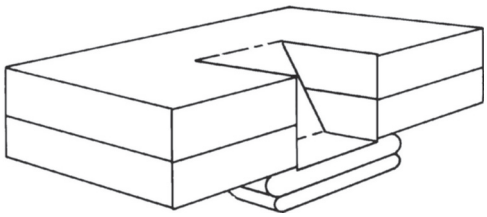
BTM's
Tog-L-Loc® and Lance-N-Loc®

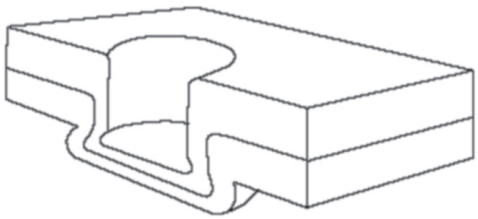
Patented

Sheet Metal Joining Systems

User's Guide for Tooling



Cross Section of a
Lance-N-Loc Joint



Cross Section of a
Tog-L-Loc Joint

Contents

BTM® CORPORATION

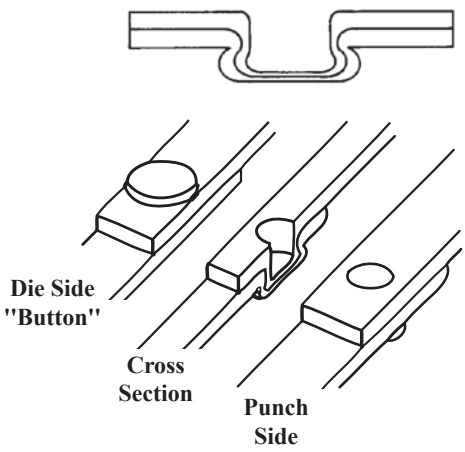
BTM Corporation 300 Davis Road Marysville, Michigan 48040 U.S.A.
Phone 810-364-4567 • Fax 810-364-6178

Revised 141208

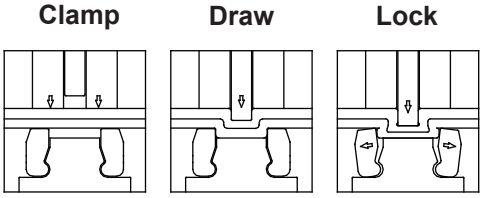
Joining Systems Description

BTM's Tog-L-Loc and Lance-N-Loc joining systems produce clean, strong and consistent joints in most coated or uncoated metals. The joints are characterized by a "button" formed on the die side layer of metal and a recess formed in the punch side layer. The button is a good indicator of joint quality and therefore, simplifies quality control. Two or more layers of metal typically ranging in thickness from .008" (0.2mm) to .157" (4.0mm) per sheet can be reliably joined in most cases.

Tog-L-Loc®

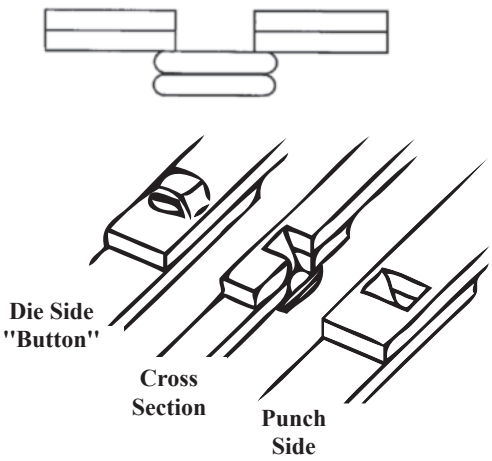


Tog-L-Loc is a circular, leakproof joint formed by drawing the metals into a circular "cup" and expanding the diameter to form a 360° lock below the bottom sheet.

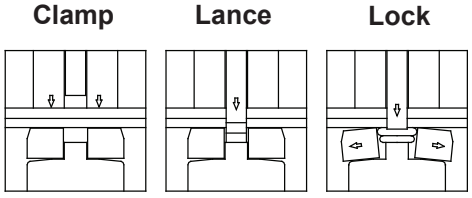


Tog-L-Loc is generally preferred due to its omnidirectional strength characteristics, excellent fatigue properties and exceptional tool life.

Lance-N-Loc®



Lance-N-Loc is a joint formed by lancing the metals on 2 sides, drawing them through the thickness and expanding the width to form a lock on 2 sides.



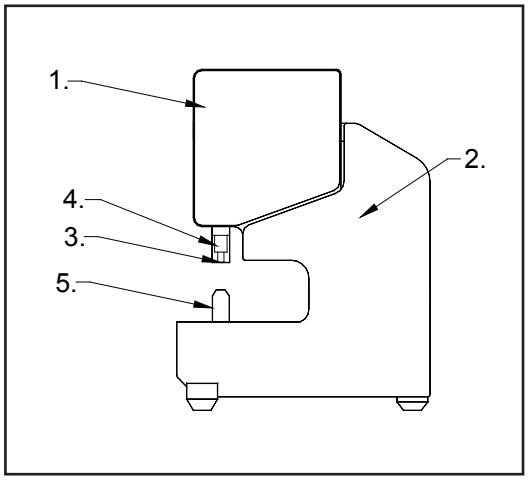
Lance-N-Loc is commonly used where metals are insufficiently ductile to join with Tog-L-Loc or in certain dissimilar combinations or multiple layers.

Tog-L-Loc Basics

A Tog-L-Loc / Lance-N-Loc system consists of 5 major components.

1. The Force Mechanism:
A device capable of producing sufficient force to form the joint(s). Hydraulic, pneumatic or mechanical presses are generally used.

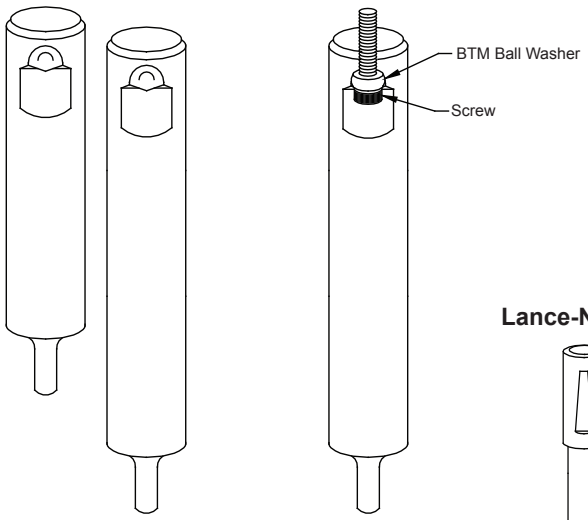
2. The Force Frame:
Forces must be contained to prohibit flexing at the punch / die. Deflection will cause degraded joint strength and tool breakage.



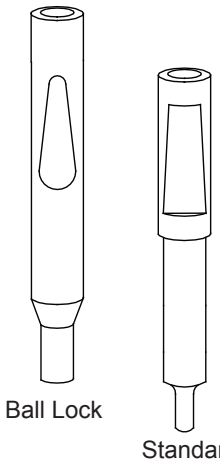
3. The Tog-L-Loc / Lance-N-Loc Punch:
Tog-L-Loc punches are available in various tip diameters (see joint size page 5), lengths and styles to suit differing application requirements. The perimeter of the round Tog-L-Loc punch tip has a slight radius to prevent piercing. Lance-N-Loc punches are also available in various lengths and styles. The square Lance-N-Loc punch tip has cutting edges on two sides and angular ramps on the other two.

(Tog-L-Loc Basics continued on following page.)

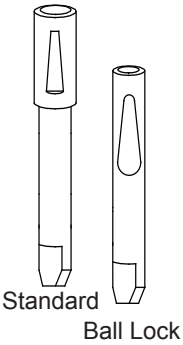
Tog-L-Loc 940 Punches



Tog-L-Loc Punches

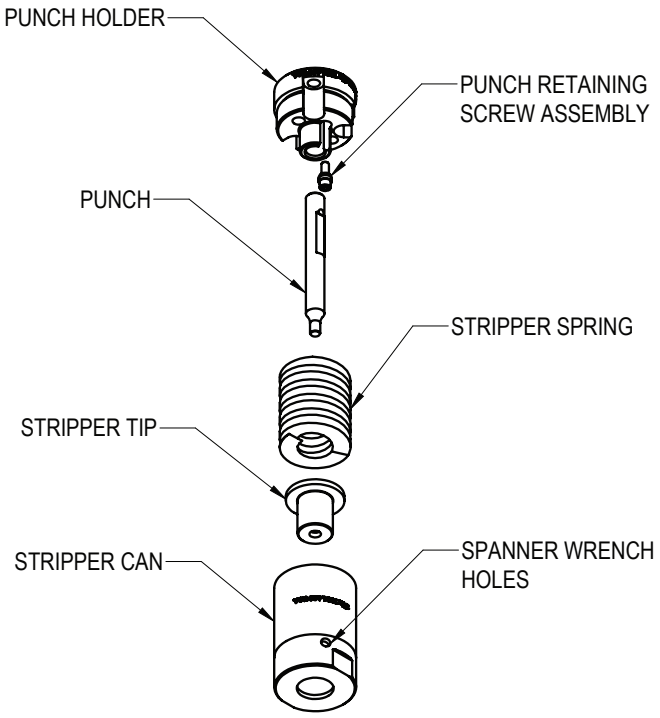


Lance-N-Loc Punches



4. The Stripper:

Both Tog-L-Loc and Lance-N-Loc require use of a spring stripper / clamping mechanism which surrounds the punch tip. The stripper must preload the parts before punch entry, and must allow full punch travel. The spring force must be sufficient to clamp the parts together during joining and prohibit upward extrusion of the metal around the punch.



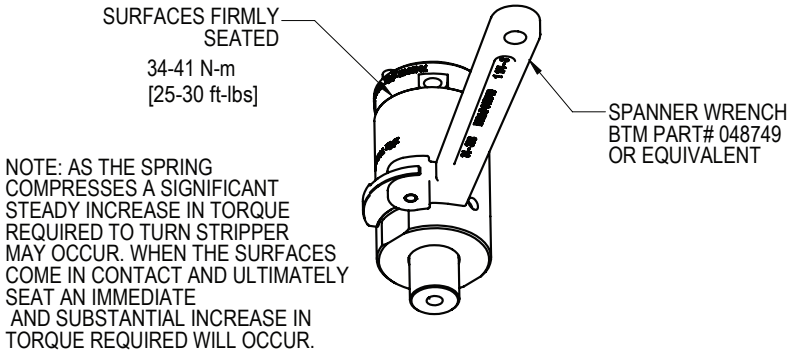
4.1 Assembly:

The stripper plays an integral role in the clinching process and must be assembled and torqued properly to ensure joint quality and tooling life. **IMPROPER ASSEMBLY OF THE STRIPPER CAN CAUSE POOR JOINT QUALITY AS WELL AS DAMAGE TO TOOLING AND PRESS.**

4.1.1 Seating the Stripper Can:

After the PUNCH HOLDER and PUNCH have been mounted and Alignment checked, the STRIPPER ASSEMBLY can be installed and SEATED.

1. Make Sure threads on PUNCH HOLDER and STRIPPER CAN are clean and lubricant free.
2. Insert STRIPPER TIP then COMPRESSION SPRING into STRIPPER CAN.
3. Thread STRIPPER CAN onto PUNCH HOLDER (NOTE:As the threads are engaged first, the STRIPPER SPRING will be preloaded next, the STRIPPER CAN will make contact with the shoulder on the PUNCH HOLDER).
4. Tighten STRIPPER CAN using a spanner wrench (BTM Part #048749 or equivalent) and ensure that the STRIPPER CAN is firmly seated on the PUNCH HOLDER (25-30 ft-lbs [34-41N-m]).



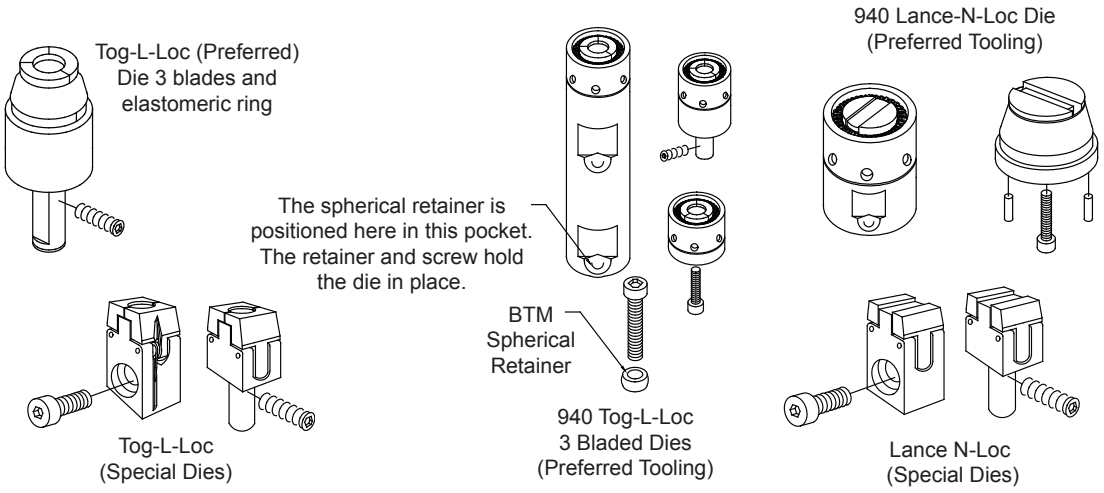
SEATING THE STRIPPER CAN

IMPROPER ASSEMBLY OF THE STRIPPER CAN CAUSE POOR JOINT QUALITY AS WELL AS DAMAGE TO TOOLING AND PRESS.

5. The Tog-L-Loc / Lance-N-Loc Die:
Tog-L-Loc dies are available in many styles to suit differing application requirements. The dies have a fixed anvil which is recessed from movable or pivoting blades. A radius is given to the blades' inside edge. Dies are retained by ball lock, set screws or socket head cap screws. The 940 Tog-L-Loc and Lance-N-Loc dies feature a one piece anvil and shield. A spring is used to close the 940 blades.

Lance-N-Loc dies are also available in various styles, however, all are two bladed. The blades have cutting edges to the inside, with a fixed anvil recessed from the blade surface.

Blade shields are supplied with several die styles. These shields protect the die blades from the force of the stripper and help to retain the blade assembly to the die. In some cases, dies are mounted in pockets within a block which functions as the shield.



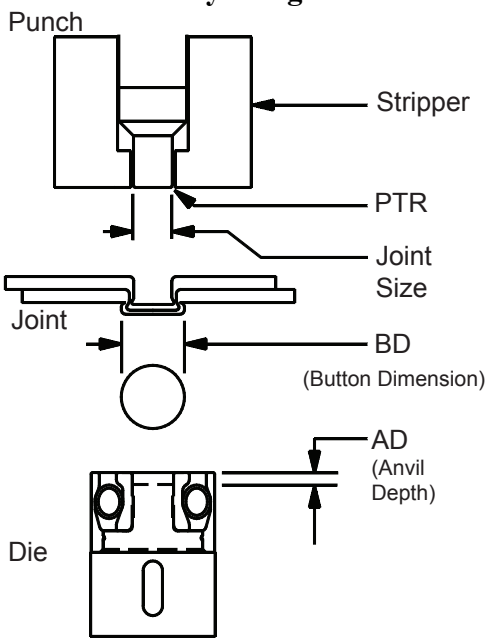
Joint Data

BTM sheet metal joining tools are furnished with joint data documentation expressed in the following terms.

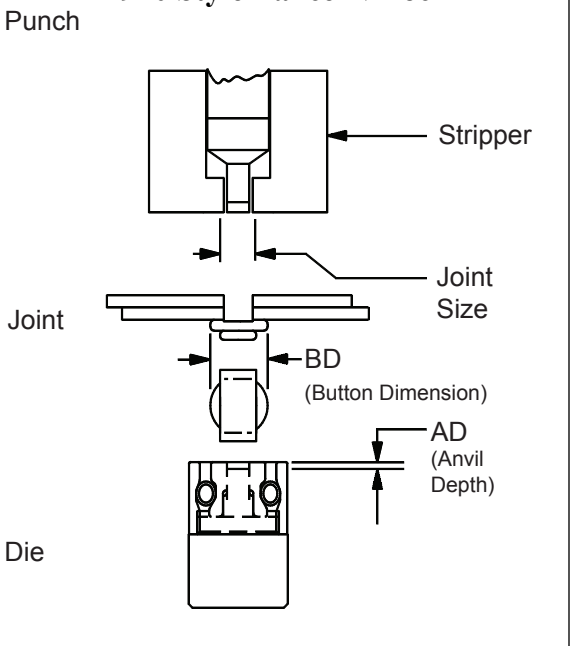
1. Joint Size: Expressed as the punch tip diameter (Tog-L-Loc) or width of the die anvil (Lance-N-Loc). For example, a .18" Tog-L-Loc has a punch tip diameter of .180" (4.6mm). Common sizes are: .12" (3.0mm), .18" (4.6mm) and .25" (6.4mm) with special sizes used on occasion.

2. PTR: (Punch Tip Radius): Tog-L-Loc only. Expressed as a decimal figure example: .010" (0.25mm). This dimension is determined at BTM to suit the application.

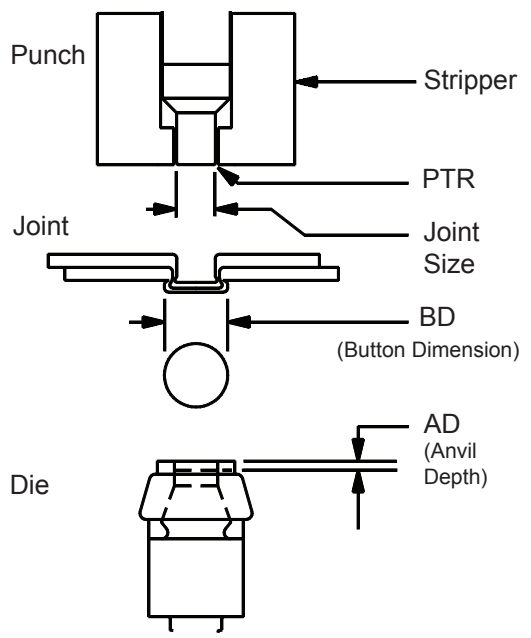
940 Style Tog-L-Loc



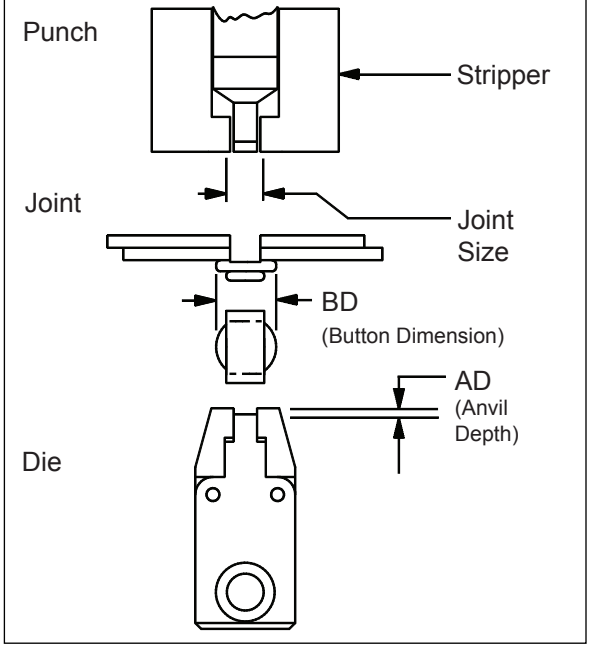
940 Style Lance-N-Loc



Elastomer Style Tog-L-Loc



Special Style Lance-N-Loc

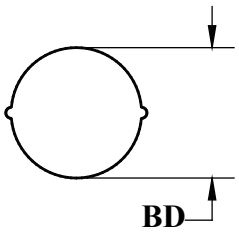
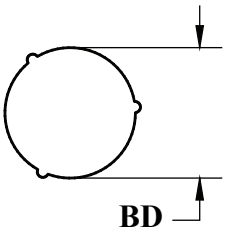
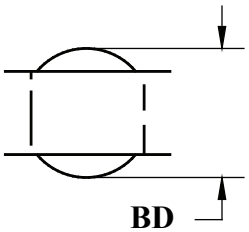


Joint Data continued

3. BD (Button Dimension): Diameter or width of the formed joint "Button." BD is expressed as a decimal figure and given a tolerance. Example: .295" + .010" -.000" (7.49mm + .25mm -.000mm). This highly repeatable dimension is used for quality control and is directly linked to joint strength.

4. AD (Anvil Depth): Depth from the top of the die blades to the top of the die anvil. Expressed as a decimal figure Example: .035" (0.9mm). This dimension is determined at BTM to suit the application.

Measuring Button Dimension (BD)

2 Bladed Tog-L-Loc® Die BD=Maximum obtainable measurement in direction of blades opening	**3 Bladed Tog-L-Loc® Die** BD=Minimum obtainable measurement	**2 Bladed Lance-N-Loc® Die** BD=Minimum obtainable measurement in direction of blades opening
		

Joint quality (strength) is monitored by measurement of the button dimension (BD). Button dimension is controlled by adjusting punch penetration. Button dimensions specified by BTM are intended to give the optimum combination of joint strength and tool life. BD specification includes a tolerance to accomodate standard mill tolerances in the metals.

OTHER PERTINENT INFORMATION INCLUDES THE FOLLOWING:

1. BTM numbers of punch and die tooling for reference and re-ordering.
2. Metal type and thickness as specified by the customer, as well as orientation - (i.e. punch side/die side.)
3. Location of Tog-L-Loc tooling within machinery where applicable.

Joining Theory and Quality Control

In order to function reliably, a Tog-L-Loc or Lance-N-Loc system must conform to the following guidelines.

1. The parts to be joined must allow adequate access for the tooling and mate without gaps at the joint locations.
2. The metals to be joined must be sufficiently ductile, within the thickness capabilities of the system and the parts must conform to the tolerances the machine was designed around.
3. The machine must consistently produce sufficient force to form the joints.
4. The machine must contain the force without excessive flexing.
5. The stripper/clamp must apply sufficient force to contain the flow of metal within the die.
6. The tooling must be appropriate to the metals being joined, (i.e. Tog-L-Loc or Lance-N-Loc, joint size, AD and PTR.) Tools purchased for one metal type and thickness may not give the best results with a different metal.
7. The tooling must be adjusted & aligned to properly form the joints, and be secured to maintain these settings.
8. The machine and tooling must be maintained properly so that all components perform their intended function. For example, worn seals can reduce force output thereby affecting joining ability.

Maintaining Joint Quality

The Lance-N-Loc Punch must have sharp angled edges. (See page 3 of this document.)

Lance-N-Loc die blades must be sharp to maintain consistent joint quality.

Correct anvil depth in Tog-L-Loc and Lance-N-Loc dies is required to obtain a superior joint.

The force unit should be in proper operating condition. A unit in poor condition could influence joint quality.

Tooling must be free from dirt, paint chips or sludge that may develop after long use. Inspect tooling at weekly intervals to ensure punches and dies are clean.

Punch and die must be in proper alignment to form a good joint.

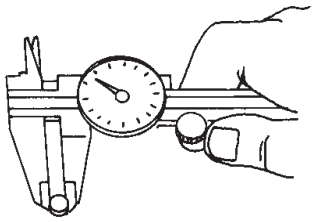
Inspect for weak, compressed or broken stripper springs and replace as necessary. BTM recommends changing springs every 100,000 cycles or when changing tooling.

Checking Button Dimension with Tolerance Gauge

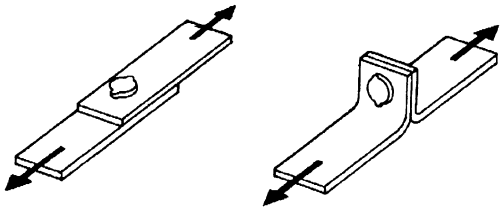
Joint quality (strength) is monitored by measurement of the button dimension (BD). Button dimension is controlled by adjusting punch penetration. As the shut height is adjusted down the button dimension increases. Backing off the shut height will decrease the button dimension.

Button dimensions, as specified by BTM Corporation, are intended to give the optimum combination of joint strength and tool life. Increasing BD to exceed the recommended figure will increase peel strength without measurable effect on shear strength, but will reduce tool life. Reducing BD to less than the recommended figure will prolong tool life at the cost of reduced peel strength; again, shear strength is not greatly affected as long as a lock is achieved.

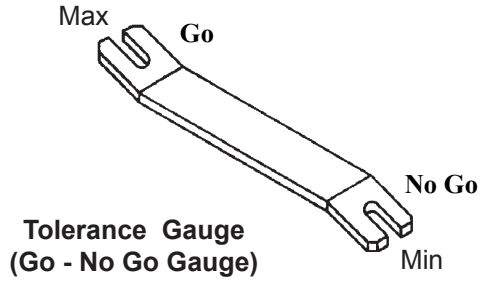
The joint button allows easy visual inspection. Broken, improperly adjusted or misaligned tools produce visually distorted buttons. Defective strippers and part nonconformity will also show up in visual inspection. Refer to "Trouble Shooting" pages 13-15 for specific information.



Checking BD with a caliper.



Shear Peel

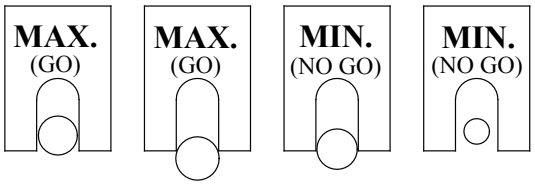


Tolerance Gauge (Go - No Go Gauge)

The tolerance gauge is a reliable and easy method of monitoring joint quality. These tools are made with a maximum and minimum gauge to allow for button growth resulting from standard mill tolerance within the metals being joined.

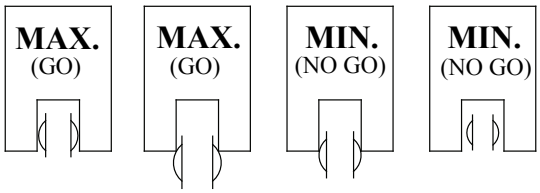
Monitoring Joint Quality With a Tolerance Gauge

Tog-L-Loc



Good Joint | **Not Acceptable** | **Good Joint** | **Not Acceptable**

Lance-N-Loc



Good Joint | **Not Acceptable** | **Good Joint** | **Not Acceptable**

Maintenance & Adjustment

7.

1. Tog-L-Loc tools are manufactured to be interchangeable so that replacing a punch and or die will not require any shut height adjustment.

2. While periodic adjustment may be necessary, a machine which begins to require frequent shut height adjustments is indicating a problem. Refer to items 3 and 4 below for typical causes.

3. Machines should be properly maintained, as problems with seals, friction, lubrication, loose or broken parts, cracks in the force frame, etc. can adversely affect the Tog-L-Loc Joints.

4. If a problem with the Tog-L-Loc joints arises, use the following checklist before adjusting tools. Tog-L-Loc tools are full hard, (Rockwell C-60 Range) and will not usually require adjustment due to wear.

   - Check part metals for thickness and hardness.
   - Check for damage to punch and die.
   - Check condition of stripper springs. *(Replace after 100,000 cycles)*
   - Check operating pressure.
   - Check machine controls sequence and positive down cycle.
   - Check adjusting mechanism for loose parts.
   - Check for flexing, yielding or damage within the force frame.

5. We support our customers and want to know of any problems you may encounter. Should you encounter problems with Tog-L-Loc tooling, call our service department. BTM corporation has extensive experience with Tog-L-Loc in production environments, and will provide expert support.

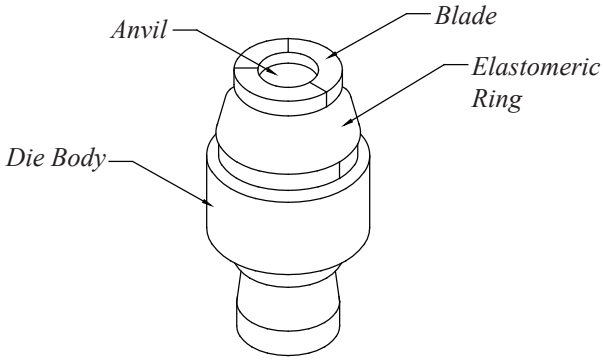
Caution:
Observe common safety practices when working with any press tooling equipment.

Changing the Die Blades

THREE BLADE TOG-L-LOC DIE ASSEMBLY:

1. Place the three blades on the anvil, surrounding the top.

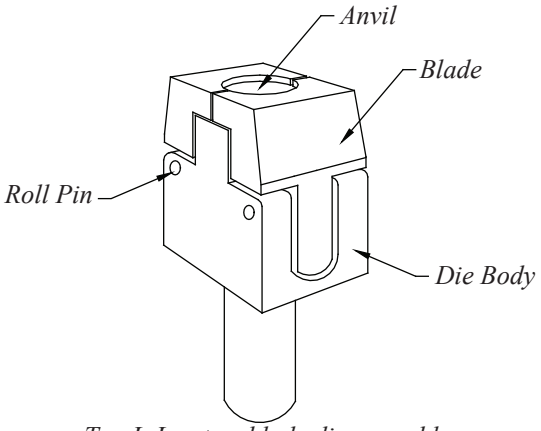
2. Slide the elastomeric ring over the top of the blades and into its groove.



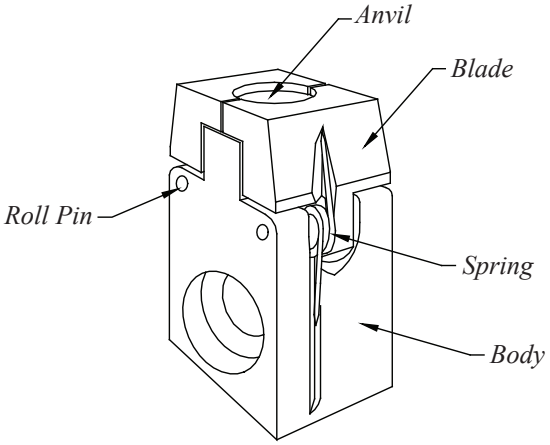
Tog-L-Loc three blade die assembly with elastomeric ring.

TWO BLADE TOG-L-LOC DIE ASSEMBLY:

1. Drive the roll pins out of the die body with a punch & hammer.
2. Remove the springs and die blades.
3. Replace with new die blades (and springs if necessary).
4. Replace new roll pins in die body.



Tog-L-Loc two blade die assembly with internal spring.

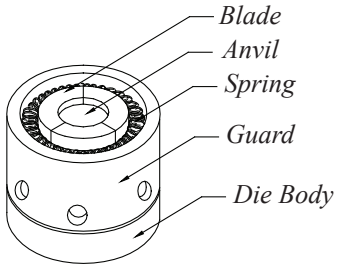


Tog-L-Loc two blade die assembly with external springs.

Changing the Die Blades (continued)

940 TOG-L-LOC DIE ASSEMBLY (Canted Coil Spring)

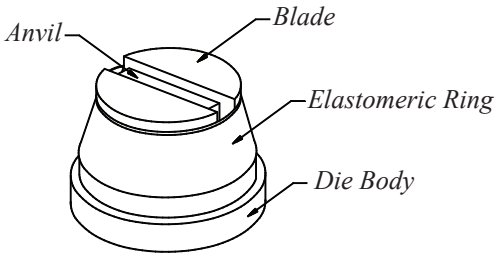
1. Remove spring with a small screw driver or tool to pry the spring out.
2. Discard old spring. Springs cannot be reused.
3. Set new blades together in a circle on a flat surface.
4. Place spring over new blades and into groove. Spring should flow around the blades in a clockwise direction.
5. Press spring and blade assembly over diameter of anvil, being careful not to damage or pinch spring.
6. If spring is crimped, bent or breaks during assembly, replace with a new spring. (A damaged spring will produce poor joint quality.)



3 blade 940 Style Die

940 Die Springs
Clockwise Direction

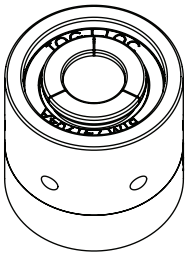
940 LANCE-N-LOC DIE ASSEMBLY



Lance-N-Loc 2 blade die assembly.

940 TOG-L-LOC DIE ASSEMBLY (Elastomer)

To change the die blades in the 940 Elastomer Series dies, special tools *(kit numbers listed below)* are required to effectively install the elastomer and blade assembly into the die. It will be necessary to also replace the elastomer because it cannot be removed without damaging it.

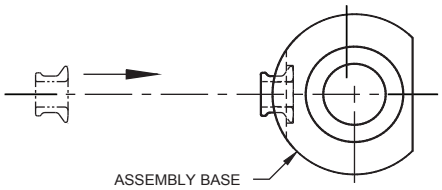


Size	Took Kit No.		Size	Tool Kit No.
3.0-940	711400J		5.5-940	741900N
3.0-940M	710200G		5.5-940M	747700K
3.8-940	793900J		6.4-940	711600N
4.6-940	711500L		6.4-940M	710500X
4.6-940M	710100U		7.6-940	779600P

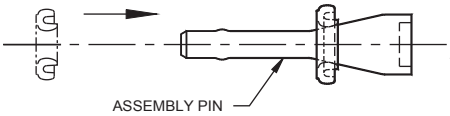
Changing the Die Blades (continued)

940 Elastomer Blade Assembly Instructions

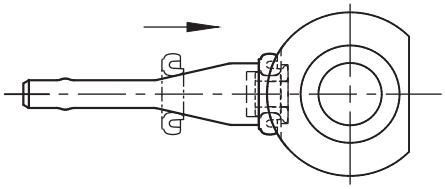
1. First, remove the old elastomer by digging it out of the die with a pick or a small screwdriver.
2. Discard old elastomer as it cannot be reused.
3. Replace blades and install a new elastomer as detailed in the procedure outlined below:

1 

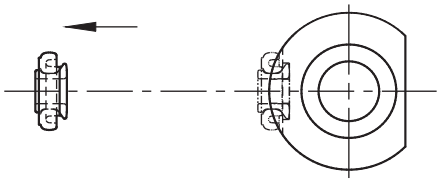
Place 3 blade sections in assembly base with bottom (larger outside diameter) of blade in counterbore.

2 

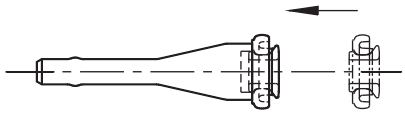
Place elastomer with groove facing down over small end of assembly pin. Push down to beginning of tapered portion of pin.

3 

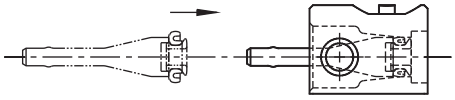
Place assembly pin and elastomer on top of blade set with pilot diameter in assembly pin surrounding the blades. Slide elastomer over blades and remove assembly pin.

4 

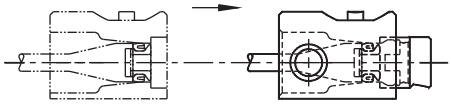
Remove blade sub-assembly from assembly base.

5 

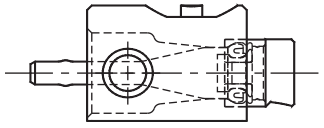
Place top of blade sub-assembly into pilot diameter in assembly pin and lubricate elastomer (light oil).

6 

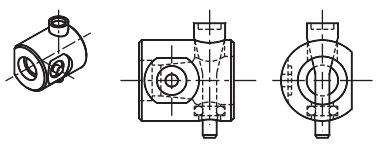
Push blade sub-assembly into tapered hole in assembly base until it reaches counterbore (for die assembly).

7 

Place counterbore at end of assembly base over top of guard on die assembly.

8 

Push assembly pin until the blade assembly snaps past guard and is retained in die assembly. Repeat steps 1-8 as required.

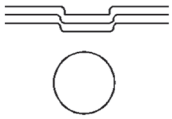
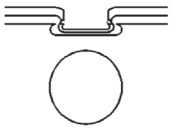
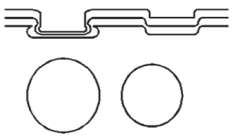
9 

Install assembly pin in assembly base as shown for storage when not in use.

Tog-L-Loc Trouble Shooting

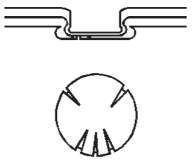
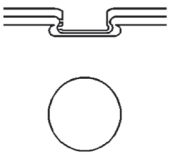
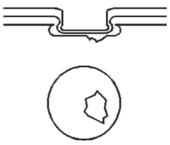
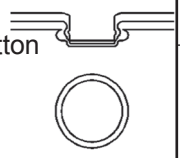
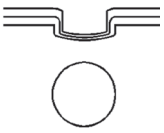
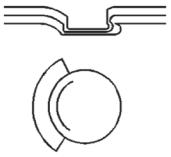
The symbol at left represents a properly formed TOG-L-LOC joint, viewed from the "button" (die) side and in section. BTM TOG-L-LOC tools can commonly produce in excess of 200,000 good joints. Problems can, however, occur. The illustrations below represent possible problem variations of the joint.

Problems, causes and their corrective actions are given in the order in which they should be checked.

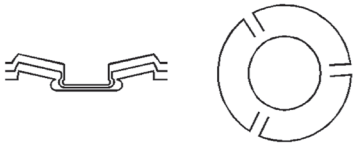
Problem	Probable Cause	Corrective Action
I. Total Failure of Joint (See also III. Deformed or Distorted Joints)		
A. No Button Formed	**1.** Broken Punch or Die	-Replace Tool
	2. Loss of Operating Pressure	-Restore Pressure
	3. Insufficient Force	-Check Force
B. Button Partially Formed No "Squeeze" 	**1.** Metals Not of Specified Thickness	-Use Specified Metals or Change to AppropriateTooling
	2. Die Elastomer or Die Spring Broken	-Replace Elastomer or Spring
	3. Pressure Drop	-Restore Pressure
	4. Incorrect Tooling for Metals	-Verify Joint Data / Change Tooling if Necessary
	5. Incorrect Shut Height / Tool Adjustment	-Adjust Shut Height for Correct BD *Refer to Maintenance Section (pg. 7)
C. Piercing or cracking of Punch Side Sheet Metal 	**1.** Metals Not of Specified Thickness	-Use Specified Metals or Change to appropriate Tooling
	2. Incorrect Tooling for Metals	-Verify Joint Data / Change Tooling if Necessary
	3. Weak or Broken Stripper Springs	-Replace Spring(s)
	4. Punch and Die Not Concentric	-Realign Tooling
II. Intermittent Failure		
A. Same Tooling Produces Intermittently Good and Bad Parts 	**1.** Insufficient Stripper Force to Compensate for Part Variation or Non-Mating Parts.	-Correct Parts to Conform. Increase Stripper Force
	2. Parts Do Not Fit Gauging / Nesting	-Correct Parts or Gauging to Fit
	3. Parts Interfere with Tooling Operation	-Correct Parts or Gauging to Allow Clearance

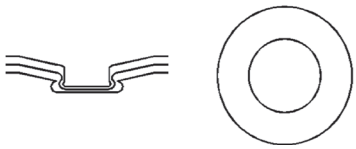
(Continued)

III. Deformed or Distorted Joints

Problem	Probable Cause	Corrective Action
A. Cracks Appear on Button 	**1.** Metals Not of Specified Thickness or Hardness	-Use Specified Metals or Change to Appropriate Tooling
	2. BD Too Large, Tooling Over Adjusted	-Back Off Shut Height Adjustment.
	3. Incorrect Tooling for Metals	-Verify Joint Data / Change Tooling if Necessary
	4. Punch and Die Not Concentric	-Realign Tooling
	5. Excessive Deflection	- Check for Damage
B. Cracks Appear Inside Joint Cup 	**1.** Metals Not of Specified Thickness or Hardness	-Use Specified Metals or Change to appropriateTooling
	2. Tooling Incorrect For Metals	-Verify Joint Data / Change Tooling if Necessary
	3. Punch and die Not Concentric	-Realign Tooling
	4. Weak or Broken Stripper Spring(s)	-Replace Spring(s)
C. Lump or Irregularity on Button. 	**1.** Chipped Tool	-Replace Tool
D. Concentric Double Button 	**1.** Missing or Non-Functional Stripper	-Replace or Repair Stripper
	2. Double Hit	-Check Controls / Operator
E. No Backflow of Button- Round Top "Squeezed"  See also Item B pg. 8	**1.** Broken or Weak Stripper Springs	-Replace Springs
F. Partial Back Flow of Button 	**1.** Die Blade Missing or Opened Before Joining	-Replace Blade if Missing, or Check for Intererence Causing Blade to Open upon Part Loading.
	2. Deflection in Force Frame or Tool Holder	-Check for Damage
G. Dimpling and Unformed Button 	**1.** Die Blades Missing	-Replace Blades
	2. Elastomer or Die Spring Broken (Blades Open)	-Replace Elastomer or Spring

(Continued)

Problem	Probable Cause	Corrective Action
H. Button Restricted Asymmetrically 	**1.** Blade is Not Opening	-Check for Interference
	2. Deflection is Binding Blades	-Check for Damage -Check Blade Guarding
I. Witnessing (Scarring) 	**1.** If Heavy: Stripper Spring is Bottoming - Insufficient Spring Travel	-Replace With Correct Stripper
	2. If Light: Dies are not Protected Adequately	-Add Blade Shielding
J. Button is Out of Round 	**1.** Flexing of Force Frame	-Check For Damage
	2. Punch and Die are not Concentric	-Realign Tooling
K. Button Restricted Symmetrically 	**1.** Metal is Thick for Joint Size or Metal is Soft	-Generally not Detrimental to Joint Strength

Problem	Probable Cause	Corrective Action
IV. Distortion of Parts		
A. Parts are Distorted During Joining 	**1.** Insufficient Stripper Force	-Replace Stripper Springs to Suit
	2. Stripper Tip too Small	-Replace with Large Diameter Tip
	3. Die Not Protected	-Add Blade Shield
	4. Die Blades Below Shield	-Adjust Shield Height
	5. Misgauging / Nesting	-Adjust or Replace Gauging / Nesting to Suit
	6. Incorrect Equalization of units on part	-Adjust Equalization Stop

Notes

Notes

Notes

Tooling Record

This Tooling Record form is provided for your convenience. Fill in the form with your data to have this important information readily accessible. Tooling records are provided with your tooling from BTM.

Job No. & Location	Metal Type & Thickness			Punch No.	PTR	Die No.	AD	BD
	Punch Side	Die Side	Other					

Notes: