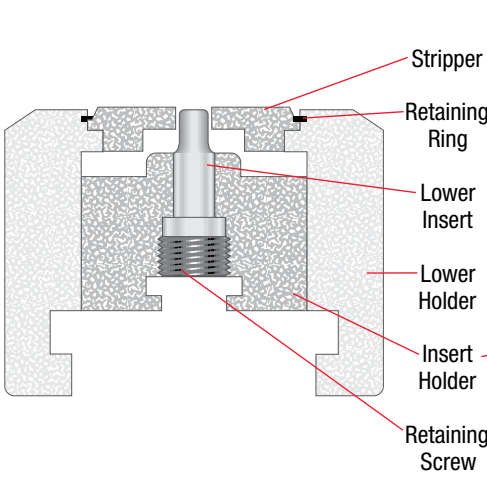


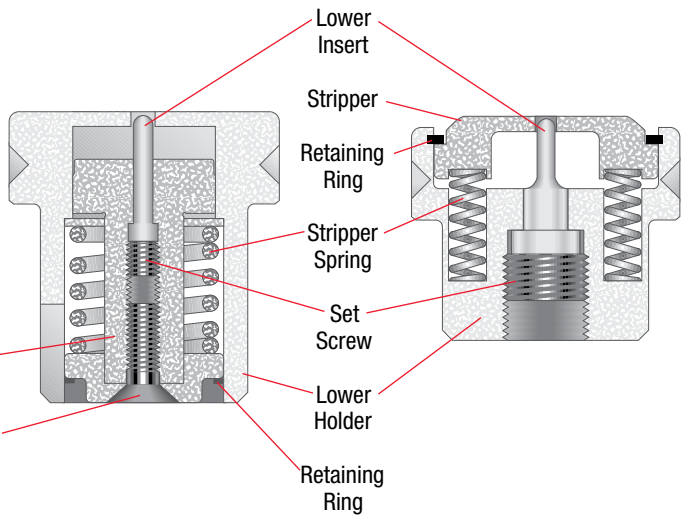
1-20, 41-76 7 TON







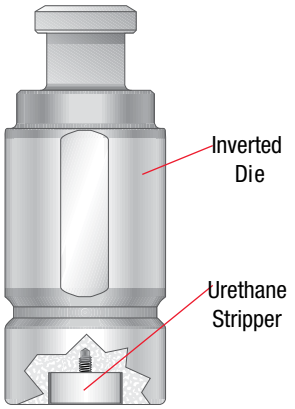


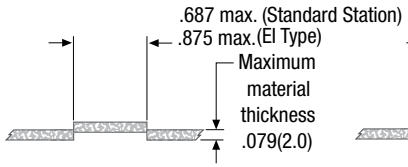


[Dimensions in Inches (mm)]

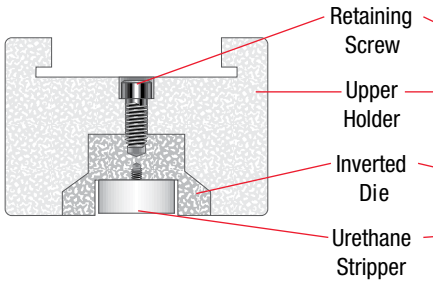
KNOCKOUT ASSEMBLY

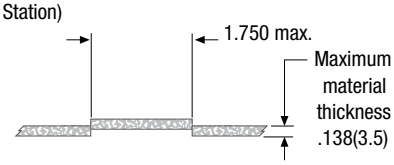
SINGLE KNOCKOUT* 1-20 41-76 7 TON



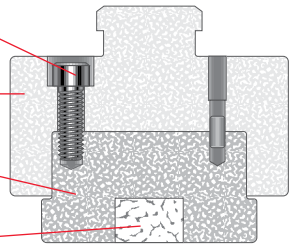


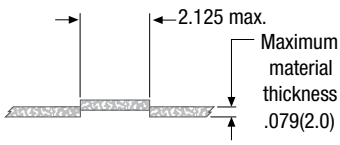
SINGLE KNOCKOUT BU POSITION 30-35 12 TON

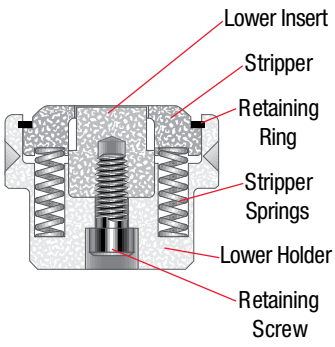


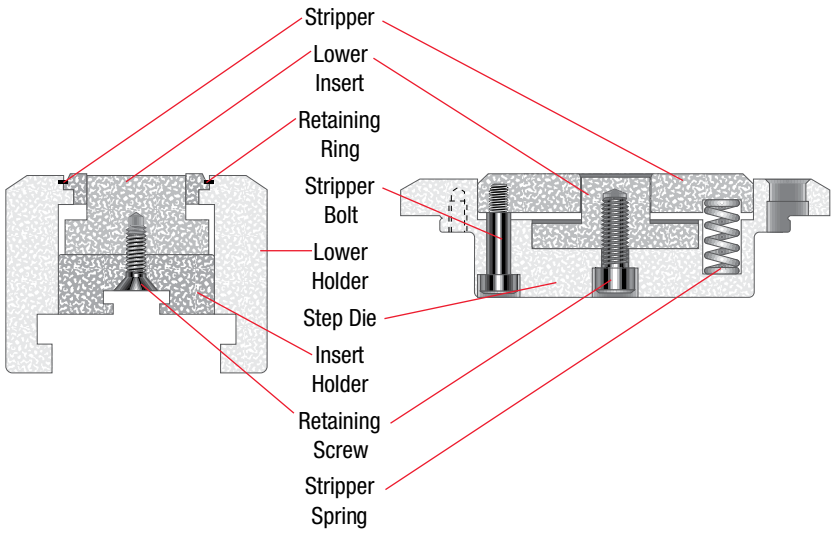


SINGLE KNOCKOUT BU POSITION 30-35 12 TON 70X90



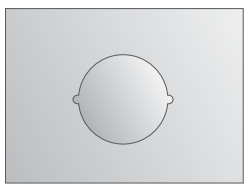






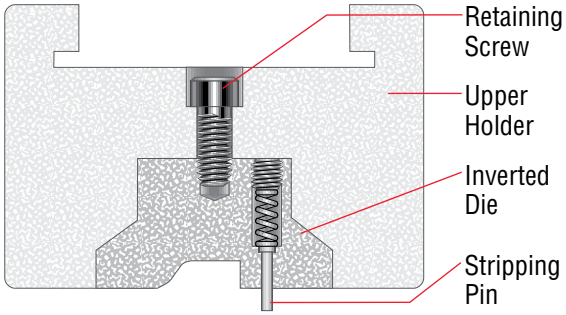
NOTE : USE DR1 FORMING CYCLE

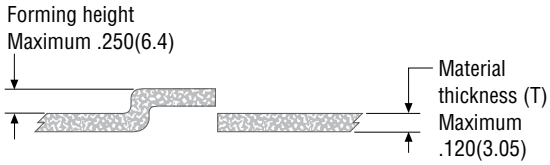
*ALSO AVAILABLE FOR EI POSITION (UPFORMING)

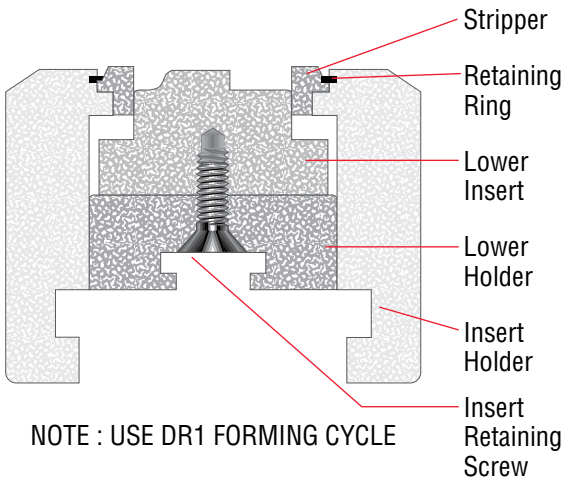


[Dimensions in Inches (mm)]

BU POSITION 30-35 12 TON

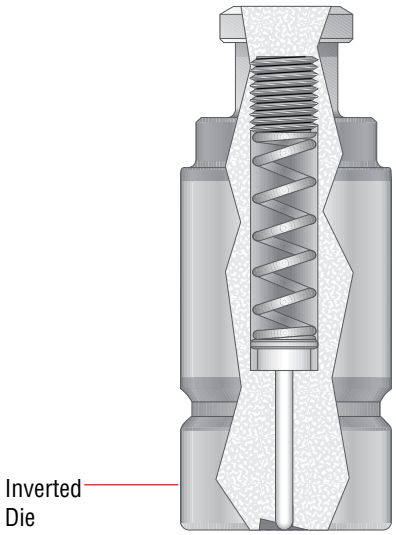


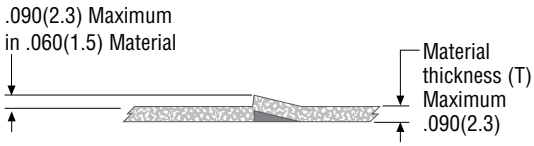


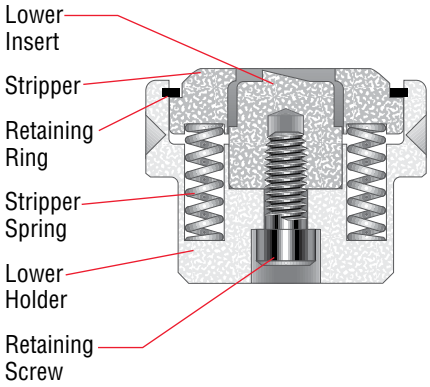


NOTE : USE DR1 FORMING CYCLE

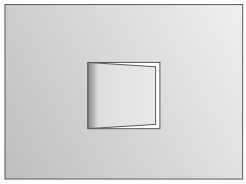
1-20, 41-76 7 TON*







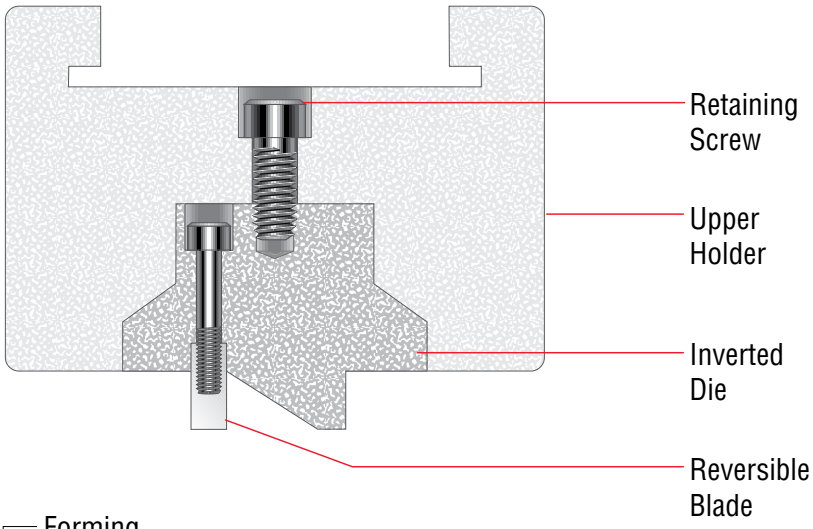
*ALSO AVAILABLE FOR EI POSITION (UPFORMING)

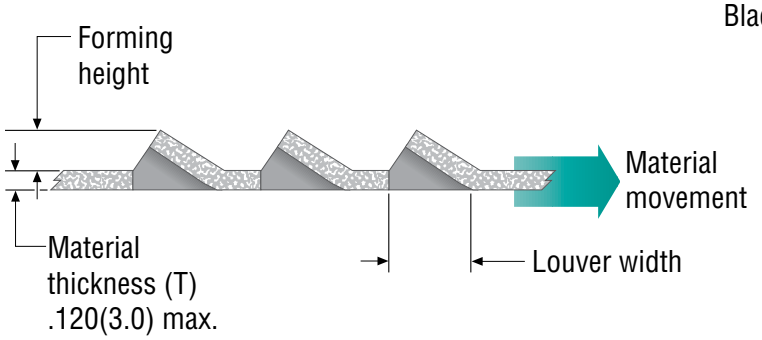


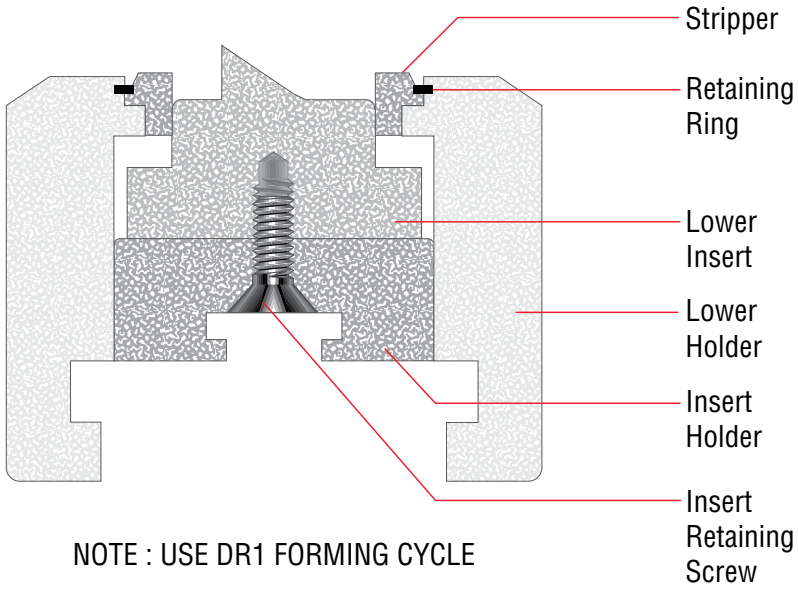
[Dimensions in Inches (mm)]

LOUVER ASSEMBLY

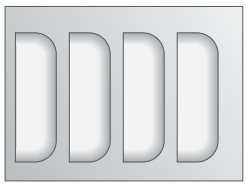
BU-POSITION 30-35 12 TON







NOTE : USE DR1 FORMING CYCLE



[Dimensions in Inches (mm)]

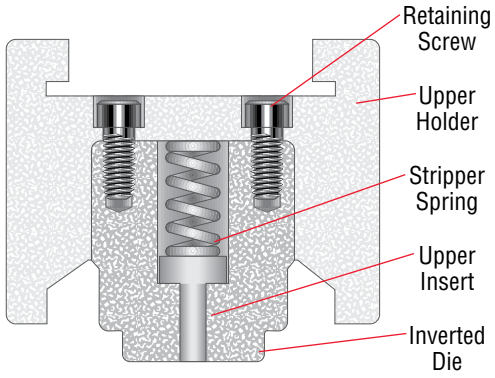
SHEARBUTTON ASSEMBLY

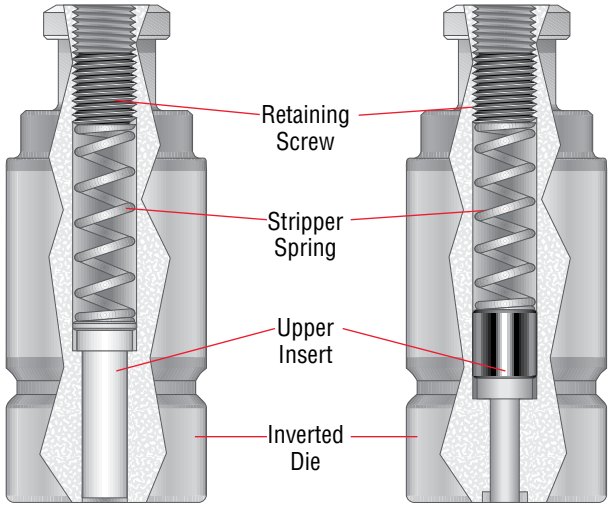
BU-POSITION
30-35 12 TON

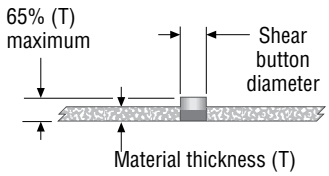
EI-POSITION
1-20, 41-76 7 TON

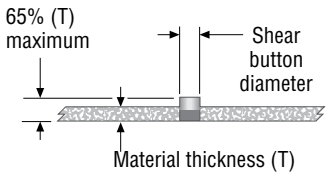
1-20, 41-76 7 TON

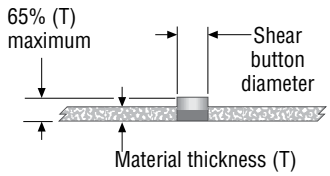
NOTE : USE DR1 FORMING CYCLE
FOR BU AND EI POSITIONS

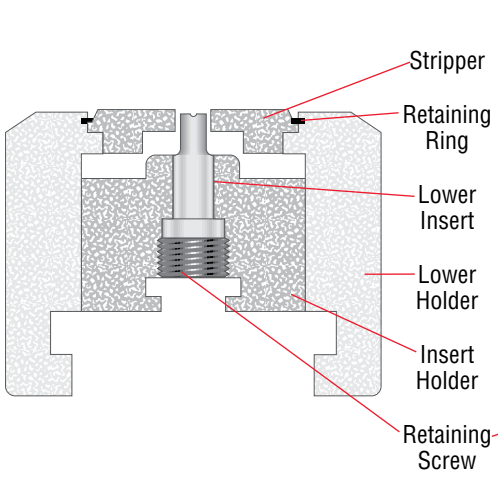


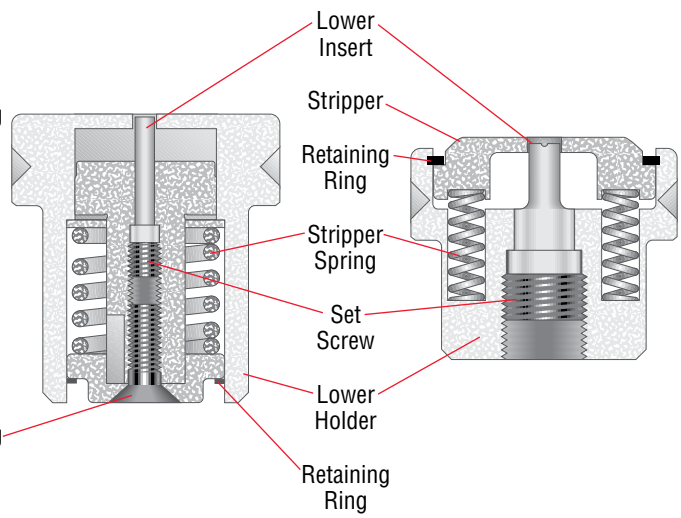


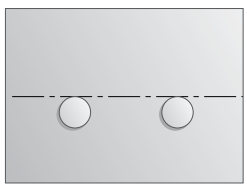








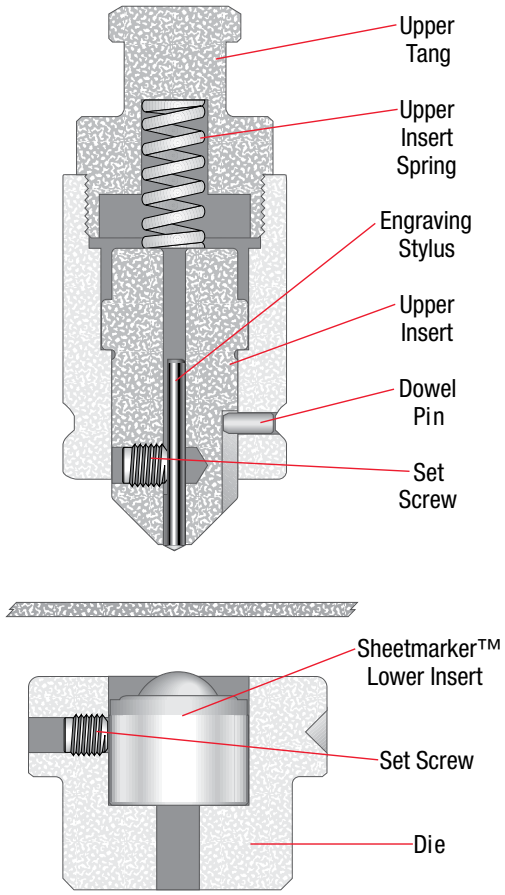




[Dimensions in Inches (mm)]

SHEETMARKER™ ASSEMBLY

33 mm POSITION
1-20, 41-76 7 TON



SHEETMARKER™

Use:

For markings or etchings on the surface of sheet metal. The tool uses a diamond pointed insert in a spring loaded holder to create the markings.

Typical Application:

- The Sheetmarker tool can be used on all material types and thicknesses

Comments:

- A wide variety of results can be produced ranging from very light etching to deep grooves on the sheet
- Variations are achieved with a combination of three spring pressures and two insert point angles
- The press must be capable of holding the ram down while the sheet is moved in the x and/or y axis

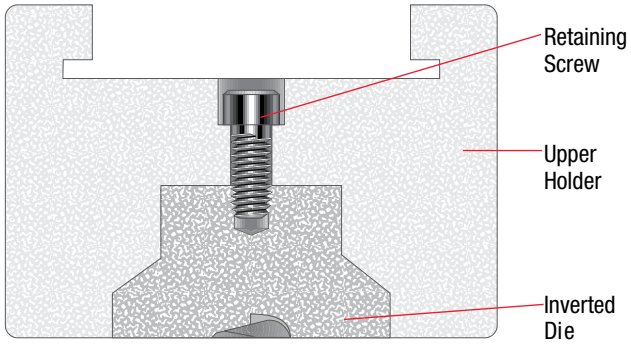
[Dimensions in Inches (mm)]

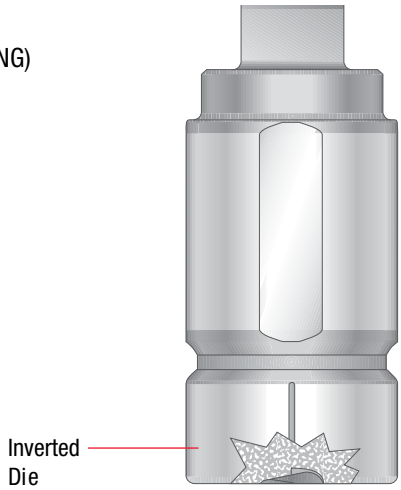
THREAD FORM ASSEMBLY

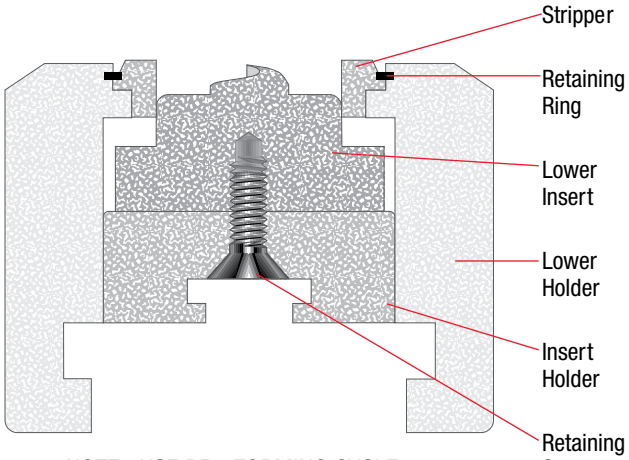
BU-POSITION
30-35 12 TON

1-20, 41-76 7 TON*

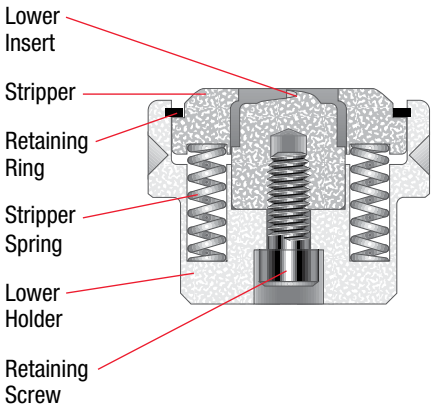
* ALSO AVAILABLE FOR
EI POSITION (UPFORMING)

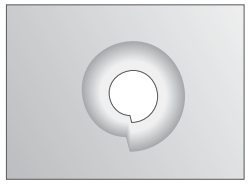






NOTE : USE DR1 FORMING CYCLE



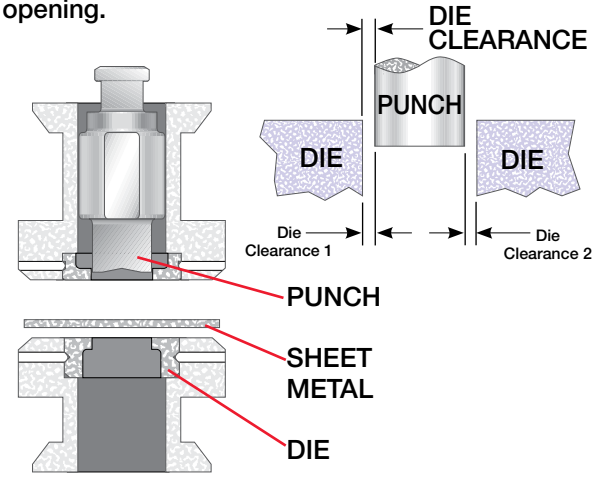


[Dimensions in Inches (mm)]

DIE CLEARANCE AND HOLE QUALITY

WHAT IS DIE CLEARANCE ?

Die clearance is equal to the space between punch and die when the punch enters the die opening.



Total Die Clearance = Die Clearance both sides of Punch

Total Die Clearance = Die Clearance 1 + Die Clearance 2

RECOMMENDED DIE CLEARANCE

DIE CLEARANCE in terms of percent (%) of material thickness :

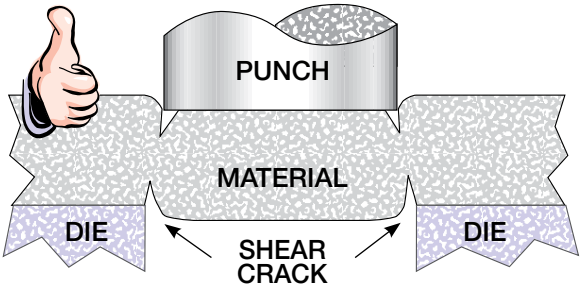
Minimum Life Clearance 15%
Optimum Clearance 20 - 25%
Extended Life Clearance 30%

MATE always refers to TOTAL DIE CLEARANCE — NOT clearance per side.

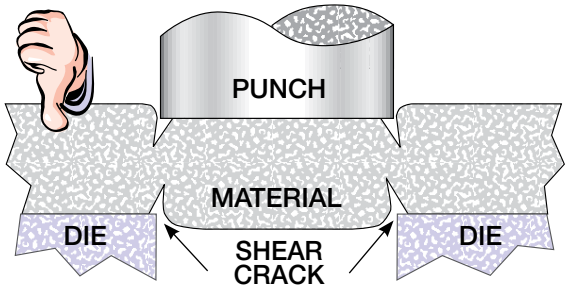
Aluminum		Copper	
Material Thickness	**Total Clearance**	**Material Thickness**	**Total Clearance**
.040"(1.0mm)	.006"(0.15mm)	.040"(1.0mm)	.006"(0.15mm)
.060"(1.5mm)	.009"(0.23mm)	.060"(1.5mm)	.009"(0.23mm)
.080"(2.0mm)	.012"(0.30mm)	.080"(2.0mm)	.012"(0.30mm)
.100"(2.5mm)	.018"(0.45mm)	.100"(2.5mm)	.018"(0.45mm)
.120"(3.0mm)	.024"(0.60mm)	.120"(3.0mm)	.024"(0.60mm)
.137"(3.5mm)	.028"(0.70mm)	.137"(3.5mm)	.028"(0.70mm)

Mild Steel		Stainless Steel	
Material Thickness	**Total Clearance**	**Material Thickness**	**Total Clearance**
.040"(1.0mm)	.008"(0.20mm)	.040"(1.0mm)	.008"(0.15mm)
.060"(1.5mm)	.012"(0.30mm)	.060"(1.5mm)	.016"(0.40mm)
.080"(2.0mm)	.016"(0.40mm)	.080"(2.0mm)	.020"(0.50mm)
.100"(2.5mm)	.020"(0.50mm)	.100"(2.5mm)	.025"(0.64mm)
.120"(3.0mm)	.030"(0.75mm)	.120"(3.0mm)	.035"(0.90mm)
.137"(3.5mm)	.034"(0.85mm)	.137"(3.5mm)	.040"(1.00mm)

WHY USE PROPER DIE CLEARANCE ?

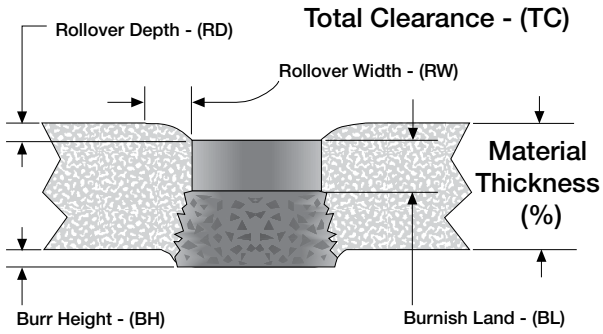


OPTIMUM CLEARANCE — shear cracks join, balancing punching force, piece part quality and tool life.



CLEARANCE TOO SMALL — secondary shear cracks are created, raising punching force and shortening tool life.

ANATOMY OF A PUNCHED HOLE



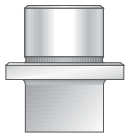
EFFECT OF TOTAL CLEARANCE AS A PERCENT (%) OF MATERIAL THICKNESS

TC	RD	RW	BH	BL
10%	10%	50%	15%	75%
15%	12%	40%	10%	55%
25%	16%	45%	6%	50%
35%	20%	50%	6%	45%

[Dimensions in Inches (mm)]

CALCULATING PUNCHING FORCE

PUNCHES WITHOUT SHEAR



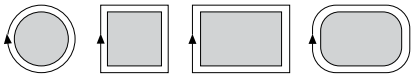
FORMULA:

- Punch perimeter in inches(mm) x
- Material thickness in inches(mm) x
- Material shear strength in lbs/in^2(kN/mm^2) =
- Punching force in lbs(kN)

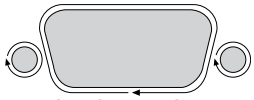
To convert to Imperial Tons: divide lbs by 2000

To convert to Metric Tons: divide kN by 9.81

PUNCH PERIMETER

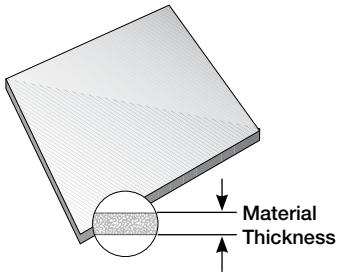


Perimeter is simply the linear distance around a punch of any shape. For a round punch, this would be the circumference.



For a cluster punch, the perimeter would be the sum of the linear distances of each of the punch components.

MATERIAL THICKNESS



Material thickness is the width of the workpiece or sheet that the punch must penetrate in making a hole. Generally the thicker the material the more difficult it is to punch, but this isn't the only factor.

MATERIAl SHEAR STRENGTH

Material shear strength is a measure of maximum internal stress before a given material begins to shear. This property is determined by metallurgical science and expressed as a numerical factor. Popular materials like aluminum, brass, mild steel and stainless steel have approximate shear strengths of:

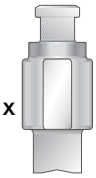
MATERIAL :	SHEAR STRENGTH - psi/in^2(kN/mm^2):
Aluminum 5052 H32	25000(0.1724)
Brass	35000(0.2413)
Mild Steel	50000(0.3447)
Stainless	75000(0.5171)

EXAMPLE PUNCHING FORCE PROBLEM

Example: using 20.0 mm square punch into 3.0 mm mild steel:
punch perimeter is 80.0 mm,
material thickness is 3.0 mm,
material shear strength is 0.3447 kN/mm^2.

80.0 mm x 3.0 mm x 0.3447 kN/mm^2 = 82.7 kN

PUNCHES WITH SHEAR



- FORMULA:
- Punch perimeter in inches(mm) x
- Material thickness in inches(mm) x
- Material shear strength in lbs/in^2(kN/mm^2) x SHEAR FACTOR =
- Punching force in lbs(kN)

PUNCHES WITH SHEAR — CONSIDERATION:

Punch shear tends to lessen punching force. The degree to which this happens is the SHEAR FACTOR. Shear factor does change as the punch becomes less sharp. Note that the factory does not recommend that you use shear to bring punching force within press capacity.

SHEAR FACTORS for material .050"(1.2mm) to .250"(6.4mm) for punches with shear

Material Thickness	.050" 1.2 mm	.060" 1.5 mm	.075" 1.9 mm	.105" 2.7 mm	.120" 3.0 mm
Shear Depth: .060(1.5)	**.50**	**.50**	**.58**	**.72**	**.75**

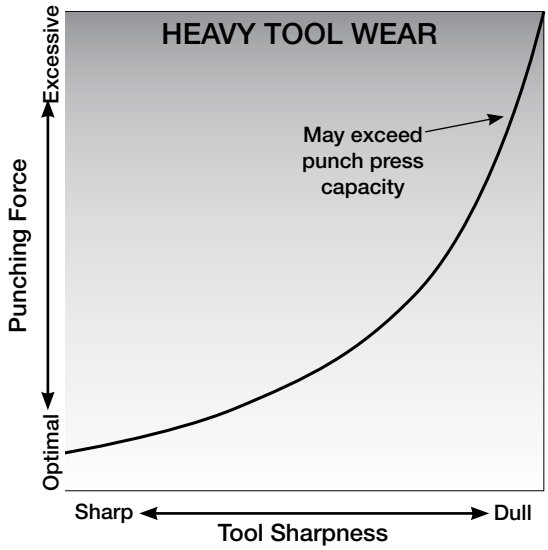
Material Thickness	.135" 3.4 mm	.165" 4.2 mm	.190" 4.8 mm	.250" 6.4 mm
Shear Depth: .060(1.5)	**.78**	**.83**	**.86**	**.90**

EXAMPLE: Formula for punching with shear (20.0 mm punch)

80.0 mm x 3.0 mm x 0.3447 kN/mm^2 x .75 = 62.0 kN

NOTE: The factory does not recommend using shear to bring punching force within press capacity because dulling tool edges quickly raise punching force and press capacity may be exceeded.

PUNCHING FORCE CHANGES AS TOOLS BECOME DULL



[Dimensions in Inches (mm)]

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