Combining rotation resistance with leak-proof characteristics

Learn more about this Clinching Solution online!
www.btmcomp.com/oval-loc.html
Oval-Loc® was created from the vision of combining all of the advantages of our popular Tog-L-Loc® round clinch joint with the rotation resistance of our Lance-N-Loc® sheet metal joining system.

The Oval-Loc® process features the leak-proof and long tool life characteristics of a traditional Tog-L-Loc® joint, but also provides improved strength.

---

**ROUND JOINTS**

Tog-L-Loc® and V-Loc™ clinch joints are the most widely used. These round clinch joints have very good strength across a broad spectrum of material combinations, are aesthetically pleasing and at low cost. V-Loc™ performs especially well when joining combinations of aluminum. BTM’s round clinch joints are an economical solution to fastening sheet metal parts. However, round joints, while most popular, have the ability to rotate when used singularly, so BTM also offers Geo-Clinch® joints.

**Geo-Clinch® JOINTS**

BTM’s Geo-Clinch® joints resist rotation, and also have the added benefit of increasing the rigidity of a sheet metal assembly.

Geo-Clinch® joints set the combined geometry of two separate parts in an assembly as required by GD&T. This makes Geo-Clinch® joints ideal for use in Geo-Set applications.

---

**Oval-Loc® IS A Geo-Clinch® JOINT**

Oval-Loc® was created from the vision of combining all of the advantages of our popular Tog-L-Loc® round clinch joint with the rotation resistance of our Lance-N-Loc® sheet metal joining system.

The Oval-Loc® process features the leak-proof and long tool life characteristics of a traditional Tog-L-Loc® joint, but also provides improved strength.
Now you can assemble your sheet metal parts with even less cost using our innovative Oval-Loc® clinch tools which deliver the following advantages:

- Parts with limited overlap area and requiring a non-rotating connection can be joined using a single Oval-Loc® punch and die
- Oval-Loc® offers tool life similar to Tog-L-Loc, is also leakproof, and keeps coatings intact.
- The non-round shape creates non-rotating rigidity and high strength with only one joint.

This makes Oval-Loc® ideal for setting the orientation geometry or “Geo-Clinching” assembled parts.

Now parts can be inexpensively “tacked” together to significantly reduce the cost of tooling for spot welding sheet metal assemblies by reducing the amount of clamps and gaging required during ongoing welding steps.

Contact our Application Engineering department for more information about using BTM products for reducing the cost of spot welded sheet metal assemblies.

**HOW AN Oval-Loc® JOINT IS MADE**

A typical Oval-Loc® joint may be created in as little as one second. The process is very similar to Tog-L-Loc®:

**Step 1: Clamps**
The stripper clamps the materials to be joined.

**Step 2: Draws**
The punch draws the material into the die.

**Step 3: Locks**
As the material flows into the die, the sides of the die expand, allowing the material to flow into an interlock.

**TO LEARN MORE ABOUT OVAL-LOC® VISIT OUR WEBSITE:**

[WWW.BTMCOMP.COM/OVAL-LOC.HTML](http://WWW.BTMCOMP.COM/OVAL-LOC.HTML)
### TERMINOLOGY

<table>
<thead>
<tr>
<th>Component</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Punch Holder Assemblies</td>
<td>Shank Punch Holder, Die Set Punch Holder</td>
</tr>
<tr>
<td>Ball Lock Retention</td>
<td>(for quick and repeatable orientation and release)</td>
</tr>
<tr>
<td>Oval-Loc® Punch</td>
<td></td>
</tr>
<tr>
<td>Punch Holder Assembly</td>
<td></td>
</tr>
<tr>
<td>Stripper Tip</td>
<td></td>
</tr>
<tr>
<td>Joint Size</td>
<td>(3x6 or 4x8)</td>
</tr>
<tr>
<td>Cap Thickness (CT)</td>
<td>Primary Metric</td>
</tr>
<tr>
<td>Punch Side Material (T1)</td>
<td></td>
</tr>
<tr>
<td>Die Side Material (T2)</td>
<td></td>
</tr>
<tr>
<td>Button Dimension (BD)</td>
<td>Reference</td>
</tr>
<tr>
<td>Oval-Loc® Stepped Short Insert (SSI) Die</td>
<td></td>
</tr>
<tr>
<td>Anvil Depth (AD)</td>
<td>Anvil Depth is the distance from the lowest point of the anvil to the top of the die blades.</td>
</tr>
</tbody>
</table>

### SAFETY NOTE

It is the customer and/or user’s responsibility to provide proper safety controls and/or guarding when a pinch point is present.
Oval-Loc SIZING GUIDE

<table>
<thead>
<tr>
<th>Tooling Size</th>
<th>Max BD (Width)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLO-3x6</td>
<td>7.0</td>
</tr>
<tr>
<td>TLO-4x8</td>
<td>7.5</td>
</tr>
</tbody>
</table>

Minimum Single Layer Thickness 0.4mm
If material is not of equal thickness, it is preferred to have thick material on Punch Side, not to exceed 3:1.
When Die Side material is thicker, a ratio of not less than 1:2 is preferred.

Contact BTM for testing and optimization of your application.
Upon completion of testing, you will receive a “Sample Process Sheet” which includes tooling and clinch parameters as well as Shear and Peel strength for the material combination as tested.

TABLE OF CONTENTS

BALL LOCK PUNCHES
TLO-3x6 ................................................................. 6
TLO-4x8 ................................................................. 6

BALL LOCK PUNCH HOLDER ASSEMBLIES
SS20 Shank Punch Holder [Metric] ................................ 7
SS20 Die Set Punch Holder ........................................ 8
SS25 Die Set Punch Holder ........................................ 9
SS25 Shank Punch Holder [Metric] ............................ 10

940 SERIES STEPPED SHORT INSERT (SSI) DIES
3x6 ................................................................. 11
4x8 ................................................................. 11

INSTALLATION HARDWARE
Ball Lock Release Tool ............................................. 12
Spanner Wrenches .................................................. 13

USING 940 DIES
Mounting Information ............................................ 14
STANDARD PUNCHES

TLO-3X6

<table>
<thead>
<tr>
<th>Length</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100mm</td>
<td>PD275201G</td>
</tr>
</tbody>
</table>

Light Duty Ball Seat

TLO-4X8

<table>
<thead>
<tr>
<th>Length</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100mm</td>
<td>PD267801G</td>
</tr>
</tbody>
</table>

Light Duty Ball Seat
SS20 SHANK PUNCH HOLDER [METRIC]

ASSEMBLY INCLUDES:
- (1) Punch Holder
- (1) Stripper Spring
- (1) Stripper Can
- (1) Ball & Retaining Spring
- (1) Oval-Loc® 3x6 Punch
- (1) Stripper Tip

TLO-3X6

<table>
<thead>
<tr>
<th>Punch Length</th>
<th>A</th>
<th>B</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>147</td>
<td>39</td>
<td>PD281000G</td>
</tr>
</tbody>
</table>

Light Duty Ball Seat

Catalog ID# - 735501AB
WWW.BTMCOMP.COM/oval-loc.html
STANDARD TOOLING
SS20 DIE SET PUNCH HOLDER

ASSEMBLY INCLUDES:

1. (1) Punch Holder
2. (1) Stripper Spring
3. (1) Stripper Can
4. (1) Ball & Retaining Spring
5. (1) Oval-Loc® 3x6 Punch
6. (1) Stripper Tip
7. (2) Dowel Pins
8. (3) Mounting Screws

TLO-3X6

<table>
<thead>
<tr>
<th>Punch Length</th>
<th>A</th>
<th>B</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>106</td>
<td>39</td>
<td>PD275200G</td>
</tr>
</tbody>
</table>
SS25 DIE SET PUNCH HOLDER

ASSEMBLY INCLUDES:

1. (1) Punch Holder
2. (1) Stripper Spring
3. (1) Stripper Can
4. (1) Ball & Retaining Spring
5. (1) Oval-Loc® 4x8 Punch
6. (1) Stripper Tip
7. (2) Dowel Pins
8. (3) Mounting Screws

TLO-4X8

<table>
<thead>
<tr>
<th>Punch Length</th>
<th>A</th>
<th>B</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>106</td>
<td>30</td>
<td>PD287700E</td>
</tr>
</tbody>
</table>

Catalog ID# - 735501AB

2X φ 6mm Dowels Provided For Location And Orientation

1.3 Pre-Travel

M6x1.0 S.H.C.S. For Mounting (3) Places

φ 6F7 (3) Places

11.50
12.50
10.50
15.00

BTM COMPANY, LL.C. • 300 DAVIS ROAD • MARYSVILLE, MI 48040 • Tel: 810-364-4567 • Fax: 810-364-6178 • www.BTMcomp.com
SS25 SHANK PUNCH HOLDER [METRIC]

ASSEMBLY INCLUDES:

1. (1) Punch Holder
2. (1) Stripper Spring
3. (1) Stripper Can
4. (1) Ball & Retaining Spring
5. (1) Oval-Loc® 4x8 Punch
6. (1) Stripper Tip

TLO-4X8

<table>
<thead>
<tr>
<th>Punch Length</th>
<th>A</th>
<th>B</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>147</td>
<td>30</td>
<td>PD283700E</td>
</tr>
</tbody>
</table>

- φ 20g5
- Light Duty Ball Seat
- φ 44.0
- A
- B
- φ 19.0
- 1.3 Pre-Travel
TLO-3X6
STEPPED SHORT INSERT (SSI) DIE

<table>
<thead>
<tr>
<th>Anvil Depth</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>.020</td>
<td>PD275100BE</td>
</tr>
<tr>
<td>.025</td>
<td>PD275100CE</td>
</tr>
<tr>
<td>.030</td>
<td>PD275100DE</td>
</tr>
<tr>
<td>.035</td>
<td>PD275100EE</td>
</tr>
<tr>
<td>.040</td>
<td>PD275100FE</td>
</tr>
<tr>
<td>.045</td>
<td>PD275100GE</td>
</tr>
<tr>
<td>.050</td>
<td>PD275100HE</td>
</tr>
<tr>
<td>.055</td>
<td>PD275100JE</td>
</tr>
<tr>
<td>.060</td>
<td>PD275100KE</td>
</tr>
</tbody>
</table>

TLO-4X8
STEPPED SHORT INSERT (SSI) DIE

<table>
<thead>
<tr>
<th>Anvil Depth</th>
<th>BTM Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>.020</td>
<td>PD272100BE</td>
</tr>
<tr>
<td>.025</td>
<td>PD272100CE</td>
</tr>
<tr>
<td>.030</td>
<td>PD272100DE</td>
</tr>
<tr>
<td>.035</td>
<td>PD272100EE</td>
</tr>
<tr>
<td>.040</td>
<td>PD272100FE</td>
</tr>
<tr>
<td>.045</td>
<td>PD272100GE</td>
</tr>
<tr>
<td>.050</td>
<td>PD272100HE</td>
</tr>
<tr>
<td>.055</td>
<td>PD272100JE</td>
</tr>
<tr>
<td>.060</td>
<td>PD272100KE</td>
</tr>
</tbody>
</table>
The Ball Lock Release Tool is used to release a ball from a ball seat. This tool may be used for both the punch holder assembly, and the punch.

**HOW TO USE A BALL LOCK RELEASE TOOL**

Simply push the end of the tool onto the ball to release it from the ball seat.

▶ **USING A BALL LOCK RELEASE TOOL TO UNINSTALL A PUNCH HOLDER**

▶ **USING A BALL LOCK RELEASE TOOL TO UNINSTALL A PUNCH**

SEE IT IN ACTION!

[Website Link]
SPANNER WRENCHES

**STRIPPER CAN WRENCH**
This tool is used to tighten/loosen the stripper can to/from the punch holder.

| BTM Number | 048749 |

**STRIPPER TIP WRENCH**
This tool is used to control stripper tip orientation at set-up and tool change.

| BTM Number | 053648 |

**HOW TO USE THE SPANNER WRENCHES**
Use the Stripper Can Wrench to tighten/loosen the stripper can, and the Stripper Tip Wrench to adjust alignment.

SEE THEM IN ACTION!
WWW.BTMCOMP.COM/OVAL-LOC-SERVICE.HTML
DIE MOUNTING INFORMATION

“940” Series Die Retention

The location tolerance to the centerline of the die hole should be ±0.013mm.

Because the 940 die has a built in blade shield, the top of the die should not be flush with the detail it’s mounted in.

If anvil strength is not an issue, the typical design method would expose the ring of small holes in the guard can.

Stepped Short Insert (SSI) Die Mounting

For all Oval-Loc® joint sizes

<table>
<thead>
<tr>
<th>Tooling Size</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>R</th>
</tr>
</thead>
<tbody>
<tr>
<td>3x6</td>
<td>Ø14H6</td>
<td>2.84 ±0.13</td>
<td>M4x0.7</td>
<td>5.000 ±0.013</td>
<td>R0.33 ±0.13</td>
</tr>
<tr>
<td>4x8</td>
<td>Ø18H6</td>
<td>3.84 ±0.13</td>
<td>M4x0.7</td>
<td>6.500 ±0.013</td>
<td>R0.33 ±0.13</td>
</tr>
</tbody>
</table>
BTM’s patented Tog-L-Loc® sheet metal joining system is the simple solution for fastening plain or coated sheet metals. Tog-L-Loc® forms a strong, leakproof “button” headed joint without welding or riveting in almost any combination of ductile sheet metals. The Tog-L-Loc® system is widely used in the manufacture of automobiles, appliances, furniture, electrical products, building supplies, and more.

If you are joining Aluminum or your product requires a high-quality; visually pleasing appearance, consider the V-Loc™ clinch joint. V-Loc™ solves many of the challenges associated with joining todays light weight high strength aluminum alloys with or without adhesives. V-Loc™’s unique geometry improves material flow producing a clinch that is resistant to necking and the effects of prestrain.

Lance-N-Loc® is a sheet metal clinching system which creates a strong mechanical joint without the use of external fasteners or welding. The metals are lanced and squeezed to form an interlock below the bottom layer of the sheet metal.

Lance-N-Loc® is good for joining harder materials, multiple layers, and is ideal for use where electrical conductivity is required.
BTM offers a range of Production Equipment for applying our Clinch tooling.

Hand Held Units
BTM’s handheld units are an economical approach to fastening sheet metal assemblies. Pneumatic, Hydraulic, and Self-Contained Units in a variety of styles are available. The units can be set up to join a range of thicknesses.

Universal Presses
Universal presses easily adapt to join a variety of parts.

Specialized Units
BTM provides pneumatic, hydraulic, air/oil, and electrically driven units with single or dual motions for both stationary and robotic applications.

Die Sets
Clinch tooling can be inexpensively designed into single or compound motion die set packages.

Special Fixtures
Manually loaded and unloaded dedicated tooling can be built for a single part or a family of parts.

Special Systems
Achieve faster cycle times with automatic part transfer and by combining processes.

Find more information online:

www.btmcorp.com/clinching-equipment.html

For more information, or to see our full line of products, please visit:

www.BTMcomp.com