Leitz Laborlux S Nosepiece Maintenance Notes

Scope

These maintenance notes describe the disassembly, cleaning, greasing and reassembly of a Laborlux S 5-piece revolving nosepiece - both the dovetail mount for the head and the turret are covered. The most common fault in the nosepiece is typically sluggishness due to aged grease in the moving parts. In large parts the notes will also apply to other Leitz Laborlux microscope models from the 160 mm tube length generation. The nosepieces of the Leitz Laborlux microscopes are inclined away from the user and towards the stand. Other contemporary Leitz microscope models (like Dialux 20/22, Diaplan, or Aristoplan) have nosepieces that are inclined towards the user.

The dovetail mount for the head has a diameter of 42 mm and will not fit to the sometimes-similar heads from the 170 mm tube length generations.

The nosepieces of the Laborlux microscopes from the 160 mm tube length period are not detachable.

Grease

Without having any special insights about microscope lubrication, I have used Super Lube Multi-Purpose Synthetic Grease with Syncolon, NLGI grade 2, for the Laborlux nosepiece. Feel free to use any other grease that you believe is more suitable. Note however that the nosepiece's moving parts are very close to sensitive optical glass surfaces, both in the microscope head and the objectives. Therefore, it makes sense to choose a grease that doesn't emit any components that can condense on the glass surfaces and that doesn't creep or migrate.

For fear of causing problems by using an unsuitable grease I have tried to leave the nosepiece entirely ungreased in one Laborlux S microscope. It still appears to work well and smoothly, but of course as an amateur microscopist I'm subjecting the microscope to far less wear and tear than a professional user would. Note that it appears that Leitz at manufacturing didn't grease the large ball bearing in the periphery of the turret (point 4. below.)

Maintenance Notes

1. Protect or remove all sensitive components from the microscope.

To facilitate the work and to avoid contamination of sensitive optics, the objectives, the head (see point 2. below if the head is stuck) with the eyepieces, and the condenser should be removed from the microscope and stored protected from dust.

Protect the field lens in the microscope foot by covering it with a suitable lid (for example, from a food container) and tape it so it doesn't fall off.

With the coarse focus controls move the stage to its lowest position.

2. Remove the head from the microscope.

To access the nosepiece and turret the microscope head must be removed by pushing the head release lever (Figure 1) towards the back of the microscope and lifting off the head. As a consequence of neglected maintenance, the release lever may be stuck from old and hardened grease. Although the head release mechanism is quite robust, excessive force should be avoided. Gentle heat works surprisingly well to soften hardened grease in preparation for cleaning and regreasing. The downside is that the stuck head will also be heated, and temperatures that differ from room temperature, or generally any temperature variations, are not healthy for optical components. So, if the lever really is stuck, remove the eyepieces from the head, cover the eyepiece tubes, and let the microscope sit for several hours in a cabinet (or any similar enclosed space where the temperature can be raised) at approx. 30°C (85°F) and then try to push the lever backwards. Hopefully, the lever will slowly move until the head releases. In difficult cases it may be necessary to increase the temperature treatment to 40°C (105°F).

Once the head has been removed, clean the dovetail mount on its underside with a piece of cloth or cotton swabs wetted with solvent (white spirit.) Be careful not to touch the glass window in the mount.

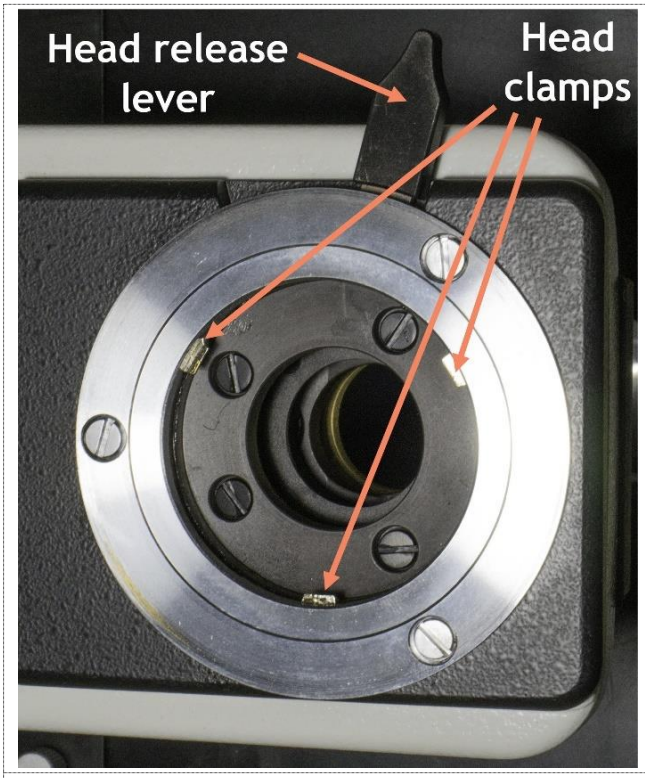

Figure 1: View from the top of the microscope down on the nosepiece, with removed head.

Figure 2: View down on the nosepiece, collar removed, showing the head release mechanism (lever and three metal clamps).

3. Disassemble the nosepiece and remove the turret.

Remove the three chromium plated M3x8 screws from the head collar (Figure 1) and remove the collar. Take note of how the three head clamps below are oriented (Figure 2.) Remove the head release lever, the three head clamps and the spring.

Pull out and remove the filter holder from the turret's filter port (Figure 4.) From the underside of the nosepiece, remove the two black M3x10 Philips screws that hold the filter port attached to the microscope stand, and pull out the port.

Remove the four black M3x8 screws that hold the turret (surrounded by orange circles in Figure 3 and Figure 4) and carefully remove the turret assembly from the nosepiece of the microscope stand (Figure 7 and Figure 8.)

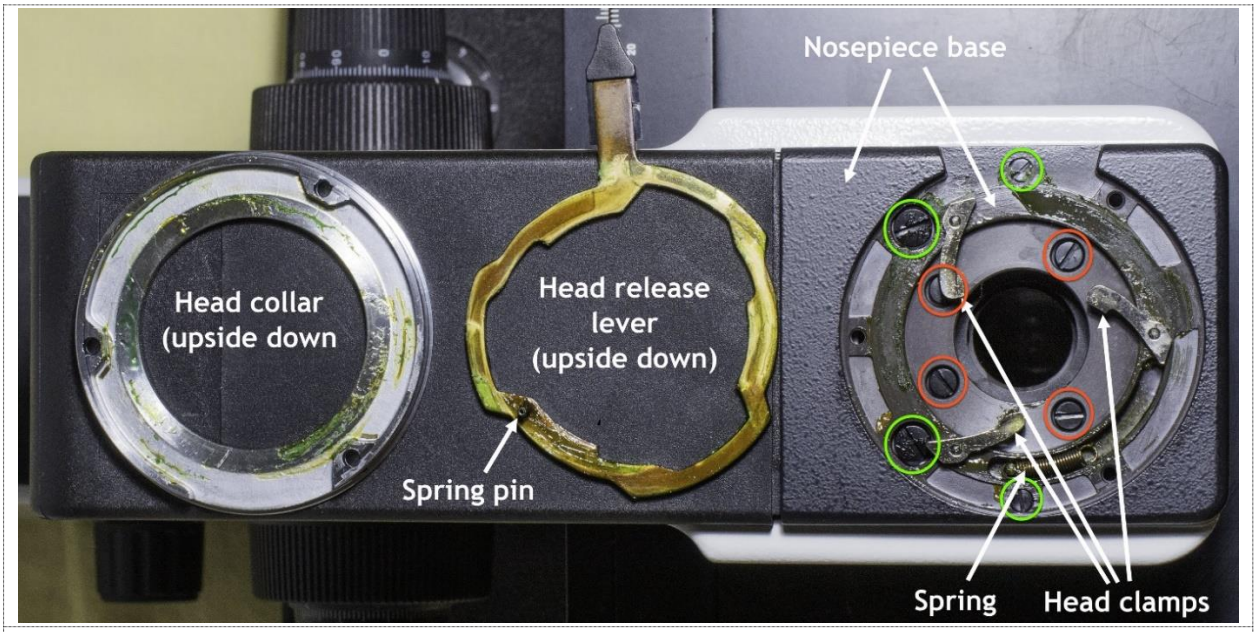

Figure 3: View down on the nosepiece, with the head release mechanism disassembled.
Screws that hold the nosepiece are surrounded by orange circles.
Screws that hold the nosepiece base are surrounded by green circles.

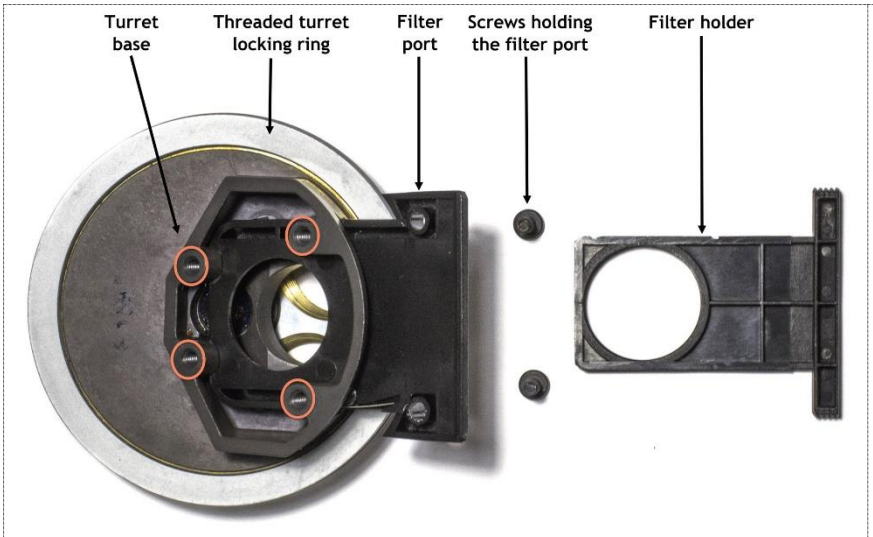

Figure 4: The turret - view from the top after the turret has been removed from the microscope's nosepiece. Also showing the filter port and the filter holder.
Screw holes for screws from the nosepiece that hold the turret are surrounded by orange circles.

Figure 5: The turret, view from the top. The filter holder and the filter port have been removed.

[The black nosepiece base (Figure 3) is a somewhat complex part, apparently manufactured from aluminium. For the work described in these maintenance notes it can be left attached to the nosepiece. If you for other maintenance tasks still need to remove it, do as follows: From the underside of the nosepiece remove both chromium plated M3x10 screws (Figure 6, where the screw holes are surrounded by blue circles.) Next, from the top of the nosepiece base remove the two black M3x12 screws and the two black M4x12 screws (Figure 3 and Figure 6, labeled by green circles.) The nosepiece base can now easily be removed.]

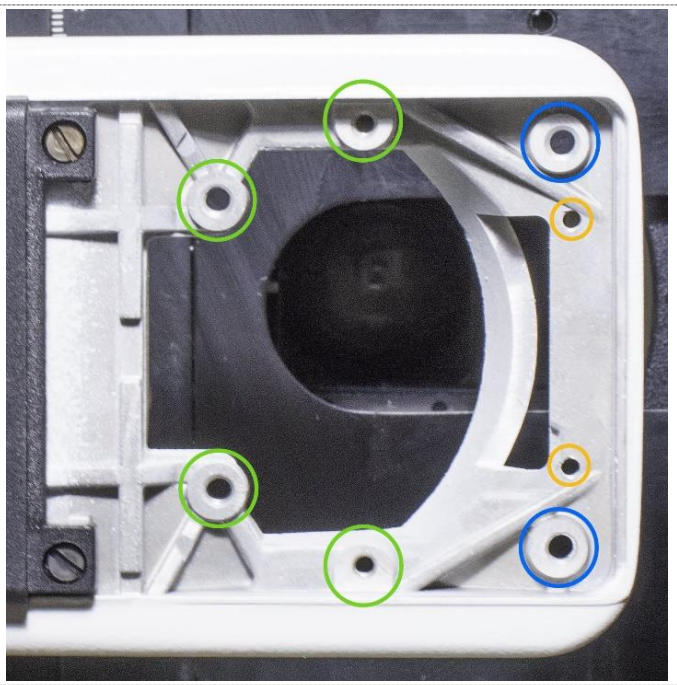

Figure 6: View from the top down on the nosepiece, after the nosepiece base has been removed.
The screw holes for the nosepiece base are surrounded by green and blue circles.
The screw holes for the filter port are surrounded by yellow circles.

4. Disassemble the turret.

Unscrew and remove the very small locking screw on the periphery of the threaded turret locking ring (Figure 7.) Hold the turret with your fingers in the objective openings with the turret's objective side facing down and carefully unscrew the threaded locking ring with your other hand and remove it. Be careful, because the large turret ball bearing just below is now unconfined and the small bearing balls may easily come loose (Figure 9 and Figure 10.) The bearing is not greased, so there is nothing that will make the balls to stick to the bearing.

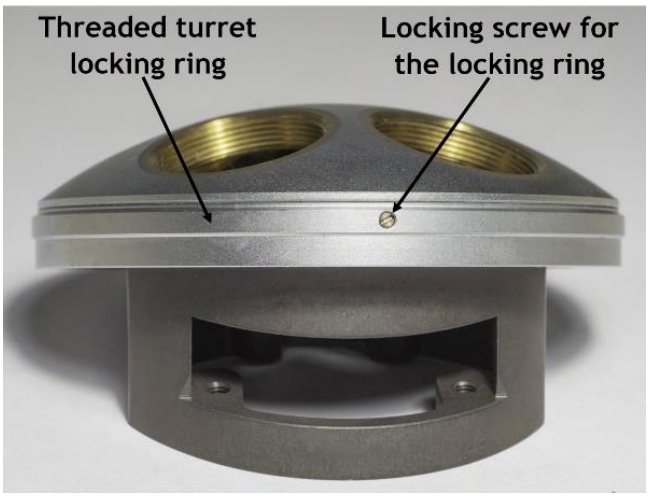

Figure 7: The turret, view from the front.

Figure 8: The turret, view from the top.

Carefully remove the bearing race, the bearing retainer and all bearing balls (Figure 9 and Figure 11.)

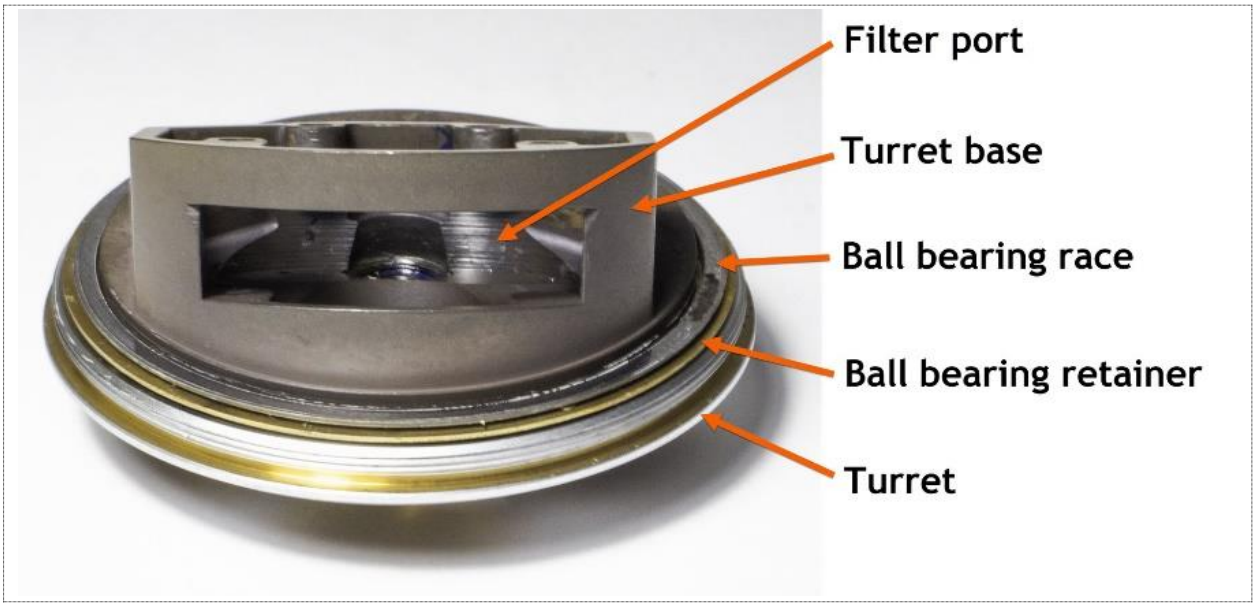

Figure 9: The turret, after the threaded turret locking ring has been removed. The large turret ball bearing is now visible. The bearing balls are not visible because they are below the ball bearing race.

Figure 10: The turret, after the threaded turret locking ring has been removed. The large turret ball bearing is now visible. The bearing balls are not visible because they are below the ball bearing race.

Figure 11: The turret, after the threaded turret locking ring and the bearing race have been removed. The bearing retainer and the bearing balls are now visible.

There should be 18 bearing balls, each 1.5 mm in diameter.

Once the large ball bearing and all its parts have been removed hold the turret with one hand and the turret base with other hand. Rotate the turret back and forth while carefully pulling the turret off from the base until they separate (Figure 12). On the inside of the turret, you will find a detent arrangement which holds the objectives in the optical path, and a simple center ball bearing consisting of a single steel ball (4.0 mm diameter) embedded in grease. (It appears that Leitz indeed did grease this bearing.)

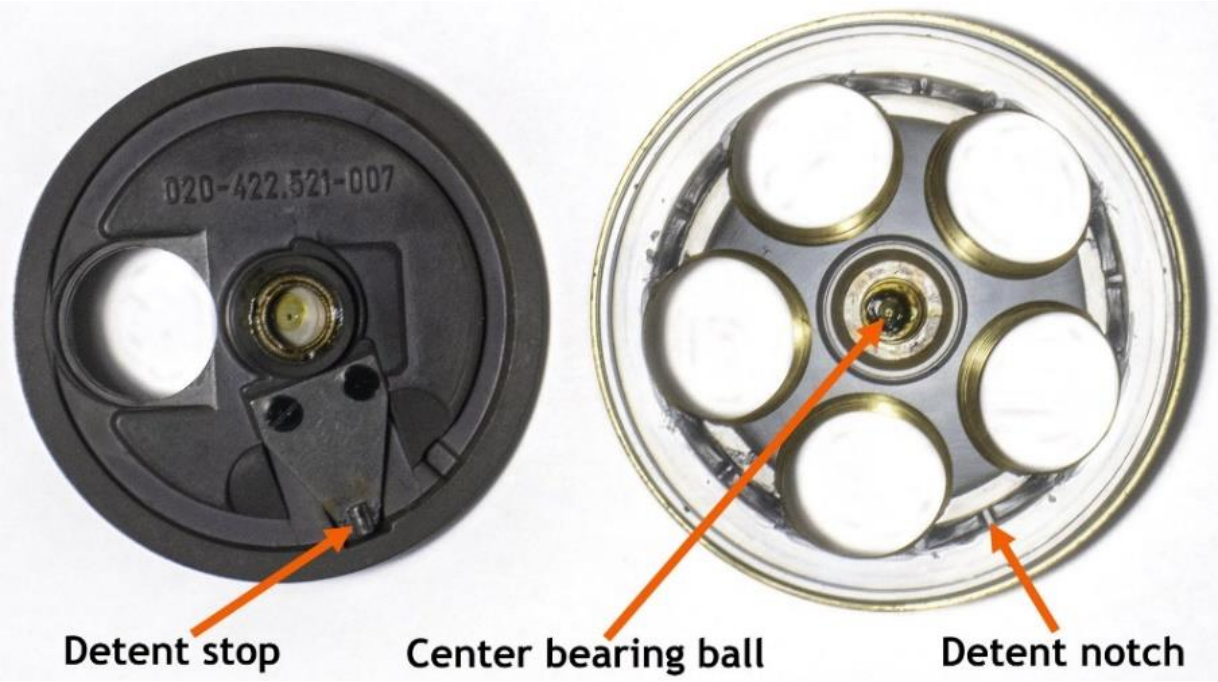

Figure 12: The insides of the turret base (left) and the turret (right) after they have been separated.

5. Clean and grease the turret.

Although the large ball bearing originally didn't have any grease, the parts should anyway be cleaned. Soak the bearing balls in a small vial with solvent (white spirit is recommended), pick them up one by one with tweezers, wipe them dry using a lint free microfiber cloth and collect them in another dry vial. Don't use tissue paper to wipe the bearing balls because it leaves a lot of paper fiber on the ball surfaces.

Use pieces of cloth or cotton swabs wetted with solvent to clean the shiny bearing race, the bearing retainer, and the surface along the periphery of the turret base where the balls are rolling. If you wish to continue with Leitz' partially grease-free approach, do not re-apply any grease on this bearing.

Clean the center bearing ball and all center axle parts with solvent to remove any old grease. Put generously of grease (e.g., Super Lube 21014) into the hollow axle, insert the 4 mm steel ball, and then apply grease to the outer surfaces of the axle.

Clean the detent stop and all detent notches with solvent to remove any old grease. Apply grease sparsely to and just around the detent notches.

6. Reassemble the turret and attach it to the nosepiece.

Making sure that the 4 mm steel bearing ball is in the center of the turret axle recombine the turret base and the turret while rotating the turret back and forth. Once combined, hold the parts together, and then check that the turret rotates freely and that the detent clicks into the notches as supposed.

Put the turret on the table with the objective side down. (If you choose to grease the large ball bearing, then apply grease very sparsely on the race surfaces.) Put the ball bearing retainer on its place on the backside of the turret base (Figure 11.) Using forceps (and perhaps a magnifier) carefully place all bearing balls in the retainer holes. Put the shiny bearing race on top of the balls and check from the side

that the balls still are where they should be. Making sure not to disturb the balls, carefully screw the threaded locking ring (Figure 7) on to the turret. Hand-tighten the locking ring lightly. Finally, secure the locking ring with the small locking screw (Figure 7.)

Attach the assembled turret to the nosepiece base using the four black M3x8 screws. Attach the filter port using the two black M3x10 Philips screws. Insert the filter holder into the port.

Perform a final check that the turret rotates freely and that the detent mechanism works as supposed for all objective positions.

7. Clean (and, if applicable, grease) the nosepiece's head release mechanism.

Clean the nosepiece base, the head release lever, the head collar and the three head clamps (Figure 1, Figure 2 and Figure 3) from old grease using solvent. Scrub the parts with pieces of cloth or cotton swabs wetted with solvent and allow the parts to dry. If you wish to continue with Leitz' grease approach, then apply grease to all sliding surfaces of the head release mechanism (including the underside of the head collar.) Re-assemble all parts as indicated in Figure 1, Figure 2 and Figure 3. The spring should be attached on one end to a pin on the nosepiece base and on the other end to the spring pin on the head release lever. Use the three chromium plated M3x8 screws to attach the head collar to the nosepiece.

Check that the head can easily be attached and removed from the nosepiece.