Maintenance Manual

Thick Turret, Trumpf® and Fab Tooling

Manual mentenanta scule tip Thick Turret, Trumpf® si FAB

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Maintenance, performance and troubleshooting guide for thick turret and punch users.

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Introduction

This manual has been developed by Wilson Tool International engineers to give advice for users of thick and thin turret tooling on punch presses. Owners make a significant investment in their tooling, and incorrect maintenance will cost them dearly in terms of replacement tooling costs, quality of product and expensive machine downtime.

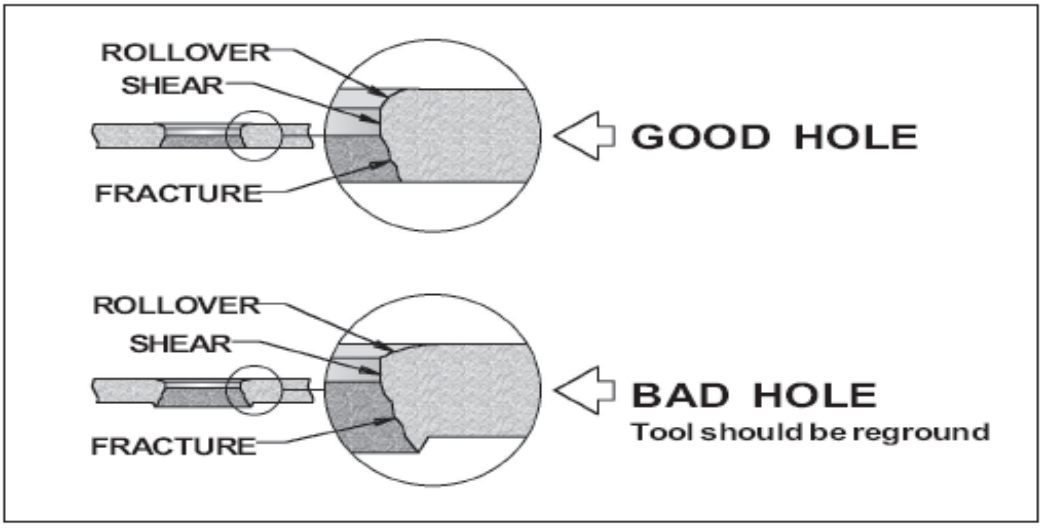
Contained within this manual is advice regarding tool regrinding and maintenance as well as a comprehensive troubleshooting guide to locate and solve problems associated with tooling. When used in conjunction with the machine manual, a maintenance schedule can be developed to maintain optimal tool and machine life.

Mission Statement

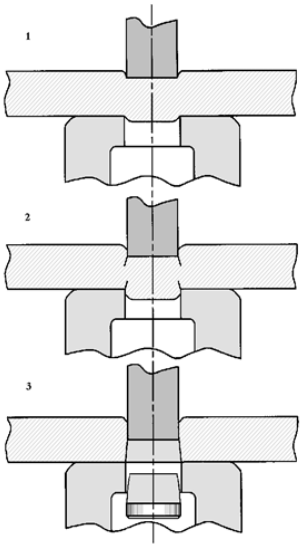
Our goal is to deliver exceptional customer service along with the most reliable and innovative products and solutions so our customers can be more successful.

Punching

There are a number of important events that take place during the punching process. The more we understand these events, the easier it is to identify the causes that contribute to problems during the punching cycle. One can experience galling, slug pulling, uneven tool wear, accelerated tool wear and/or tool breakage, etc. A basic understanding of what takes place during the punching process will better prepare you to identify the cause of a problem and more easily determine a solution.



Three Phases to a Punched Hole



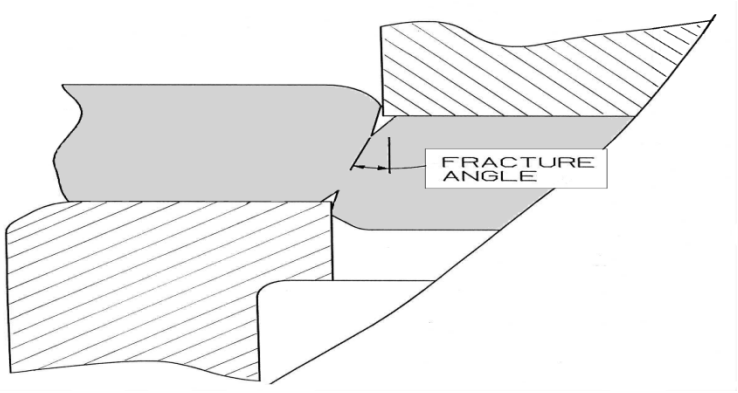
1. Plastic Deformation
During the downward stroke, the punch presses against the material, compressing it. As pressure increases, the punch sinks into the material to a point, which is called the ***elastic limit.*** This is the point beyond which the material will not return to its original shape if the punch were stopped and removed.

2. Penetration
At this point, fracture lines appear, starting at the sharp edges of the punch and die, and working their way into the material from opposite sides of the sheet.

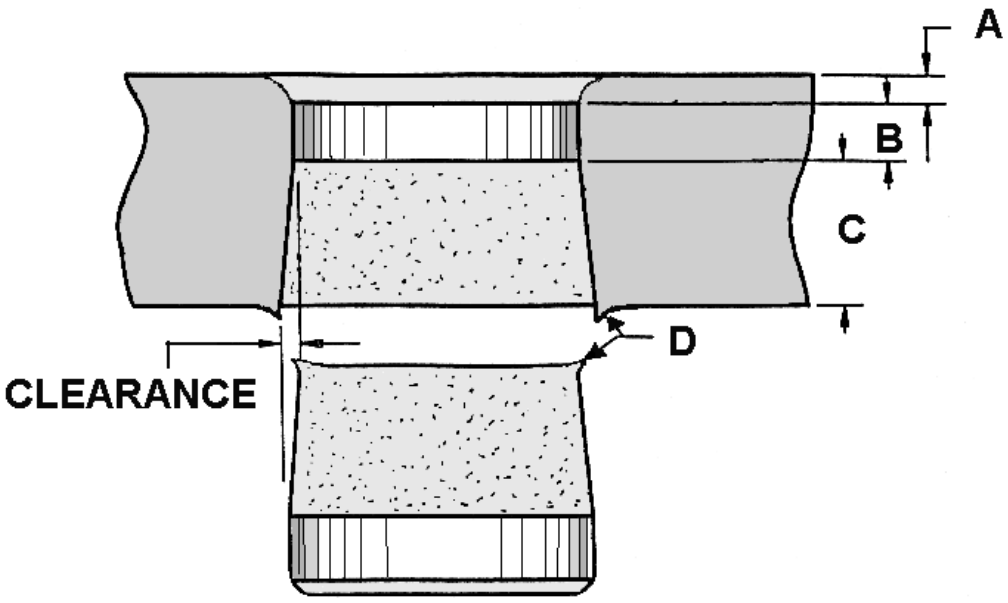
3. Fracture
When the fracture lines from above and below meet, the slug is separated from the sheet.

Fracture Angle

Because each material fractures at a unique angle, fracture angle is determined by material type or material density. Clearance is the distance between of the edge of the punch to the edge of the die. Clearances for aluminum, mild steel and stainless steel are all different. For this reason, different die clearances are required for different materials even though they may be of similar thickness. The key to clearance selection is picking the right clearance so the fracture from the topside of the sheet meets the fracture from the bottom side of the sheet. Doing so creates the optimum punching condition and minimizes the work done by the tooling while maximizing the quality of the hole.



Parts of a Punched Hole



NOTE:
To effectively troubleshoot tooling problems, you must be familiar with and be able to recognize each part on either the slug or in the hole. Many problems are resolved after recognizing variations of these parts.

A. Deformation (or Rollover)
The depth to which the punch sinks into the material before fracture lines begin.

B. Shear
The depth into the material where the punch is rubbing against the sidewall of the hole.

C. Fracture (or Breakout)
That part of the hole that the punch does not touch as it passes through the material.

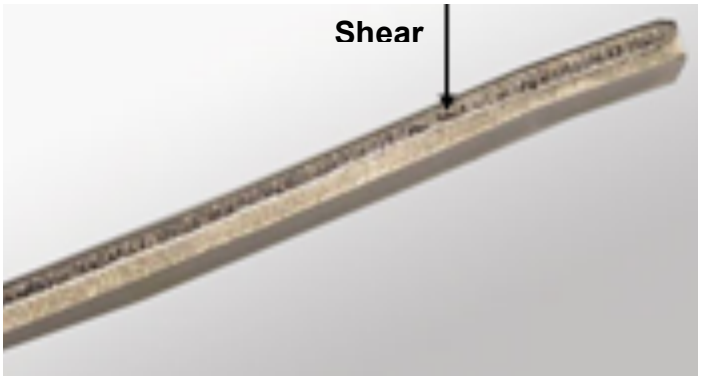
D. Burr
Can be found on both the part and the slug. The larger the clearance, the bigger the burr. The softer the material, the bigger the burr.

Reading Slugs

Slugs tell a story. The slug is essentially a mirror image of the hole in the sheet, with the same parts in reverse order.

An ideal slug will have a shear of approximately 1/3 the material thickness. The shear thickness will change as the tool dulls. The symmetry of the shear area will change if the tools lose alignment and/or the die is not properly seated.

Shear Amount Material Thickness Ratios



When the clearance is correct and the fracture angles match up, the listed percentage of shear to material thickness ratio can be seen on the side of the slug.

For the exact amount of shear, please look at the listing below. Note: Non-ferrous materials are usually softer and have more shear. The harder the material the less shear will appear on the side of the slug. The amount of shear can be read either on the slug or on the hole in the sheet. Both should be mirror images of the other.

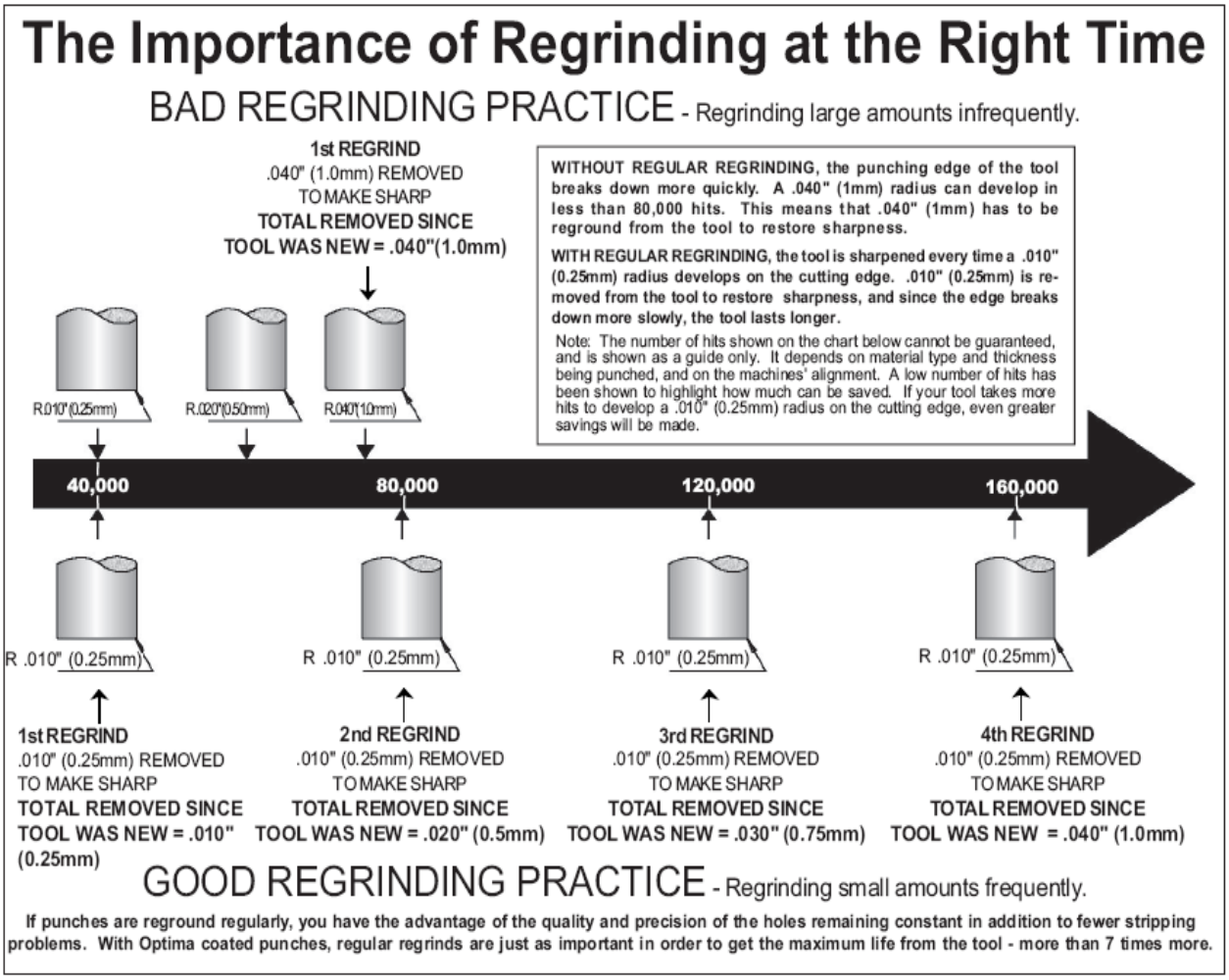
Shear percentages per material type:

- Mild Steel – 25-30%
- Aluminum – 60%
- Bronze – 25%
- Stainless Steel – 15%
- Copper/Brass – 55%

Tool Regrinding

The Importance of Tool Regrinding

Regular regrinding of tools is essential to achieve consistent quality holes. Regrinding regularly by small amounts ensures that the machine and tooling last longer. The image below illustrates the importance of regrinding at the correct time.



Indicators That a Tool Needs Regrinding

There are no hard and fast rules for the number of hits a tool can achieve before regrinding becomes necessary – it depends upon the size and shape of the tool, as well as material type and thickness.

Three key indicators that a tool needs regrinding:

- **Monitor the tool cutting edge.** It is recommended that tools be re-sharpened when the cutting edges are worn to .004” (0.1mm) radius. (See Figure 1.)
- **Monitor the quality of the holes.** Are there excessive burrs?
- **Monitor the punching noise.** If the punch press is making more noise when punching with a particular tool than it normally does, the tool’s cutting edge may be dull.

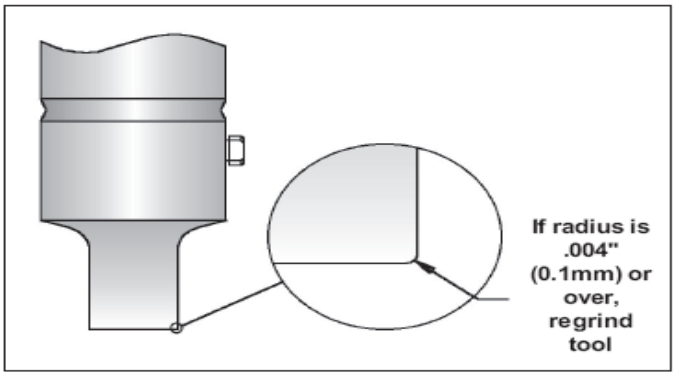


Figure 1: Regrind tools when .004" (0.1mm) radius develops on cutting edge

Regrind Rules

The following factors should be considered when regrinding tools.

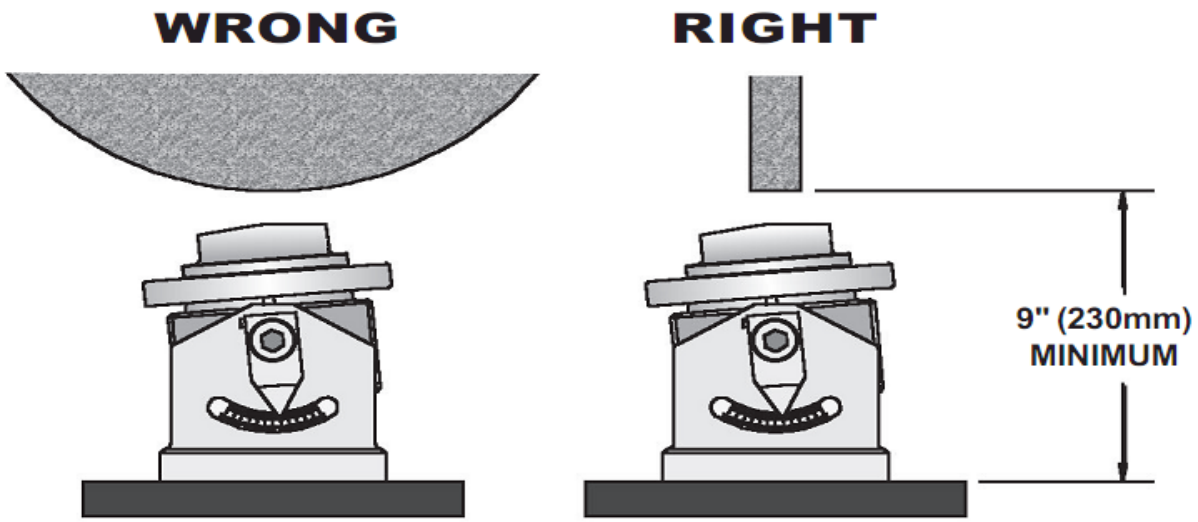
- Removal of between .004” (0.1mm) and .010” (0.25mm) should return the tool to proper sharpness.
- The grinding wheel should be dressed to present a new, clean, flat surface.
- Wilson Tool suggests the use of an open, coarse, soft bond wheel; for example, a Norton SGB46KVX.
- Light, frequent passes should be taken, vertically no more than .0005” (0.01mm) per pass, while moving horizontally on the punch or die face. Removal of more material per pass may cause the metal to burn resulting in surface cracking. These heat checks will cause the punch tip edges to break down quicker than usual, resulting in a need for more frequent regrinds and reducing tool life.
- The tool must **ALWAYS** be flooded with coolant while grinding
- To minimize vibrations and chatter, the punches or dies should be firmly clamped in suitable fixtures. Fixtures should be quick-change and capable of indexing in order to grind shear angles on punches.
- Sharpening Optima™ (TiCN) coated punches will not affect performance. See **Grinding Coated Punches** below.

Grinding Coated Punches

- When using Optima (TiCN) coated punches, the sharpness of the die must be checked on a regular basis.
- Exceeding maximum life may lead to tool and machine damage.
- **WARNING:** Regrind life is dependent on the thickness of the material to be punched.

Grinding Long, Narrow Punches

- Make sure the grinding wheel addresses the punch in a horizontal direction. The wheel should pass across the width and not the length of the tool.



Sharpening Tips When Grinding

Problem	Causes	Solutions
Discoloration and surface cracks	Insufficient coolant; improper wheel grit; improper wheel dress	Redirect or increase coolant; use coarser grain and softer grade grinding wheel; dress wheel more often
Harsh cutting sound and/or poor surface finish	Uneven surface finish; excessive feed rate; improper wheel grade	Reduce feed rate and use coarser grade or softer grinding wheel

Material Removal

- Wet grind only, taking light passes of .0005” to .0010” per pass
- If not using a Wilson/DCM grinder, the following steps are recommended:
  - Make sure the wheel is dressed frequently to reduce wheel loading and tool burning.
  - Pass the wheel over the tool quickly to avoid excessive heat buildup.

Removing Galling

- Aluminum gall can be removed by soaking the tool in muriatic acid or EASY-OFF® oven cleaner, or punching stainless steel.
- Use a hard rubber wheel (see image) or a Scotch-Brite™ pad (scrubbing in a vertical direction only).
- Restore complete surface of punch (Don’t leave corners with wear still showing).

Recommended Grinding Machines/Wheels

- Wilson/DCM Grinder - Use the following wheel WT- #6859
- Standard - Norton 32A46-H12VBEP or equivalent

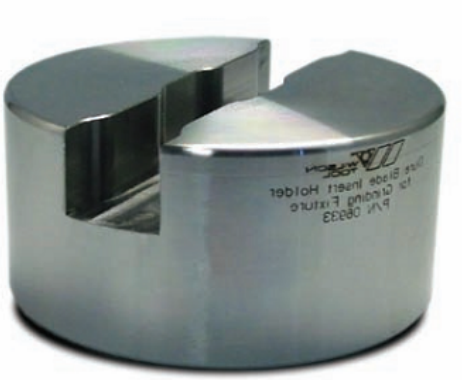
Wilson/DCM

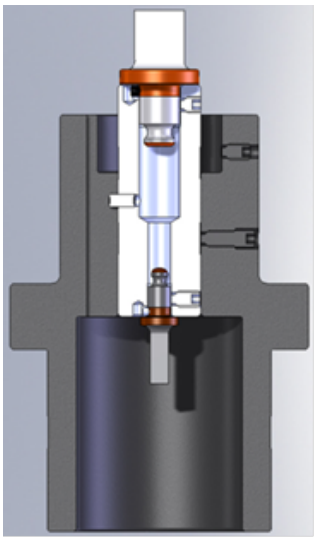
Standard

Other Style Tool Grinders

Dura-Blade Grinding Fixture

EXP Grinding Fixture





Accessory Items

Tool Lubrication

Proper lubrication of tools helps to reduce wear. Wilson Tool recommends the use of lubrication on all punch and guide assemblies. Apply lubrication between the guide and the punch and between the guide and the turret bore.

Machine Delivered Lubrication

- Pre-lubricate the punch and internal and external guide-bearing surface with light machine oil (no WD-40, hydraulic, or evaporating lubricants). You may use the same oil that your machine delivers.
- Periodically check and lubricate tools that are not removed from the machine (standard load tools).
- When machine has been idle for more than eight (8) hours, manual lubrication is required. Add two squirts of oil from a hand-pump oiler, inserted at the center hole at the top of the tool with the same pre-lube oil (do not overfill).

Manual Lubrication (non-machine delivered lubrication)

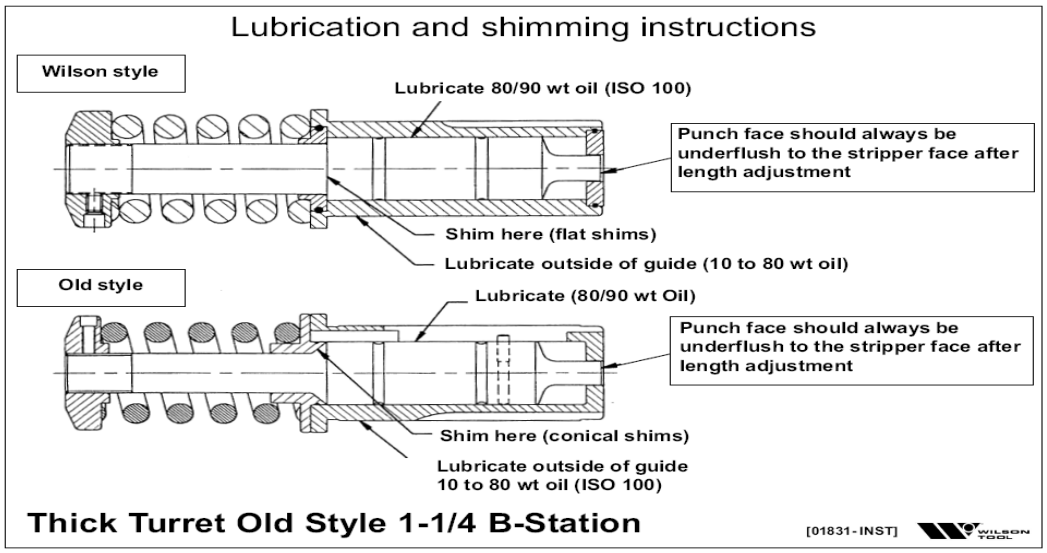
- When the machine has been idle for more than eight (8) hours, manual lubrication may be necessary. Check lubrication between punch and guide, and guide and turret bore.
- Pre-lubricate the punch and internal and external guide-bearing surface with light machine oil (no WD-40, hydraulic, or evaporating lubricants). You may use the same oil that your machine delivers. (Grease or GN paste is acceptable only on internal surfaces, i.e. between the punch and guide). Oil up to 80 weight can be used when manually lubricating tools.
- Use only oil on outside of guides. Do not use grease on outside of guides.
- Periodically check and lubricate tools that are not removed from the machine (standard load tools).

Notes on Lubrication:

- Oil is a lubricant, which flushes and cleans out impurities between bearing surfaces. It is recommended where debris can enter a bearing surface.
- Grease is a lubricant that stays and lubricates for a long period of time. It is not recommended where debris can enter a bearing surface. It is for “closed” environments.
- Anytime there are two metal surfaces sliding against one another, lubrication cannot be overlooked.
- WD-40 and other evaporating lubricants are not recommended for tool lubrication.

Lubrication for Large Station Guide Assemblies Manufactured by Wilson Tool

All Wilson Tool manufactured large station guide assemblies (2”, 3 ½”, 4 ½” etc.) are made with internal lubrication systems. Oil weight up to 80/90 weight (ISO 100) can be used in these assemblies to lubricate the inside and outside of the tool. When employing an air-oil delivery system, it is still important to pre-load the guide assemblies with oil and pre-lube the outside and inside of the guide. When no air-oil system is available, lubrication is delivered via “gravity feed”: a few squirts of oil into the port on the top of the tool will ensure that oil is fed to the tool through normal punching operations.



Calculating Maximum Regrind Life

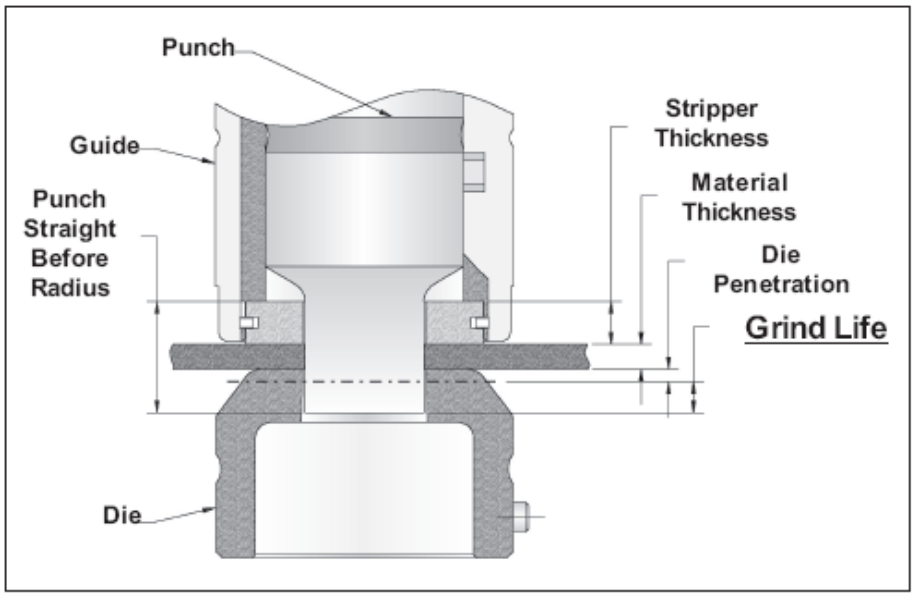
The amount of the punch or die that can be reground (grind life) is dependent upon the punch straight before radius, the material thickness, the stripper thickness and the die penetration for the punch press. The relationship of these factors is shown in the formula below and in Figure 8.

Grind Life = (Punch Straight Before Radius) - (Stripper Thickness) - (Material Thickness) - (Die Penetration)

Example:
Punching .787” (20mm) square in .080” (2mm) material on thick turret machine with 1-¼” tooling.

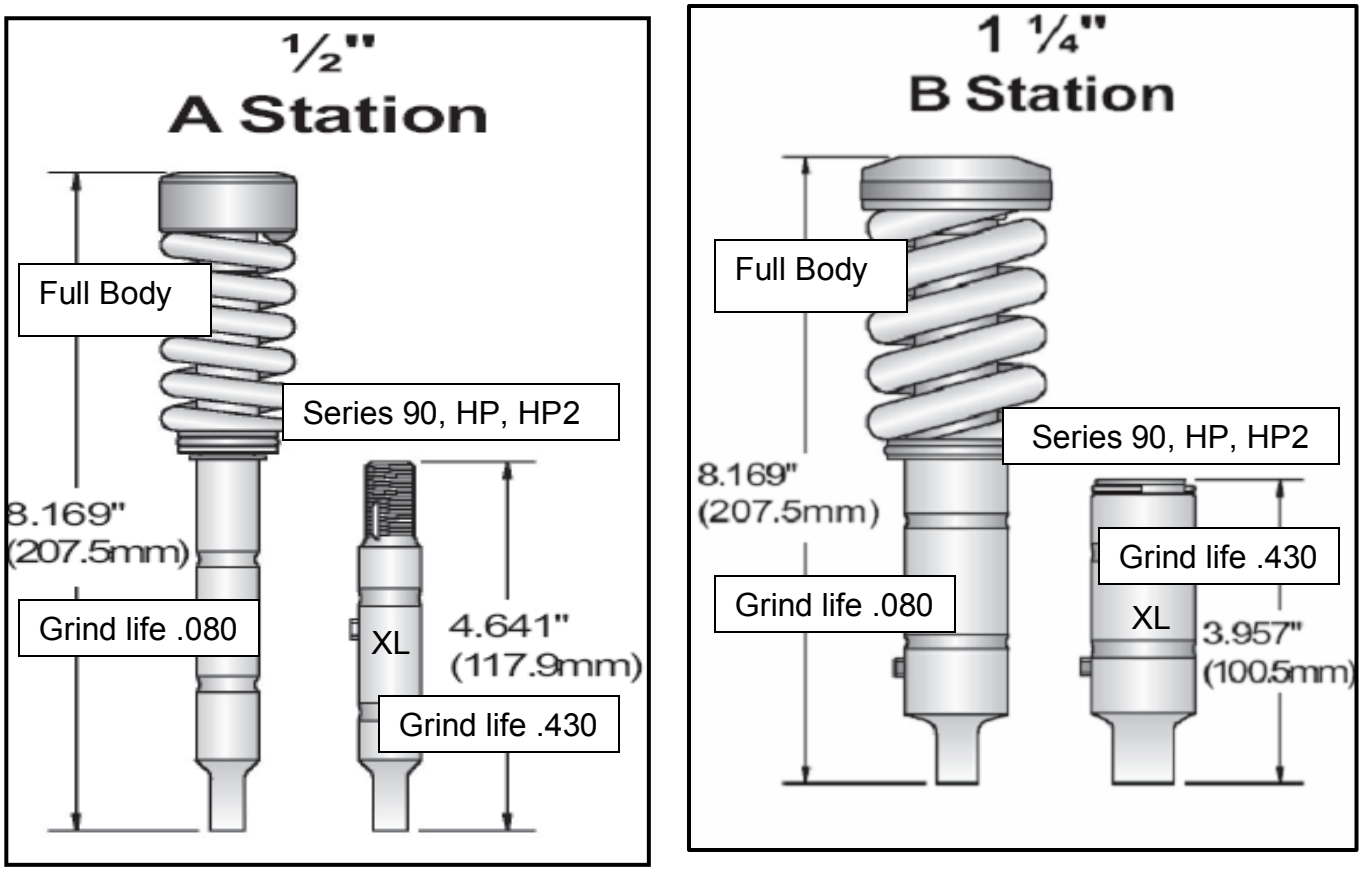
Punch straight before radius = .709” (18.0mm)
Stripper thickness = .272” (6.9mm)
Material thickness = .079” (2.0mm)
Die penetration = .079” (2.0mm)

FIGURE 8: Calculating Grind Life for Punches



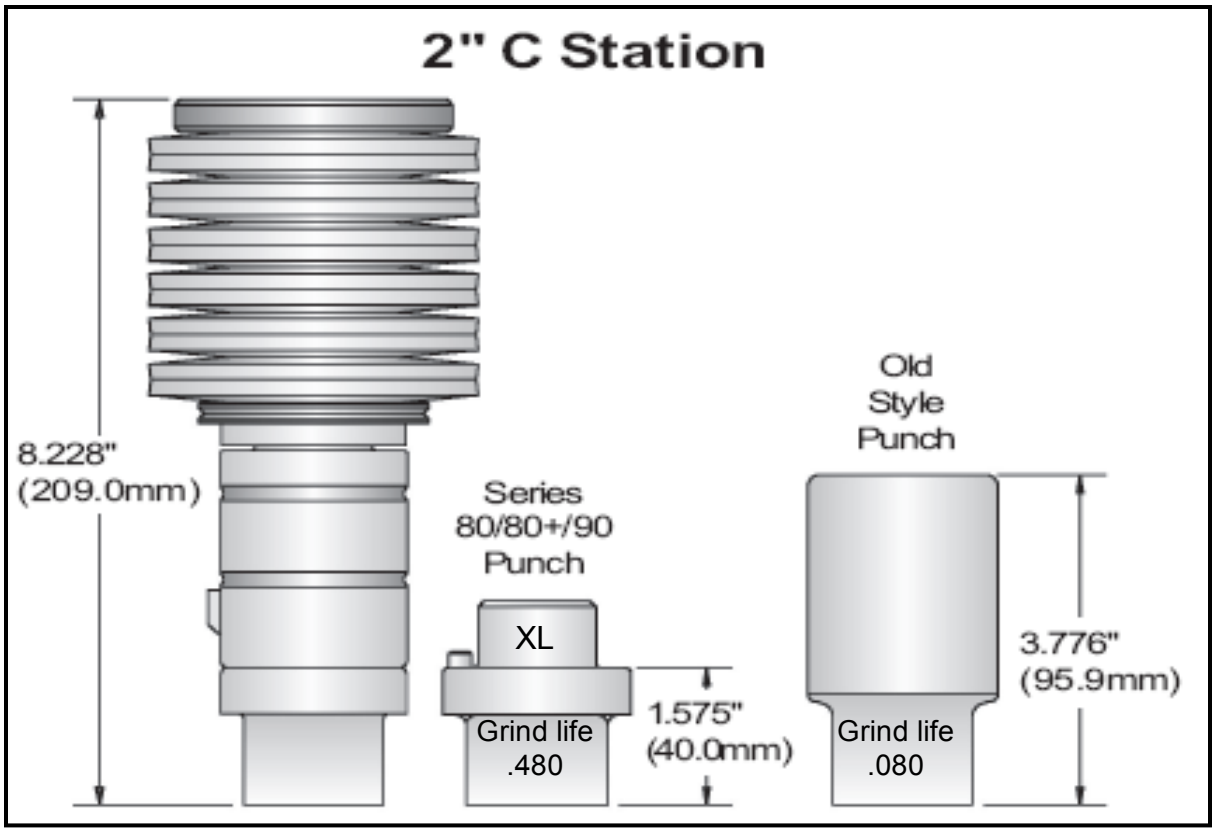
Grind Life = .709” – .272” – .079” – .079” = .279”
(18mm - 6.9mm – 2mm – 2mm = 7.1mm)

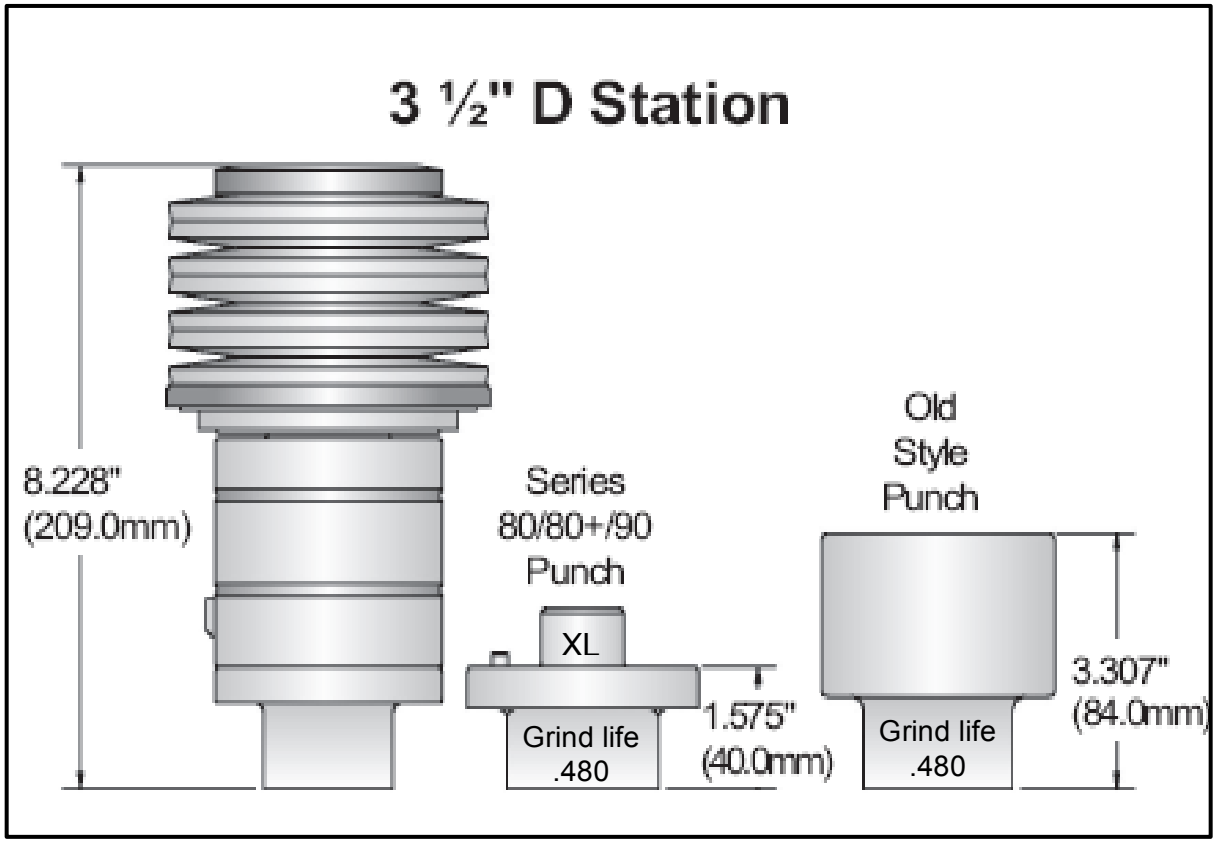
Maximum Grind Life Values for Punches

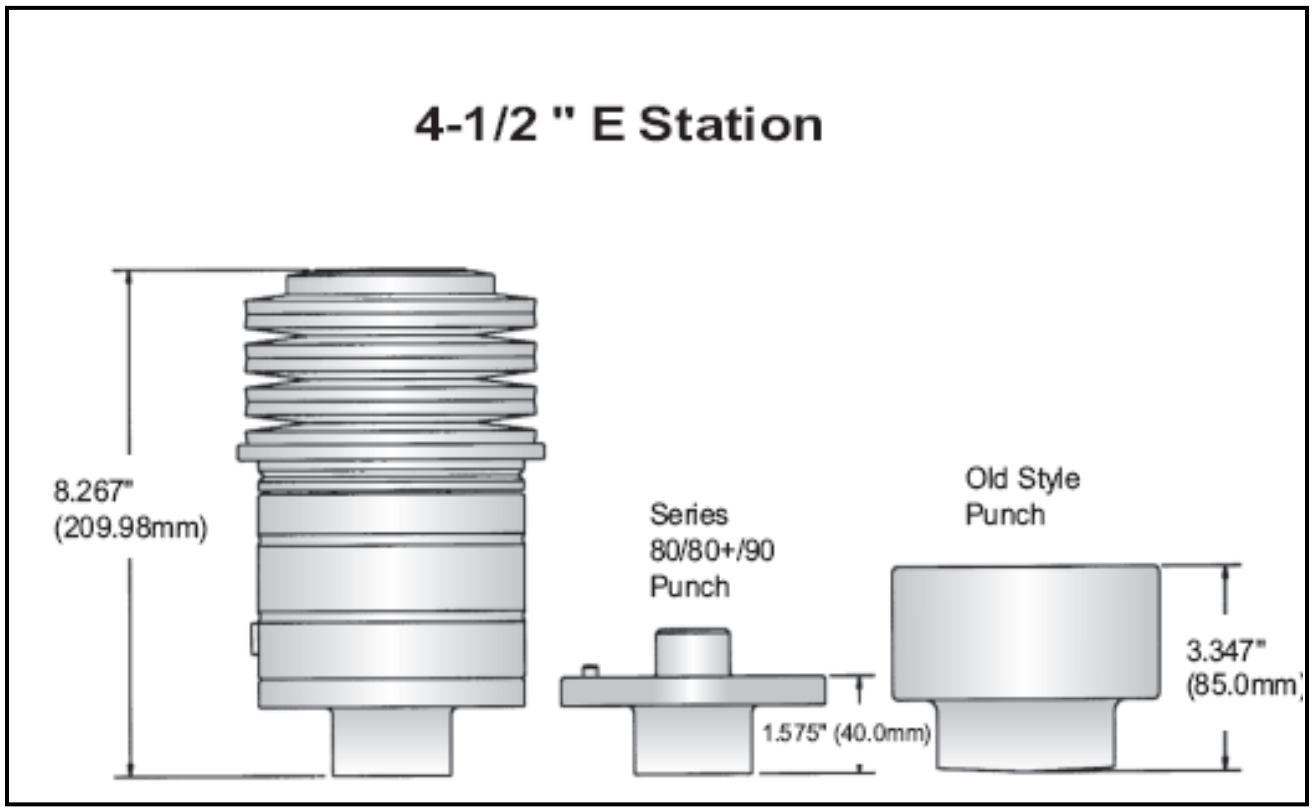


½" and 1-¼" punches laser marked with an XL have an EXTENDED LENGTH on the SBR (Straight Before Radius) on the punch tip. These A and B punches can be ground for a total of .430 on the punch tip. A and B punches without an XL marking have a maximum grind life of .250 on the punch tip.

Note:
All Series 90, HP and HP2 punches from Wilson Tool purchased since August of 2009 were shipped with the XL SBR grind life at no additional charge. All future punches (after 8/09) will be XL punch tips. Be sure to check the punch you are measuring for the maximum regrind values. If older punches are ground beyond .250, damage to the tool could occur as the radius of the punch body contacts the stripper plate. Consult the sales desk or your sales engineer if you have any questions.


2" C Station
8.228"
(209.0mm)
Series
80/80+/90
Punch
XL
Grind life
.480
1.575"
(40.0mm)
Old
Style
Punch
3.776"
(95.9mm)
Grind life
.080


3 ½" D Station
8.228"
(209.0mm)
Series
80/80+/90
Punch
XL
Grind life
.480
1.575"
(40.0mm)
Old
Style
Punch
3.307"
(84.0mm)
Grind life
.480



Maintaining Tool Life

Here are a few tips to help you get the maximum life from your tools:

- Keep your tools sharp, regrind them often taking off .005 to .010 for each sharpening. Use a hone to put a very slight radius on the sharpened edge.
- Keep die clearances within the proper range.
- Use shims to maintain the proper overall height. If upper unit is not adjustable, shim the dies.
- Maintain proper turret alignment.
- Lubricate the sheet.
- Use punch coatings to enhance punch performance.
- Use Ultima® tool steel to increase punch and die life.
- Use Durablade and Duradie high performance tools for parting.
- Consider punch shear to limit tonnage on tough jobs.
- Consult the sales desk or your sales engineer for advanced applications.

Achieving Maximum Tool Life with Tool Lubrication

Proper lubrication of tools helps to reduce wear. Wilson Tool recommends the use of a graphite or Moly based grease (or 80, 90 or 150 wt. oil) on the inside of the tool, between the guide and the punch, and a light machine oil on the outside of the tool, between the guide and the turret.

Lubricating Series 80, Series 90 and HP (High Performance) Punches

Wilson large station guide assemblies are equipped with an internal lubrication system. At the beginning of each shift, using a hand pump oiler, approximately two squirts of 80/90 wt. oil or ISO 100 oil (a heavy gear oil) should be applied down the center hole. The outside of the tool, between the guide and turret bore, should be lubricated using either the same oil or lighter oil. Daily use is recommended.

The WLS Tool Lubrication System

Wilson Lubrication System (WLS) tooling has been developed to suit machines with the automatic tool lubrication facility. WLS Series 90 tooling is engineered with an internal/external lubrication system that provides lubrication between the punch body and the guide, as well as between the guide and the turret, on every stroke. This means that the tooling and turret are automatically lubricated by the machine.

Extending Tool Life with the Use of Shims

Shims can be used to extend the life of dies for all stations, and also to extend the life of the “old style” punches in all stations. Shims are used after regrinding the punch or die. The die shim maintains correct die penetration by the punch.

It is recommended that only hardened, precision shims manufactured from a suitable shim steel be used. Failure to use quality shims will result in shim warpage, which can cause misaligned tools, decreased tool life and die shoe damage.

Warning: Shims should only be used with old style punches – never shim Series 80, Series 80 Plus or Series 90 punches.

Maintaining Tool Life by Regularly Checking Turret Alignment

Turret alignment is a critical procedure, which can help prevent problems such as poor tool life, unacceptable part quality and turret wear. Wilson Tool recommends regular checks for station alignment on random stations within the turret.

For more information regarding the procedure for turret alignment, and to obtain suitable tools, contact the sales desks or your sales representative.

The turret keys must be checked on a regular basis. Worn turret keys can lead to excessive tool wear and “rat’s tails.”

Shimming Old Style A Station Punches

Disassemble the tool. Place the punch shims between the spring retainer clips and the spring retainer. Reassemble the tool.

Shimming Old Style B Station Punches on Thick Turret, Thin Turret and Strippit® Machines

After disassembling the tool, place shims down the shank of the punch until it rests on the punch shoulder.

Adjusting B Station and 5/8” Drop-In Punches

Loosen the set screw in the punch head and rotate the punch head to move the punch up or down as required. When the tool has been adjusted to the correction length, the set screw should be tightened against one of the vertical grooves in the punch threads.

Shimming Thick Turret, Thin Turret and Strippit® Old Style C, D, E and F Station Punches

Following the removal of the punch from the guide assembly, a shim should be placed on top of the punch, with the slot aligned with the key pin. The punch and shim should be placed carefully into the guide for assembly, with extra care taken not to disturb the shim alignment. The tools should always be lubricated before reassembly.

The Problem of Over-Shimming Old Style Punches

Excess shimming of old style punches causes loss of key location. If too many shims are used, the punch driver key no longer engages within the punch slot. This is shown in Figure 16.

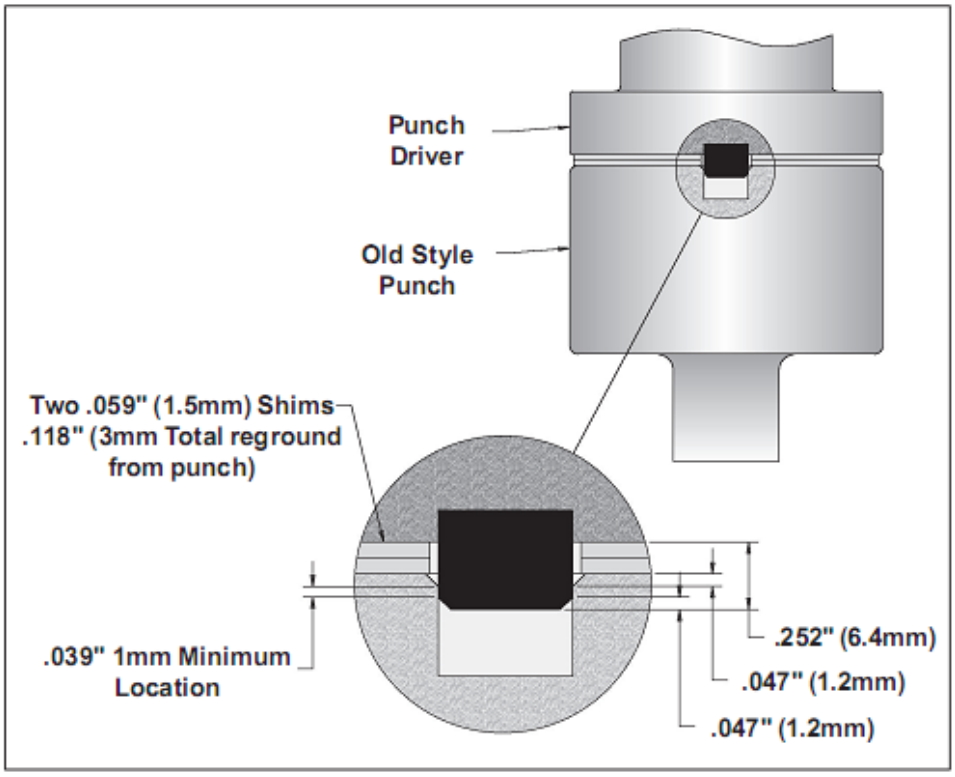


Figure 16: The problem of over shimming old style punches

No Shimming Required: HP Punching Systems (Series 80, 80 Plus and Series 90 Tool Systems)

In the 1980s, Wilson Tool engineers developed an alternative to old style large station tooling – the Series 80 concept. This style of tool was replaced in the 1990s by Series 80 Plus and Series 90 tooling – each system refined the tool length adjustment ideas of the Series 80 original.

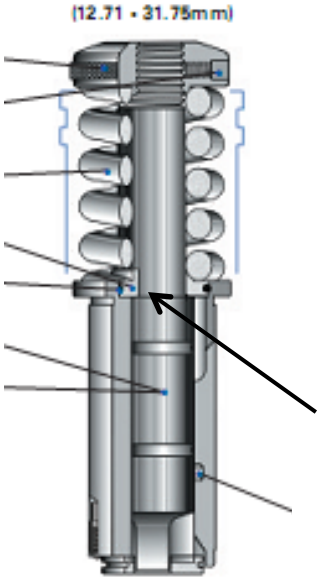
Series 80 Plus is available in large stations for thick turret, thin turret and Strippit® machines. Series 90 is available in small and large stations for the same machines. Series 90 tooling is identical to Series 80 Plus tooling in every respect apart from the addition of a *push-turn-lift* stripper retention system.

Series 80 Plus and Series 90 offer simple, click adjustment for punch length, with extended regrind life in all ranges. They also offer the following advantages over conventional old style tooling:

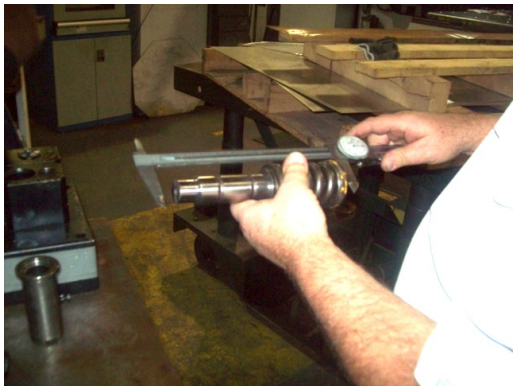
- Increased punch grind life – up to three times more than old style.
- Simple turn and click punch length adjustment.
- Quick set up.
- Reduced tooling costs.
- More bearing surface for increased stability.
- Simple fingertip adjustment – no tools needed.
- No need for length check.

Shimming and Adjustment

Thick Turret Tooling - A & B Station WT Style Punches

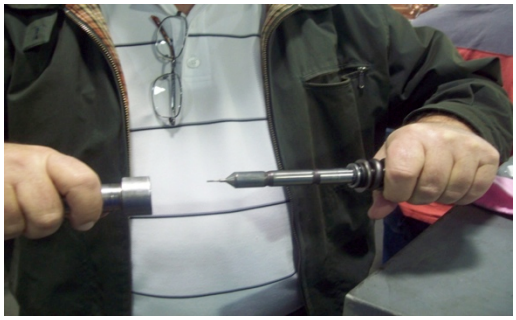


A & B station WT style punches are identified by a flat on the shank.



1. When brand new, the height is 8.169” without the guide.

2. Grab tool from spring pack and guide.



3. Pull guide apart from spring pack.

4. Find screw area on punch head.

5. Use an Allen wrench to take the screw out.

6. Put the punch into a device that secures the punch.

7. Use a spanner wrench to take the head of the punch.

8. Take the spanner wrench and place around the head.

9. Screw head off the punch.

10. Take the spring off the punch.

11. Take the retainer collar off the punch.

12. If tool measures 8.109” or less, use a .060” shim. If the tool measures 8.049” or less use two .060” shims. If more than .150” off punch, then replace with a new punch.

13. Take retainer collar and make sure raised edge is up when placing on punch over shim.

14. Place spring over retainer collar.

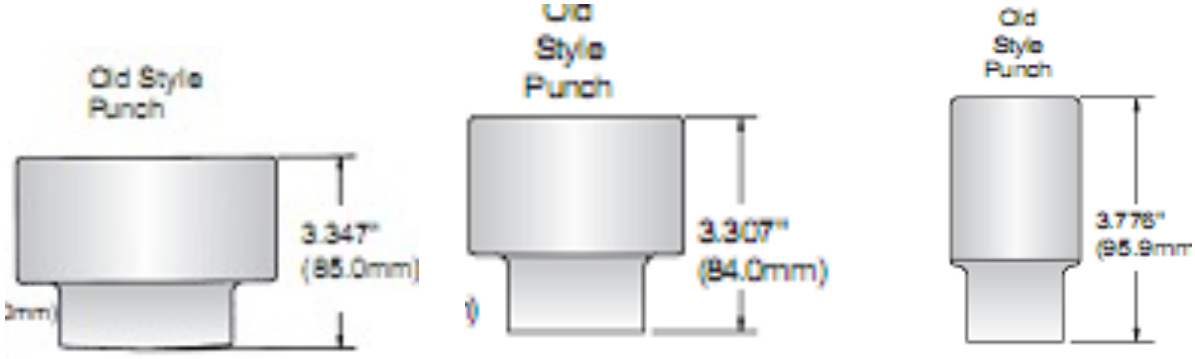
15. Take head of punch and tighten by hand.

16. Take punch and secure in a fixture.

17. Use spanner wrench and tighten head until punch is flush with the head of the punch.

16. Measure punch and return to original height of 8.169”.

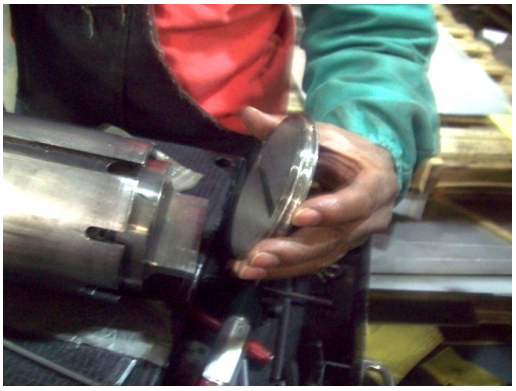
Thick Turret Tooling - Large Station Punches



4-1/2” Punch 3-1/2” Punch 2” Punch

- Each large station punch is different in size.
- Most metric large punches need shimming.

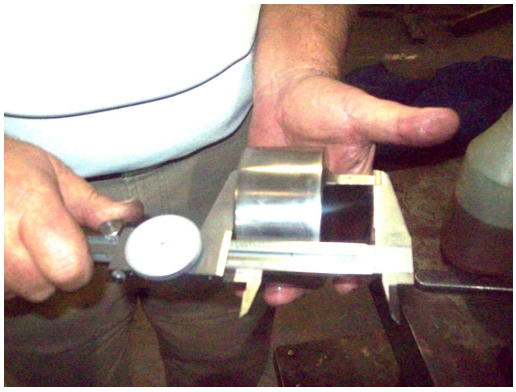
1. Loosen stripper plate clips at each location on the punch holder.



2. Remove stripper plate.

3. Use large Allen wrench to loosen punch. You may need to put holder in a device to loosen punch.

4. Remove punch.

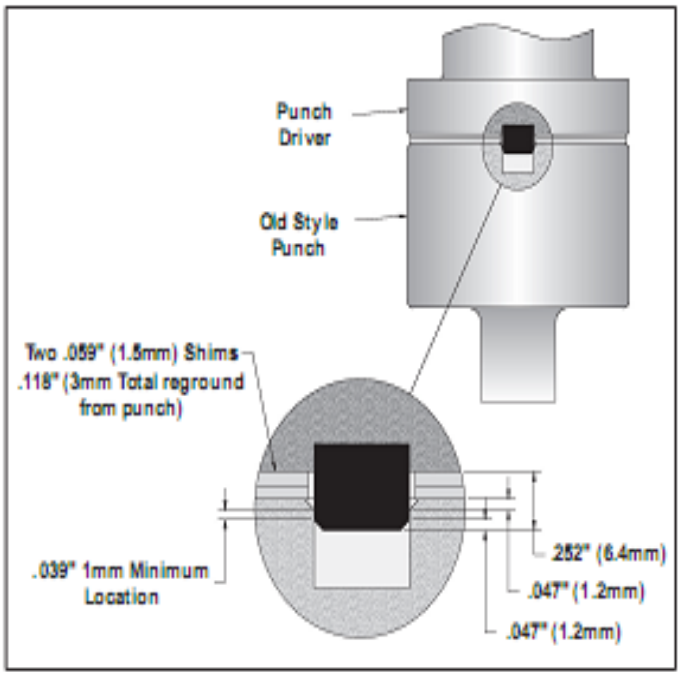


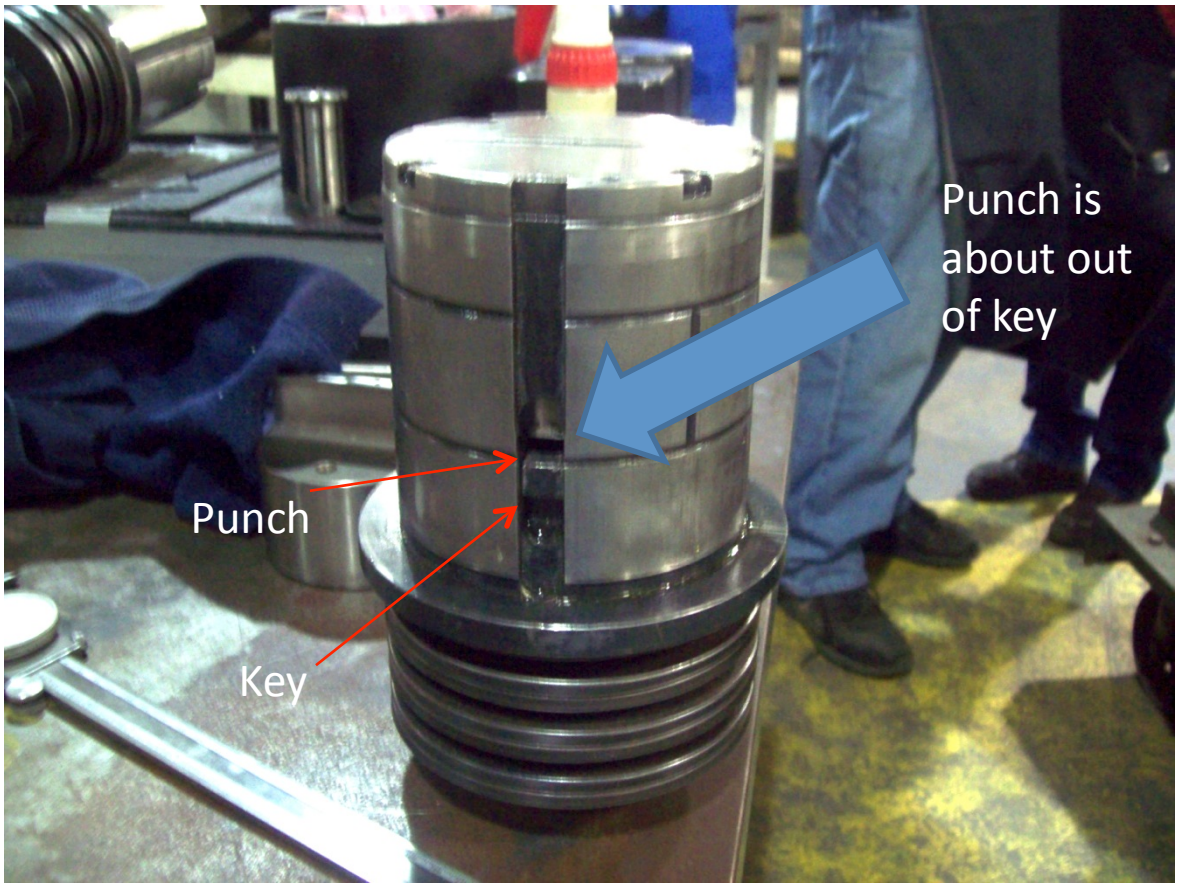
5. Measure the punch. If measurement is less than .060", then use a shim. Never use more than two .060" shims in a large station punch.

6. Do not over-shim. Damage will occur! NO MORE THAN TWO .060 SHIMS!

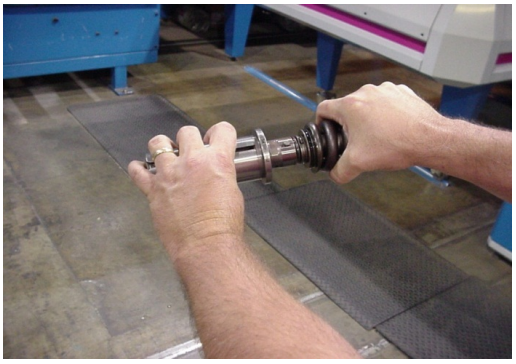
7. This is an example of a punch shim.

8. Shims need to be placed over key inside the punch holder.


Punch
Driver
Old Style
Punch
Two .059" (1.5mm) Shims
.118" (3mm Total reground
from punch)
.039" 1mm Minimum
Location
.252" (6.4mm)
.047" (1.2mm)
.047" (1.2mm)

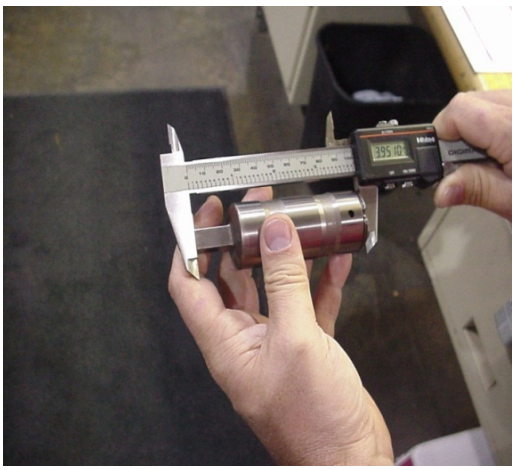

Punch is
about out
of key
Punch
Key

HP Tooling



1. Remove guide from spring assembly. Grasp firmly, spring assembly in one hand and guide in other hand and pull apart.

2. Unscrew punch from spring assembly by turning counter-clockwise. Replace with new or sharpened tool.

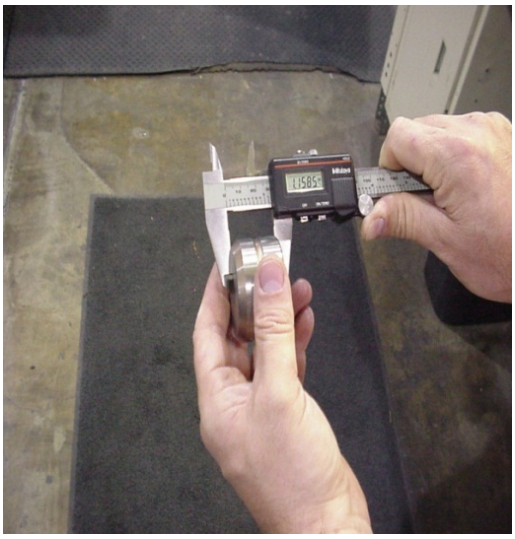


3. Measure tool height with caliper. Put spring assembly back on by turning clockwise until punch is flush with spring. Turn back counter-clockwise until ring clip snaps into punch groove.

Dies

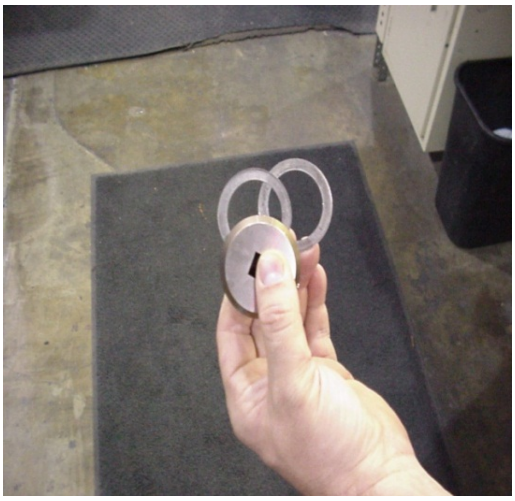
All new dies measure 1.181” (30mm) in all stations.

Shimming Dies



Measure dies after regrind and add shims accordingly.

Shims come in .010”, .030” and .060” sizes.



The height should equal or be within .010” of 1.181”.

The life of a die is .120”.

Achieving Maximum Tool Life by Using Suitable Die Clearance

Selection of die clearance should be based upon the type and thickness of material to be punched. Incorrect selection of die clearance can cause the following problems:

- If clearance is too small, tool wear will increase and galling may result.
- If clearance is too big, slug pulling may result, including excessive burrs.

Clearance should be selected using the clearance table shown in Figure 17.

Die Clearance Selection			
	% Total Clearance		
Material	**Minimum**	**Best**	**Maximum**
Copper (1/2 Hard)	8	12	16
Brass (1/2 Hard)	6	11	16
Mild Steel	10	15	20
Steel (0.5 C)	12	18	24
Aluminum (Soft)	5	10	15
Stainless Steel	15	20	25
% x Material Thickness = Total Clearance			

Figure 17: Table of die clearances

Example:
Punching .079” (2mm) mild steel:
Best die clearance for material = 15% of .079” (2mm) = .012” (0.30mm)

Note:
Wilson Tool recommends the **“best”** % total clearance for optimum performance. However, as material thickness increases approaching .156” (4mm), the **“maximum”** die clearance percentage should be selected from the table above rather than the **“best”** die clearance percentage.

Selection of Die Type

The three different die styles as offered by Wilson Tool are illustrated in Figure 18.

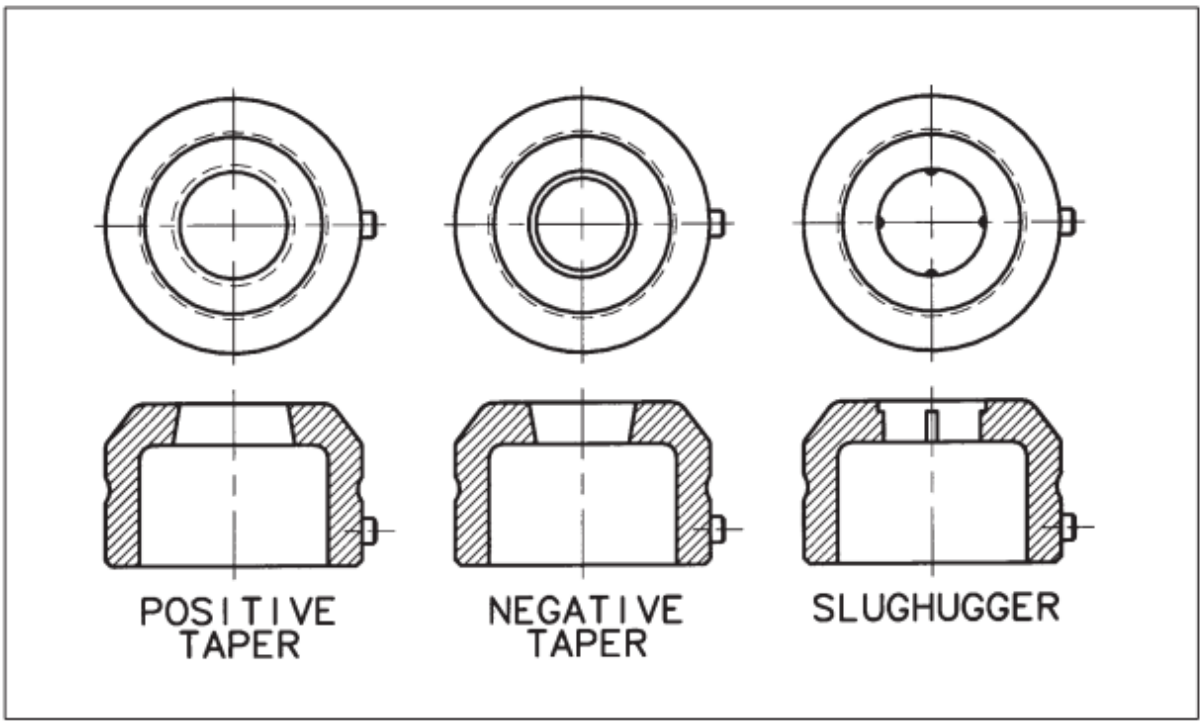


Figure 18: Die styles

Standard Taper
Not shown above. A standard taper die has a negative taper for the first .068” of an inch in the die land, and a positive taper for the remainder. Wilson Tool provides standard taper dies for all rounds. Shapes can also be selected upon special request.

Positive Taper
This is the best style of die for punching holes of less than .236” (6mm) diameter in mild steel and stainless steel, or less than .472” (12mm) diameter in aluminum. However, use of this style of die can result in slug pulling.

Negative Taper
Although the taper is only .0005” (0.01mm), this is enough to help squeeze and hold the slug as it is pushed down into the die land, thus helping to prevent slug pulling. Negative taper is not recommended for punching aluminum or plastic because of slug packing.

Slug Hugger® Dies
This is the only guaranteed method of stopping slug pulling and is especially recommended for use with modern punch presses due to the high punching speed.

The high speed of today's punch presses has increased the problem of slug pulling. The quicker punching speeds can cause a vacuum to form between the punch and slug, which pulls the slug out of the die as the punch retracts. To resolve this problem, Wilson Tool has developed Slug Hugger dies.

A Wilson Tool innovation, Slug Hugger dies have specially designed "bumps" on the inside of the die land, which "hug" the slug and ensure that it stays within the die. This style of die is individually designed with each order to suit the particular material type and thickness to be punched.

Slug Hugger dies also offer the advantage of stopping slugs from spinning within the die (See Fig. 19). Spinning slugs can cause the sheet to be pulled from the clamps causing sheet and tool damage.

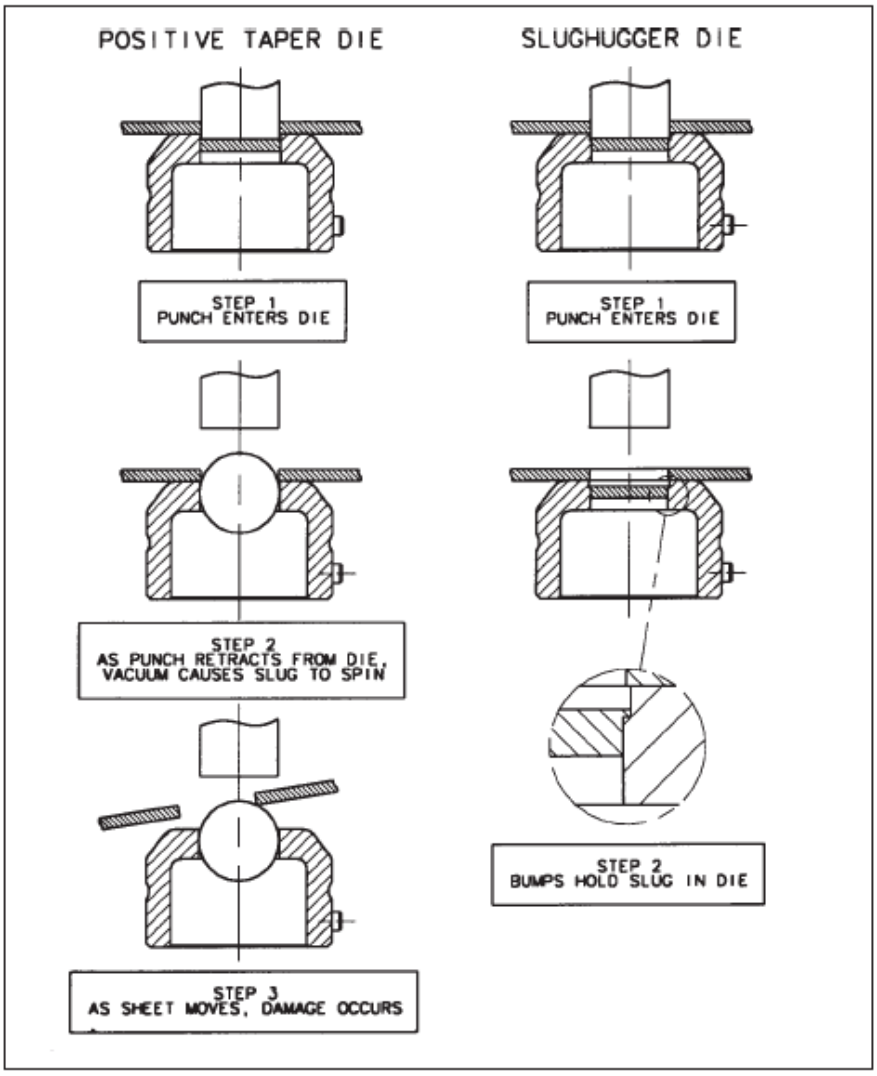


Figure 19: How Slughugger dies prevent slug spinning

Slug Hugger® 2 Dies
Slug Hugger 2 dies are similar to Slug Hugger dies, but made with a positive taper die land. The protrusions on the land (Slug Hugger nibs) are then made in a negative/positive fashion. The nib will appear somewhat diamond shaped. The advantage of a Slug Hugger 2 die is that while still holding the slug and not allowing it to pull, it stacks fewer slugs in the die land and causes far less back pressure than a negative die or a standard Slug Hugger die. Slug Hugger 2 dies are now the standard selection for slug retention.

Maintaining Tool Life by Regularly Checking Turret Alignment

Turret alignment is a critical procedure, which can help prevent problems such as poor tool life, unacceptable part quality and turret-wear. Wilson Tool recommends regular checks for station alignment on random stations within the turret.

For more information regarding the procedure for turret alignment, and to obtain suitable tools, contact the sales desk or your sales representative.

The turret keys must be checked on a regular basis.

Worn turret keys can lead to excessive tool wear and “rat’s tails.”

Tool Maintenance

- Punches should always be as sharp as or sharper than the die.
- When sharpening the punches, the punch inserts must be supported. If not secured, the vibrations caused by regrinding will break the inserts. Vibration can be reduced by wrapping the inserts in rubber bands or with the use of a punched plastic sheet.
- When using Optima™ TiCN coated punches, which have longer life, the sharpness of the die must be checked on a regular basis.

Stripper Clearance Types

Wilson Tool offers the following three stripper clearance types:

Closed Round Stripper
This style of guide or stripper is used when punching heavy plate with an additional punch tip length, and to eliminate scale build-up within the guide. It is also a good choice for use in drop-in guide assemblies for quick-change capabilities. Some care is necessary when using this guide to punch thin or soft materials to avoid marking or bending the material.

Fitted Shaped Stripper
This style of guide or stripper is the Wilson Tool standard for individual punch and guide assemblies. It gives the support needed around the punch to eliminate sheet marking while still preventing scale building up within the guide.

Slip Fit Shaped Stripper
This style of guide or stripper is used when material deformation is a problem, as in punching foil gauge materials. It can also be used for some nibbling operations. There are associated problems with galling and material build-up in the guide, so this style of stripper is only recommended for special applications.

The three styles of stripper are illustrated in Figure 22.

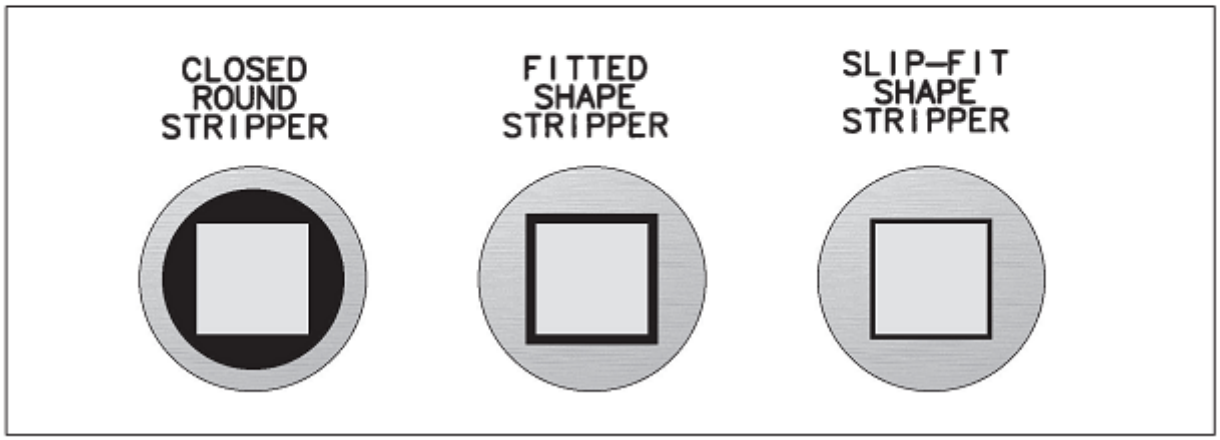


Figure 22: Stripper clearance styles

Calculating Punching Force

When punching holes with a large perimeter in heavy gauge materials, exceeding the recommended punching force (tonnage) could damage the machine or tooling. Therefore, Wilson Tool recommends the calculation of punching force whenever large tools are used in thicker materials. This is done using the following formulas:

> Punching Force (tons) = Total Land Distance (L) (shape perimeter) x Material Thickness (T) x 25 x Material Multiplication Factor (F) x Shear Factor (S)
>
> Punching Force (kn) = Total Land Distance (L) (shape perimeter) x Material Thickness (T) x .345 x Material Multiplication Factor (F) x Shear Factor (S)

The figures for (T), (L), (F) and (S) can be determined from the following four tables (Figures 23, 24, 25 and 26).

Material Description	Material Multiplier
Aluminum (soft sheet)	0.30
Aluminum (1/2 hard)	0.38
Aluminum (hard)	0.50
Brass (soft sheet)	0.60
Brass (1/2 hard)	0.70
Copper (rolled)	0.57
Mild steel	1.00
Cold rolled steel	1.20
Stainless steel	1.40

Figure 23: Material multiplier (F) table for punching force calculation

Material Gauge Steel Sheet	Material Thickness (T)	
	Gauge decimal (inches)	Gauge decimal (mm)
24	.024	0.61
22	.030	0.76
20	.036	0.91
18	.048	1.21
16	.060	1.52
14	.075	1.9
12	.105	2.66
10	.135	3.42

Figure 24: Material thickness (T) table for punching force calculation

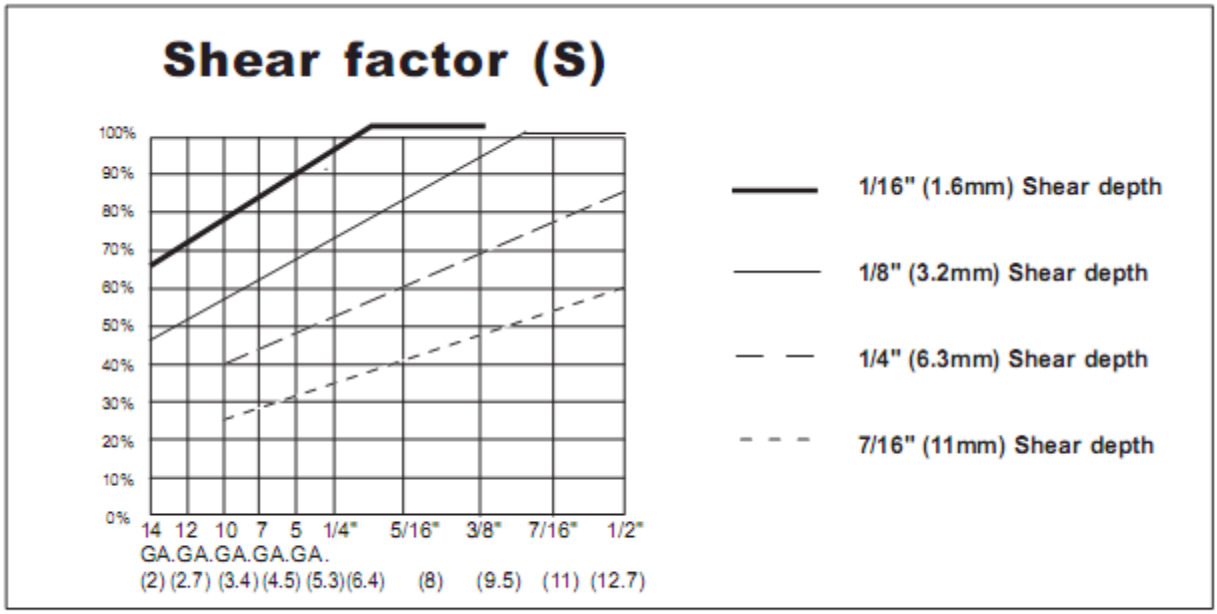
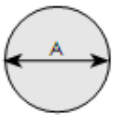
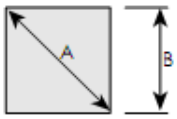
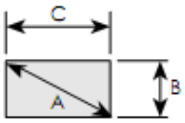
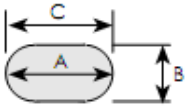
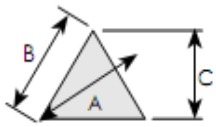
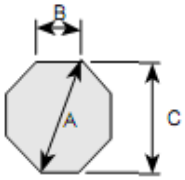
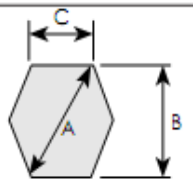


Figure 25: Shear factor (S) chart for punching force calculation

SHAPE	'A' DIMENSION	'L' DIMENSION
ROUND 	A = Diameter	L = 3.14 x A
SQUARE 	A = B x 1.414	L = 4 x B
RECTANGLE 	$A = \sqrt{(B^2 + C^2)}$	L = 2 x (C + B)
LONG 'D' 	$A = \sqrt{(B^2 + C^2)}$	L = 2C + 1.57B
OBROUND 	A = C	L = 2C + 1.14B
EQUILATERAL TRIANGLE 	A = 1.155 x B or A = 1.334 x C	L = 3 x B
QUAD 'D' 	A = Diameter	L = 3.14 x A
OCTAGON 	A = 1.082 x C or A = 2.613 x B	L = 8 x B L = 3.32 x C L = 3.06 x A
HEXAGON 	A = 1.155 x B or A = 2 x C	L = 3 x A

Punch Shear

Although shears are usually used to reduce punching force, a small amount of shear on punches can also greatly reduce the noise level when punching most materials, especially stainless steel.

For reducing punching force when punching thick materials, shear on the punch tip or die surface is of little value unless the shear depth is greater than or equal to half the material thickness.

Figure 20 shows the shear types offered by Wilson Tool.

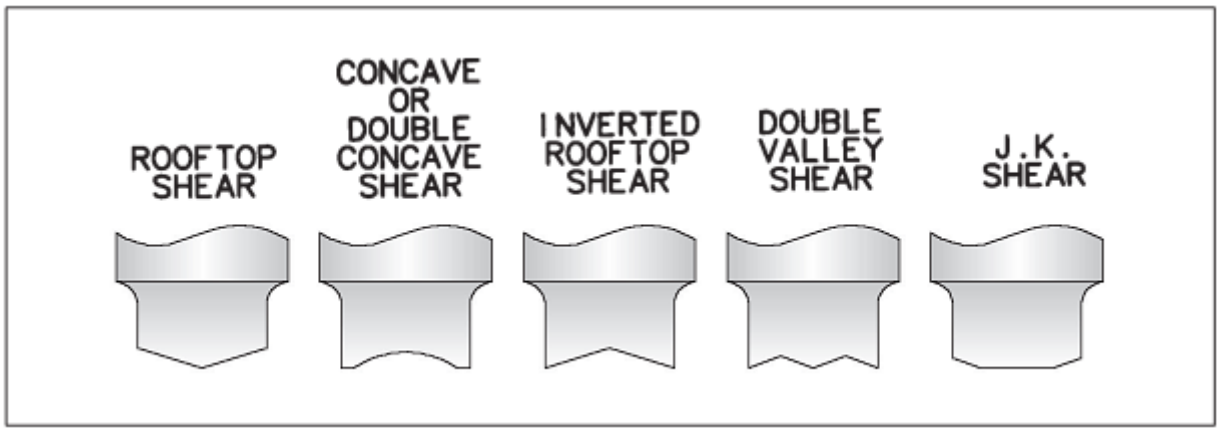


Figure 20: Shear Types

Each shear has benefits and limitations, which make it more suitable for certain applications. These features are highlighted in Figure 21.

Shear Table

Shear Type	Benefit	Limitation
Rooftop Shear	Best shear for minimizing punching force in thick materials.	Nibbling must be done with 75% of bite or excessive side loading will result.
Concave or Double Concave Shear	Best shear for partial hits. This shear forms a lock against the sheet, which resists punch deflection.	Because of inverted stresses, a narrow punch can split with high punching force operations.
Inverted Rooftop Shear	Also a good shear for nibbling because of inverted stresses. Easier to sharpen than concave shear.	More susceptible to breakage because of a sharp focal point for stresses. Do not use narrow punches on heavy materials.
Double Valley Shear	Best shear for nibbling when the shape is long and narrow.	Because of inverted stresses, the punch can break when punching at high tonnages.
J.K. Shear	A special type of shear developed to punch and easily strip out of heavy or high strength materials.	Maximum punch tip size is 1.000” (25.4mm). Caution: Increases tonnage.

Figure 21: Benefits and limitations of shear types

Interchangeability of Series 90, HP Punch and Guide Assembly

Certain components within Series 90 Standard, ABS and WLS assemblies are interchangeable with each other. Components are designed to be standard between the three ranges of tooling wherever possible to make the changeover from standard tooling to WLS or ABS tooling as easy as possible. However, using incorrect components within assemblies can reduce the tooling life, as well as damage the tooling and machine.

The figures on the following pages show how to identify whether component parts are Standard, WLS or ABS, and which components can be interchanged with each other between the three styles of assembly. Putting this information into practice will help you avoid damage to your tooling.

Punch Driver Assembly
All of the punch driver assembly apart from the punch holder is standard between the three tooling styles.

Punch
This is standard between the three lines of tooling.

Punch Holder
Standard punch holders cannot be exchanged with WLS or ABS punch holders. Doing so may cause machine or tooling damage. WLS and ABS punch holders are common and can be exchanged with each other.

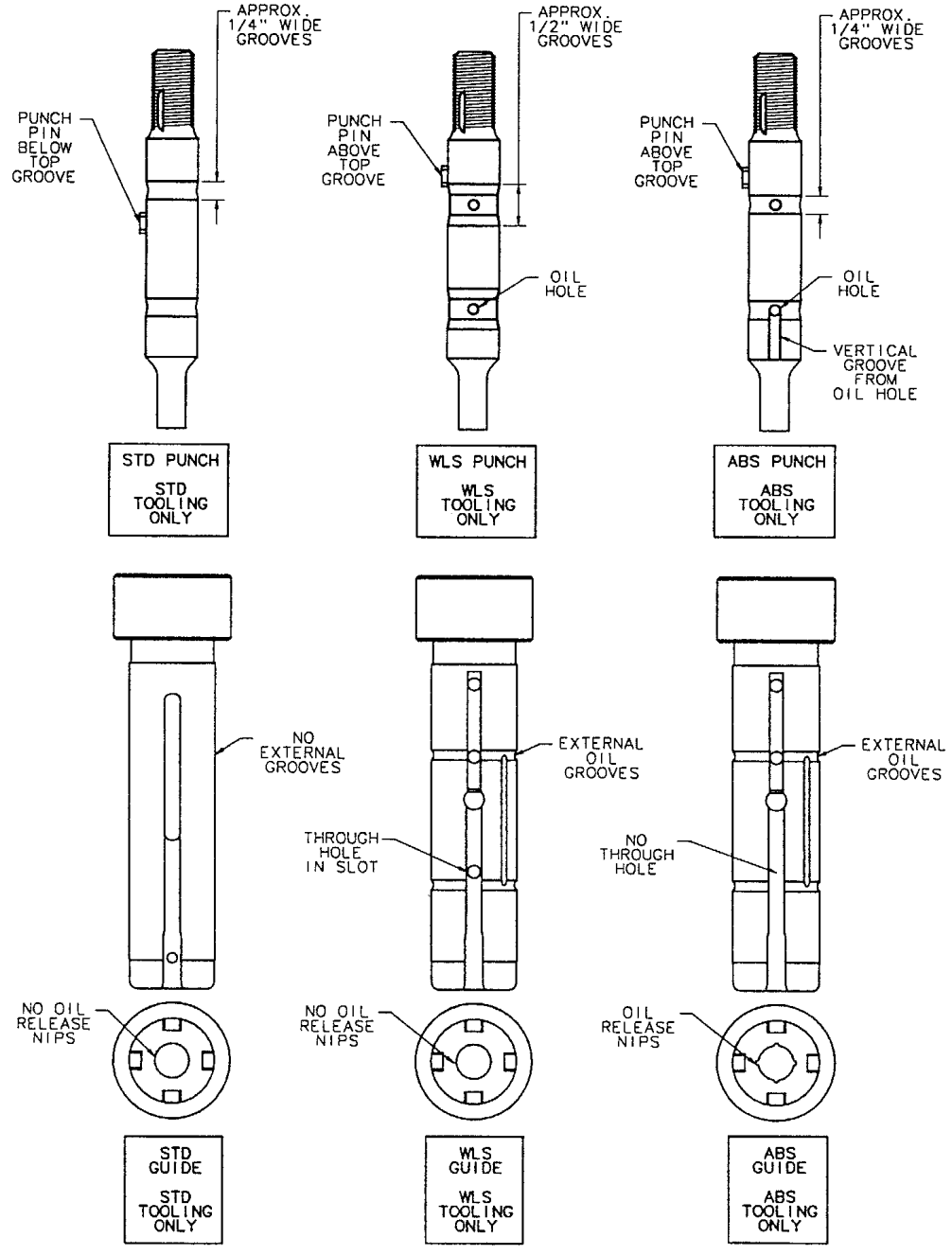
Guide
Standard guides cannot be exchanged with WLS or ABS guides. Doing so may cause machine or tooling damage.

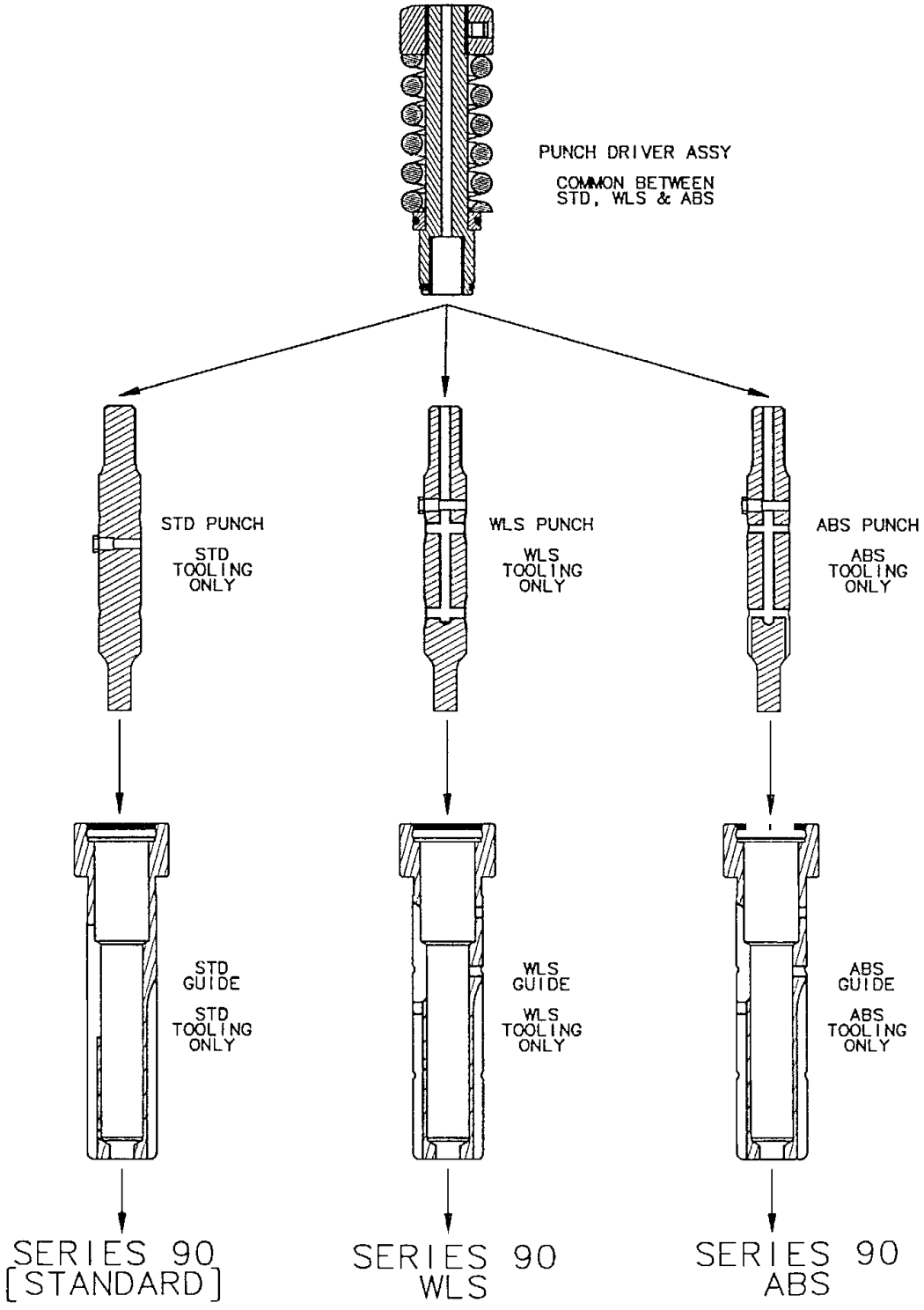
Stripper
Standard and WLS strippers are common and can be exchanged with each other. ABS strippers can only be used with an ABS guide.

HP/Series 90 Identification Charts

The following charts show the differences between ABS and WLS components and their interchangeability between types.

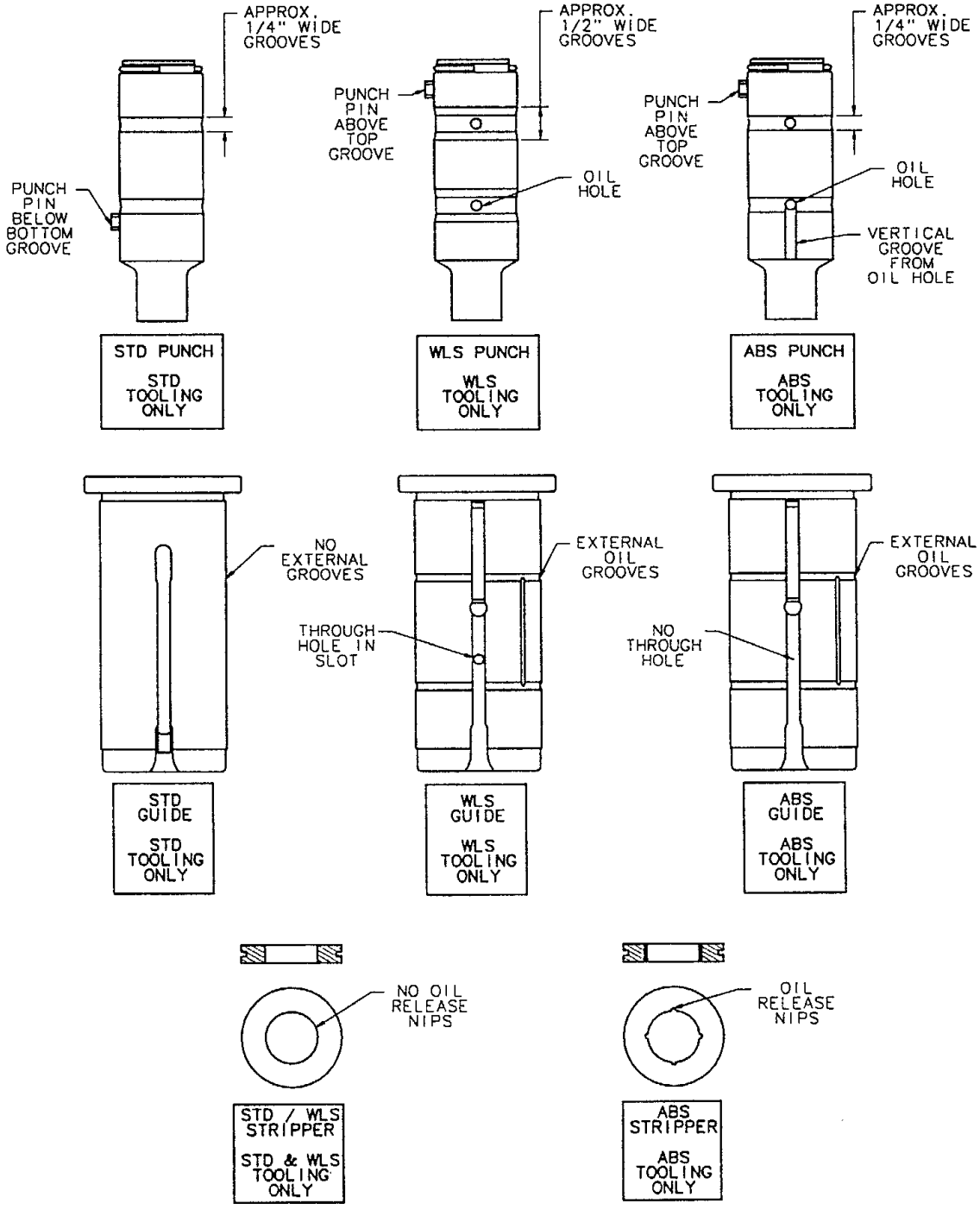
½ inch (A) Station
(Note pin placement.)

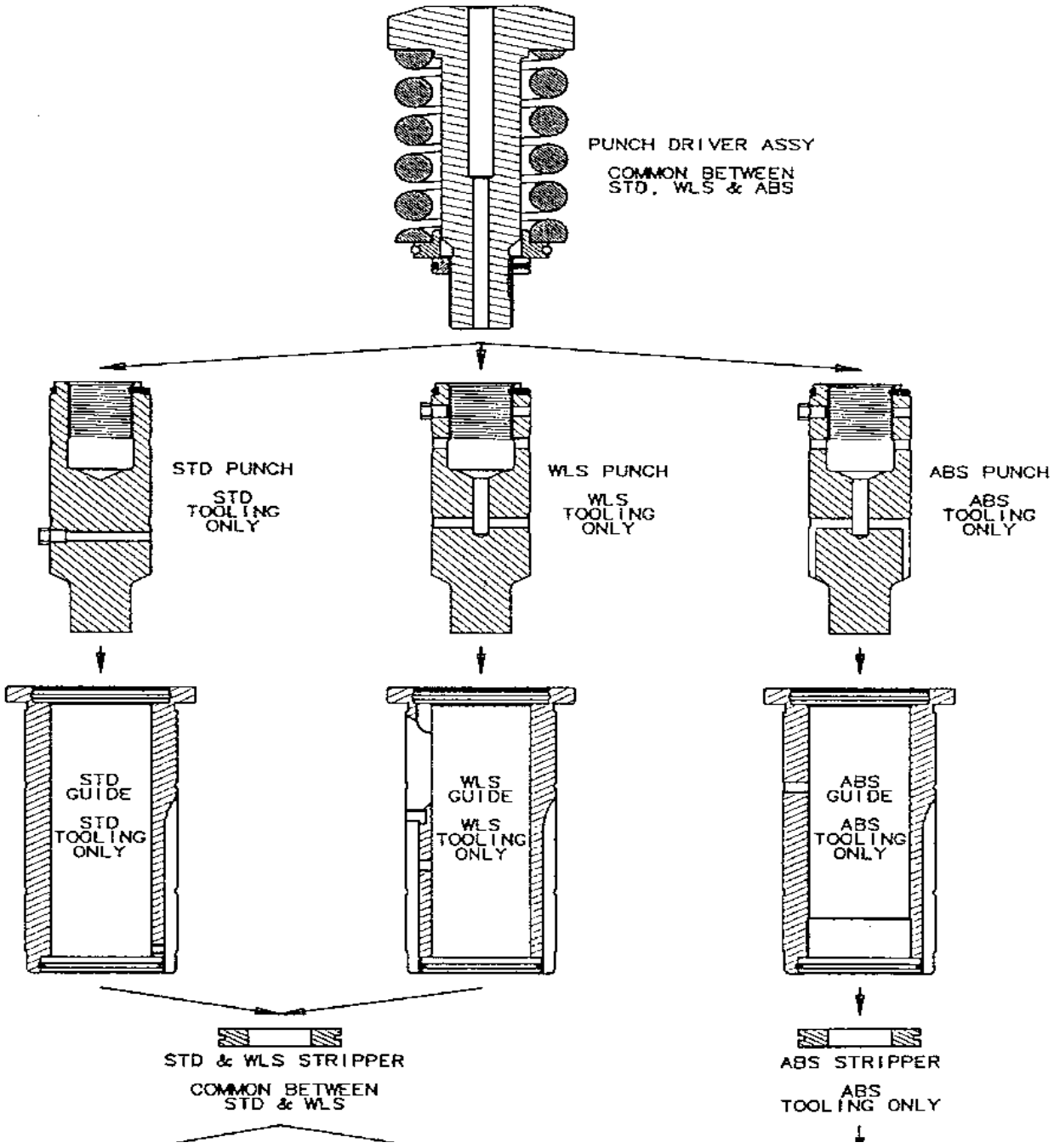



PUNCH DRIVER ASSY
COMMON BETWEEN
STD, WLS & ABS
STD PUNCH
STD
TOOLING
ONLY
WLS PUNCH
WLS
TOOLING
ONLY
ABS PUNCH
ABS
TOOLING
ONLY
STD
GUIDE
STD
TOOLING
ONLY
WLS
GUIDE
WLS
TOOLING
ONLY
ABS
GUIDE
ABS
TOOLING
ONLY
SERIES 90
[STANDARD]
SERIES 90
WLS
SERIES 90
ABS

Standard HP/Series 90

1¼ Inch (B) Station
(Note pin placement.)




PUNCH DRIVER ASSY
COMMON BETWEEN
STD, WLS & ABS
STD PUNCH
STD
TOOLING
ONLY
WLS PUNCH
WLS
TOOLING
ONLY
ABS PUNCH
ABS
TOOLING
ONLY
STD
GUIDE
STD
TOOLING
ONLY
WLS
GUIDE
WLS
TOOLING
ONLY
ABS
GUIDE
ABS
TOOLING
ONLY
STD & WLS STRIPPER
COMMON BETWEEN
STD & WLS
ABS STRIPPER
ABS
TOOLING ONLY

Problem Solving Checklist for Tool Failure

The following is the list of questions Wilson Tool asks when trying to establish why a tool has failed. Answers to these questions often give clues to possible problems.

Piercing Tools

- What type and thickness of material was used?
- Has the turret alignment been checked on the machine?
- Have the tools been sharpened? Properly?
- Was anything unusual noticed before failure?
- Was there much sheet distortion?

Forming Tools

- What type and thickness of material was used? Was it the material the tool was designed for?
- Has the turret alignment been checked on the machine?
- Is the tool length set properly? Does the tool bottom out?
- Is there a post delay in the program to allow the tool to strip?
- Are the forms close to the clamps?
- Is there any noticeable damage to the tool (e.g. burrs, nicks or chips)?
- Has the tool been sharpened? Properly?
- Was the correct size and shape pre-punch used?
- Was the spring pressure in the upper unit reduced (if required)?
- How often is general maintenance carried out on the tool?

Troubleshooting

The most common reasons for punching operation stoppages on punch presses are tooling problems. Included within this section is a table of the most common tooling problems, along with possible solutions. This enables the user of tooling from Wilson Tool to identify and prevent possible problems. Wilson Tool technical experts are also always available to help with tooling problems.

Basic points to remember:

- Die clearance should be selected to suit the type and thickness of material to be punched.
- Slug Hugger dies should be used wherever possible to eliminate slug pulling.
- Tools should be regularly reground.
- Tools should be regularly cleaned and lubricated.
- Nibbling causes side loading on the punch, which leads to additional wear. This principle is illustrated (exaggerated) in Figure 34. Optima® TiCN coating can be especially useful in nibbling operations.
- Possible tooling problems should be identified using the following Troubleshooting Tables and eliminated.
- The Wilson Tool sales desk members are all technically trained tooling experts and can be called at any time to help solve tooling problems.

Figure 34: The problem of side loading during nibbling operations

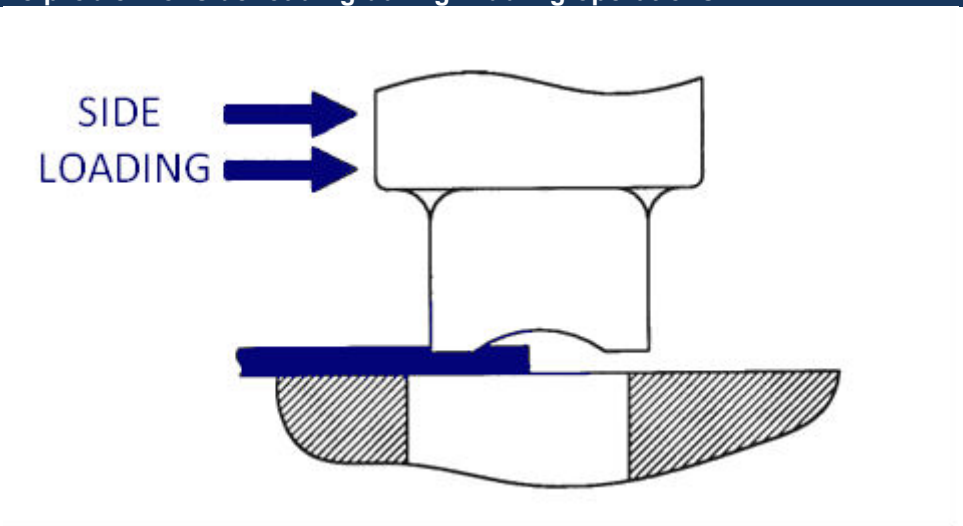


Figure 35: Troubleshooting Table - Rapid Tool Wear Problems and Solutions

Rapid tool wear	Inadequate die clearance	Increase clearance.
	Poor tool station alignment	Realign stations.
		Level turrets.
	Misalignment as a result of wear	Replace tool holder.
		Rework turret or replace bushing.
	Punch overheating	Use sheet lubricant.
		Use lubricant between punch and die.
		Use more than one punch of the same size in the program.
		Use Wilson Optima TiCN coated punches.
	Poor regrind practices.	Use coarser, softer wheels.
		Dress wheel more often.
		Reduce metal removal rates.
		Use generous amounts of coolant.
		Use surface grinder with Wilson Grinding Fixture.
	Nibbling	Increase nibbling pitch.
		Punch slot or opening with bridge hitting.
		Use Wilson Optima TiCN coated punches.

Figure 36: Troubleshooting Table - Punch 'Pickup' or Galling Problems and Solutions.		
Punch 'pick up'	Insufficient die clearance	Increase die clearance.
	Dull punch	Sharpen punch using surface grinder & Wilson Grinding Fixture.
		Grind extra back taper on punch tip.
		Use Wilson Optima TiCN coated punches.
	Insufficient lubrication	Apply correct lubrication to work piece.

Figure 37: Troubleshooting Table - Poor Stripping Problems and Solutions		
Poor stripping	Insufficient die clearance	Increase die clearance.
	Punch wear	Sharpen punch using surface grinder with Wilson Grinding Fixture.
	Poor spring	Replace spring.
	Slug spinning in die (see Figure 18)	Use Slug Hugger dies.
	Material 'pickup' or galling	Remove galling.
		Use Wilson Optima TiCN coated punches.

Figure 38: Troubleshooting Table – Slug Pulling Problems and Solutions		
Slug pulling	Die problem	Use Wilson 'Slug Hugger' dies.
		Decrease die clearance 10% on small holes.
		Increase die clearance on holes greater than 2.000" (50mm).
		Use die with negative taper.
		Use thinner lubricant or eliminate lubricant.
		Increase die land.
		Decrease die land.
		Notch die with diamond file.
	Punch problem	Increase punch penetration into the die.
		Use slug ejectors.
		Use shear ground punches to increase punch penetration.

Figure 39: Troubleshooting Table – Workpiece Problems and Solutions		
Work piece distortion	Lateral movement in work piece	Increase die clearance.
	Bending of work piece	Increase stripper pressure.
		Turn sheet over after hitting.
		Alternate holes on first operation.
		Reprogram punching sequence.

Figure 40: Troubleshooting Table – Work Accuracy Problems and Solutions		
Work accuracy (hole to hole reference)	Lateral movement of Work piece.	Increase die clearance.
	Movement of work holders.	Adjust or replace.
	Movement of work piece in work holders.	Replace gripping surfaces in work holders.
	Table not aligned to press.	Realign table.
	Tools misaligned.	Realign turret after checking with Wilson alignment tool.
	Turret out of level.	Level turrets.
	Station location housing worn.	Inspect & replace.

Figure 41: Troubleshooting Table – Punching Noise Problems and Solutions		
Punching noise	Poor stripping	Increase die clearance.
		Use correct lubricant.
		Increase stripping.
		Use soft face stripper.
		Wilson 'Zip-Mar' adhesive disks.
	Poor work piece support	Use Wilson 'Ball Riding' dies.
		Reduce work piece size.
		Increase work piece thickness.
	Warped work piece	Straighten before running.
	High punching noise with heavy material	Program smaller hits. Use soft material on stripper plate.

Figure 42: Troubleshooting Table – Sheet Pulling Out of Clamps Problems and Solutions		
Sheet pulling out of clamps	Tool not stripping	Extra Back taper on punches.
		Lubricate sheet.
		Use Optima™ coated punches.
		Use heavy-duty tooling.
	Pulled slug jammed between die and workpiece	See "slug pulling" solutions.

Figure 43: Troubleshooting Table – Punch Breakage Problems and Solutions		
Punch Breakage	Inadequate die clearance	Adjust to proper.
	Crossed shapes	Ensure tools are properly loaded in turret.
	Size of punch less than one material thickness	Fitted stripper / Stubby punch and die.

Figure 44: Troubleshooting Table – Punch Does Not Strip Problems and Solutions		
Punch Does Not Strip / Punch Sticking in Work Piece	Dull punches or dies	Sharpen tooling.
	Inadequate lubrication	Lubricate bottom of the sheet.
	Improper die clearance	Adjust to proper.
	Difficult material	Adjust die clearance.
	Weak spring	Heavy-duty spring pack / Extra back taper on punch.
	Tool limitations exceeded	
	Galling	Lubricate tooling.
		Add coatings.

Figure 45: Troubleshooting Table – Sheet Accuracy Problems and Solutions		
Sheet Accuracy	Worn work holders	Adjust or replace.
		Replace gripping surfaces.
	Alignment problems	Realign table to press.
		Inspect for worn turret bores.
		Level turret.

Figure 46: Troubleshooting Table – Warpage of Work Piece Problems and Solutions		
Warpage of Work Piece	Dull tools	Sharpen punch and die.
	Improper clearance	Increase or decrease as Necessary.
	No lubrication	Lubricate sheet.
	Poor stripping	Increase stripping.
	Programming	Reprogram punching sequence.
		Bridge hit large openings.

Thick Turret Tooling: Punch Body Breakage

C Station

- Broken shank caused by:
    - Over-tightened bolt (Wilson Tool recommends 50 ft. lbs. (67.7Nm) of torque to tighten bolt).
    - Using a well-used or starched bolt (causes the top of the shank to break off).
    - Using too many shims on a non-Series 80, 80 Plus or 90 tool holder (breakage caused by too little thread engagement).
- Broken flange caused by:
    - Dowel pin not seated properly in keyway of punch holder.
    - Material slivers or chips between the punch and punch holder.
    - The use of poor quality shims.

D Station

- Broken shank caused by:
    - Overtightened bolt (Wilson Tool recommends 50 ft. lbs. (67.7Nm) of torque to tighten bolt).
    - Using a well-used or stretched bolt (causes the top of the shank to break off).
    - Using too many shims on a non-Series 80, 80 Plus or 90 tool holder (breakage caused by too little thread engagement).
- Broken flange caused by:
    - Dowel pin not seated properly in keyway of punch holder.
    - Material slithers or chips between the punch and punch holder.
    - The use of poor quality shims.

Thick Turret Tooling: Punch Tip Breakage

Use of a punch that is smaller in diameter or width than the thickness of the material will probably cause the tip to break, no matter what the range. It is recommended that stubby style punches be used for these operations. Stubby punches use a very small length of punch tip, thus supplying additional strength and rigidity to punch thicker materials.

Thick Turret Tooling: Die Breakage

- Slug Hugger or negative taper on long, narrow shapes or small rounds (positive taper recommended).
- Dull tooling (punch & die should be checked for sharpness).
- Poor turret alignment.
- Incorrect die clearance.
- Slug pulling.
- Punch deflection (side loading of punch caused by nibbling on smaller pitch or edge trimming with punch).
- Embedded chips or slivers of material in die or die shoe causing the die to not sit flush.
- Maximum punching force or material thickness for station has been exceeded.

Coining Tools: Punch Insert Breakage

- Incorrect pre-punch – material pinching the pilot.
- The operator hasn't tightened the set screw holding the insert into the body, or the screw threads have stripped.
- Material too thick for replaceable insert design (over .118" (3mm) material should be solid punch body style.
- Poor turret alignment.
- No post delay on machine – tool must have time to strip.

Extrusion Tools: Insert Breakage

- No post delay – sheet moving before insert can strip.
- Poor turret alignment.
- Too close to machine clamps.
- Not pre-punching prior to extrusion operation.
- Using material thicker than the tool was designed for.
- Using adjacent stations to punch holes.
- Worn springs causing the tool not to strip.

Lance and Form Tools

Lance and form less than 90°, of 90° and bridge lance and forms.

- No post delay.
- Too close to machine clamps.
- Over stroked.
- Using material thicker than the tool was designed for.
- Poor turret alignment.
- Operator error.
- Hitting slug on sheet caused by slug pulling.
- Slug tearing off (caused by dull tools) and building up in the tool.
- Double bridge lance and form webs breaking off if too narrow.
- Using adjacent stations to punch holes.
- Worn springs causing the tool not to strip.

Recommendations for Punching Soft or Thin Materials

When punching thin, soft materials (such as aluminum or brass), witness marks may be left on the material from either the die or the guide. The following recommendations should be followed if this should happen:

- The die and guide should be checked for sharp particles, irregularities and material buildup.
- If marks persist, Zip-Mar patches should be attached to the bottom of the guide assembly. Alternatively, masking tape can be applied to the guide and die.
- If problems still persist, special light duty springs or spring packs should be used. This reduces spring pressure.

Recommendations for Punching Non-Metallic or Plastic Materials

As the industry has changed, there has been more call to punch a variety of materials such as plastics or other non-metals. The following recommendations are given to reduce problems when punching these often-difficult materials:

- Punches and dies should be extremely sharp.
- Die clearances should be reduced to 5-8% of material thickness.
- Positive taper dies should be used.
- Support should be given to foil gauge materials with a sheet of single laminate cardboard. This allows the materials to ride over both the turret and the table.
- The machine should be run in slow cycle, watching at all times for failure to strip.
- If the stripper marks the sheet, Zip-Mar should be applied to the bottom of the guide and a light spring pack should be used
- Hard plastics should be lubricated before punching.
- Abrasive or fiber reinforced materials such as Plexiglas® or laminated epoxy glass cause additional punch wear. Optima™ TiCN coated punches can help to reduce tool wear.

Recommendations for the Use of Forming Tools

- Machine stroke length varies. This means that a tool properly set and working on one machine may be over- or under-set for another. Tools should always be reset on their shortest setting.
- The tool should always bottom out to achieve the best form. This is achieved by starting with the shortest setting, adjusting the tool by approximately .004" (0.1mm) at a time and taking sample hits. The adjustment is complete when faint grind lines appear on the sample part.
  Warning! Overstroking will cause tool and machine damage.
- The tool length should not be altered by more than .005" (0.12mm) per adjustment. Over adjustment will cause the tool to overstroke, fatigue and fail. Easy-set punch heads can be used on small station tooling, and Series 90 adjustable holders can be used on large station form tools to make adjustments in small, known increments.
- Sheet “bowing” or “marring” can occur if the material is formed into the stripper plate. Excessive stripping pressure can be corrected with the use of a light spring or light spring pack.
- Ball rolling dies should be used either side of the forming die within the turret. The lower turret must always be full of dies, but use of forming or standard dies in the stations next to the forming die will result in sheet distortion.
- Forming should always be done as far away from the clamps as possible.
- Forming should always be the final operation on the sheet wherever possible. This eliminates the possibility of a collision between a standard punch assembly and an existing form on the sheet.
- Lubrication of the sheet aids stripping and prevents galling.
- Slug Hugger® dies should be used to prevent slug pulling. Slugs left on the sheet cause tool damage.
- Many forming tools have positive stops, which must be retained after regrinding to maintain form quality. Instructions are provided for all forming tools that require regrinding.
- Relieved slitting assemblies can be used to slit close to forms on the sheet.
- Forming tools with built-in stripping require additional time to strip. Therefore, form tools should be run at a slower punching rate.

Recommendations for the Use of Cluster Tools

General Suggestions

- Punched holes should not be re-entered by the cluster punches. Doing so causes shaving of the holes and dangerous side-loading of the tool.
- Sheet lubrication is important.
- Tooling should be regularly checked for sharpness.

Minimizing Sheet Distortion

In punching some perforated patterns on a punch press, material deformation can be a problem. Stresses in the sheet caused by punching large numbers of holes can cause the material to “warp.” The following suggestions can help to minimize sheet distortion:

- Punches and dies should be kept sharp and die clearance should be selected to suit the type and thickness of the material to be punched. Dull tooling and too much clearance increase the coining effect of each hit.
- Lubrication should be used on both the top and bottom of the sheet. The oil helps to keep the cutting edges of both the punch and die sharp, as well as aiding stripping.
- The pattern should be punched either from the outside of the sheet inwards, or from the inside of the sheet outwards. Various materials behave differently.
- The punching pattern should be staggered, alternating rows and taking several passes to complete the pattern. In some extreme cases, it may be necessary to flip the sheet on every other pass to equalize the warping effect.
- Buildup should be frequently removed from the tools.
- The lower coefficient of friction of Optima™ TiCN coated tooling helps to prevent warping.

Appendix A

Thick Turret Tooling: Tool Length and Grind Life

Tool Heights	1/2" Stn	1 14" Stn.	2" Stn.	3 1/2" Stn	4 1/2" Stn
Full Assy	8.169"	8.169"	8.228'	8.228"	8.267"
Old style Punch	8.169"	8.169"	3.776"	3.307"	3.347"
grind life	.250"	.250"	.080"	.080"	.080"
HP Punch	4.641"	3.957"	1.575"	1.575"	1.575"
grind life	.420"	.420"	.480"	.480"	.480"
EXP Punch	1.745"	2.065"			
grind life	.420"	.420"			
Die	1.181"	1.181"	1.181"	1.181"	1.181"
grind life	.100"	.100"	.100"	.100"	.100"
Dura-Die			1.181"	1.181"	1.181"
Dura-Die insert			.472"	.472"	.472"
grind life			.100"	.100"	.100"

Notes:

- Tool heights for assemblies are measured from top of punch head to tip of punch.
- Grind life is listed as maximum attainable for use in 16-gauge material.
- Grind life on EXP punches will be less for use with old style assemblies.
- Old style grind life refers to Wilson Tool manufactured tooling, Amada manufactured tooling ½" and 1 ¼" grind life is .080".

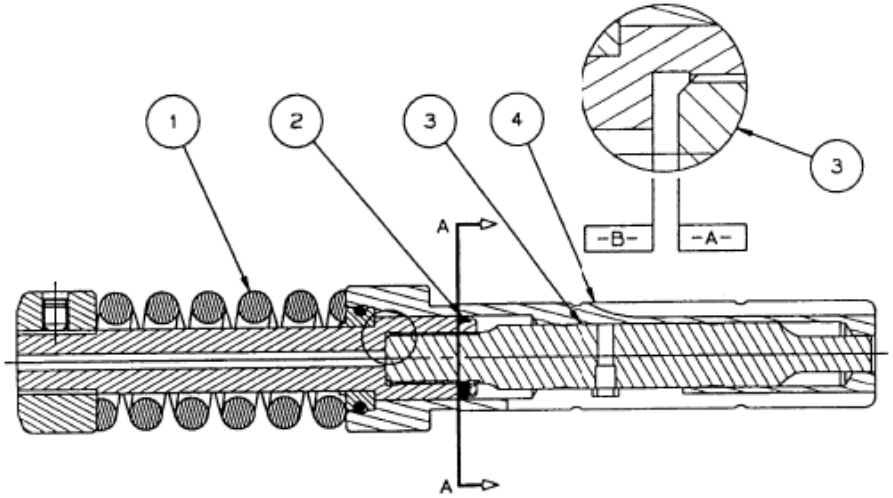
No Tools Needed

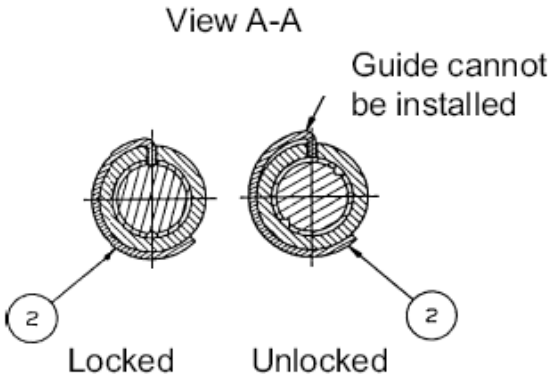
New tool instructions

1. To remove guide (4) from assembly, grasp guide (4) firmly in one hand, and spring (1) in the other. Pull guide (4) off assembly.
2. Turn punch (3) clockwise until surface (A) contacts surface (B). Do not tighten!!! Then turn punch (3) counter clockwise until ring clip (2) snaps into groove (locked position).
3. Slide guide (4) over punch (3) with moderate pressure until guide (4) snaps into place. Caution: Guide (4) will not pass over ring clip (2) if not in locked position.

Sharpening and adjusting instructions

1. To remove guide (4) from assembly, grasp guide (4) firmly in one hand, and spring (1) in the other. Pull guide (4) off assembly.
2. Remove punch (3) from assembly by turning punch (3) counter clockwise.
3. Sharpen punch (3).
4. Put punch (3) back on assembly by turning clockwise.
5. Adjust punch (3) to proper length and snap ring clip (2) into closest groove. Each click of the ring clip (2) = .025" (0.64mm) of adjustment. For every .030" (0.76mm) of sharpening, lengthen punch assembly by turning punch (3) counter clockwise one click.
6. Slide guide (4) over punch (3) with moderate pressure until guide (4) snaps into place. Caution: Guide (4) will not pass over ring clip (2) if not in locked position.





1/2"A-Station Thick Turret Series 90 Instructions

[02423-INST] WILSON TOOL

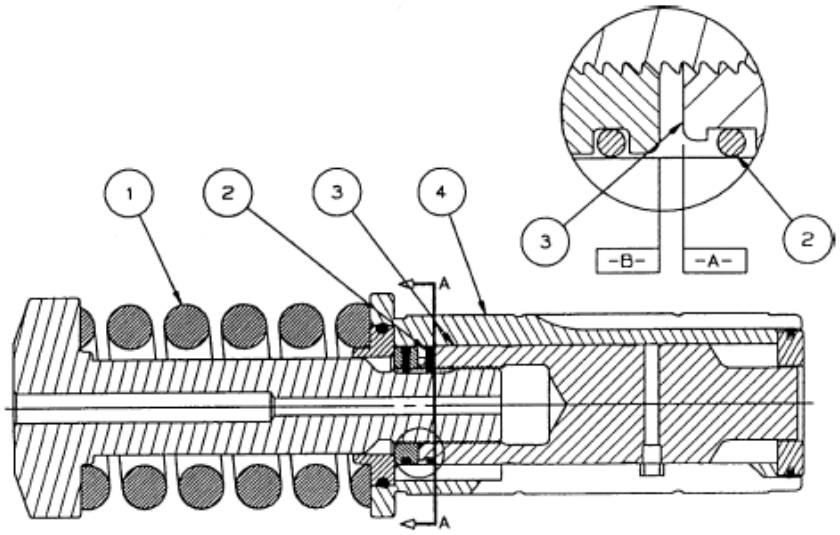
No Tools Needed

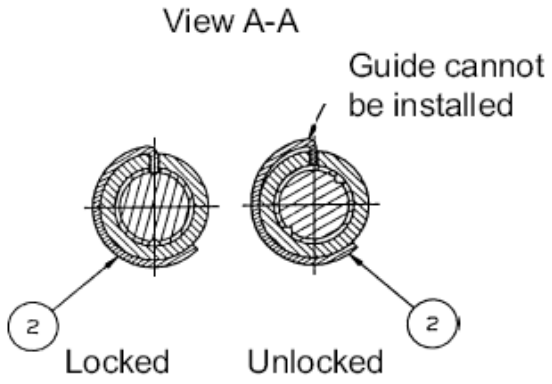
New tool instructions

1. To remove guide (4) from assembly, grasp guide (4) firmly in one hand, and spring (1) in the other. Pull guide (4) off assembly.
2. Turn punch (3) clockwise until surface (A) contacts surface (B). Do not tighten!!! Then turn punch (3) counter clockwise until ring clip (2) snaps into groove (locked position).
3. Slide guide (4) over punch (3) with moderate pressure until guide (4) snaps into place. Caution: Guide (4) will not pass over ring clip (2) if not in locked position.

Sharpening and adjusting instructions

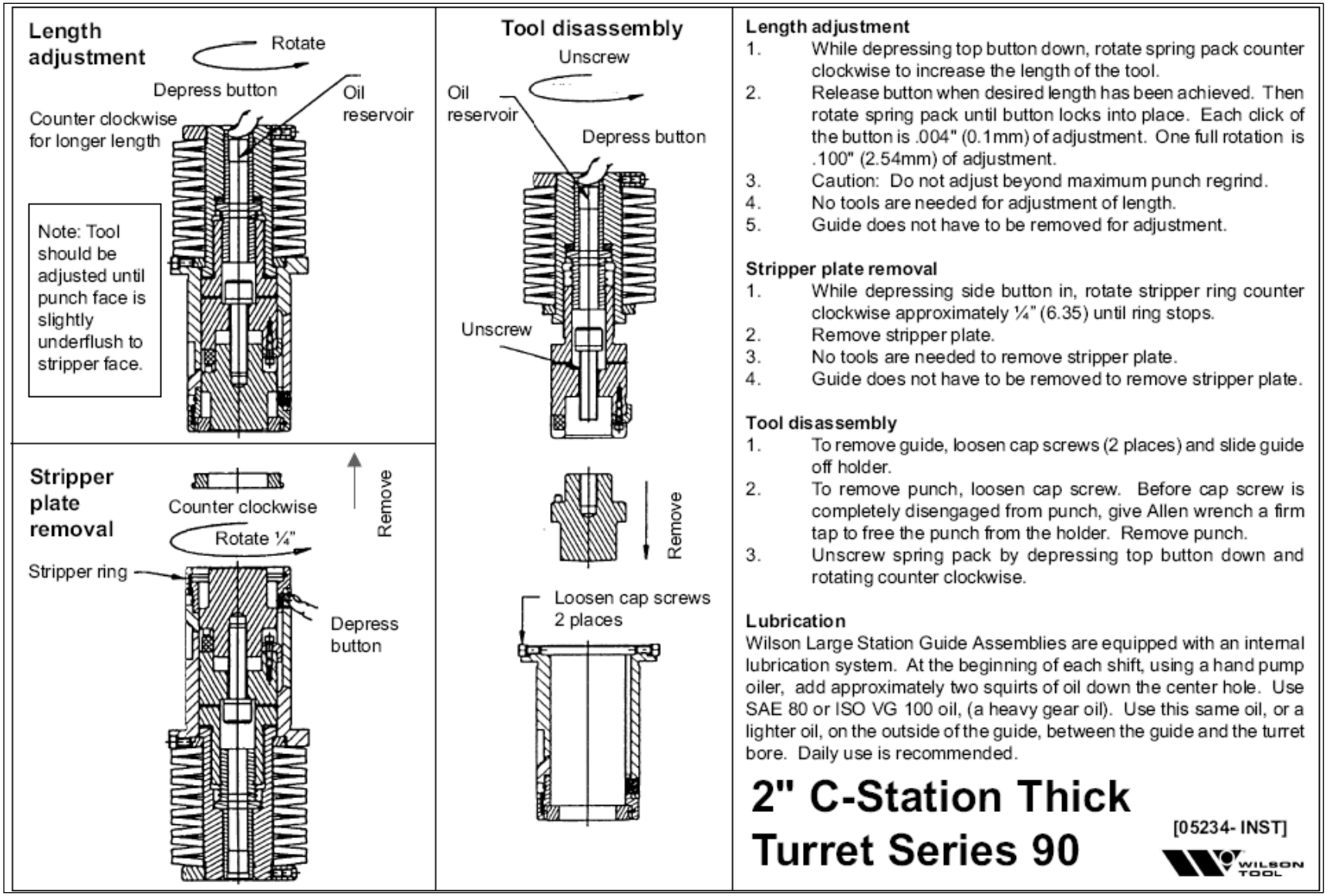
1. To remove guide (4) from assembly, grasp guide (4) firmly in one hand, and spring (1) in the other. Pull guide (4) off assembly.
2. Remove punch (3) from assembly by turning punch (3) counter clockwise.
3. Sharpen punch (3).
4. Put punch (3) back on assembly by turning clockwise.
5. Adjust punch (3) to proper length and snap ring clip (2) into closest groove. Each click of the ring clip (2) = .031" (0.79mm) of adjustment. For every .030" (0.76mm) of sharpening, lengthen punch assembly by turning punch (3) counter clockwise one click.
6. Slide guide (4) over punch (3) with moderate pressure until guide (4) snaps into place. Caution: Guide (4) will not pass over ring clip (2) if not in locked position.





1-1/4" B-Station Thick Turret Series 90 Instructions

[02427-INST] WILSON TOOL



Length adjustment

1. While depressing top button down, rotate spring pack counter clockwise to increase the length of the tool.
2. Release button when desired length has been achieved. Then rotate spring pack until button locks into place. Each click of the button is .004" (0.1mm) of adjustment. One full rotation is .100" (2.54mm) of adjustment.
3. Caution: Do not adjust beyond maximum punch regrind.
4. No tools are needed for adjustment of length.
5. Guide does not have to be removed for adjustment.

Stripper plate removal

1. While depressing side button in, rotate stripper ring counter clockwise approximately ¼" (6.35) until ring stops.
2. Remove stripper plate.
3. No tools are needed to remove stripper plate.
4. Guide does not have to be removed to remove stripper plate.

Tool disassembly

1. To remove guide, loosen cap screws (2 places) and slide guide off holder.
2. To remove punch, loosen cap screw. Before cap screw is completely disengaged from punch, give Allen wrench a firm tap to free the punch from the holder. Remove punch.
3. Unscrew spring pack by depressing top button down and rotating counter clockwise.

Lubrication

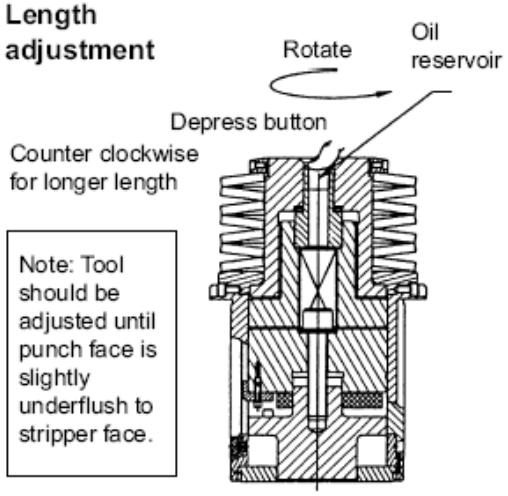
Wilson Large Station Guide Assemblies are equipped with an internal lubrication system. At the beginning of each shift, using a hand pump oiler, add approximately two squirts of oil down the center hole. Use SAE 80 or ISO VG 100 oil, (a heavy gear oil). Use this same oil, or a lighter oil, on the outside of the guide, between the guide and the turret bore. Daily use is recommended.

2" C-Station Thick Turret Series 90

[05234- INST]

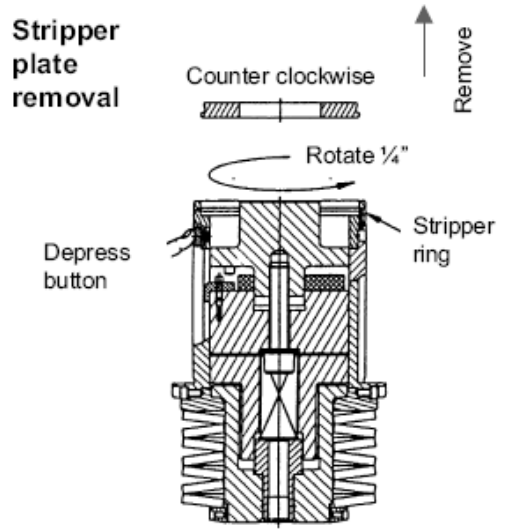
WILSON TOOL

Length adjustment

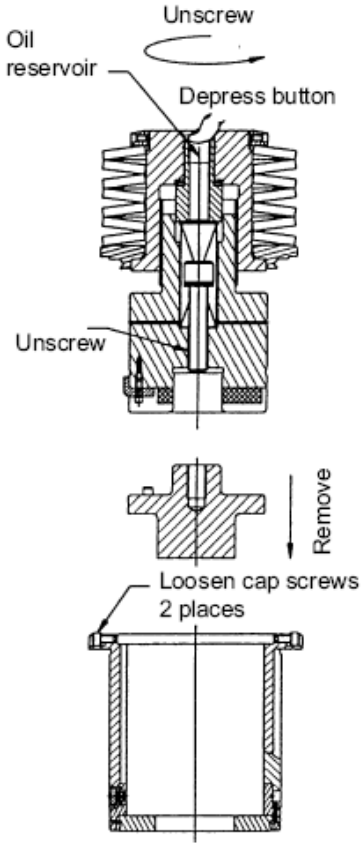


Note: Tool should be adjusted until punch face is slightly underflush to stripper face.

Stripper plate removal



Tool disassembly



Length adjustment

1. While depressing top button down, rotate spring pack counter clockwise to increase the length of the tool.
2. Release button when desired length has been achieved. Then rotate spring pack until button locks into place. Each click of the button is .004" (0.1mm) of adjustment. One full rotation is .100" (2.54mm) of adjustment.
3. Caution: Do not adjust beyond maximum punch regrind.
4. No tools are needed for adjustment of length.
5. Guide does not have to be removed for adjustment.

Stripper plate removal

1. While depressing side button in, rotate stripper ring counter clockwise approximately ¼" (6.35mm) until ring stops.
2. Remove stripper plate.
3. No tools are needed to remove stripper plate.
4. Guide does not have to be removed to remove stripper plate.

Tool disassembly

1. To remove guide, loosen cap screws (2 places) and slide guide off holder.
2. To remove punch, loosen cap screw. Before cap screw is completely disengaged from punch, give Allen wrench a firm tap to free the punch from the holder. Remove punch.
3. Unscrew spring pack by depressing top button down and rotating counter clockwise.

Lubrication

Wilson Large Station Guide Assemblies are equipped with an internal lubrication system. At the beginning of each shift, using a hand pump oiler, add approximately two squirts of oil down the center hole. Use SAE 80 or ISO VG 100 oil, (a heavy gear oil). Use this same oil, or a lighter oil, on the outside of the guide, between the guide and the turret bore. Daily use is recommended.

3-1/2"D-Station Thick Turret Series 90

[05170- INST]

WILSON TOOL

Large Station High Performance guide assemblies for Series 90® punches

Installing a punch

- Inspect the inside of the assembly to be sure that it is free of grit, dirt, slivers, etc. If cleaning is required, use a 4mm hex key to loosen the two cap screws on the flange of the guide ("E" station assemblies use four cap screws on the lifter buttons). Then pull the guide up and off of the assembly (Image 1).
- Install a punch into the assembly and ensure that the alignment pin on the punch engages the key slot in the punch holder (Image 2). Note: The guide does not need to be removed for punch installation.
- Install the stripper plate (Image 3) and press down to lock it in place.
- Insert a 3/8" hex key into the oil reservoir and tighten the cap screw (Image 4). Torque the screw to 68 NM (50ft-lbs).

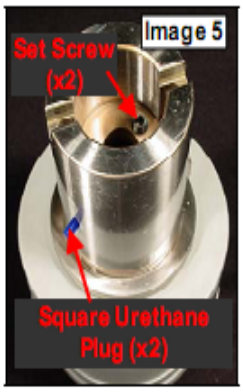
Adjusting the punch length

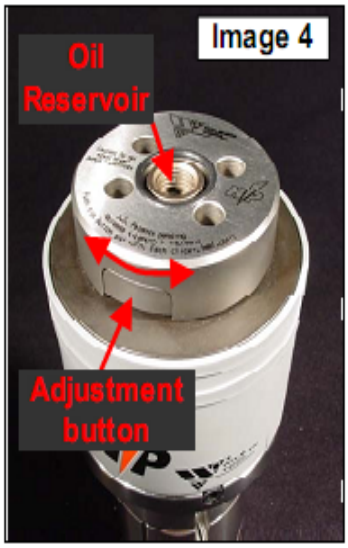
- Depress the adjustment button (Image 4) and rotate the spring pack while holding the guide stationary. Each "click" of the button adjusts the tool length by .1mm (.004"). Adjust the punch length so that the punch tip is recessed in the stripper plate approximately 1.0mm (.040").
- Release the adjustment button and rotate the spring pack until the button locks.

Caution: Do not adjust beyond the capabilities of the punch.

Lubrication

- ABS and WLS® guide assemblies are designed to work with the automatic tool lubrication systems on many machines. Before using the assembly in this type of machine, lubricate the inside and outside of the guide and prime the oil reservoir (Image 4) using the same oil used in your machine's lubrication system. Do not use grease - it will clog the ports within the guide assembly.
- Gravity feed lubrication is used on machines that do not have automatic lubrication systems. Guide assemblies for those machines are marked "WLS capable", and the punch holder (Image 5) is fitted with two set screws and two square urethane plugs to restrict the flow of oil. At the beginning of each shift add approximately two squirts of heavy gear oil (SAE 80 or ISO VG 100) to the Oil Reservoir using a hand pump oiler. Apply this same oil to the outside of the guide (between the guide and the turret bore). Frequent lubrication is recommended.





8005685 Rev. A

WILSON TOOL
Innovation Engineered for Performance

Large Station High Performance Guide Assemblies

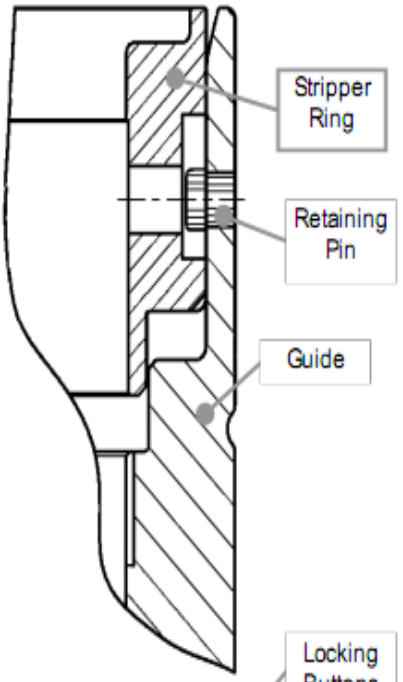
Stripper Ring service instructions

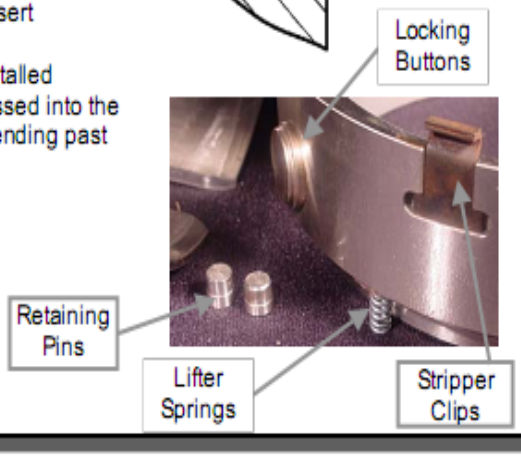
Disassembly

1. While holding the stripper ring flush with the end of the guide, drive the two retaining pins inward.
2. Lift the stripper ring out of the guide.
   Caution: The locking buttons and their springs will spring out as the ring is removed.

Assembly

1. Install the lifter springs, the locking buttons, and the stripper clips into the stripper ring. Note: Use grease to hold the parts in place as required.
2. Align the keyways on the stripper with the keyways on the guide. Depress the locking buttons, and place the ring in the guide.
3. While holding the stripper ring flush with the end of the guide, insert the two retaining pins.
   Note: The two retaining pins are stepped and must be installed from the inside of the guide. The smaller diameter is pressed into the guide while the larger diameter prevents the pin from extending past the O.D. of the guide.





8005983 Rev. A

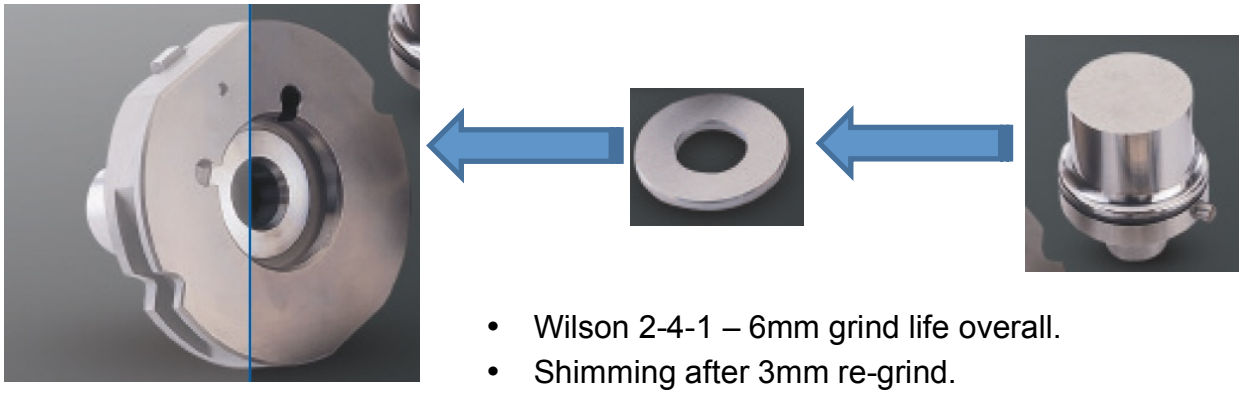
Spring Replacement Instructions for Large Station HP Guide Assemblies

Changing disc springs for HP-thick, 2”, 3 ½”, 4 ½” stations.

1. Remove the guide.
2. Remove punch holder. Punch can still be attached.
3. At a vise, place the changing bar in the vise clamps and tighten.
4. Place the spring pack top up onto the changing bar, insert draw bolt and washer through head of spring pack assembly and screw into changing bar.
5. Tighten draw bolt. About three full revolutions should compress springs enough to remove pressure from retaining spring clip. Use t-handle wrench to tighten punches. Note: You may need to use a cheater bar.
6. Loosen vise and turn spring pack with bolt and bar assembly tightened. Place on bench with changing bar up.
7. Use spanner, clip wrench, to expand retaining clip up and out of machined groove. Pull clip free. A screwdriver may be needed to slide clip off of driver shaft.
8. Place changing bar back in vise, tighten vise, remove draw bolt from changing bar.
9. Slide punch driver out of spring stack. Replace springs and slide driver back though springs.
10. Place ring clip on changing bar with bolt hole in center. Place spring pack assembly in groves on changing bar top up.
11. Re-insert draw bolt and washer into spring pack and tread into changing bar. Tighten to compress springs until machined ring groove is fully visible.
12. Remove spring pack assembly with changing bar and draw bolt attached and tightened. Remove from vise.
13. Place changing bar up. Use spanner wrench to expand ring clip and slide back into place. Make sure ring clip is fully engaged in machined groove.
14. Replace spring pack assembly in vise. Slowly loosen draw bolt.
15. Make sure ring clip is seated fully.
16. Reassemble punch holder and guide.

Appendix B

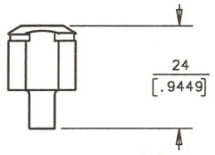
Trumpf Tooling – Wilson 2-4-1 Tooling



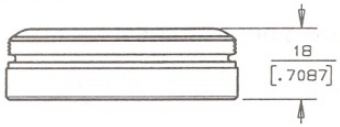
- Wilson 2-4-1 – 6mm grind life overall.
- Shimming after 3mm re-grind.

Grind Life and Die Heights

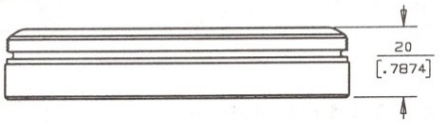
Size 0 Multi Tool Punches:
Punch Length = 24.0mm (.9449")
Maximum Regrind = 0.8mm (.0315")



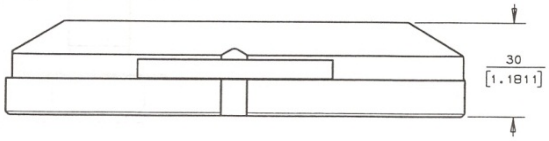
Size 1 Dies:
Die Height = 18.0mm (.7087")
Maximum Regrind = 1mm (.0394")

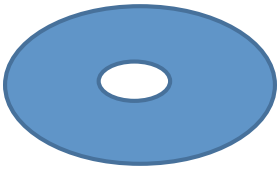


Size 2 Dies:
Die Height = 20.0mm (.7874")
Maximum Regrind = 1mm (.0394")



Size 3 Dies:
Die Height = 30.0mm (1.1811")
Maximum Regrind = 1mm (.0394")





Shim

- Shims available in 0.1mm, 0.3mm and 0.5mm.

Die Adaptor

GL Dies

Wilson Tool manufactured GL dies allow for 2.5mm (.100”) grind life. They must be used with GL die keys to achieve maximum grind life (see chart below). To facilitate the maximum grind life there are additional dies shims of 1.5mm (.060”) thick.

Grind Life Chart

Size 1	**Maximum Grind Life**
“GL” Die	2.5mm
Current Die	1mm
Size 2	**Maximum Grind Life**
“GL” Die Installed In A “GL” Die Plate	2.5mm
“GL” Die Installed In A Current Die Plate	1.5mm
Current Die Installed In A “GL” Die Plate	1.5mm
Current Die And Die Plate	1mm

Trumpf Tooling: Tool Length and Grind Life

	Tool Heights		Grind Life		GL Die	
Std Assy	74.0mm	2.913"				
Std Punch	74.0mm	2.913"	3.0mm	.118"		
2-4-1 Assy	74.0mm	2.913"				
2-4-1 Punch	34.3mm	1.340"	6.0mm	.236"		
Long Std Assy	77.5mm	3.051"				
Long punch	77.5mm	3.051"	6.0mm	.236"		
2-4-1 Long Assy	77.5mm	3.051"				
2-4-1 Long punch	37.8mm	1.489"	9.0mm	.354"		
Size 1 Die	18.0mm	.708"	1.0mm	.039"	2.5mm	.098"
Size 2 Die	20.0mm	.788"	1.0mm	.039"	2.5mm	.098"
Size 3 Die	30.0mm	1.181"	1.0mm	.039"		
5-Stn MT punch	28.2mm	1.111"	.5mm	.020"		
5-Stn MT die	14.05mm	.553"	1.0mm	.039"		
10-Stn MT Punch	26.7mm	1.052"	.5mm	.020"		
10-Stn die plate	12.0mm	.473"	1.0mm	.039"		
10-Stn MT die	10.05mm	.396"	1.0mm	.039"		

Notes:

- Tool heights are from top of tool to tip or bottom edge.
- Grind life is maximum attainable, caution should be taken over 16 gauge material.

Appendix C

Fab (Strippit and Thin Turret) Tooling: Tool Length and Grind Life

Fab Tooling	Tool Height	Grind Life	
1/2" Drop In Assy	5.480"		
1/2" Drop In Punch	5.480"	.250"	
5/8" Drop In Assy	5.480"		
5/8" Drop In Punch	5.480"	.250"	
Snap-a-Part Assy	5.480"		
Snap-a-part Punch	5.480"	.120"	
1 1/4" Full Body Assy	5.480"		
1 1/4" Full Body Punch	5.480"	.250"	
1 1/4" HP Assy	5.480"		
1 1/4" HP Punch	3.100"	.140"	
1 1/4" HD Assy	5.480"		
1 1/4" HD Punch	2.490"	.250"	
1 1/4" Die	1.181"	.100"	
2" P&G Assy	5.500"	.300" HP	.100 O/S
2" Punch	1.020"		
2" Die	1.181"	.100"	
3 1/2" P&G Assy	5.500"		
3 1/2" Punch	1.020"	.300"	
3 1/2" Die (thin)	.844"		
3 1/2" Die (thick)	1.181"	.100"	