



PRECISION MACHINE SPINDLE REBUILDING

Educational Video Series

Part 1: Introduction to Rebuilding a Spindle

For all the videos in this Educational Video Series, please visit:
<http://www.activeatom.com/education-spindle-rebuilding-videos.php>

Part 1: Introduction to Rebuilding a Spindle

This document was written to be used along with video Part 1 in the Precision Machine Spindle Rebuilding video series. Please note that separate documents have been written for each video Part covering 6 main Parts and featuring sub-parts in the series entirety. So be sure you download all the appropriate documents related to the video Parts you have watched.

The video timestamps displayed throughout these documents are provided to allow you to visit that section in the video where that topic written here is being discussed where the video sections are covered in the finest of detail. The video timestamps provide a great convenience for jumping straight to the video section you are interested in.

The purpose of Part 1 of this video series is to introduce you to what is involved in rebuilding a machine spindle. We go into detail when it becomes necessary to rebuild a machine spindle, a little education on Angular Contact Bearings, how they differ from Deep Groove Bearings and why they are recommended for use on machine spindles.

1. Introduction

00:00:19 in video Part 1 Section 1

a) This Video is focused on rebuilding Levin spindles

Although most of the information provided in this video can be used on many machine spindles from many manufactures, this video is focused primarily on the Levin spindles for all their machines and accessories such as the Lathe Headstocks, Drill Press spindle and Lathe Accessory spindles.

b) A dedicated Website section has been created for this Video Series

For each of our Educational Series videos, we have produced these written instructions capturing the details of great importance with the main goal being that you would not feel the need to stop watching a video to take notes of vital importance. So the viewer can focus entirely on watching the content of the video.

We set out with the goal of creating a section on our website called [Active Atom Education](#) that is devoted to being your guide and have it contain resources and links to products, documentation and forms that have been discussed in the videos. These documents will also have the latest up to date information that we may have overlooked in the videos and valuable information shared by viewers in the video comments.

2. Rebuilding Spindles is Not for the Inexperienced

00:09:24 in video Part 1 Section 2

a) The Inexperienced

It is very common for somebody to get into the machining or watchmaking trade and purchase their first machine such as a Levin lathe with a ball bearing spindle. The problem is that most of these used lathes have been sitting idle for many years where the bearings now need to be replaced. The reason why the Spindle Rebuilding process should not be performed by a beginner is because they likely do not possess the proper tools for the job, don't have the experience to work on machines/equipment yet and don't have the experience to diagnose any problems that may arise during the rebuilding process.

b) Even for the Experienced Machinist, you still need the proper tools

We have come across too many spindles that have been disassembled (or attempted) in the past and they show the telltale signs of not being disassembled correctly using the proper tools. Especially the infamous use of serrated jawed pliers is all too common where the spindle nut and other parts are chewed up when proper tools such as a spanner wrench should have been used.

3. We Do Not Provide Spindle Rebuilding Service or Offer Support

00:12:56 in video Part 1 Section 3

a) We do not provide this service

Unfortunately, we do not provide Spindle Rebuilding services, we are only sharing our knowledge of doing these procedures with the target audience of this video being for educational purposes for the curious person wanting to know how it's done. And for the experienced user that feel that they have the necessary skills and tools to perform this job properly and can diagnose any issues that arise during the rebuilding process.

b) We do not offer support

If after watching our Spindle Rebuild videos, you want to perform this Spindle Rebuilding procedure, please understand that we cannot provide any type of support including through email or phone. If you have any questions or thoughts regarding any of the information provided, we encourage you to leave a comment under the appropriate YouTube video and we will respond back to you. But unfortunately, we do not have the resources available to provide assistance for doing this procedure or assisting in diagnosing problems that may arise.

We do have the highest level of respect for you in stepping up to the challenges of at least learning how to or maybe even successfully accomplishing the rebuilding of a precision machine spindle. We wish you the best results possible so stay patient when performing this type of work.

4. How We Gained our Knowledge to Do This

00:15:35 in video Part 1 Section 4

a) Our Mentor got us started

Our mentor who taught us how to rebuild Levin spindles was a Master Machinist named Bill who lived in Sherman Oaks, California. He spent his entire life specialized in making tiny parts beginning in a city named Burbank located in California. Many years ago early in his career, he owned a micro-machining shop which consisted of 8 to 10 Levin lathes and all the Levin accessories. Due to the large number of Levin spindles that needed to be rebuilt over time, he learned how to rebuild them himself by talking to people he knew in the industry. Later in his retirement years, he taught us how to rebuild these spindles and also generously gifted us with his tools and extra parts that he used for performing these spindle rebuilds. We are forever grateful to Bill for this extra push and helping hand as the thought of rebuilding a precision machine spindle for the first time can be a little intimidating. It is one of the main reasons why we are sharing this information as we want to give you the knowledge and confidence for doing a successful rebuild.

b) Talking to others with experience

Over the years, we just asked questions from people that perform spindle rebuilds. Levin & Son itself (in the earlier years) has gracefully provided good insight on how they perform some of the tasks including their break-in procedure.

c) Improve skills by doing

Over the years, we have performed well over 25 Levin spindle rebuilds which include all the headstock and accessory spindles for our own machines as well as for other people. In addition, we have performed spindle rebuilds for other machine spindles from a variety of manufacturers including other machines we own.

5. When does a Levin Spindle Need to be Rebuilt

00:21:17 in video Part 1 Section 5

a) Count on a used Levin lathe to need a spindle rebuild

Of all the Levin headstock and accessory spindles that we have acquired over the years, we have only ended up with 1 spindle that didn't require a rebuild and that was a Levin Milling Attachment which was sold as New Condition and fresh from the Levin & Son factory. This was indeed a rare find which showed absolutely no signs of use.

The reason why we mention this is because if you are shopping for a used Levin lathe or accessory, you can pretty much count on the spindle needing to be rebuilt before you can put it to use. Yes, we've known some people that have performed a break-in procedure on a used spindle and were able to use it but this is not recommended unless the machine is for hobby use only where you are not dependent on the machine for your business and can sacrifice performance, accuracy and risk a short life span.

b) Spindle has been sitting idle for many years

This is by far the most common reason why a Levin spindle needs to be rebuilt. Most of these Levin machines and accessories are purchased used, where they have been sitting idle for 10, 20 or even 30 years and due to this length of time, the bearing grease dries up. Even worse are machines that were stored in a non-climate controlled environment such as a shed, garage, warehouse shelf or storage unit and the machine has rusted causing the bearings to corrode and/or rust with it.

c) What is the symptom of a spindle needing a rebuild?

When turning the spindle by hand, there are 2 very common symptoms that can be felt which can only be resolved by rebuilding the spindle. The 1st common symptom is the spindle does not turn smoothly where there is constant or intermittent resistance. The 2nd common symptom is a bumpy feel where it feels like there is sand or dirt in the bearings. This feeling can actually be caused by the dried grease or from the ball bearings being rusted or corroded. If the cause is only from the old grease, the problem can sometimes be resolved by performing a break-in procedure. However, we do not recommend doing this even if successful because we feel that it is only a short term solution as the problem will typically come back in a short time and continue to worsen over time.

6. What is the Accuracy of a Rebuilt Spindle

00:27:57 in video Part 1 Section 6

A new Levin spindle from the manufacture has a guaranteed accuracy of 0.000050" T.I.R. (Total Indicator Runout) or roughly a little more than 1 Micron (0.001 mm). That is a measured runout of 50 millionths of an inch which is accomplished with a very accurate and ground spindle and using quality ABEC-7 (P4) Angular Contact Bearings.

a) So what level of accuracy can be expected from a rebuilt spindle?

It is difficult to estimate the accuracy you can expect from a rebuilt spindle as the main factor is going to be the condition and accuracy of the main spindle shaft. The condition of the spindle housing and related parts are also going to contribute to the overall accuracy of the spindle. Even Levin warns you that they cannot guarantee the accuracy of their rebuilt spindles because they have no control over the condition of the spindle that is provided to them.

During the assembly procedure of this video series, we will be showing you how to properly measure your spindle to determine the condition and accuracy of it. If the test results indicate a spindle in poor condition and/or accuracy, you will need to make a decision to either proceed with the Spindle Rebuilding procedure and accept a rebuilt spindle that will not meet the factory specifications, purchasing a new spindle shaft from Levin if available or sending it out to have it reground if this is an available or viable option.

7. What are Angular Contact Bearings

00:31:35 in video Part 1 Section 7

While exposing you to precision spindle rebuilding within this Part 1 Introduction in a broad view of your getting you prepared for your own spindle rebuild venture, we wanted to share with you in great detail about several precision bearing types and styles pertaining to machine spindles in general and with a focus on Levin headstocks and spindles.

In Part 1 of this video, we share 7 detailed sub-parts on Angular Contact Bearings below and that is not including the deep groove bearing information that follows. Angular Contact Bearings are that important to learn about and share with you. We feel that the bearings are one of the most important components involved in the spindle rebuild process so we wanted to share the who, what and why of bearings pertaining to machine spindle rebuilding, so please read on.

a) How do Angular Contact Bearings differ from Deep Groove Bearings and why are they preferred for use in machine spindles?

Angular Contact Bearings have a greater number of balls and higher capacities than deep groove bearings of the same dimension. Although deep groove bearings can be lightly preloaded, angular contact bearings are designed to be preloaded and with different preload strengths being available from the bearing manufacture which is very important for a machine spindle as it provides much greater axial loads where deep groove bearings are designed primarily for radial loads. Also very important, the preload takes up any play in the bearings which is crucial for a precision machine spindle.

8. What Type of Angular Contact Bearing do I Need to Purchase?

00:36:39 in video part 1 Section 8

a) Contact Angle

Angular contact bearings can be purchased with different contact angles such as 15, 25 and 40 degree angles. For Levin spindles, a 15 degree contact angle is recommended however, we have found from experience that a 25 degree contact angle can also be used as well. An increase in the bearing contact angle will provide greater axial load but will also cause a decrease in the bearing Maximum Speed Limit and a reduction in the Radial Load. However for use on the Levin spindles, the larger 25 degree contact angles can also be utilized successfully without sacrificing accuracy or performance.

b) Bearing Arrangement

The bearing arrangement for all Levin spindles are installed in a Back-to-Back arrangement. So when ordering these bearings, you must specify a bearing arrangement of either Back-To-Back or Universal Matching. What this means is that the inner and outer bearing races are precision ground so that when installed together, they provide the preload as specified.

Universal Matching means that the bearing races have been precision ground on both sides of the bearing races so that the bearings can be installed in a Back-to-Back, Face-to-Face or in Tandem arrangement.

In our personal experience, most angular contact bearings offered today are stocked in Universal Matching arrangement.

c) Duplex Pairs

When shopping for Angular Contact Bearings, you will notice that they are sold individually and in pairs which are often referred to as Duplex and/or Matched Sets. In our experience, the cheaper bearing brands only offer these bearing types individually and you do not want to purchase these.

For rebuilding spindles, you absolutely want to purchase these bearings in matched sets as the manufacture will match the tolerance values of both bearings in order to achieve the best precision and performance of your spindle when installed together. There are actually markings on the bearings that are placed by the manufacture that indicate the maximum radial runout area which will be discussed later in Part 3a of this video series during the bearing installation procedure.

d) Tolerance Class

The tolerance class is most often referred to as ABEC class. You will need ABEC 7 class bearings which are also known as Class 4 (P4) bearings.

ABEC meaning is “Annular Bearing Engineering Committee”

e) Preload

Many years ago, bearing manufactures would grind their angular contact bearings with no preload so the bearing installer would need to use a bearing shim with a specified thickness provided by the manufacture for producing the required amount of preload. If you are disassembling an old spindle including from Levin that has never been rebuilt before, it is very common to find a bearing shim between a bearing pair.

These days, angular contact bearings are ground by the manufacture to provide the specified amount of preload which is also referred to as Flush Ground. When you purchase Angular Contact Bearings, you specify the amount of preload you need which is generally offered as Extra Light, Light, Moderate, Heavy and Special (custom preload). What this means is that the factory grinds the inner and outer races so when installed together, the bearings provide the specified preload without the need for bearing shims. For all Levin spindles, you want either an Extra Light (if offered by bearing manufacturer) or Light preload.

f) Phenolic Bearing Cage

Most common bearings will have a metal bearing cages for keeping the ball bearings separated from each other in the bearing race. However for these angular contact bearings, you will want the bearing cage to be made out of Phenolic Resin which is typically a cotton fabric reinforced phenolic resin.

The reason for using this type of material is that it allows for absorption of oil which assists in the lubrication of the bearing cage and rolling elements. Be aware that some cheaper angular contact bearings may substitute Phenolic Resin with Nylon which does not provide the same lubrication properties.

g) Do not purchase Cheap Bearings

With all that said, we now share our experiences of purchasing low cost Angular Contact Bearings which can look attractive but stay away from them. Here are some reasons why:

- Not sold in matched pairs so tolerances between 2 bearings will not match. It is recommended that the variation of the bearing inner and outer race diameter tolerance is within 1/3 of tolerance range for optimum load sharing.
- Missing inner and outer race ring markings (usually an 'O', asterisk or dot) that indicates the position of the maximum bearing radial runout.
- Bearing cages made out of Nylon instead of Fabric Reinforced Phenolic Resin which has oil retention properties for assisting the lubrication of the bearing cage, ball bearings and raceways.

9. Any Additional Bearing Requirements?

01:07:28 in video Part 1 Section 9

a) Precision Deep Groove Bearing

All Levin spindles use a single pair of Duplex Angular Contact Bearings. However if you are rebuilding a Levin lathe headstock, you will also need to order a single high precision deep groove bearing. This bearing should also match the Tolerance Class of the angular contact bearings and with the same bearing cage material. So when ordering this bearing, you need to order an ABEC-7 (P4) bearing with a Phenolic Resin bearing cage. Do not be tempted to order a cheap common deep groove bearing as you will compromise the precision and reliability of the spindle.

10. Levin Spindle Replacement Parts

01:17:27 in video Part 1 Section 10

In addition to ordering new bearings, we highly recommend replacing the following spindle parts which can be purchased from Levin. Levin should have these parts even for headstocks that have been discontinued many years ago but be aware that some parts do become discontinued.

a) Felt Ring Seals

These felt ring seals look like thin washers and are installed in the bearing caps on all Levin headstocks and accessory spindles with the exception of the closed style headstocks so don't be concerned if you take one of these headstocks apart and do not find them. There are 4 felt seals in the open style headstocks and 2 felt seals in the accessory spindles.

Unfortunately, Levin has discontinued most of these felt seals so we now recommend that you clean the existing felt seals before reusing them. If you find any of these felt seals missing, we recommend contacting Levin to see if they have any left in stock but be aware that most are no longer available.

If you find that the felt rings are damaged to where cleaning them cannot restore them for continued use, we do share how you can cut new ones by making the correct tools.

For additional information, please refer to Part 3, Section 2 on how to clean the felt rings.

b) Collet Key

The collet key is a pin that is installed near the front inside area of the spindle and its purpose is to keep the inserted collet from spinning inside the spindle. It is very common to see these collet keys broken off, damaged, worn or even completely missing, leaving only a hole where it should have been installed. If necessary, it is very important to replace this collet key even if slightly worn as it can cause continued damage to the collets and their key slots.

Also all collet keys installed in Levin ball bearing spindles are press fit and not riveted. We are not sure about the older Levin cone bearing headstock spindles as we have never taken one apart. We have disassembled spindles where a prior owner replaced the collet key and riveted the new one in place which we can only assume they did this because they have seen other manufactures that rivet theirs in place or read in a Watchmaker Lathe book where they show a new collet key replacement being riveted in place.

11. Tools Required

01:35:37 in video Part 1 Section 11

We can't stress enough the importance of having the proper tools for this spindle rebuild procedure. Over the years, we have seen too many Levin spindles with parts chewed up due to the use of improper tools from a prior user. Very common damage that we see is the use of serrated jawed pliers on the bearing caps and spindle nut, where a proper spanner wrench should have been used.

In the video, we also share the hand made tools that were given to us by our mentor who first taught us how to rebuild Levin spindles.

The most important tool you are going to need here is a fellow co-worker or friend with a keen eye and steady hand, needed for several of these operations for both the disassembly and assembly procedures.

Following is the list of tools required for this spindle rebuild procedure. Also under the Documentation section for this video series on our website, you can download a Tools & Supplies Checkoff Sheet which lists everything you will need for performing this spindle rebuilding service.

<http://www.activeatom.com/education-spindle-rebuilding-docs.php>

a) Quality Imperial Allen Wrench Set

All the fasteners used on the Levin closed-style Headstocks are imperial socket head cap screws. These screws are used for securing the front spindle bearing caps and due to their small size, it is very important to use a high quality set of Allen wrenches as they are easily stripped due to the small size of the fasteners used.

b) Small flat-head screwdriver

On all the Levin spindles with the exception of the 3C closed-style Headstock, the spindle nut uses a very small Slotted Head Screw for securing it onto the spindles threads. The 3c closed style Headstock uses a socket head screw.

c) Adjustable Pin Spanner Wrenches – 1/16”, 3/32” and 1/8”

1/16” pin size is used on the Levin spindle nut or up to 3/32” for the 3c collet spindle nut. The bearing caps on the Levin open style headstocks use a 1/8” pin size and on the Levin accessory spindle, both a 1/16” and 1/8” pin size are used.

d) Bearing Separator

A Bearing Separator is required for removing the bearings from the spindle. For the Levin spindles, we use the smallest available such as the OTC 1121.

e) Hydraulic Press or Dead Blow Hammer

For the removal and installation of the bearings on the spindle, a Hydraulic Press is highly recommended as it provides very good control especially for difficult to remove bearings which would otherwise require very hard hammer blows on the spindle. However use extreme caution to monitor the hydraulic load as you can easily damage the spindle or related parts.

For those users that do not have a hydraulic press, we highly recommend using a good quality dead blow hammer because it is much safer on the spindle as it delivers a controlled impact with minimal vibration and rebound.

f) Bearing Installation Tool

We personally use an SKF Bearing Installation (Fitting) Tool Set Model TMFT36. When installing bearings onto a spindle, it is extremely important to only press on the inner bearing race as pressing on the outer bearing race places pressure on the bearing balls and raceways which can cause dimples to be formed on them. When this occurs, it can damage the bearings to where they have to be replaced or at minimum, will greatly shorten their life.

With the use of this SKF bearings installation tool, the risk of damaging the bearing raceways and bearing balls is minimized. This SKF tool set also includes a quality dead blow hammer however, SKF also specifies that this set can be used in a hydraulic press if necessary. We personally use the provided dead blow hammer but if the bearings prove too difficult to remove, we will then use the hydraulic press.

We also understand that there are people that don't want to purchase a Bearings Installation tool set especially if they don't install bearings very often. If that is the case where you do not want to purchase a Bearing Installation tool set, you can also make the bearing die's out of Delrin on a lathe which we show you some examples in the video. If you do make the bearing die's yourself, you still want to use a Dead Blow Hammer with them.

g) Surface Temperature Meter

This meter is used during the spindle break-in procedure after the spindle has been assembled. During the break-in procedure, we will want to monitor the surface temperature of the spindle housing or headstock to ensure that the bearings are not overheating.

The bearing manufactures recommend the use of a Type K Thermocouple for measuring the bearing temperature. Preferably, you want to use 2 thermocouples so that the temperature at each end of the spindle can be measured. We personally use 2 separate temperature meters but there are also meters available that contain 2 thermocouples that can also be used.

h) Steel, Brass or Aluminum Rod (~1 Foot Length)

This rod is only required if you need to replace the collet key on the spindle. We recommend a rod that has a clean undamaged surface and large enough in diameter to place inside the spindle for inserting the collet key in place as shown in the video.

i) Wiha Tools – Precision Chip Lifter (Part # 26810)

This tool is only required for use on the spindle bearing caps used on the Levin open style headstocks and accessory spindles. This tool is used to remove the retainer clip from the bearing caps that holds the felt ring in place.

j) Small 2 Ounce Hammer

This small hammer is used together with a 1/8" pin punch for loosening stuck spindle nuts on the Levin spindles (if the spanner method does not work).

k) 1/8" Pin Punch

This pin punch is used together with the small 2 ounce hammer above for loosening stuck spindle nuts on the Levin spindles (if the spanner method does not work).

12. Surface Plate & Measuring Instruments Required

01:51:53 in video Part 1 Section 12

After disassembling a spindle, you will need the following measuring instruments and tools for testing the condition and accuracy of the main spindle shaft. Also, in preparation for the installation of the angular contact bearings, we need to find the high point of the spindle shaft as will be explained in the assembly procedure.

After the assembly procedure, we will also be measuring the accuracy of the spindle shaft to get a baseline reading before moving forward. Then after the final procedure of grinding the collet seat (if needed), we will take a final measurement to see if we were successful in rebuilding an accurate spindle.

a) Surface Plate

Surface plate will be used as our main platform for testing the condition and accuracy of the spindle, and also for finding the high point of the spindle.

b) High Resolution Test Indicator

A high quality test indicator with a resolution of either 0.000050" or 0.001 mm. Remember, we need to take measurements of a spindle that leaves the factory with a guaranteed accuracy of 0.000050" T.I.R. (Total Indicator Runout) or roughly a little more than 1 Micron for our metric viewers.

c) V-Blocks

Either a matched set of high tolerance narrow v-blocks or a single long length v-block. The v-block(s) is used to hold the spindle shaft for measurement. The size and number of v-blocks required is dependent on the spindle type you are rebuilding.

d) 10x Loupe

Not necessarily a measuring tool or instrument but we list the 10x Loupe here as it can be very helpful for identifying needle movement on the test indicator especially when measuring high precision spindles such as from Levin where it can be very difficult to detect any runout. The loupe is also very useful for checking the surface condition of the spindle and related parts.

e) Height Gauge or Test Indicator Base

The height gauge is used on the surface plate and holds the test indicator so that we can take our measurement readings of the spindle shaft. If using a height gauge, you will also need the indicator accessory which replaces the height gauge scribe for holding the indicator as shown in the video.

f) Magnetic Test Indicator Stand

This magnetic test indicator stand will be used to hold the test indicator on the lathe bed so that we can take our measurement readings of the assembled headstock or accessory spindle.

13. Supplies Required

01:57:07 in video Part 1 Section 13

The following supplies are required for this Spindle Rebuild procedure:

a) Acetone

After disassembling the spindle, you will be cleaning all the parts with Acetone. We do not recommend the use of Isopropyl Alcohol as it does not have the cleaning power of acetone for removing all the grime and old grease/oil that you will find on all the parts. Very clean parts is very important for a successful spindle rebuild.

Please take special care with the internal and external threads of the spindle shaft and parts as they are very fine threads and require extra care when cleaning and prepping the parts for reassembly.

b) Machine Oil

You will want to use a light general purpose machine oil for placing a light coat of oil on all the parts. It is good practice to always oil all your machine parts during reassembly so that they don't corrode or rust over time. Don't forget to oil all the fastener threads as corroded and/or rusted fastener threads are very common on spindles that haven't been disassembled for a long time. We also want to ensure that the spindle is lightly coated with oil for the bearing installation procedure.

We personally use NyOil as it is a very high quality and highly refined mineral based oil that also prevents rust.

c) Chemtronics ControlWipes (Part # C910)

We strongly discourage the use of paper towels when assembling a spindle because they are a paper based product that can contaminate the precision bearings. Instead, we highly recommend these general purpose wipes as they are non-woven, spunlaced polyester cellulose fabric, highly absorbent and most important, are lint free. These wipes are also very strong and will not tear.

d) Bearing Grease

The grease you want to use for all precision bearing installations is Kluber Isoflex NBU15. You will want to purchase the 30ml Syringe as it provides an easier method of transferring the grease to the smaller application syringes.

e) 1 ML Syringe

For injecting the bearing grease into the bearings, we use a Syringe as shown in the video. A 1 ML Syringe is large enough for use with all Levin spindle bearings but for larger spindles, you may need to purchase a larger capacity syringe. We stock and use both 1 ML and 10 ML which covers all our needs.

f) 18 Guage Blunt Tip Needle

This blunt tip needle is used with the syringe listed above. The 18 Guage size is perfect for injecting bearing grease into the bearings.. This type of needle is not an injectable type and is commonly used in labs for application or distribution purposes. This blunt tip type is not sharp and much safer to use.

g) Grinding Bits

After the spindle has been assembled and the break-in procedure completed, the last step is to regrind the spindle collet seat. Depending on the size of the spindle, we use one of the following Aluminum Oxide Cylindrical grinding bit types shown below. Be sure to purchase these bits in both 60 and 120 Grit. If any rough grinding is necessary where you have to remove a lot of material, you will use a 60 grit wheel. The 120 grit wheel is used for the final grind.

- **1/4" Diameter, 1/4" Length, Shape # W160, 60 & 120 Grit**
This size is recommended for all Levin spindles.
- **3/8" Diameter, 1/4" Length, Shape # W174, 60 & 120 Grit**
This size is not required but we personally use this size for use on the Levin 3C collet headstock where the collet seat diameter is much larger in size so we prefer the use of a larger grinding bit.

14. Location to Perform the Spindle Rebuild Procedure

02:07:04 in video Part 1 Section 14

The last topic we want to discuss is the importance of performing this spindle rebuild procedure in a clean environment. Due to the high precision and accuracy of these spindles, it is crucial that the internal spindle components including the bearings do not get contaminated with any foreign matter or particles such as hair, lint, dust, dirt, etc.. Even a tiny strand of hair or lint will be felt in the bearings so it is so critical to perform this rebuild procedure in a very clean environment.

We personally perform this spindle rebuild procedure in our watchmaking workshop as it is a sealed room with its own air controlled system. At minimum, we recommend that you use an enclosed room with a door you can close when performing this procedure. The reason why you want to keep the door closed during this procedure is because you want the air inside the room to be very stable without any drafts and most important, you don't want to be bothered or interrupted when performing this procedure especially in an office/work environment.

Also, you want to perform this procedure on a hard and stable tabletop. You will want to remove anything else from the table that is not part of this procedure and clean the tabletop very well before placing anything on it.

Cleanliness is crucial when performing a spindle rebuild.