Leitz Lamphouse 50 - Maintenance Notes

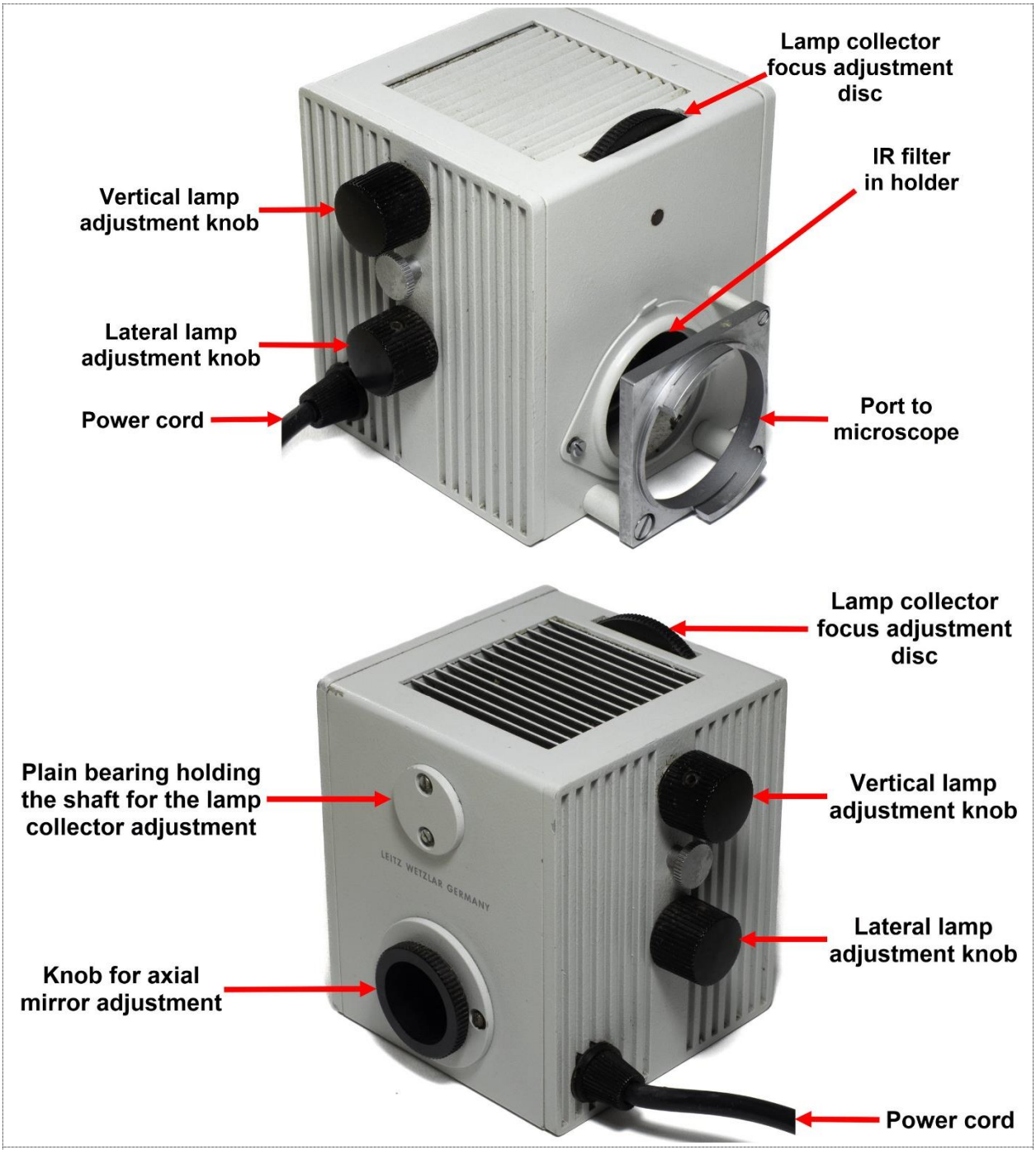

Figure 1: Lamphouse 50.

Leitz Lamphouse 50 was introduced in the early 1970s for some of the “grey era” microscopes with 170 mm tube length (for example, Ortholux II and Dialux, but not for Orthoplan.) It uses a 12V 50W halogen lamp that is powered by an external power supply unit. The lamp has a simple axially (along the optical path) adjustable concave mirror behind the bulb, a simple focusable aspherical collector lens and a heat (infrared) blocking glass filter. The lamp position can be adjusted laterally (sideways in the optical path) and vertically (up and down.) The lamphouse appears quite robust as it is almost entirely manufactured

of metal, only the control knobs are plastic. It is connected to the microscope's illumination port by a bayonet mount. The top of the lamphouse has a grid for venting of heat from the lamp. The lamp adjustment knobs are on the lamphouse's left side but can, if desired, easily be moved to the right side (only some rather simple rerouting of the lamp wires would be required).

Scope

This writeup describes the disassembly and reassembly of the Leitz Lamphouse 50 including a few maintenance actions.

Cleaning of the IR filter.

Halogen lamps emit a lot of infrared, or "heat", radiation that is beamed through the microscope specimen where the concentrated heat may negatively affect or even damage the specimen. The purpose of the IR filter is to absorb and remove most of the IR radiation from the light before it reaches the microscope. The filter (Figure 1) sits loose in a holder that can be moved sideways out of the optical path. Turn the filter holder sideways out of the optical path (don't let the filter fall on the floor) and remove the filter. Dip the filter in lukewarm water with some dish detergent and while submerged gently clean it with a very soft optical brush (preferable one with sabre, squirrel, or marten hair). Rinse the filter with tap water and isopropanol and leave it to dry (or dry it with a clean microfibre cloth.)

The microscope port.

The lamphouse is attached to the microscope by a bayonet mount situated over the microscope port (Figure 1.)

The IR filter holder (Figure 1) is attached by a small screw attached to the front of the lamphouse. A small, lightly greased washer sits between the filter holder and the lamphouse.

The bayonet mount is firmly attached to the lamphouse with three screws. The screws go through white metal spacers that insulate the hot lamphouse from the microscope. The M2x20 screw on the top of the mount is directly attached to the lamphouse, while the two M4x25 screws below are attached to a common "yoke" on the inside of the lamphouse (Figure 2.)

Figure 2: The yoke with the two M4x25 screws that hold the bayonet mount.

Disassembling the Lamphouse.

Disconnect the lamphouse from the power supply unit and remove it from the microscope's bayonet mount by turning it ¼ turn counterclockwise (when viewed standing behind the microscope.)

Unscrew the locking screws (Figure 3 and Figure 4) that hold the side panels of the lamphouse attached and remove the side panels.

Figure 3: The right side panel with its locking screw.

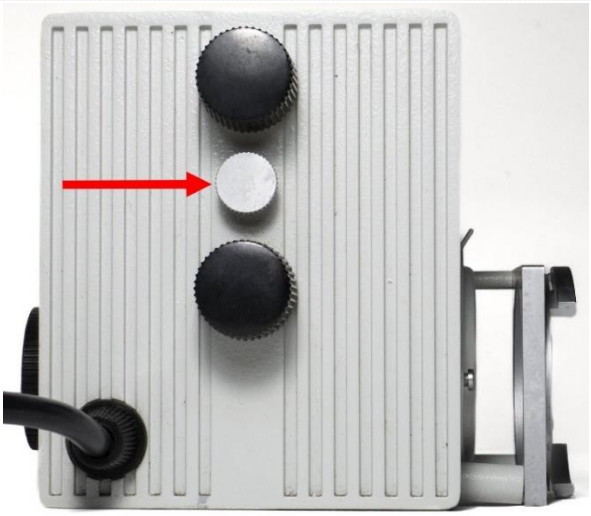

Figure 4: The left side panel. The red arrow pints to its locking screw knob.

The inside of the lamphouse is now accessible for repair or maintenance (Figure 5.)

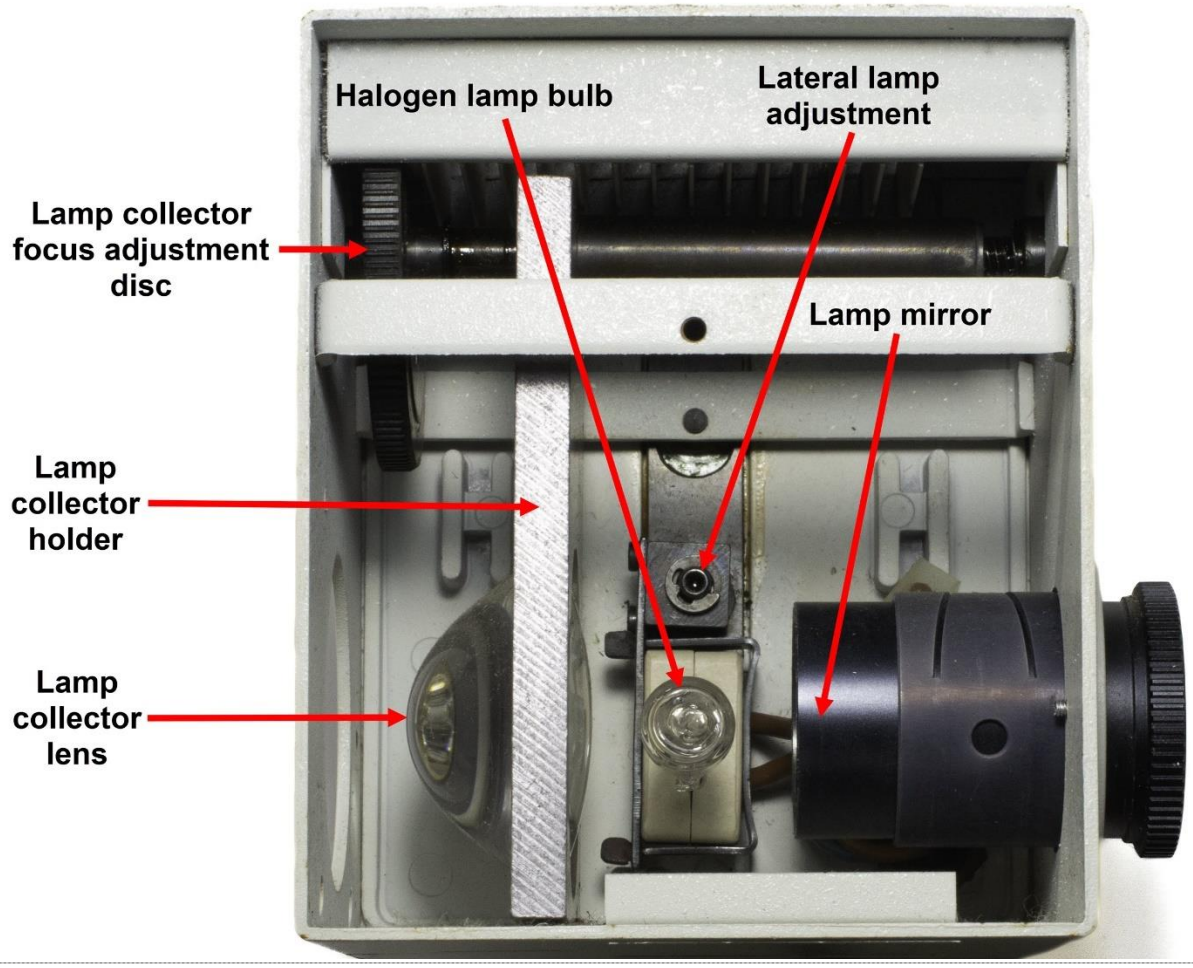

Figure 5: The interior of Lamphouse 50 after the right-side panel has been removed.

Remove the black plastic knob (that holds the concave mirror) for the mirror adjustment (Figure 1 and Figure 5.) Turn the knob back and forth while carefully pulling it out.

Check that the concave lamp mirror surface appears clean. If required, blow off any dust using a camera air blower, and/or carefully clean it with aqueous lens cleaning solution and cotton swabs. Be gentle with the cleaning, the mirror appears to be surface silver plated and may be vulnerable for scratches.

Disassembling and cleaning of the lamp alignment mechanism.

A common problem is that the vertical and lateral lamp alignment knobs have become very sluggish due to old, hardened grease.

During all work with the lamphouse be careful not to touch the halogen bulb with your fingers or contaminate it with any foreign substance, like grease. Any trace of contaminant will burn into the quartz glass and shorten the lifetime of the bulb.

Figure 6 shows the inside of the left side panel. The power cord can be left attached to side panel through the grommet, but to access and grease the lamp alignment mechanism the electrical wires from the lamp holder must be disconnected from the terminal block (Figure 6.)

Remove the two screws (yellow circles in Figure 6) that attach the lamp holder to the lamp adjustment mechanism. This will provide access for disassembling and cleaning the bare mechanism (Figure 7.)

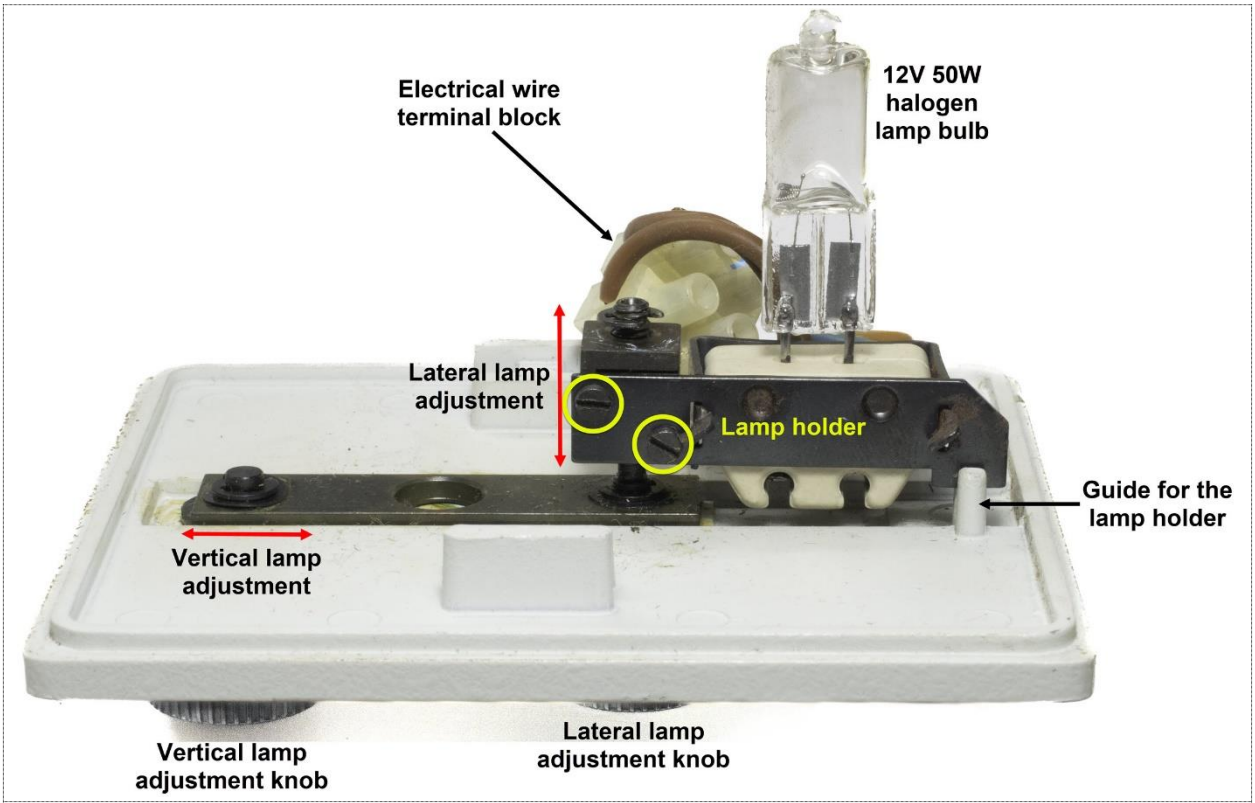

Figure 6: The removed left side panel with the lamp bulb holder and the lamp adjustment mechanism.

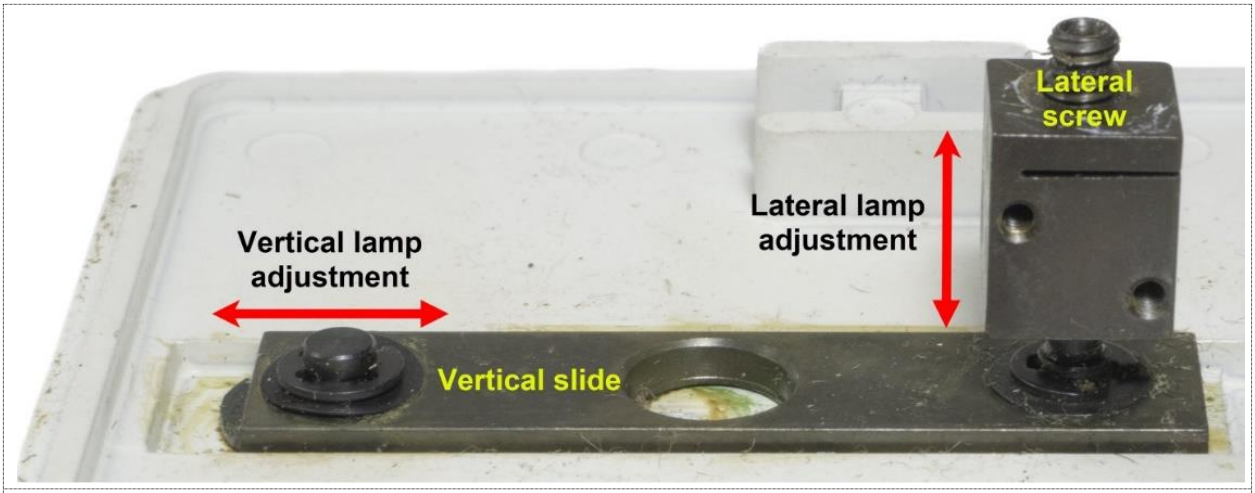

Figure 7: The lamp adjustment mechanism. The E clips on top of the adjustment controls have been removed in this image.

Remove the two adjustment knobs on the outside of the lamphouse's left side panel – the knobs are attached by M4 grub screws that require a 2 mm Allen key for removal. Then the mechanism can be disassembled; refer to Figure 8 for an exploded view of the parts. Be mindful when you pull off the three involved E clips – they tend to pop away and disappear.

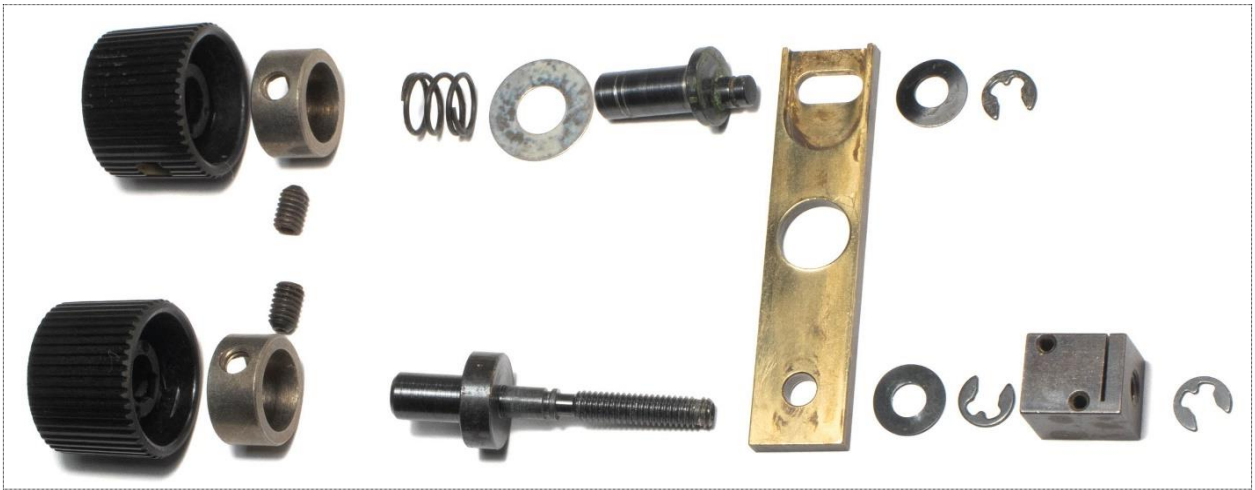

Figure 8: Exploded view of the lamp adjustment mechanism. The vertical adjustment parts on the top of the image, and the lateral adjustment parts on the bottom of the image. The vertical slide is the shared part.

The vertical adjustment parts are (Figure 8, top row, from the left side to the right side):

- Black plastic knurled knob with an M4 grub screw
- Steel inset with a thread for the grub screw
- Coil spring
- Steel washer (o.d. 14.0 mm, i.d. 6.5 mm, thickness 0.30 mm)
- (The side panel, not included in Figure 8)
- The vertical adjustment axle
- The vertical slide
- Wave washer (o.d. 9.0 mm, i.d. 4.1 mm, thickness 0.2 mm)
- E clip

The lateral adjustment parts are (Figure 8, bottom row, from the left side to the right side):

- Black plastic knurled knob with an M4 grub screw
- Steel inset with a thread for the grub screw
- The lateral adjustment lead screw
- (The side panel, not included in Figure 8)
- The vertical slide
- Wave washer (o.d. 9.0 mm, i.d. 4.1 mm, thickness 0.2 mm)
- E clip
- Cubic lead nut
- E clip

Clean all metal parts thoroughly with solvent (white spirit is recommended) including the slide on the inside of the left side panel. The old grease may be difficult to remove and also require scraping with wood or plastic toothpicks. Pay extra attention to the thread of the lead screw, you may need to use a steel needle to remove the solidified grease in the thread. Finish by scrubbing with a hard brush and warm water with dish detergent, and dry thoroughly. Polish the brass slide with a suitable metal polish (for example, Autosol), and finish off by washing with a hard brush (for example, an old hard tooth-brush) and warm water with dish detergent. Soak the knobs over the night with water and dish detergent, brush the knurled sides with a hard brush and dry the knobs thoroughly.

If the side panels are dirty, now is a good time to clean them. Wash them with a brush and warm water with dish detergent. Let the panels dry completely.

Greasing and reassembling the lamp alignment mechanism.

Grease (I used Super Lube Multi-Purpose Synthetic grease with Syncolon, NLGI grade 2, but the choice of grease is not critical) the underside of the vertical slide, the corresponding slide surface on the inside of the left side panel, and the disc and the excentric knob on the inner end of the vertical adjustment axle. Attach the vertical adjustment axle from the inside of the side panel and cover it with the vertical slide (positioned properly.) Attach the wave washer (greased) over the excentric knob on the vertical adjustment axle and lock the axle and slide by attaching the E clip to the groove on the top of the axle's excentric knob. Attach the shiny steel washer and then the coil spring (greased) over the axle on the outside of the side panel. Attach the black plastic knob including the steel inset and the grub screw. Before tightening the grub screw push the knob down against the coil spring.

Grease and attach the lateral adjustment lead screw from the outside of the side panel. Attach the wave washer (greased) over the threaded end that sticks out through the vertical slide. Lock the lead screw with an E clip in the groove just above the wave washer. Thoroughly grease the thread of the lead screw and attach the cubic lead nut turned the proper way as in Figure 7. Attach the last E clip to the thread close to the top of the lead screw. There is no special groove for the E clip, it can be attached over any of the threads. The E clip limits the lateral adjustment range for the lamp - if the clip is attached too close to the top of the lead screw, the lamp holder may be able to slip out of the lamp holder guide (Figure 6.) Attach the black plastic knob including the steel inset and the grub screw.

Attach the lamp holder to the cubic lead nut. Check that both alignment mechanisms work as expected and that the lamp holder stays within the reach of the lamp holder guide. Adjust the E clip and/or the lamp holder screws, if required.

Reattach the electrical wires from the lamp holder to the terminal block.

Disassembling and cleaning the lamp collector and its focus mechanism.

The lamp collector consists of an aplanatic lens attached in a steel holder (Figure 5.) The collector holder with the focus shaft (Figure 9) moves axially along the focus lead screw that is turned by the focus adjustment disc on the top of the lamphouse (Figure 1 and Figure 5.) A screw head in the bottom of the collector holder runs in a groove in the bottom of the lamphouse to prevent the holder from swerving. The ends of the focus lead screw are anchored by plain bearings in the front and back sides of the lamphouse (Figure 10 and Figure 11.)

Figure 9: The lamp collector with its holder and the focus shaft.

Figure 10: The lamphouse front. The arrow points to the tip of the focus lead screw.

Figure 11: The lamphouse backside. The arrow points to the plain bearing that holds the other tip of the lead screw.

Figure 12: Exploded view of the lamp collector focus mechanism.

From the left side to the right side:

- *Plain bearing, greased, attached to the backside of the lamphouse (Figure 11) by two screws and two small washers*
- *Wave washer, greased (o.d. 9.0 mm, i.d. 4.1 mm, thickness 0.17 mm)*
- *Two black steel washers, greased (o.d. 9.0 mm, i.d. 4.2 mm, thickness 0.08 mm)*
- *The focus shaft, outside thread fitting the collector lens holder, and greased inside triple-start thread fitting the lead screw*
- *The focus lead screw, triple-start thread that fits into the focus shaft*
- *E clip to limit the focus range of the lamp collector*
- *Black plastic collector focus control disc*

Remove both side panels (Figure 3 and Figure 4) from the lamphouse. Remove the plain bearing for the lead screw from the backside of the lamphouse (Figure 11 and Figure 12) and collect all three washers. Turn the focus control disc to move the collector holder as far as it goes toward the inside of the lamphouse and then remove the E clip from the lead screw. Remove the focus control disc from the lead screw. Unscrew the focus shaft from the collector holder and carefully remove the holder with its lens from the lamphouse. Unscrew and remove the focus lead screw from the focus shaft.

Clean the collector holder with the lens by putting it in a beaker with lukewarm water with some dish detergent. While submerged, gently brush it with a very soft optical brush (preferably one with sabre, squirrel, or marten hair). Be careful not to scratch the lens. Rinse the holder and the lens with tap water and then isopropanol and leave it to dry in the air.

Thoroughly clean the plain bearing, the washers, the focus shaft, and the focus lead screw with solvent (white spirit is recommended.) The old grease may be difficult to remove and also require scraping with wood or plastic toothpicks. Pay extra attention to get the threads clean. Let the cleaned parts dry.

If the lamphouse is dirty, now is a good time to clean it. Remove all items attached to the lamphouse (i.e., the microscope port and the mirror adjustment mount.) Wash the lamphouse with a brush and warm water with dish detergent. Let the lamphouse dry completely.

Greasing and reassembling the lamp collector and its focus mechanism.

Before reassembling the collector and the focus mechanism you need to decide whether you wish to grease the lead screw or leave it ungreased. Greasing it will make the focus settings very smooth and pleasant, leaving it ungreased will ensure that the mechanism doesn't get stuck in case the grease disappoints by again solidifying sometime within the next 50 years. (It should be mentioned that even without grease the collector focus mechanism will work quite smoothly.) If you choose to use grease, then here are the areas where you should apply it: The threads of the focus lead screw and the focus shaft, the washers, and the inside of the plain bearing.

Screw the focus lead screw all the way into the focus shaft (refer to Figure 12 for the parts).

Put the collector lens holder into the lamphouse with the bulging side of the lens (Figure 9) pointing toward the microscope port. Position the screw head in the bottom of the holder (Figure 9) in the groove in the bottom of the lamphouse.

Put the lead screw with the inserted shaft through the lamphouse's bearing hole and screw the shaft's tread into the collector lens holder's thread. Use pliers to tighten the shaft to the holder so it doesn't release later during normal use. (Depending on the size and shape of the pliers it may be somewhat difficult to get a grip around the shaft.)

Attach the focus control disc over the tip (the left tip in Figure 12) of the lead screw and then put the tip into the hole in the front of the lamphouse (above the microscope port.) It may help to turn the lead screw to move it within the shaft into a more comfortable position.

Attach the three washers over the other tip of the lead screw: First the two regular washers and then the wave washer. Attach the plain bearing (it may make sense to grease its inside even if you choose not to use grease between the lead screw and the shaft) to the backside of the lamphouse making sure that the axle tip properly fits into the bearing.

Move the lamp collector (using the focus control disc) as far as it goes back toward the mirror and attach the E clip to the groove in the lead screw. It is difficult to reach, so you will probably need to use long nose pliers. Be careful not to scratch the collector lens.

Check that the collector moves freely through the entire range when the focus control disc is turned.

Changing and aligning the halogen lamp bulb

For instructions on changing and aligning the halogen bulb, refer to section References below.

Always keep halogen bulbs completely clean and protect them from any fingerprints, contamination, and dirt. Always handle halogen bulbs wrapped in tissue, never touch the bulb with your fingers.

Lamphouse 50 is designed for 12V 50W halogen lamp bulbs. The bulb type should be T3, where "T" indicates "tubular" shape and "3" is the bulb diameter in 8ths of an inch, in this case 3/8 inch (or 10 mm), and the base should be G6.35, where "G" is the code for a bipolar bulb with 1 mm thick pins, and "6.35" is the distance in millimeters between the pins. The size and shape of the filament has however some relevance for implementing a strict Köhler illumination. Furthermore, the maximal ranges of the lamphouse's vertical and lateral adjustments put some restrictions on the optimal distance between the lower end of the bulb base and the filament.

Unfortunately, I haven't been able to find any official filament or bulb specifications provided by Leitz for lamphouse 50. Searching the Internet one can however find some more or less anecdotical information about supposedly suitable bulb makes and models. The "Osram 64610 HLX 50W 12V" halogen bulb is one example, but similar bulbs from other manufacturers are also identified. The larger halogen bulb manufacturers typically issue data sheets that include the filament size, shape, and position parameters.

It's important to understand that while regular halogen lamps have average lives of 1000-2000 hours, the specialized scientific halogen bulbs (like the above mentioned Osram bulb) that often are used in high-end projectors and laboratory or medical equipment only have average lives of 50-100 hours. These specialized bulbs are brighter than the regular bulbs and also provide a somewhat colder light (approx. 3350K vs. 3200K.) The life of the specialized halogen bulbs can be extended by running them at slightly lower voltage than the nominal (one rule-of-thumbs says that a 5% voltage reduction will double the life), but this of course also decreases the light intensity and color temperature. Avoid reducing the voltage by more than 30% as this has been reported to jeopardize the bulb's halogen regenerative cycle resulting in an increasing darkening rate of the bulb envelope.

A general international trend is that halogen bulbs are being phased out due to energy saving and global warming concerns. Probably halogen bulbs for scientific use will remain available for several more years, but one should still expect steadily increasing scarceness and costs.

There is room for some creative 3D printer modifications of Lamphouse 50 to retrofit it for LED illumination.

References

Leitz Lamphouse 50 is described in the following brochure:

Ortholux II - Instructions or alternatively Ortholux II - Instructions