



# PRECISION MACHINE SPINDLE REBUILDING

## *Educational Video Series*

### Part 2: Disassembling the Precision Machine Spindle

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

#### 0. Introduction

00:00:17 in Part 2

We disassemble a small Levin & Son accessory spindle that is used in many of their lathe accessories such as their Milling, Grinding and Micro Drilling attachments, and Micro Drill Press. Unfortunately, in the interest of time and preparation for this video series, we have already disassembled all our Levin headstocks prior to making these videos but we will show the parts of a disassembled headstock so that the user can get an idea of what is involved in a Levin Headstock disassembly.

While we perform the disassembly of the Levin accessory spindle in the video, we also go over the open and close style headstocks to show you what you need to do to disassemble these spindle types. So even though the Levin accessory spindle is the focus of this video, it also applies to the Levin headstock spindles.

#### 1. Removing the Belt Pulley

00:02:57 in Part 2 Section 1

##### a) Levin Accessory Spindle

The belt pulley is removed by loosening the set screw that is located in the belt groove. Please note that this set screw is commonly a socket head hex type but we have occasionally found slotted set screws.

Once the set screw is loosened, the belt pulley should slide off the spindle fairly easily but can be more difficult to remove if there is rust, corrosion or dried oil/grease between the parts.

We share important additional pulley removal tips and techniques related to the open and closed style headstocks, there are some really helpful and cautionary pieces of advice provided here. We show in depth isolated details of the closed style headstock its pulley the bearing nut and key-way key not shared in the other headstock or spindle rebuilds.

#### 2. Removing the Bearing Caps

00:06:20 in video Part 2 Section 2

##### a) Levin Accessory Spindle

There are 2 bearing caps located at each end of the spindle that are fastened to the spindle housing that need to be removed. Please note that the bearing caps contain very fine threads so be careful not to damage them.

The front bearing cap is removed with a spanner wrench containing 1/8" or 3mm pins and the rear bearing cap is removed with a spanner wrench containing 1/16" or 1.5mm pins. During this procedure, we recommend keeping the spindle housing attached to the bracket for the Grinding Attachment and the slide base for the Milling Attachment. For the Grinding Attachment, we use a bench vise with soft jaws for holding the bracket.

**b) Levin Open Style Headstock**

There are a total of 4 bearing caps that need to be removed on the closed style headstocks. 2 bearing caps located at each end of the headstock housing and 2 additional bearing caps that are located on the inside area of the headstock housing where the belt pulley is located.

To remove the 2 outside bearing caps at each end of the headstock housing, you will need a spanner wrench containing 1/8" or 3mm pins. The 2 inside bearing caps are press fit so you only need to press these out.

**c) Levin Closed Style Headstock**

On the closed style headstocks, we only need to remove 1 bearing cap which is located at the front of the headstock housing. But before we can remove this bearing cap, we first need to remove the Slinger cap.

Both of these caps are fastened using socket head cap screws. It is very important to use a quality set of hex wrenches especially for the fasteners securing the slinger cap which are very small in size and easily stripped.

**3. Removing the Spindle Nut**

00:18:40 in video Part 2 Section 3

The spindle nut on all Levin spindles including the Accessory spindle and all Headstocks styles, is removed by using a spanner wrench. Before moving forward with this procedure, you first need to remove the small fastener that is located on the spindle nut. On the Accessory spindle and Open style headstocks, this is a slotted screw and on the Closed style headstocks, this is a socket head hex screw. We recommend removing this fastener completely from the spindle nut to ensure that the threads on the spindle shaft are not damaged during removal.

The bearing nut has a small custom made screw and it is used for locking the spindle nut onto the spindle threads once in place. If it is in need of being reworked and the reworking is not achievable or you would prefer to replace it, you will need to order a replacement from Levin or machine a new one.

a) **Levin Accessory Spindle**

When removing the spindle nut, we need a way to hold onto the spindle shaft without damaging it so we use a nylon jawed adjustable wrench. Using this wrench, we hold onto the spindle shaft at the front end of the spindle while using a spanner wrench containing 1/16" or 1.5 mm pins. Be carefully not to use too much force as you will easily bend or break off these small pins on the spanner wrench.

If you are unsuccessful in removing the spindle nut using the method above, we recommend using a small 2 oz. hammer and a 1/8" pin punch. Using light taps of the hammer, tap a few times at one end of the spindle nut and then rotate it 180 degrees to tap it at the other end of the spindle nut. This tapping method is shown in the video.

Do not attempt to insert anything in the spindle such as a 3 or 4 jaw chuck for holding the spindle in place while removing the spindle nut. This can easily shear off the collet key in the spindle and/or cause other damage to your spindle.

b) **Levin Open Style Headstock**

On this headstock, we do not recommend using the belt pulley locking pin for holding the spindle shaft in place while removing the spindle nut as it is too delicate and will likely break or even cause damage to the belt pulley index holes. We recommend holding onto the belt pulley with one hand and using the other hand to remove the spindle nut with a spanner wrench. However before proceeding, ensure that the set screw holding the belt pulley is secured very well and not loose.

Do not use too much force using the above method as this belt pulley is only being held onto the spindle shaft using a small set screw so using too much force could cause damage to either the belt pulley or spindle shaft or both.

If you are unsuccessful in removing the spindle nut using the method above, we recommend using a small 2 oz. hammer and a 1/8" pin punch. Using light taps of the hammer, tap a few times at one end of the spindle nut and then rotate it 180 degrees to tap it at the other end of the spindle nut. This tapping method is shown in the video.

c) **Levin Closed Style Headstock**

For this headstock, we utilize the spindle locking mechanism that is located at the front of the spindle. Simply push in the knob to lock the spindle and remove the spindle nut using a spanner wrench.

Although this spindle locking mechanism is very strong, we do not recommend using too much force in removing the spindle nut. In the event that the spindle nut is secured tightly, we recommend using a small 2 oz. hammer and a 1/8" pin punch. Using light taps of the hammer, tap a few times at one end of the spindle nut and then rotate it 180 degrees to tap it at the other end of the spindle nut. This tapping method is shown in the video.

Please note that the spindle nut secures the belt pulley onto the spindle so now is a good time to remove it as well. Be aware that the belt pulley contains a very small key that keeps the belt pulley from spinning on the shaft and is easily lost.

#### **4. Pressing the Spindle Out**

00:32:07 in video Part 2 Section 4

For this procedure, we recommend the use of a hydraulic press as it provides more control in removing the spindle shaft and with less risk of damage as oppose to using a hammer.

We also recommend using a small square piece of Delrin between the hydraulic press piston and spindle shaft to reduce the risk of damage to the spindle shaft and related spindle parts.

##### **a) Levin Accessory Spindles**

At this stage, you will want to remove the spindle housing from the bracket if for a grinding attachment or the slide base if for a milling attachment. For any other attachment, the spindle housing should have already been removed leaving you with only the cylindrical spindle housing in your hand. Be cautious not letting it slip easily from your hand.

Due to the small size of this spindle housing, we use a bearing separator as shown in the video to ensure we have a very flat platform surface for use on the hydraulic press. After the spindle shaft is removed from the spindle housing, we then use the bearing separator to remove the 2<sup>nd</sup> bearing from the spindle shaft.

If during this procedure, a bearing gets stuck in the spindle housing after the removal of the spindle shaft, we have found that a Blind Hole Bearing Removal Tool to be the perfect tool for removing these stuck bearings. We show a good example of this in the disassembly of the Levin accessory spindle which can be seen in video Part 3.

##### **b) Levin Open Style Headstock**

For all open style headstocks, remove the set screw using the belt pulley. We highly recommend removing this set screw completely to ensure that no parts are damaged when pressing out the spindle shaft.

After the spindle shaft is removed from the headstock housing, the 2 angular contact bearings are removed with the bearing separator. If during this procedure, a bearing gets stuck in the spindle housing after the removal of the spindle shaft, we have found that a Blind Hole Bearing Removal Tool to be the perfect tool for removing these stuck bearings. We show a good example of this in the disassembly of the Levin accessory spindle which can be seen in video Part 3.

**c) Levin Closed Style Headstock**

For all closed style headstocks, you will first need to remove the spindle locking mechanism that is located at the front of the spindle and is secured with 3 socket head cap screws. Once this locking mechanism is removed, you can now proceed with the spindle removal.

After the spindle shaft is removed from the headstock housing, the 2 angular contact bearings are removed with the bearing separator.

**5. Preliminary Parts Review**

00:42:32 in video Part 2 Section 5

Now that the spindle has been disassembled, we now want to go over all the parts and check for any obvious issues such as rust, corrosion, wear, damage, etc.. We do this parts review prior to cleaning any of the parts as this can give us clues on problems that were being experienced when using this spindle. For example, if rust is identified on any of the parts, we need to determine what caused this condition and what can be done during the assembly process so that this problem does not occur again. Solutions to problems may also be something that is added to the normal ongoing maintenance such as proper cleaning and oiling of the parts (if accessible).

Keep in mind that once all the parts are cleaned in the next video part, we will want to do another parts review where the identification of wear and damage will be the main focus.

**6. Removing the Felt Rings**

00:47:50 in video Part 2 Section 6

For the Close style headstocks, this step can be skipped since these headstock spindles do not contain any felt rings.

For this step, be very careful not to damage the felt rings as they can no longer be purchased from Levin as they have discontinued them. If you happen to damage a felt ring, you will need to make one by purchasing a sheet of felt and using hallow punches. But due to their uncommon sizes, you will likely need to make the hallow punches with a lathe and heat treat them before use. You could use the spindle without these felt rings as Levin is currently doing on new spindles but we do not recommend this as it can greatly shorten the bearing life.

The Accessory spindle contains 2 felt rings which are located in the 2 bearing caps that we have already removed. And for the Closed style headstocks, there are a total of 4 felt rings that are located in the 4 bearings caps which have also been removed.

The felt rings are secured in the bearing caps with an aluminum retainer ring which also looks like a thin washer. Extra care must be taken when removing the retainer clip because it is easily bent and you also do not want to damage the felt rings. Do not attempt to use a flat head screwdriver for removing the retainer clip as this will definitely damage the wool felt ring. We highly recommend the use of a tool for this procedure that can be purchased online and is made by Wiha part # 26810. We also show a custom made tool in the video that can be made on your lathe but keep in mind that this custom tool will also need to be heat treated.

## **7. Final Thoughts**

00:53:45 in video Part 2 Section 7

We just want to reiterate the issues that can be experienced when doing a spindle rebuild if the spindle nut is tightened too hard during the assembly process. Remember as we explained in Part 1 of this video series, that the bearing preload is performed by the manufacturer where they grind the bearing races depending on the preload strength that was ordered. So with this in mind, the tightening of the spindle nut has no reflection on the bearing preload strength so there is no need to over tighten it. Just a good snug fit is enough as the spindle nut also contains a fastener that ensures that it stays securely on the spindle shaft during operation.