M357 E 05.9.NF.1

Nikon

Polarizing Microscope
ECLIPSE LV100POL

Instructions

Thank you for purchasing the Nikon product.
This instruction manual is written for the users of the Nikon Microscope ECLIPSE LV100POL.
To ensure correct usage, please read this manual carefully before operating the product.

- It is prohibited to reproduce or transmit this manual in part or whole without Nikon's expressed permission.
- The contents of this manual are subject to change without notice.
- Every effort has been made to ensure the accuracy of this manual. If you find that any portion of this manual is unclear or incorrect, please contact your nearest Nikon representative.
- Some of the products described in this manual may not be included in the set you have purchased.
- Also be sure to read the manuals for any other products that you are using with this system.

WARNING and CAUTION Symbols

Although Nikon products are designed to provide the utmost safety during use, incorrect usage or failure to follow the safety instructions provided may cause personal injury or property damage. To ensure correct usage, read the instruction manual carefully and thoroughly before using the product. Do not discard the manual; keep it handy for easy reference.
Safety instructions within this manual are accompanied by the following symbols to highlight their importance. For your safety, always follow the instructions accompanying these symbols.

Symbol	Meaning
 **WARNING**	Disregarding instructions accompanying this symbol may lead to serious injury or death.
 **CAUTION**	Disregarding instructions accompanying this symbol may lead to injury or property damage.

Meaning of the symbol used on the product

The symbol appearing on the product indicates the need for caution at all times during use. Always refer to the instruction manual and read the relevant instructions before manipulating any part to which the symbol has been affixed.

Symbol	Meaning
	**Caution for heat** This marking on the back of the lamp house and near the lamp house clamp screw of the LV-UEPI Universal Epi Illuminator calls your attention on the following: You can see the positions of this symbol on Page 10 and 11. • The lamp house become extremely hot while the lamp is on and immediately after it is turned off. • Do not touch the lamp house during and immediately after lighting to prevent the risk of burns. • Make sure that the lamp house is sufficiently cool before the lamp replacement.

WARNING

1. Intended product use

This microscope is intended primarily for microscopy and photomicrography of stones, rocks, minerals, and high-polymer materials using a polarized light illumination. Besides, this microscope is intended for use in optical property analysis in the fields of mineralogy and high polymer chemistry.

2. Do not disassemble

Disassembling this product may result in electric shock or malfunctions. Damage or injury that may occur due to mishandling is unwarranted. Never attempt to disassemble any part other than the parts described in this manual. If you experience problems with the product, contact your nearest Nikon representative.

3. Read the instructions carefully

To ensure safety, carefully read this manual and the manuals provided with any other equipment used with this product. In particular, observe all warnings and cautions given at the beginning of each manual.

To use an external light source

When an external light source, such as a mercury lamp or a xenon lamp, is used, you must take great care of the lamp. Read the instruction manual for the light source and follow the instructions and cautions for it.

4. Rated voltage

The power supply circuit in this product is designed for AC power of 100 to 240 VAC and 50/60 Hz. Before connecting the power cord, check that the power supply to be used conforms to the voltage and frequency described above. Use of a non-conforming power supply may result in equipment malfunction, failure, or fire.

5. Power cord

Be sure to use the specified power cord. Using a wrong power cord may result in malfunctions or fire. The product is classified as subject to Class I protection against electrical shock. Make sure it is connected to an appropriate ground terminal (protective earth terminal). To prevent electrical shock, always turn off the power switch (press it to the "○" position) on the power supply before attaching or detaching the power cord. For specifications of the power cord, refer to "VII. Specifications."

6. Specified light source

Use this product with a specified light source. The specified light source devices are as follows:

- **Episcopic illuminator**
  Nikon LV-UEPI Universal Epi Illuminator (model name: LV-UEPI)
- **Lamp house (for episcopic illumination and diascopic illumination)**
  Nikon LV-LH50PC Precentered Lamp House 12V 50W (model name: LV-LH50PC)
- **Lamp**
  Nikon LV-HL50W 12V 50W LONGLIFE halogen lamp (model name: LV-HL50W), or non-Nikon 12V 50W SHORTLIFE halogen lamp (model name: OSRAM HLX 64610, OSRAM HLX 64611, or PHILIPS 7027).

If you wish to buy these lamps, please contact your nearest Nikon representative.

Note that if a lamp not specified is used for this product, the product is not approved as a UL listed product.

WARNING

7. Heat from the light source

The lamp and the lamp house become extremely hot. To avoid burns, do not touch the lamp house while the lamp is lit or for thirty minutes after it is turned off. Furthermore, to avoid the risk of fire, do not place fabric, paper, or highly flammable volatile materials (such as gasoline, petroleum benzine, paint thinner, or alcohol) near the lamp house while the lamp is lit or for about thirty minutes after it is turned off.

8. Air vents

Do not block the air vents on the microscope and lamp house. If the air vents are blocked, the temperature of the microscope will raise. And it results in damage or fire.

9. Reflection

Lustrous samples reflect the illumination. Do not observe the illuminated surface of a sample for a long time because the strong reflection may hurt your eyes.

CAUTION

1. Handle with care

This product is a precision optical instrument. Handle the product with care to avoid shock on impact.
In particular, objectives may loose accuracy when exposed to even a weak physical shock.

2. Do not wet the microscope

If the microscope gets wet, a short circuit may cause malfunction or abnormal heating of the microscope. If you accidentally spill water on the microscope, immediately turn off the power switch (flip it to the "○" side) and unplug the power cord from the wall outlet. Then, wipe off the water with a piece of dry cloth. If water enters a component, immediately suspend use of this product, disconnect the power cord from the outlet, and contact your nearest Nikon representative.

3. Weak electromagnetic waves

The product emits weak electromagnetic waves. There is a possibility that some precision electronic devices are affected by the electromagnetic waves. To prevent bad influences, locate such electronic devices away from the microscope system. If a TV or radio reception is affected, move the TV or radio set farther from the product.

4. Installation location

This microscope system is a precision optical instrument. The usage or storage in an inappropriate environment may result in malfunctions or poor performance.
Consider the following factors when selecting an installation location:

- Avoid a brightly lit location, such as exposed to direct sunlight or directly under a room light. The image quality deteriorates if there is excessive ambient light.
- Always install the microscope with a surrounding clear area of 10 cm or more.
- Choose a location that is free from considerable dust or dirt.
- Choose a flat surface with little vibration.
- Choose a sturdy desk or table for the base of the microscopy system.
- Do not install the microscope in a hot and humid location.
- Select a layout that allows easy removal of the power cord from the product's AC inlet in the event of an emergency.
- For details about the operating environment and storage environment, see "VII. Specifications."

5. Cautions on moving the microscope

- This product is a precision optical instrument. Handle it carefully and do not subject it to a strong physical shock. (In particular, objectives may loose accuracy when exposed to even a weak physical shock.)
- When moving the microscope, first remove the lamp house. Then, securely hold the microscope by the root of the arm from the back.
  (Information) The microscope with the stage, eyepiece tube, lamp house, and other parts attached, weighs approx. 20 kg.
- Do not hold the focus knobs, eyepiece tube, lamp house, sub-stage, or so on, when carrying the microscope. They may come off and may cause serious injury or malfunction.
- Be careful not to pinch your hands or fingers when setting up the microscope.

6. Cautions on assembling the microscope

- Be careful not to pinch your fingers or hands during assembly.
- Scratches or fingerprints on the lenses will adversely affect the image. Be careful not to scratch or touch the lens surfaces.

CAUTION

7. Cautions on lamp replacement

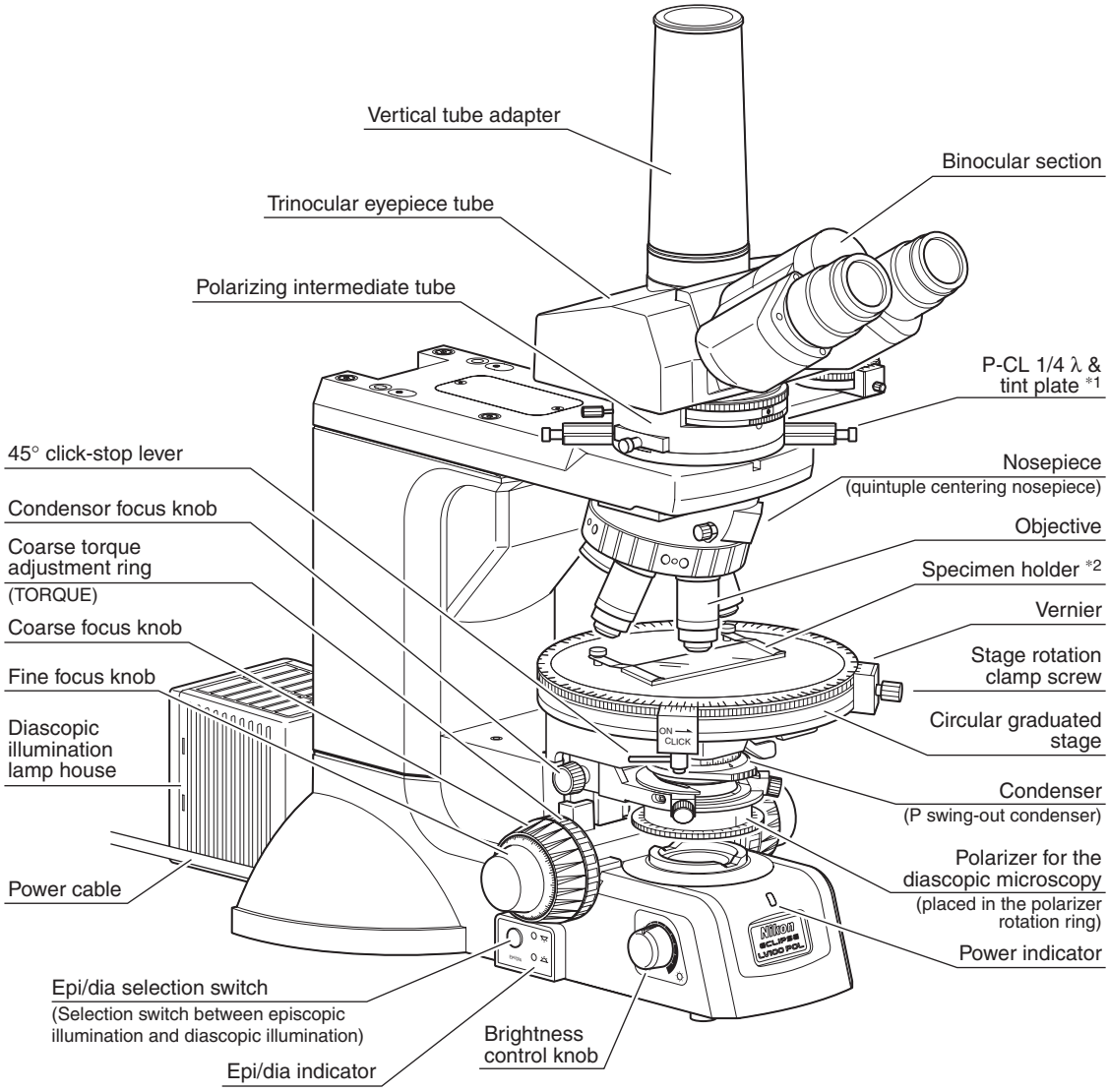
- To prevent burn injuries, wait at least 30 minutes after the lamp is turned off to give it sufficient time to cool when replacing lamps.
- To prevent electrical shock and damage to the microscope, always turn off the power switch (flip it to the "○" side) and unplug the power cord from the outlet before attaching or detaching the lamp house.
- Never touch the glass surface of the lamp with bare hands. Doing so will cause fingerprints, grease, etc. to burn onto the lamp surface, reducing the illumination. If you do get any fingerprints or dirt on the lamp, wipe them clean.
- Make sure the lamp house cover is securely fitted to the lamp house after replacing lamps. Never turn on the lamp with the lamp house cover removed.
- When you dispose of the replaced lamp, do not break it up. Instead, dispose of the used lamp as special industrial waste or dispose of it according to the local regulations and rules.

CONTENTS

I Part Names

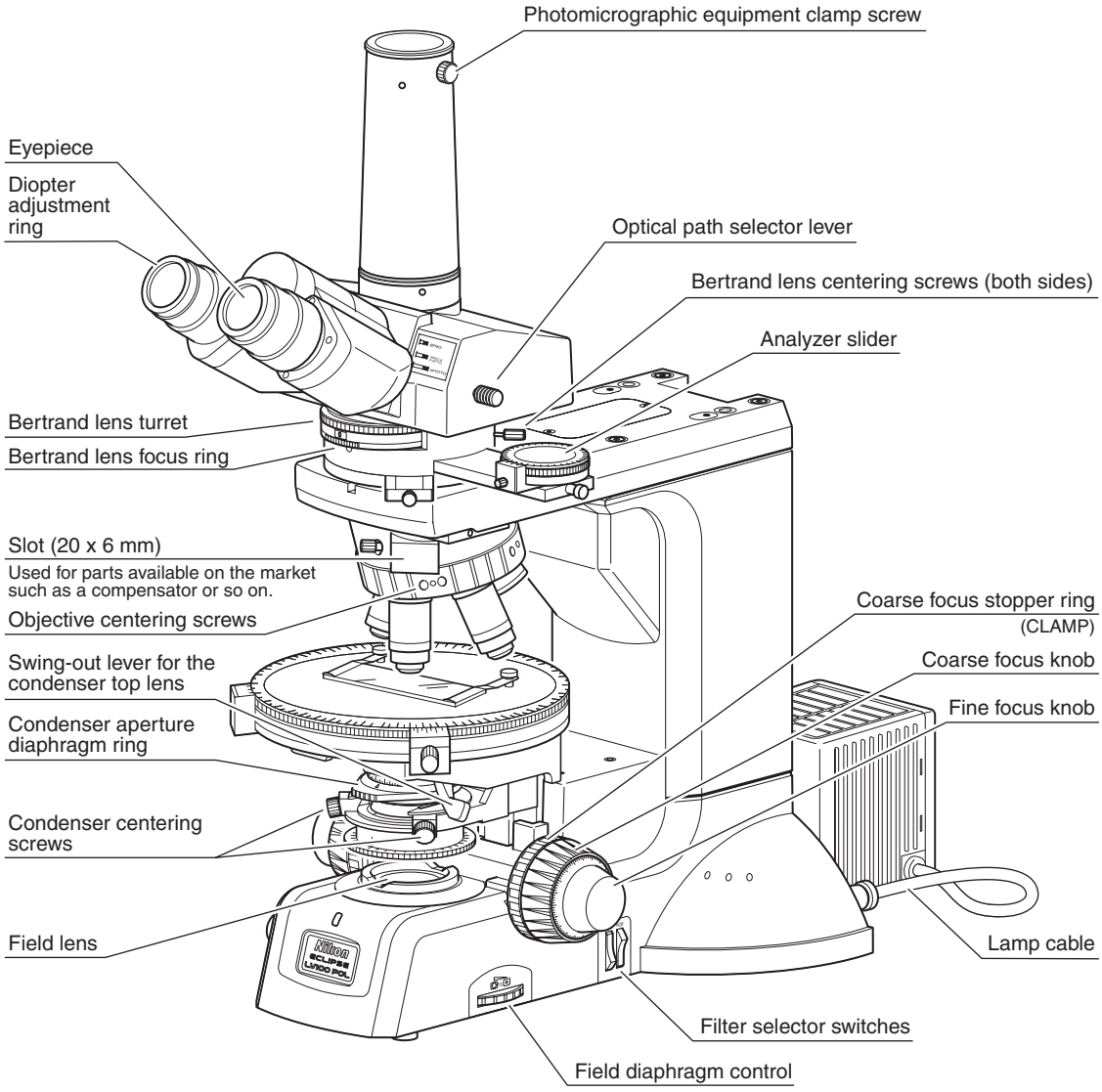
1 Components and Controls

The figures in this section show the ECLIPSE LV100POL microscope with the diascopic illumination lamp house, the trinocular eyepiece tube, the vertical tube adapter, and the P swing-out condenser.



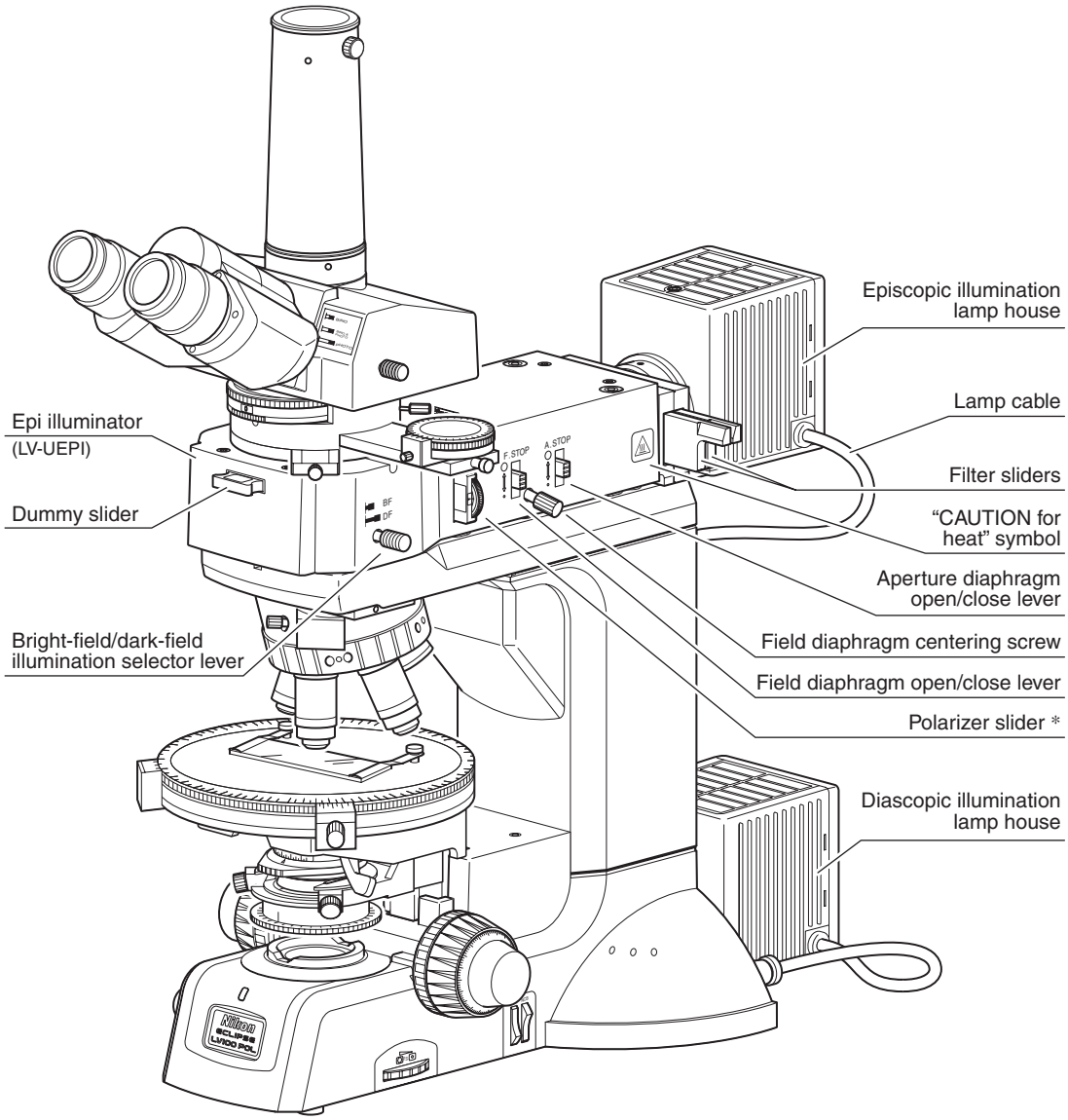
*1: This part can be changed to the optional P-CS Senarmont compensator or P-CQ quartz wedge.

*2: This part is removed to install the optional attachable mechanical stage.


Photomicrographic equipment clamp screw
Eyepiece
Diopter adjustment ring
Optical path selector lever
Bertrand lens centering screws (both sides)
Analyzer slider
Bertrand lens turret
Bertrand lens focus ring
Slot (20 x 6 mm)
Used for parts available on the market such as a compensator or so on.
Objective centering screws
Coarse focus stopper ring
(CLAMP)
Coarse focus knob
Fine focus knob
Swing-out lever for the condenser top lens
Condenser aperture diaphragm ring
Condenser centering screws
Field lens
Lamp cable
Filter selector switches
Field diaphragm control

2 LV100POL with Epi Illuminator

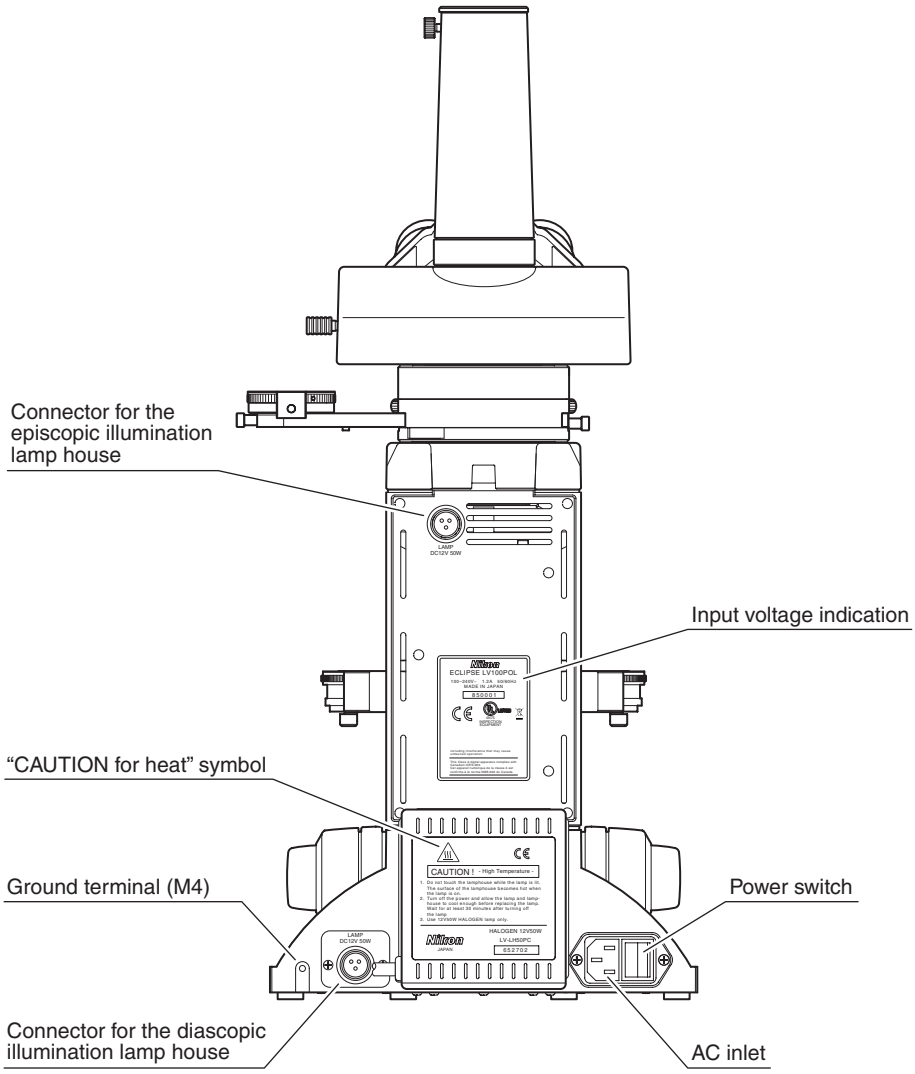
The figure in this section shows the ECLIPSE LV100POL microscope with the epi illuminator, the episcopic illumination lamp house, the diascopic illumination lamp house, the trinocular eyepiece tube, the vertical tube adapter, and the P swing-out condenser.



*: This part is used to perform the episcopic polarization microscopy.

3 Rear View

The figure below shows the ECLIPSE LV100POL microscope with the diascopic illumination lamp house, the trinocular eyepiece tube, and the vertical tube adapter.



II Microscopy

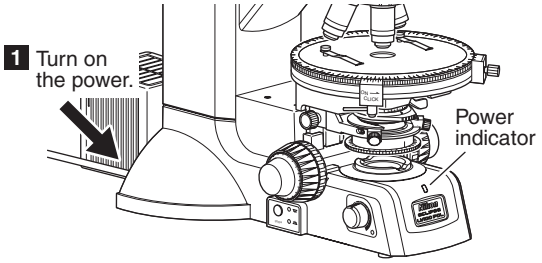
This chapter explains microscopy procedures with the LV100POL microscope.

- For detailed information about operations of parts of the microscope, refer to Page 22, “III. Operation of Each Part.”
- If the microscope is not assembled yet, refer to Page 46, “IV. Assembly” and assemble the microscope before hand.

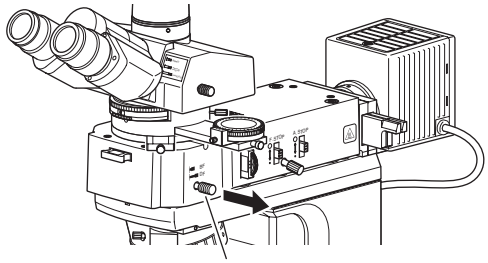
1 Diascopic Bright-field Microscopy

This section describes the diascopic bright-field microscopy using the diascopic illumination lamp.

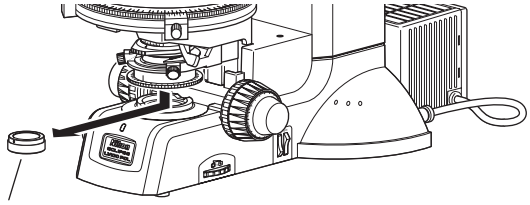
1 **Turn on the power switch.**
When the microscope power is turned on, the power indicator on the microscope base is lit.
See Page 22.



2 **When the episcopic illuminator is attached, pull out the illumination selector lever to set the dark-field position (DF) for it.**
See Page 42.

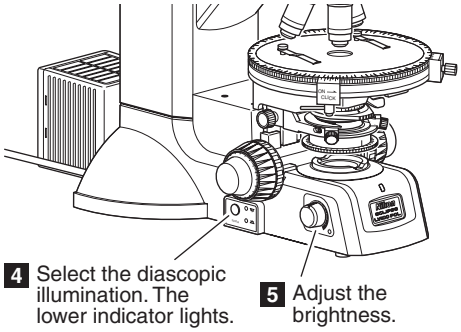


3 **Remove the polarizer for the diascopic microscopy.**
See Page 36.



4 **Push the epi/dia selection switch to select the diascopic illumination. The indicator for the diascopic illumination (lower side) turns on.**
See Page 23.

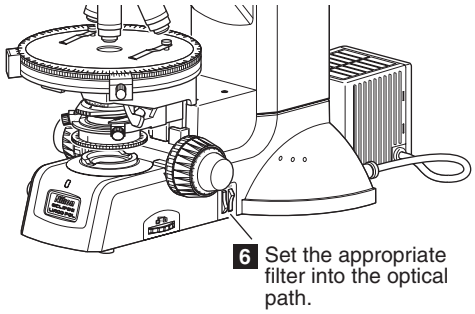
5 **Turn the brightness control knob to adjust the brightness.**
When the brightness control knob is turned, the brightness of the illumination selected by the epi/dia selection switch is changed.
See Page 23.
When the lamp lights, the power indicator on the microscope base lights green.



6 **When necessary, push the filter selection switches on the base of the microscope. The NCB11 filter and ND8 filter can be placed into the optical path.**

See Page 24.

Filter type	Intended use
NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND8 (ND filter)	For brightness adjustment (transmittance 12.5%)

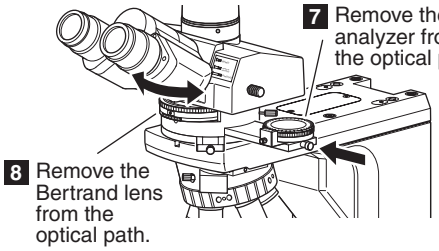


7 **Push in the analyzer slider on the polarizing intermediate tube to remove the analyzer from the optical path.**

See Page 37.

8 **Move the Bertrand lens turret to the "0" position to remove the Bertrand lens from the optical path.**

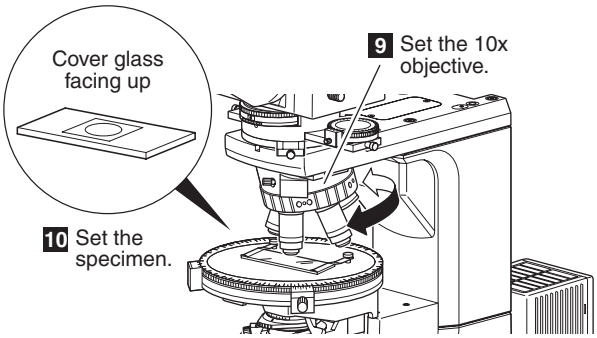
See Page 39.



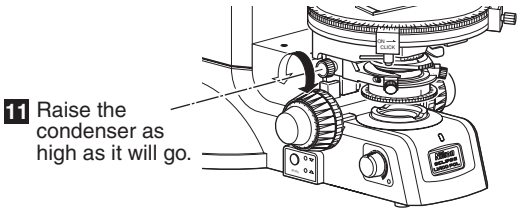
9 **Rotate the nosepiece to place the 10x objective into the optical path.**

The nosepiece must be stopped at the click stop position.

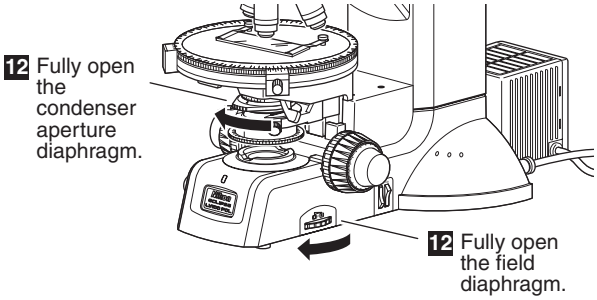
10 **Set the specimen in place with the cover glass facing up.**



11 **Raise the condenser as high as it will go.**

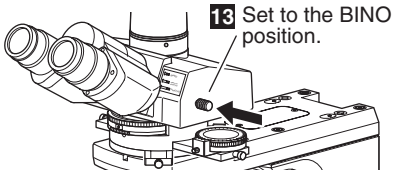


12 **Fully open the field diaphragm and the condenser aperture diaphragm.**



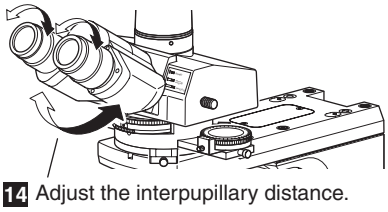
13 **When using the trinocular eyepiece tube, set the optical path selector lever to the position where 100% light goes through the binocular eyepiece.**

See Page 27.



14 **Adjust the diopters and the interpupillary distance.**

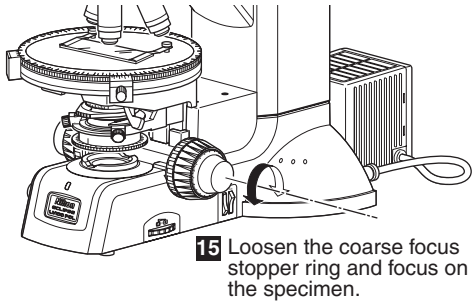
See Page 28.



15 **Focus on the specimen.**

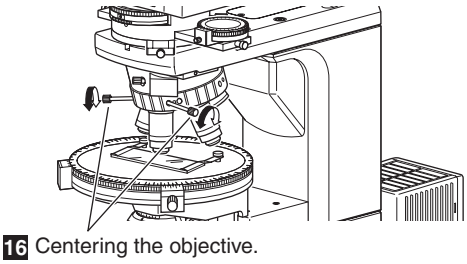
Fully loosen the coarse focus stopper ring.

See Page 25.



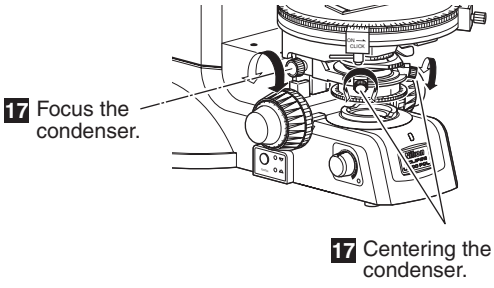
16 **Center the objective.**

See Page 33.



17 **Focus and center the condenser.**

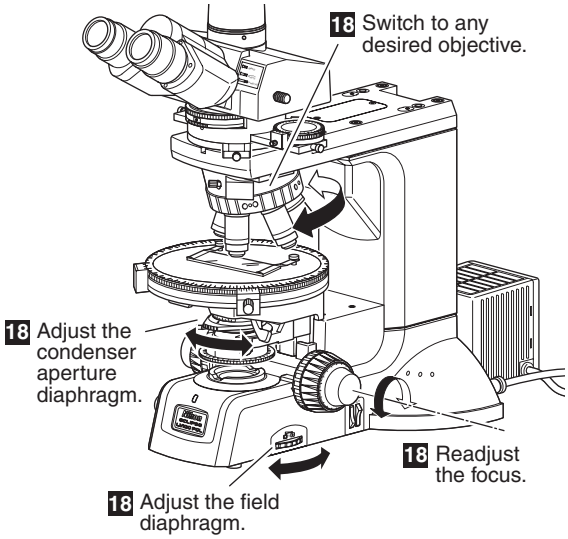
See Page 30.



18 **Rotate the nosepiece to locate the desired magnification objective into the optical path. Then, perform the microscopy.**

- Each time you change objectives, the field diaphragm and the condenser aperture diaphragm must be adjusted.
  - The field aperture should be adjusted so that its image circumscribes the view field.
  - And the aperture diaphragm should be 70% to 80% of the numerical aperture of the objective.

  See Pages 31 and 32.
- Focus on the specimen again using the fine focus knob or the coarse focus knob.
  See Page 25.
- The top lens of the swing-out condenser must be operated depending on the magnification of the objective to be used.
  See Page 29.
- To use an oil immersion type objective or a water immersion type objective, perform the oil immersion or water immersion.
  See Pages 34 and 35.



19 **When the microscopy ends, turn off the power switch.**

2 Orthoscopic Observation

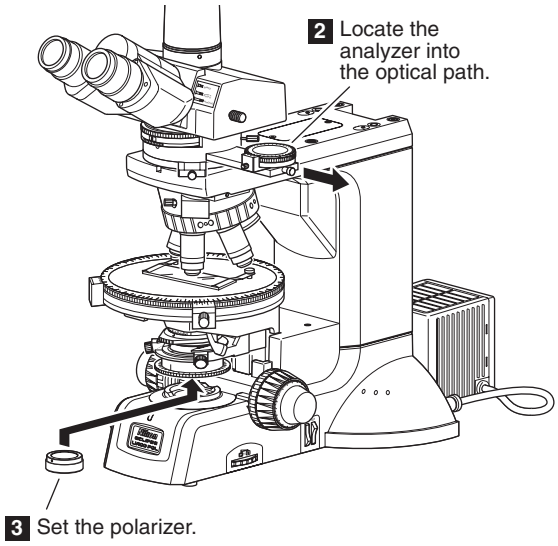
This section describes the orthoscopic observation procedure. This observation method is the characteristic method for polarizing microscopes. In this method, the specimen is observed with the polarizer and the analyzer placed in the optical path.

The shape of the specimen in the direction of the optical axis and its optical properties in the direction of the thickness can be observed. The vibration direction of the light and the property of the refraction can be measured with observing light extinction or interference colors of specimens using the circular graduated stage.

1 **Focus on the specimen with the diascopic bright-field microscopy. (Refer to Page 12, "1. Diascopic Bright-field Microscopy.")**

2 **Pull out the analyzer slider of the polarizing intermediate tube to locate the analyzer into the optical path.**

Set the scale for the analyzer to the "0" position. And, remove the Bertrand lens from the optical path.
See Pages 37 and 39.



3 **Set the polarizer for the diascopic microscopy into the polarizer rotation ring.**

See Page 36.

4 **Adjust the orientation of the polarizer and the analyzer.**

See Page 38.
After the adjustment, observe the specimen and focus on it again.

5 **Perform the orthoscopic microscopy.**

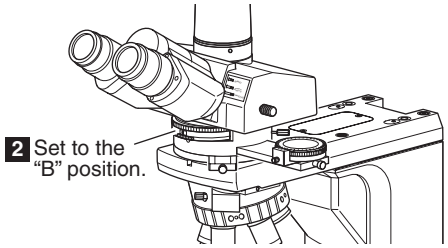
- You can measure the retardation in various range with the P-CL 1/4 λ & tint plate.
  See Page 40.
- The condenser aperture diaphragm and the field diaphragm must be adjusted in the same ways for the bright-field microscopy.
  See Pages 31 and 32.
- The top lens of the swing-out condenser must be operated depending on the magnification of the objective to be used.
  See Page 29.

3 Conoscopic Observation

This section describes the conoscopic observation procedure. This is the characteristic observation method of polarizing microscopes. In this method, the specimen is observed with the polarizer, the analyzer, and the Bertrand lens placed in the optical path.
The specimen can be observed from various angles with diascopic light in the form of a single image. However, the shape of the specimen itself is not visible with this observation. You can distinguish the property of the specimen between uniaxial and biaxial and can observe the optical axial angle and optical characteristics of the specimen.

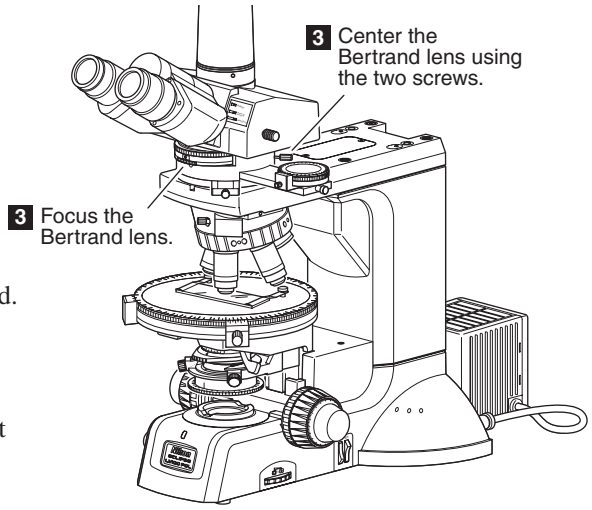
1 **Perform the orthoscopic observation. (Refer to Page 16, "2 Orthoscopic Observation.")**

2 **Rotate the Bertrand lens turret on the polarizing intermediate tube to the "B" position to locate the Bertrand lens into the optical path.**
See Page 39.



3 **Focus and center the Bertrand lens.**
See Page 39.

4 **Perform the conoscopic microscopy.**
- The P-CL 1/4 λ & tint plate is not used in this microscopy. Move it to the vacant position.
- Select an objective having a large numerical aperture (high magnification: normally 40x or higher).
- The condenser aperture diaphragm should be adjusted so that its image circumscribes the conoscopic view field or should be fully opened.
- The field diaphragm should be adjusted so that its image circumscribes the conoscopic view field.
- The top lens of the P swing-out condenser must be placed in the optical path.
See Page 29.



The table below shows the settings for the orthoscopic microscopy and the conoscopic microscopy.

	Orthoscopic observation		Conoscopic observation
Observation purpose	Observation for light extinction or interference color of the specimen to detect the vibration direction of the light and the property of the double refraction.		Observation for the property between uniaxial and biaxial and observation for the optical axial angle and optical characteristics.
Bertrand lens	OUT ("0" position)		IN ("B" position)
Top lens of the P swing-out condenser	10x or higher	IN	IN
	4x or lower	OUT	
Condenser aperture diaphragm	10x or higher	70% to 80% of the numerical aperture of the objective	Circumscribe the conoscopic view field (or fully open)
	4x or lower	Fully open	
Field diaphragm	10x or higher	Circumscribe the view field	Circumscribe the conoscopic view field
	4x or lower	Fully open	

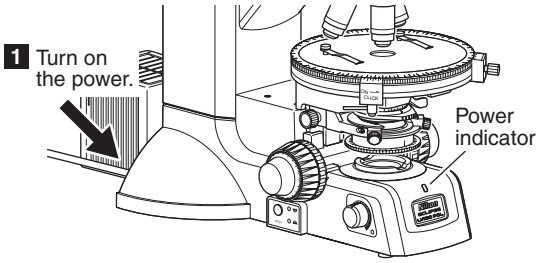
4 Episcopic Microscopy (with the Epi Illuminator Option)

When the epi illuminator is attached, you can perform the episcopic microscopy with the episcopic illumination lamp house.

Check the cumulative lit-on time of the lamp before the microscopy. If the cumulative lit-on time has exceeded the average operation life, replace the lamp with new one.

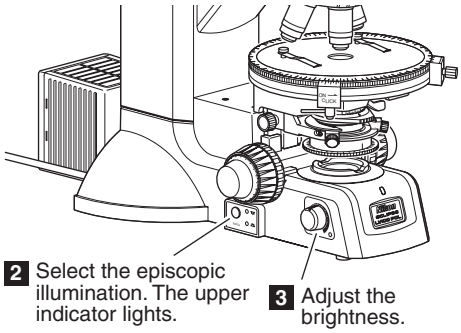
1 **Turn on the power switch of the microscope.**

When the microscope power is turned on, the power indicator on the microscope base is lit.
See Page 22.



2 **Push the epi/dia selection switch to select the episcopic illumination. The indicator for the episcopic illumination (upper side) turns on.**

See Page 23.

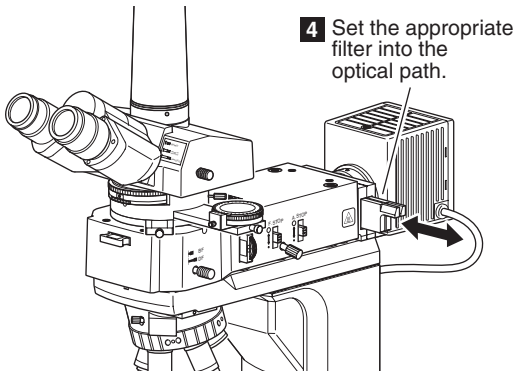


3 **Turn the brightness control knob to adjust the brightness.**

When the brightness control knob is turned, the brightness of the illumination selected by the epi/dia selection switch is changed.
See Page 23.
When the lamp lights, the power indicator on the microscope base lights green.

4 **When necessary, operate the filter slider on the epi illuminator to locate the desired filters into the optical path.**

Filter type	Intended use
NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND4, 16 (ND filter)	For brightness adjustment (ND4: transmittance 25%, ND16: transmittance 6%)
GIF (green interference filter)	For contrast adjustment
IF (interference filter)	For interference



5 **Pull out the polarizer slider on the epi illuminator to remove the polarizer from the optical path.**
See Page 36.

6 **Push in the analyzer slider on the polarizing intermediate tube to remove the analyzer from the optical path.**
See Page 37.

7 **Move the Bertrand lens turret to the "0" position to remove the Bertrand lens from the optical path.**
See Page 39.

8 **Push in the illumination selector lever on the epi illuminator to set the bright-field (BF) position for it.**
See Page 42.

9 **Rotate the nosepiece to place the 10x objective into the optical path.**

10 **Set the specimen in place with the cover glass facing up.**

11 **Fully open the field diaphragm and the aperture diaphragm on the epi illuminator.**
See Pages 43 and 44.

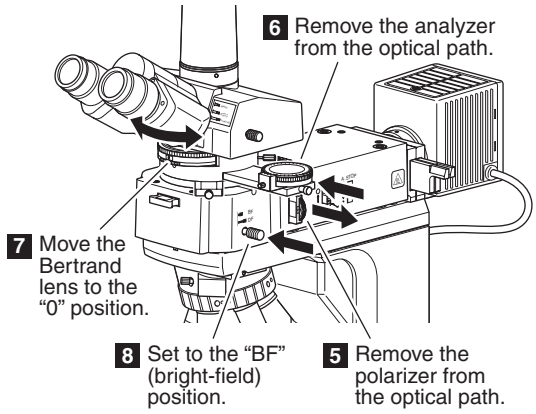
12 **When using the trinocular eyepiece tube, set the optical path selector lever to the position where 100% light goes through the binocular eyepiece.**
See Page 27.

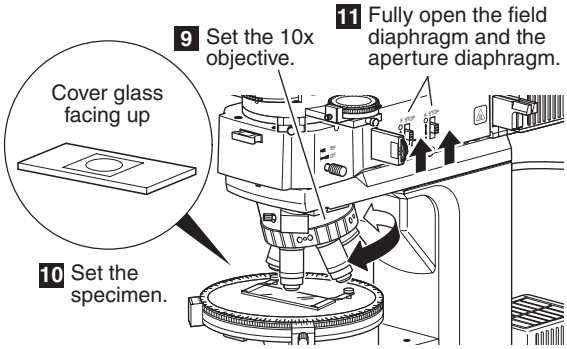
13 **Adjust the diopters and the interpupillary distance.**
See Page 28.

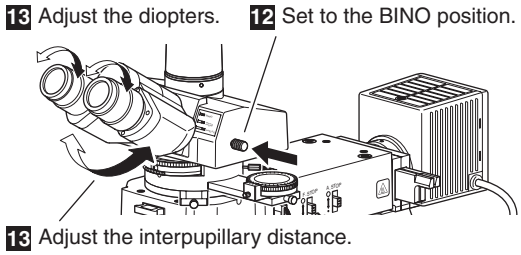
14 **Focus on the specimen.**
Fully loosen the coarse focus stopper ring.
See Page 25.

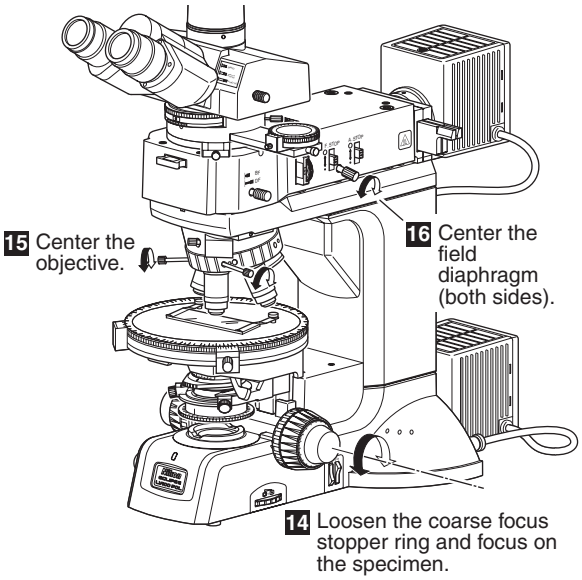
15 **Center the objective.**
See Page 33.

16 **Center the field diaphragm.**
See Page 43.





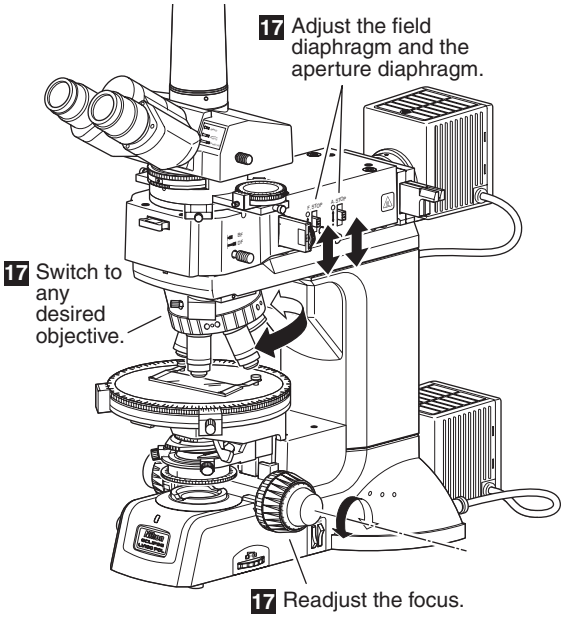




17 **Rotate the nosepiece to locate the desired magnification objective into the optical path. Then, perform the microscopy.**

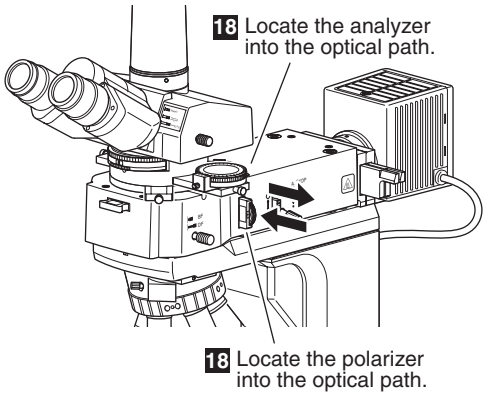
- Each time you change objectives, the field diaphragm and the condenser aperture diaphragm on the epi illuminator must be adjusted.
  - The field aperture should be adjusted so that its image circumscribes the view field.
  - And the aperture diaphragm should be 70% to 80% of the numerical aperture of the objective.

  See Pages 43 and 44.
- Focus on the specimen again using the fine focus knob or the coarse focus knob.
  See Page 25.
- Use the ND filters on the epi illuminator to adjust the brightness.
  See Page 44.
- To use an oil immersion type objective or a water immersion type objective, perform the oil immersion or water immersion.
  See Pages 34 and 35.



18 **To perform the episcopic polarization microscopy, locate the polarizer on the side of the epi illuminator into the optical path and locate the analyzer on the polarizing intermediate tube into the optical path.**

- The polarizer azimuth should be adjusted with the ring on the polarizer slider.
  See Page 36.



19 **To return to the bright-field microscopy**

- Fully rotate the brightness control knob to the far side to turn off the epi illumination lamp.
- Pull out the illumination selector lever on the epi illuminator to set the dark-field (DF) position for it.
- Push the epi/dia selector switch to select the diascopic illumination. The indicator for the diascopic illumination (lower side) turns on.
- Rotate the brightness control knob to turn on the diascopic illumination lamp and adjust the brightness.
- Remove the analyzer out of the optical path.

20 **Turn off all the power after completing the observation.**

5 Photomicroscopy

For detailed information for the camera, photomicroscopic software, and PC, refer to the operating manuals provided with the respective products. The following instructions assume that the digital camera DS-5M and the camera control unit DS-L1 are used.

1 Adjust the microscope for proper image observation.

Refer to Page 12, "1 Diascopic Bright-field Microscopy" through Page 18, "4 Episcopic Microscopy."

2 Adjust the camera head attaching position until the image is displayed properly on the monitor.

Loosen the attachment guide fixing screw on the C mount and adjust the camera position so that moving the stage left-right moves the image on the monitor in the opposite direction. After making the appropriate adjustments, tighten the screws firmly.

3 Make camera settings.

For detailed information, refer to the instruction manual provided with the camera.
When using the DS-L1, you must choose and enter at least the following information:

- Folder for data storage
- Name of the file to be saved (You can select "Auto.")
- File format and file size
- Date and destination of data

4 Select the camera scene mode suitable for the microscopy method.

5 Set the camera white balance.

To adjust the white balance, press the WB button while capturing an image of a clear section of a specimen slide.
For fluorescent photomicrography, adjust the white balance under normal lighting conditions before the image capturing.)

6 Capture and save images.

- Move the stage to get the target on the specimen.
- Readjust the focus.
- Adjust the image brightness using the camera exposure compensation function.
- Check the image using the Freeze button function.
- When the image is acceptable, press the CAPT. button to save the image.

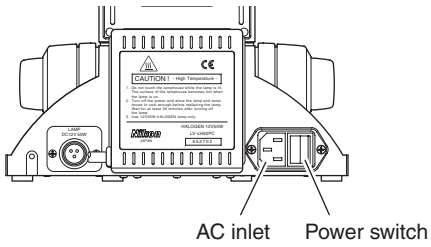
(The operating procedure differs if DF/FL scene mode is selected. For details, see the manual for the camera.)

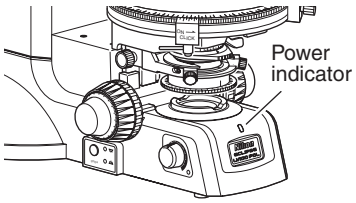
III Operation of Each Part

1 Power ON / OFF

The power switch for the microscope is located beside the AC inlet on the rear side.
To turn on the microscope, push the power switch to the "|" side. To turn off the microscope, push the power switch to the "○" side.

When the power to the microscope is on, the power indicator on the front side of the microscope is lit. (When the lamp is off, the indicator is orange, and when the lamp is on, the indicator is green.)





▶ Power supply for the lamp

The LV100POL has a built-in power supply circuit for the halogen lamp. With the specified lamp house (LV-LH50PC), the lamp lights up simultaneously as the power supply for the microscope is turned on.

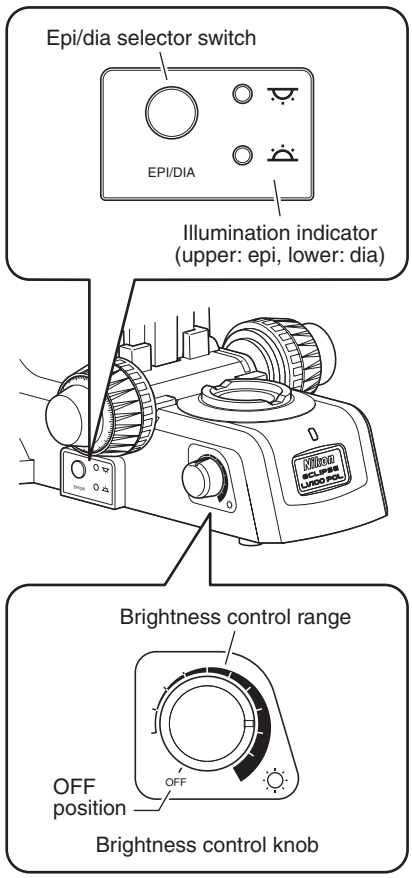
> ***Power supply for the lamp***
>
> *To use a lamp other than the specified one, turn on the power supply for the light source by hand.*

2 Operation for the Illumination

▶ To select the episcopic illumination or the diascopic illumination

When the epi illuminator and the episcopic illumination lamp house are attached, the epi/dia selector switch on the left side of the microscope can be used to select either the episcopic illumination or the diascopic illumination. Each time the switch is pressed, the illumination toggles and the indicator for the selected illumination lights.

* When the epi illuminator is not attached, the switch can be used to turn on/off the diascopic illumination lamp.



▶ Brightness control and lamp power supply

When the brightness control knob is turned, the brightness of the illumination selected by the epi/dia selector switch is changed.

* To use an external light source, adjust the brightness at the light source side or use the ND filters on the microscope or the epi illuminator to adjust the brightness.

A switch is included in the brightness control knob to turn on/off the lamp. Turn the brightness control knob to the far side (counter clockwise) and position to the OFF to turn off the illumination selected by the epi/dia selector switch.

* When an external light source is used, the illumination is turned on/off at the light source side.

Color temperature shift affected by the brightness control

Adjusting brightness with the brightness control knob will affect the lamp color temperature and alter the color balance of the image. If accurate color reproduction is critical, adjust the brightness control knob to the "three o'clock" position. In other words, turn the index mark to the horizontal position. (See the figure above.) In this adjustment, the lamp voltage becomes about 9 V. And you can get the best color reproduction with NCB11 filter. When adjusting the brightness, use ND filters.

▶ Power indicator

The color of the power indicator changes in accordance with the halogen lamp condition. When the halogen lamp is lit, the indicator is green. When the brightness control knob is set to the OFF position, the indicator is orange.

3 Filter Operation

For the diascopic illumination

Two filters are installed in the base of the microscope.
And filter selector switches for the filters are located at the right side of the microscope. To locate the filter into the optical path, push the lower side of the switch. To remove the filter from the optical path, push the upper side of the switch.

Filter type	Intended use
NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND8 (ND filter)	For brightness adjustment (transmittance 12.5%)

For the episcopic illumination

Two filter sliders are located near the rear side of the epi illuminator. Each slider can holds two filters. Push in or pull out the filter slider to locate the filters. To attach filters to the filter slider, see Page 50.

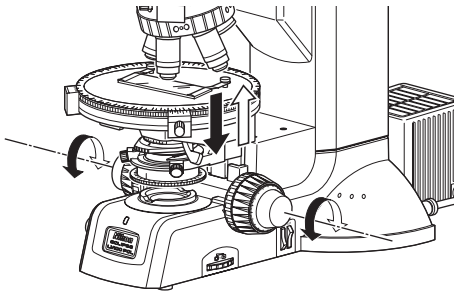
Filter type	Intended use
NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND4 (ND filter)	For brightness adjustment (transmittance 25%)
ND16 (ND filter)	For brightness adjustment (transmittance 6%)
GIF (green interference filter)	For contrast adjustment
IF (interference filter)	For interference

4 Coarse Focus Knob / Fine Focus Knob Operation

▶ Knob rotation and stage vertical movement

The right figure relates the rotation direction of the coarse focus knob/fine focus knob to the vertical movement of the stage.

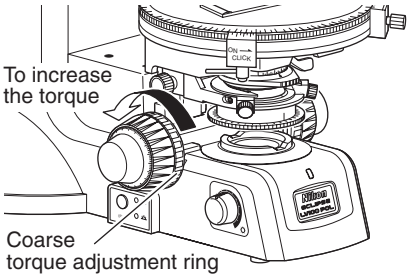
- The stage rises/falls approximately 14.0 mm per one turn of the coarse focus knob.
- The stage rises/falls approximately 0.1 mm per one turn of the fine focus knob.
- The fine focus knob is marked in 1 μm.
- The vertical movable range (coarse/fine focus stroke) of the stage is from 1 mm above the reference position (upper surface of the stage) to 29 mm below the reference position.



Never attempt either of the following actions, as they will damage the microscope.
- *Rotating the left and right knobs in opposite directions at the same time.*
- *Continuing to rotate the coarse/fine focus knob after the stage has reached the limit of its movement.*

▶ Adjusting the torque of the coarse focus knob

The torque of the coarse focus knob can be adjusted.
To increase the torque, turn the coarse torque adjustment ring in the direction shown by the arrow on the microscope base (labeled "TORQUE →"). To decrease the torque, turn the ring opposite to the arrow.

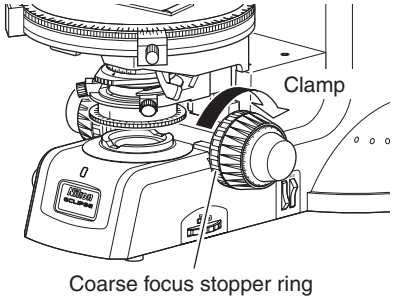


▶ Coarse focus stopper

The coarse focus stopper restricts the movement of the coarse focus knob so that the stage cannot be raised higher than the position the operator specifies.
When the coarse focus stopper ring is rotated in the direction of the arrow (labeled "CLAMP →") on the microscope base, the coarse focus knob cannot be used to move the stage any higher. (Movement of the stage by the fine focus knob is not restricted.)
For example, once the coarse focus knob is clamped in place at the focus position, a rough focus can be attained the next time simply by raising the stage until the coarse focus knob cannot be turned any further.
If the coarse focus stopper is not being used, be sure to turn the ring in the direction opposite to the arrow on the microscope base as far as it goes.

[Example usage]

With the sample in focus, turn the coarse focus stopper ring as far as it goes in the direction of the arrow (labeled "CLAMP →") on the microscope base (about 3/4 revolution). The coarse focus stopper is now clamped in position.
When changing the sample, lower the stage by turning only the coarse focus knob. After changing the sample, gently raise the stage by turning only the coarse focus knob as far as it goes. The sample should be roughly in focus when the stage has been raised as far as it goes. Use the fine focus knob to bring the sample into perfect focus.

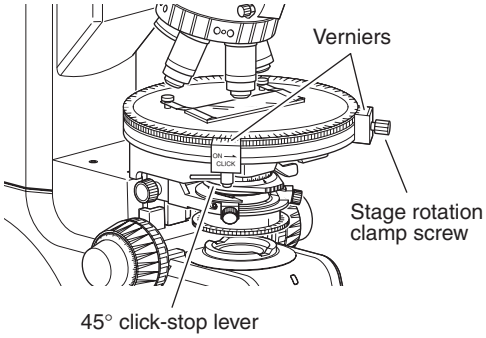


5 Stage Rotation

> ***Caution***
>
> *Do not try to put a large specimen on the stage if the specimen is larger than the stage.*

▶ Stage rotation

To rotate the circular graduated stage, loosen the stage rotation clamp screw and turn the whole stage carefully by hand.
The angle of rotation can be read to 0.1 degrees with the two vernier scales.

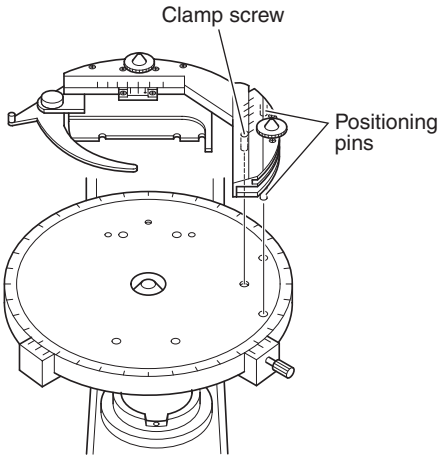


▶ 45° click-stop function

Turning the 45° click-stop lever towards the front until it stops causes the click-stop function to move in 45° increments from the position where the lever was rotated. This makes it possible to move easily and accurately from the extinction position to the diagonal position.
Turning the lever towards the back until it stops releases the click-stop function.
Release the click-stop function where the stage has dropped into a click position. If the click-stop function is released where the stage is not at this position, the first 45° increment will not be accurate the next time the click-stop function is operated.

▶ Attachable Mechanical Stage (Option)

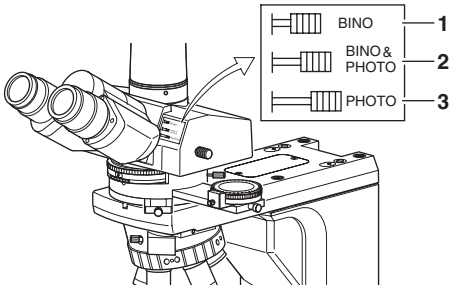
The optional attachable mechanical stage is installed by inserting the two pins on the bottom into the two pinholes on the stage surface. Tighten the clamp screw using the supplied hexagonal wrench.
To move the specimen position under observation, rotate the knob on the stage. You can adjust the position in the X-direction and Y-direction individually. (Travel range: 35 x 25 mm) The travel amount can be read to 0.1 mm with the two vernier scales.
Specimens are fixed with a lever. So you can change specimens with easy operation.



6 Trinocular Eyepiece Tube Operation

▶ Optical path selection

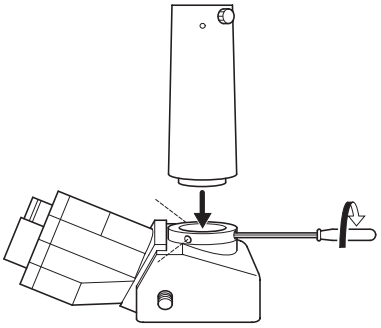
The optical path selector lever can be used to select the way to distribute light to the binocular part and the vertical tube.
When the lever is pushed in as far as it goes, the distribution of light for the binocular part is 100%. When the lever is pulled out, the distribution of light for the vertical tube is 100%. When the lever is at the middle position, the distribution of light for the binocular part is 20% and the distribution of light for the vertical tube is 80%.



Lever position	Distribution of light	
	Binocular part	Vertical tube
1	100	0
2	20	80
3	0	100

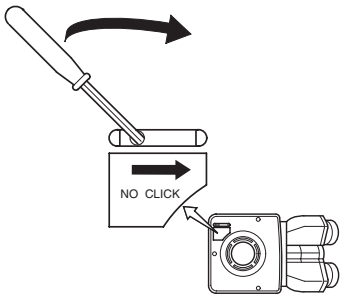
▶ Vertical tube adapter

The TV vertical tube adapter or the TV vertical tube adapter 0.55x can be mounted on the vertical tube section of the trinocular eyepiece tube.
To mount the adapter, remove the cap from the vertical tube section of the trinocular eyepiece tube, insert the vertical tube adapter, and fix it with three screws on the vertical tube section with the attached tool.



▶ Disabling the clicking of the optical path selection lever

The trinocular eyepiece tube has a “NO CLICK” switch on the tube attaching surface. Slide this switch in the direction of the arrow with the tip of a pointed tool to disable clicking for the optical path switching lever. Set the switch to this position if you need to eliminate the slight vibrations resulting from the clicking action.

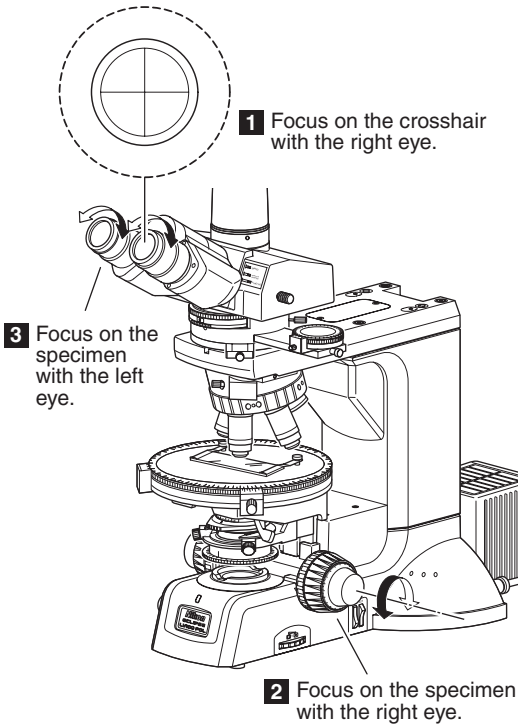


7 Diopter Adjustment

Diopter adjustment compensates for differences in visual acuity between the right and left eyes. This adjustment improves binocular observation and minimizes focal deviation when switching objectives.

In the case of a polarization microscope, since an eyepiece containing crosshairs is used for the right eye, the procedure for adjusting the diopter differs from that of an ordinary microscope.

1. Observe the right eyepiece with the right eye. Turn the diopter adjustment ring to bring the crosshair in the eyepiece into focus.
2. Still observe the right eyepiece with the right eye. Turn the fine/coarse focus adjustment knob to bring the specimen on the stage into focus.
3. Observe the left eyepiece with the left eye. Turn the diopter adjustment ring on the eyepiece to bring the specimen into focus. (not the fine/coarse focus adjustment knob)

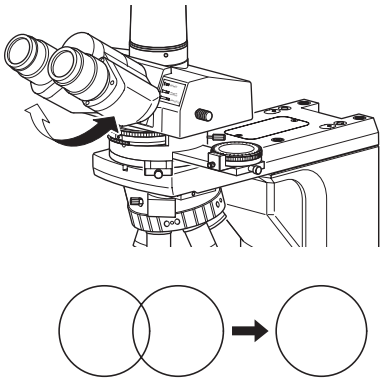


8 Interpupillary Distance Adjustment

Interpupillary distance adjustment improves the ease of binocular observation.

Perform steps 1 to 14 on Page 12 “Diascopic Bright-Field Microscopy” and focus on the specimen using the 10x objective. Then, move the eyepiece sleeve until the view fields for the right and left eyes coincide.

In addition, the binocular part has a scale for the interpupillary distance. Make a memo of your interpupillary distance for future adjustments.



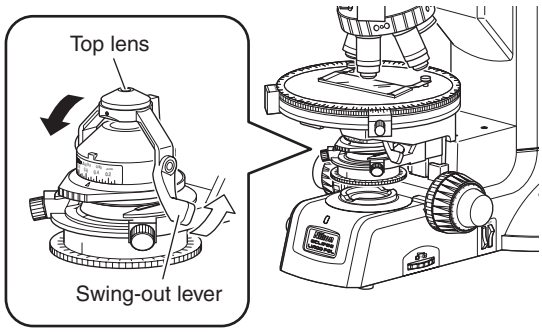
Converge until the right and left view fields coincide.

9 Condenser Operation

The P swing-out condenser must be attached to perform the polarization microscopy.

▶ How to use the P swing-out condenser

The top lens of the P swing-out condenser can be moved outside the optical path with the swing-out lever.
During normal bright-field microscopy or orthoscopic microscopy using a low-power objective of 4x or lower, swing out the top lens.
During microscopies using an objective of 10x or higher or conoscopic microscopy, the top lens is placed into the optical path.
During measurement of retardation or evaluation by interference color, swing out the top lens (the condenser aperture diaphragm may be stopped down) and illuminate with light that is as parallel to the optical axis as possible.

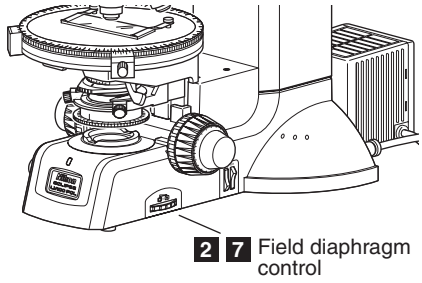


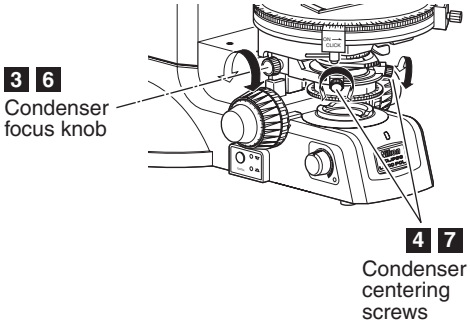
Depending on the type of objective, the indicated numerical aperture of the objective may not be achieved. For example, when an objective with an N.A. of 1.4 is used, the maximum aperture of the swing-out condenser will be only about 65% of the objective's N.A., even when the condenser aperture diaphragm is wide open.

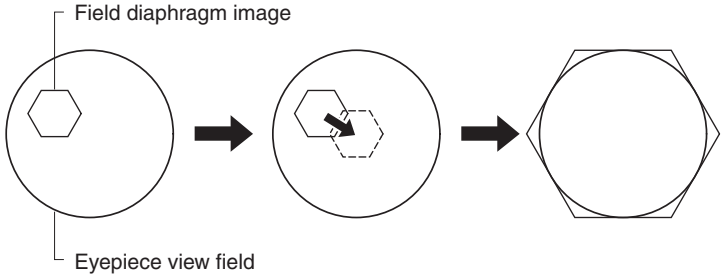
10 Focusing and Centering the Condenser

At the first time usage of the microscope or after attaching the condenser, focus and center the condenser so that the light through the condenser is focused on the correct position of the specimen surface (at the center of the optical path).

1. Perform steps in Page 12, "1 Diascopic Bright-Field Microscopy," and focus on the specimen using the 10x objective.
2. Turn the field diaphragm control on the microscope base to stop down the field diaphragm.
3. Turn the condenser focus knob to form the field diaphragm image on the specimen surface.
4. Turn the condenser centering screws (on both sides) so that the field diaphragm image is positioned in the center of the view field.
5. Locate the 50x objective into the optical path. Turn the fine focus knob to focus on the specimen.
6. Turn the condenser focus knob to form the field diaphragm image on the specimen surface.
7. Adjust the field diaphragm control and the condenser centering screws so that the field diaphragm image inscribes the view field.
8. To observe the specimen, turn the field diaphragm control so that the field diaphragm image circumscribes the view field. (Adjust the field diaphragm image every time when objectives are changed.)







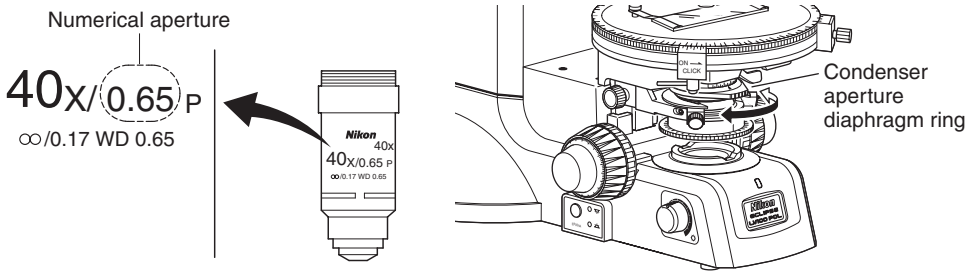
11 Adjusting the Aperture Diaphragm

The aperture diaphragm for the diascopic microscopy is adjusted with the condenser aperture diaphragm ring.
For the aperture diaphragm adjustment for the episcopic microscopy, refer to Page 42, "22 Episcopic microscopy."

For the Bright-field Microscopy and the Orthoscopic Microscopy

The aperture diaphragm is important because it is related to the resolution, contrast, depth of focus, and brightness of the optical image. Turning the condenser aperture diaphragm ring changes the size of the aperture diaphragm.
As the aperture diaphragm is stopped down, resolution and brightness are reduced while contrast and depth of focus are increased. Conversely, as the aperture diaphragm is opened, resolution and brightness are increased while contrast and depth of focus are reduced. It is not possible to adjust one pair of characteristics without affecting the other.
The numerical aperture for the condenser can be read with the scale on it. You can adjust the numerical aperture with the scale. To perform the bright-field microscopy or the orthoscopic microscopy, generally, a satisfactory image with appropriate contrast can be obtained with an aperture setting that is 70% to 80% of the numerical aperture of the objective. The numerical aperture is indicated on the barrel of each objective.

An indication of 40x/0.65 means that the magnification is 40x and the numerical aperture is 0.65.



0.65 x 0.7 to 0.8 = 0.455 to 0.52

If the aperture diaphragm is stopped down too far, the resolution is reduced; therefore, except when viewing a nearly transparent specimen, we do not recommend stopping down the aperture to less than 60% of the numerical aperture of the objective.

- **Adjusting the size of the aperture diaphragm according to the condenser scale**
  Since the condenser scale indicates the numerical aperture, adjust the aperture diaphragm ring according to the scale.
  (Normally, the index on the aperture diaphragm ring should be aligned with the scale line corresponding to 70% to 80% of the numerical aperture of the objective.)
- **Adjusting the size of the aperture diaphragm using the Bertrand lens**
  Insert the Bertrand lens into the optical path (by placing in position “B”). Turn the diaphragm control ring to stop down the aperture diaphragm to its minimum setting. Turn the Bertrand lens focus ring to focus on the aperture diaphragm image. Turn the diaphragm control ring to adjust the aperture diaphragm. (This is normally adjusted to 70-80% of the view field.)

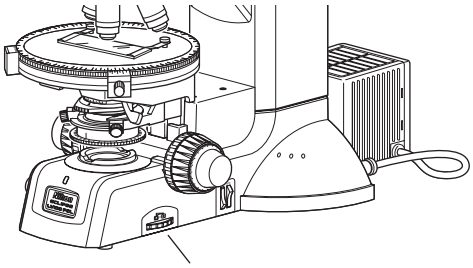
For the conoscopic microscopy

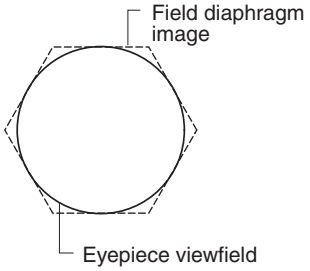
For the conoscopic microscopy, the condenser aperture diaphragm functions as a field diaphragm on the conoscopic image surface. Stop down the diaphragm until it circumscribes the circumference of the view field of the conoscopic image (pupil of the objective).

12 Adjusting the Field Diaphragm

The field diaphragm restricts illumination to the area of the specimen that is being viewed. Operating the field diaphragm control changes the size of the field diaphragm. For normal observation, the size of the diaphragm should be such that it is just outside the edge of the viewfield.
If a broader area than necessary is illuminated, stray light will enter the optical system, creating flaring, reducing the contrast of the optical image. Appropriate field diaphragm settings are particularly important for photomicrography and digital image capturing.
In general, good results will be obtained by stopping down the field diaphragm to settings slightly wider than the area to be reproduced within the photo frame or monitor display.

* For the field diaphragm of the epi illuminator, refer to Page 42, “22 Episcopic Microscopy.”





13 Filter on the Field Lens

You can attach up to two optional filters of 45 mm diameter into the filter pocket of the field lens part.

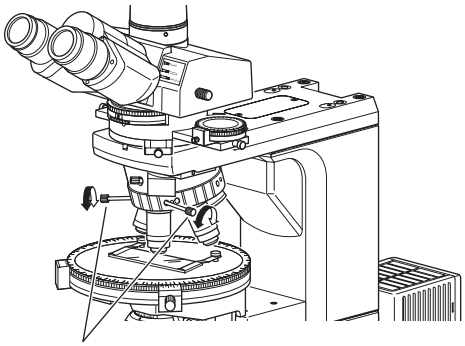
Filter type	Intended use
NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND16 (ND filter)	For brightness adjustment (transmittance 6%)
GIF (green interference filter)	For retardation measurement and contrast adjustment

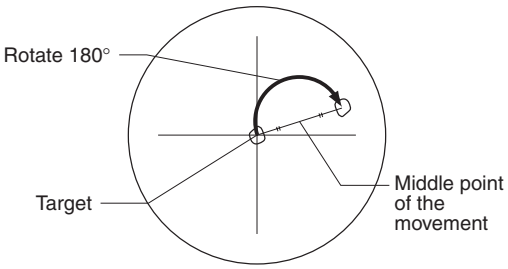
14 Centering the Objective

To perform the polarization microscopy, the center of the objective optical path must be aligned to the rotation center of the circular graduated stage. This product comes with the centering nosepiece. You can perform the centering adjustment for each objective.

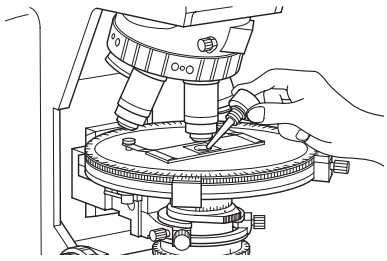
Required tools two centering tools (provided with the nosepiece)

1. Before centering the objectives, focus on a specimen using the 10x objective.
2. Bring an appropriate target such as granules that can be easily used as a marker in the specimen to the center of the crosshairs of the eyepiece.
3. Insert the centering tools into the centering screws on the nosepiece.
4. Rotate the stage about 180 degree. Move the objective using the centering tools so that the center of the crosshairs moves by one-half the amount of movement of the target.
5. Move the specimen and bring the target to the center of the crosshairs.
6. Repeat this procedure several times. Carry out this centering procedure for each objective.





15 Oil Immersion Operation



Objectives marked “oil” are oil-immersion type objectives. These objectives are used with immersion oil (option) between the specimen and the tip of the objective. Bubbles in the oil will adversely affect the viewing of the image. Be careful to prevent bubbles from forming. To check for air bubbles, fully open the field diaphragm and aperture diaphragm, remove the eyepiece, and examine the pupil (bright round section) of the objective inside the eyepiece tube. If it is difficult to ascertain the presence of bubbles, attach an optional centering telescope with an optional adapter, then check for air bubbles while turning the eyepiece section of the centering telescope to adjust focus. If you detect bubbles, remove them by one of the following methods:

- Turn the nosepiece slightly to move the oil-immersed objective back and forth once or twice. (In the case of the condenser, gently turn the condenser focus knob to move the condenser up and down slightly.)
- Apply more oil.
- Remove the oil and replace it with new oil.

Use as little oil as possible (just enough to fill the space between the tip of the objective and the specimen, or between the tip of the condenser and the specimen). If too much oil is applied, the excess oil will flow onto the stage or around the condenser.

▶ Wipe off oil

Any oil remaining on the oil-immersion objective or adhering to the dry-type objective will noticeably degrade image quality. After use, thoroughly wipe off all oil, and make sure that no oil remains on the tips of other objectives. Oil on the condenser should also be wiped away carefully after use.
Use petroleum benzine to wipe off immersion oil. For optimum results, we recommend following up petroleum benzine with absolute alcohol (ethyl or methyl alcohol).
If petroleum benzine is unavailable, use methyl alcohol alone. However, methyl alcohol does not clean as well as petroleum benzine, it will be necessary to wipe the surface repeatedly. (Usually, three- or four-times wipe is sufficient to clean the lenses.)

WARNING When using petroleum benzine or absolute alcohol, always follow the instructions provided by the manufacturer. These liquids are highly flammable and must be kept away from flames and sparks.

16 Water Immersion Operation

Objectives marked “WI” or “W” are water-immersion type objectives. These objectives are used with immersion water (distilled water or physiological saline) applied between the specimen and the tip of the objective. Microscopy procedures are the same as for oil-immersion type objectives. Since water evaporates readily, monitor the immersion water during observation. Avoid using too much water, since excess water will flow onto the stage and around the condenser, promoting corrosion.

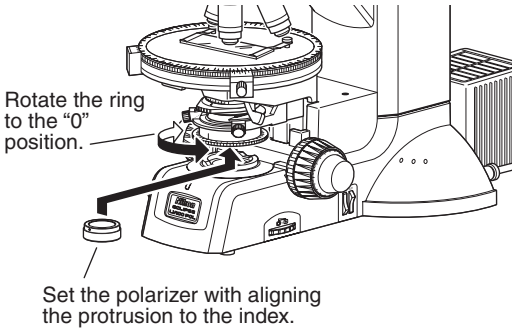
▶ Wipe off water

After use, wipe off water from the tip of the objective and condenser, then follow up by wiping with absolute alcohol.
If you observe water stains, apply a small amount of neutral detergent and wipe gently, then follow up with absolute alcohol.

17 Operation of the Polarizers

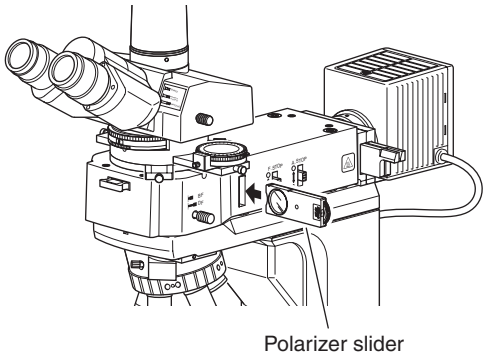
▶ Polarizer for the diascopic microscopy

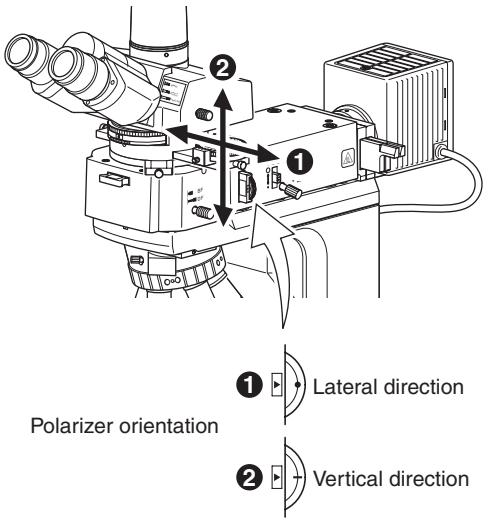
To perform the diascopic polarization microscopy, attach the polarizer for the diascopic microscopy into the polarizer rotation ring.
On the polarizer, there is a protrusion to identify its orientation. Set the scale for the polarizer orientation on the lower part of the condenser to the “0” position. And attach the polarizer so that its protrusion is aligned to the index on the polarizer rotation ring.
You can change the polarizer orientation using the polarizer rotation ring.



▶ Polarizer for the episcopic microscopy

To perform episcopic polarization microscopy, attach the polarizer for the episcopic microscopy into the epi illuminator.
Insert the polarizer slider with the orientation index facing front side (eyepiece side).
Pushing the polarizer slider in to the first click-stop position inserts the empty hole into the optical path. Pushing it further in to the second click-stop position inserts the polarizer into the optical path.
You can change the polarizer orientation using the polarizer rotation ring.

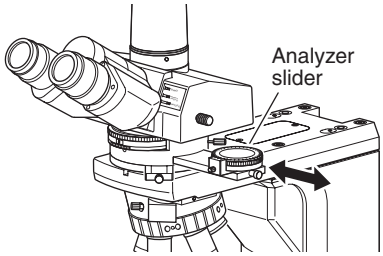




18 Operation of the Analyzer

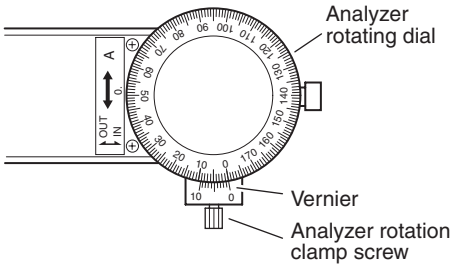
▶ Attach/detach the analyzer

The polarizing intermediate tube has the analyzer slider. The analyzer can be placed into the optical path with the operation of the slider.
To place the analyzer into the optical path, pull out the slider. To remove the analyzer from the optical path, push in the slider.
The analyzer is designed to be inserted from the right side of the polarizing intermediate tube in normal use, but it can be inserted from the left. In the later case, its scale displays the opposite way. Be careful.



▶ Rotate the analyzer

The analyzer slider has a rotating dial. The orientation of the analyzer can be rotated with it. To adjust the analyzer, loosen the analyzer rotation clamp screw and rotate the rotating dial. The angle of rotation can be read from 0 to 180 degrees in steps of 0.1 degrees with the two vernier scales.

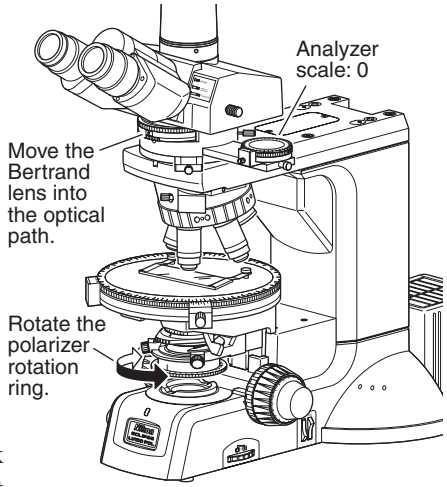


The intermediate tube also has a de-polarizer. You can use the photomicrography device or so on independently of the orientation of the polarizer.

19 Azimuth Adjustment of the Polarizer and Analyzer

For the diascopic observation

1. Remove the polarizer and analyzer from the optical path.
2. Focus on the specimen.
3. Pull out the analyzer slider and move the analyzer into the optical path.
4. Turn the analyzer rotation dial and align at the “0” position on the scale.
5. Turn the polarizer rotation ring and align at the “0” position. Locate the polarizer for the diascopic microscopy into the optical path and align its orientation to the index.
6. Move the specimen out of the optical path.
7. Move the Bertrand lens into the optical path. The pupil of the objective will then be visible through the eyepiece.
8. Turn the polarizer rotation ring for the diascopic microscopy and adjust the orientation so that the dark cross image appears in the pupil as shown in the right figure.
   This is so-called the crossed Nicols position, where the orientations of the polarizer and analyzer coincide with those of the orientation plate on the microscope base (the polarizer, P, is in the X direction and the analyzer, A, is in the Y direction).

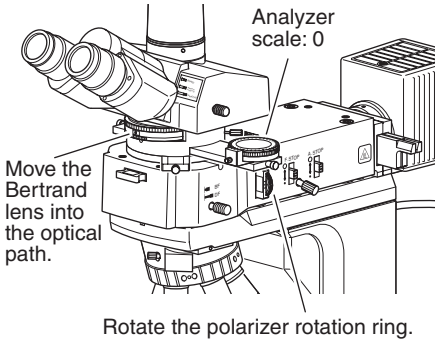


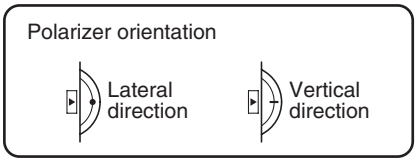
dark-cross

It should be noted that the X direction is explained as that of the analyzer and Y direction as that of the polarizer in some commercially available technical manuals and reference books.

For the episcopic observation

1. Push in the analyzer setting knob and move the analyzer out of the optical path.
2. Place a dummy specimen on the stage. It must have high reflectance with optical isotropy, for example a mirror. And then, focus on the specimen.
3. Pull out the analyzer slider and move the analyzer into the optical path.
4. Turn the analyzer rotation dial and align at the “0” position on the scale.
5. Push in the polarizer slider on the epi illuminator to place the polarizer for the episcopic microscopy into the optical path.
6. Move the Bertrand lens into the optical path.
7. Turn the polarizer rotation ring for the episcopic microscopy and adjust the orientation so that the dark cross image appears in the pupil as shown in the right figure.
   When the dark cross can be seen, the condition is called the crossed Nicols.





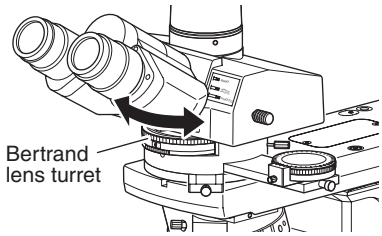
dark-cross

20 Bertrand Lens Operation

The polarizing intermediate tube has the Bertrand lens. The Bertrand lens can be placed into the optical path to perform the conoscope observation.

▶ Setting the Bertrand lens

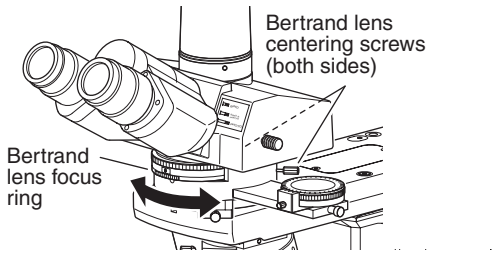
Put the Bertrand lens turret in the “B” position to move the Bertrand lens into the optical path.
Put the Bertrand lens turret in the “0” position to remove the Bertrand lens from the optical path.



▶ Focusing and centering the Bertrand lens

The objective pupil positions vary by magnification and type. So, each time objectives are switched, the Bertrand lens must be adjusted.
Besides, the Bertrand lens must be centered so that it is aligned to the optical path of the objective. Note that you need not center the Bertrand lens each time in the case that you have centered the objective already. (Page 33)
In this adjustment, the aperture diaphragm image is used in the same manner as the condenser lens adjustment. Do as follows:

1. Perform steps in Page 12, “1 Diascopic Bright-Field Microscopy,” and focus on the specimen.
   And focus and center the condenser. (Page 30)
2. Move the Bertrand lens into the optical path.
3. Stop down the aperture diaphragm of the condenser to get a diaphragm image into view.
4. Perform the focusing for the Bertrand lens.
   Adjust the Bertrand lens focus ring on the polarizing intermediate tube to get a clear image of the diaphragm.
5. Fully stop down the aperture diaphragm of the condenser.
6. Center the Bertrand lens.
   Rotate two centering screws on the polarizing intermediate tube so that the diaphragm image comes to the center of the field of view.



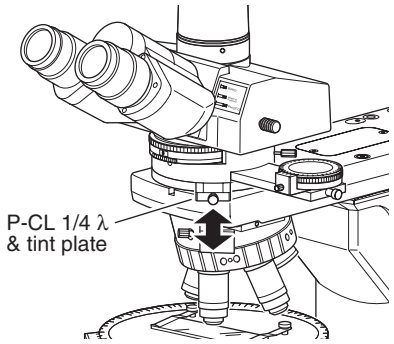
21 How to Use Examination Plates

The polarizing intermediate tube has a slot for examination plates. It is used not only for the standard P-CL 1/4 λ & tint plate but also for the optional P-CS Senarmont compensator, the PCW quartz wedge, or so on to perform the retardation measurement.

To use an objective of 10x or higher magnification in standard observation, place the top lens of the P swing-out condenser into the optical path. To perform the retardation measurement or to perform evaluation by interference color, the illumination light must be as parallel to the optical axis as possible. So, the condenser aperture diaphragm must be stopped down or the top lens of the swing-out condenser must be swung out (the aperture diaphragm is fully opened), even if an objective of 10x or higher is used.

▶ P-CL 1/4 λ & tint plate

The P-CL 1/4 λ & tint plate has an empty hole in the center. By pushing it into the slot, the sensitive color plate (530 nm) is placed into the optical path. Pulling it out places the 1/4 λ plate into the optical path.
This plate is used for recognition of very weak birefringence and the determination of X' and Z' of the specimen.



▶ P-CS Senarmont compensator

Remove the P-CL 1/4 λ & tint plate from the slot of the polarizing intermediated tube and insert the P-CS Senarmont compensator into the slot.
You can measure retardation of light up to 1 λ with the following steps.

1 Determination of extinction position

Rotate the stage with the specimen under the crossed Nicols to find the direction where the part of the specimen to be measured appears darkest.

2 Determination of subtraction position

Rotate the stage 45 degree from the extinction position to place a diagonal position. Insert the P-CL 1/4 λ & tint plate into the optical path and confirm that the interference color of the section of the specimen to be measured changes toward the lower order side. If the interference color changes toward the higher order side, rotate the stage another 90 degree.

3 Measurement

Place the GIF filter on the field lens and remove the P-CL 1/4 λ & tint plate and locate the P-CS Senarmont compensator.
Rotate the analyzer so that the section of the specimen to be measured becomes darkest. When the rotation angle of the analyzer at that time is taken to be theta (θ) degrees, then retardation (R) (nm) is determined with the following formula:

$$R = \frac{\theta}{180}\lambda \text{ (}\lambda\text{: wavelength to be used)}$$

The value of λ when using the GIF filter is 546 nm.

P-CQ quartz wedge

The P-CQ quartz wedge is used by inserting it into the slot of the intermediate tube in place of the P-CL 1/4 λ & tint plate.
The quartz wedge is engraved with a scale and can be used for rough measurement of retardation in the range of 1 λ to 6 λ.

1 Determination of extinction position

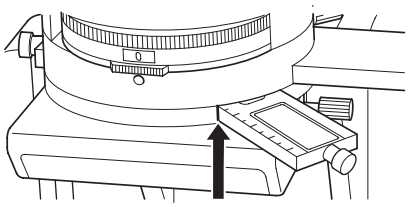
Rotate the stage with the specimen under the crossed Nicols to find the direction where the part of the specimen to be measured appears darkest.

2 Determination of subtraction position

Rotate the stage 45 degree from the extinction position to the diagonal position (direction where the specimen appears brightest). Insert the P-CQ quartz wedge into the slot of the intermediate tube and confirm that the interference color of the section of the specimen to be measured changes toward the lower order side. If the interference color changes toward the higher order side, rotate the stage another 90 degree.

3 Measurement

Move the section of the specimen to be measured to the center of the crosshairs of the eyepiece. Next, slide the P-CQ quartz wedge along the slot and observe that the interference color sequentially changes. Stop sliding the quartz wedge where the dark stripe covers the section of the specimen to be measured. Reading the value from the quartz wedge scale at that time can make a rough measurement of retardation.
Retardation can be measured even more accurately by using the P-CS Senarmont compensator in combination with the P-CQ quartz wedge.



Read the scale.

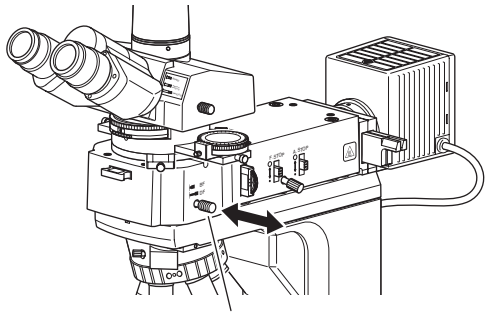
22 Episcopic Microscopy

To perform episcopic microscopy, attach the LV-UEPI universal epi illuminator and a lamp for the epi illumination to the microscope.

1. Switching the Episcopic Illumination

You can switch the illumination between the bright-field and the dark-field to be used for the episcopic microscopy by operating the illumination selector lever on the right side of the epi illuminator.

When the lever is pushed in, the bright-field (BF) illumination is specified. And when the lever is pulled out, the dark-field (DF) illumination is specified. But you cannot perform the episcopic dark-field microscopy with this microscope. Note that the dark-field setting (DF) is used for the diascopic illumination.



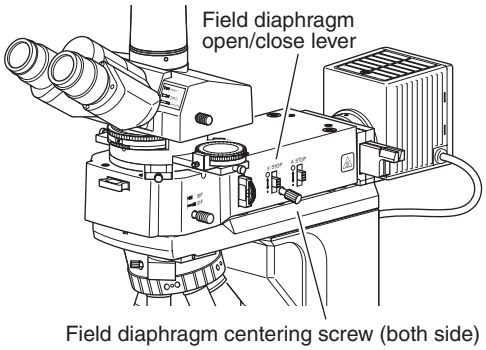
Illumination selector lever

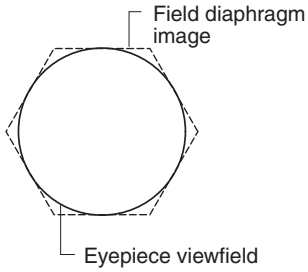
Lever position	Illumination method
Push in (BF)	Episcopic bright-field illumination (and Episcopic polarization microscopy)
Pull out (DF)	Diascopic bright-field illumination (The dark-field microscopy is not available.)

2. Field Diaphragm in the Epi Illuminator

The field diaphragm restricts illumination to the area of the specimen that is being viewed. Operating the field diaphragm open/close lever changes the size of the field diaphragm. For normal observation, the size of the diaphragm should be such that it circumscribes (or inscribes) the edge of the viewfield. If a broader area than necessary is illuminated, stray light will enter the optical system, creating flaring, reducing the contrast of the optical image.

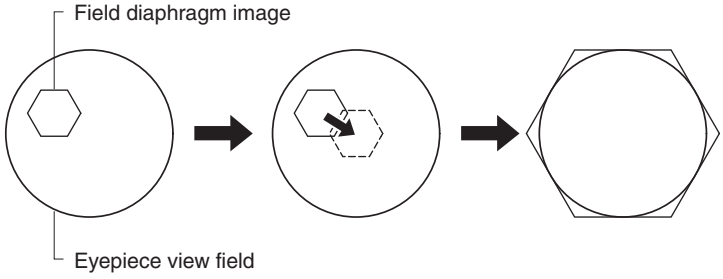
Appropriate field diaphragm settings are particularly important for photomicrography and digital image capturing. In general, good results will be obtained by stopping down the field diaphragm to settings slightly wider than the area to be reproduced within the photo frame or monitor display.





▶ Centering the field diaphragm

1. Perform steps in Page 18, “4 Episcopic Microscopy (with the Epi Illuminator Option)” and focus on the specimen using the 10x objective under the episcopic illumination.
2. Lower the field diaphragm open/close lever to stop down the field diaphragm.
3. Turn the field diaphragm centering screws (on both sides) so that the field diaphragm image is positioned in the center of the view field.
4. Adjust the field diaphragm image with the field diaphragm open/close lever and centering screws so that it inscribes the view field.
5. To observe the specimen, raise the field diaphragm open/close lever so that the field diaphragm image circumscribes the view field.



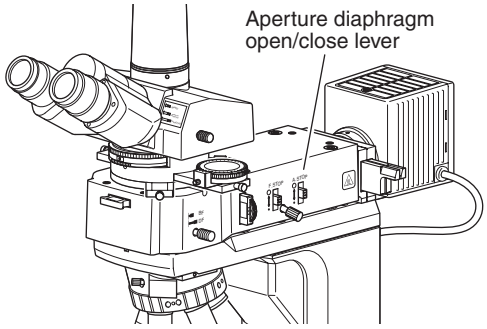
3. Aperture Diaphragm in the Epi Illuminator

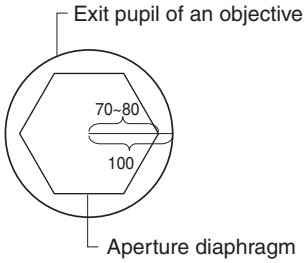
Since the aperture diaphragm is used for adjusting the numerical aperture of the illumination system, this diaphragm is related to the resolution, contrast, and depth of focus of the optical image. Generally, the aperture diaphragm should be adjusted to about 70 to 80% of the numerical aperture of the objective.

The aperture diaphragm open/close lever changes the opening of the aperture diaphragm. Remove one of the eyepieces, and then adjust the aperture diaphragm opening while observing the exit pupil of the objective (the bright area when the aperture diaphragm is fully opened) in the eyepiece tube.

The diaphragm image may not appear in the case of samples with low reflectivity. In this case, change to a sample with a near-polished surface.

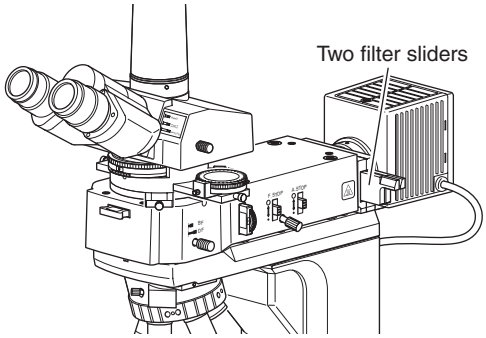
* The aperture diaphragm in the LV-UEPI illuminator was centered before shipping. You don't need center the aperture diaphragm.





4. Operating Filters on the Epi Illuminator

Two filter sliders are located near the rear side of the epi illuminator. Each slider can holds two filters. Push in or pull out the filter slider to locate the filters.



Filter type	Intended use
NCB11 (color balancing filter)	For color balance adjustment and color photomicrography
ND4 (ND filter)	For brightness adjustment (transmittance 25%)
ND16 (ND filter)	For brightness adjustment (transmittance 6%)
GIF (green interference filter)	For contrast adjustment
IF (interference filter)	For interference

23 Image Capturing

Images under the microscope observation can be captured by attaching a camera head to the trinocular eyepiece tube.
For detailed information, refer to the operating manual provided with the camera head or camera control software.

Proper adjustment of light intensity and focus on the microscope are important for obtaining clear images. Listed below are key considerations in capturing clear images.

▶ Adjusting light intensity

- **Lamp voltage:** If accurate color reproduction is important, adjust the brightness control knob to the "three o'clock" position. When adjusting the brightness, use ND filters.
- **Filter:** Place a commercially available color compensation filter on the filter pocket at the microscope base, as necessary.

▶ Adjusting the condenser

- Focus and center the condenser always.
- For normal operations, set the diaphragm aperture to 70 to 80% of the N.A. of the objective.

▶ Confirming the photomicrographic range

The image on the monitor represents the photomicrographic range.

▶ Confirming the focus

Check the focus by viewing through the eyepiece and viewing the monitor. If the focal positions for the two images differ, adjust the focal position adjustment screw at the camera port.

▶ Making Adjustments to Keep out Ambient Light

- **Field diaphragm:** Stop down the diaphragm to a setting just slightly wider than the area shown on the monitor.
- **Eyepiece:** Cover the eyepiece with a piece of cloth.

▶ Anti-vibration measures

If the exposure is less than 1/8 of one second, reduce light intensity with ND filters to make exposures longer than 1/8 of one second. (If accurate color reproduction is not important, you can use the brightness control knob to reduce light intensity.)

IV Assembly

Assemble each part of the microscope by referring to the diagram on the next page.

WARNING

- Before assembling the microscope, be sure to read the ⚠ WARNING and ⚠ CAUTION at the beginning of this instruction manual and follow the instructions written therein.
- To prevent electrical shocks and fire, turn off the power switch (flip it to the "○" side) when assembling the microscope.

CAUTION

- Be careful not to pinch your fingers or hands during assembly.
- Scratches or fingerprints on the lenses will adversely affect the microscopy image. Handle these components carefully to keep them free from scratches and fingerprints. If lenses are contaminated with fingerprint or such, clean them according to the procedure described in "VI. Care and Maintenance."
- This product is a precision optical instrument. Handle it carefully and do not subject it to a strong physical shock. (In particular, objectives may loose accuracy when exposed to even a weak physical shock.)

▶ Required tools

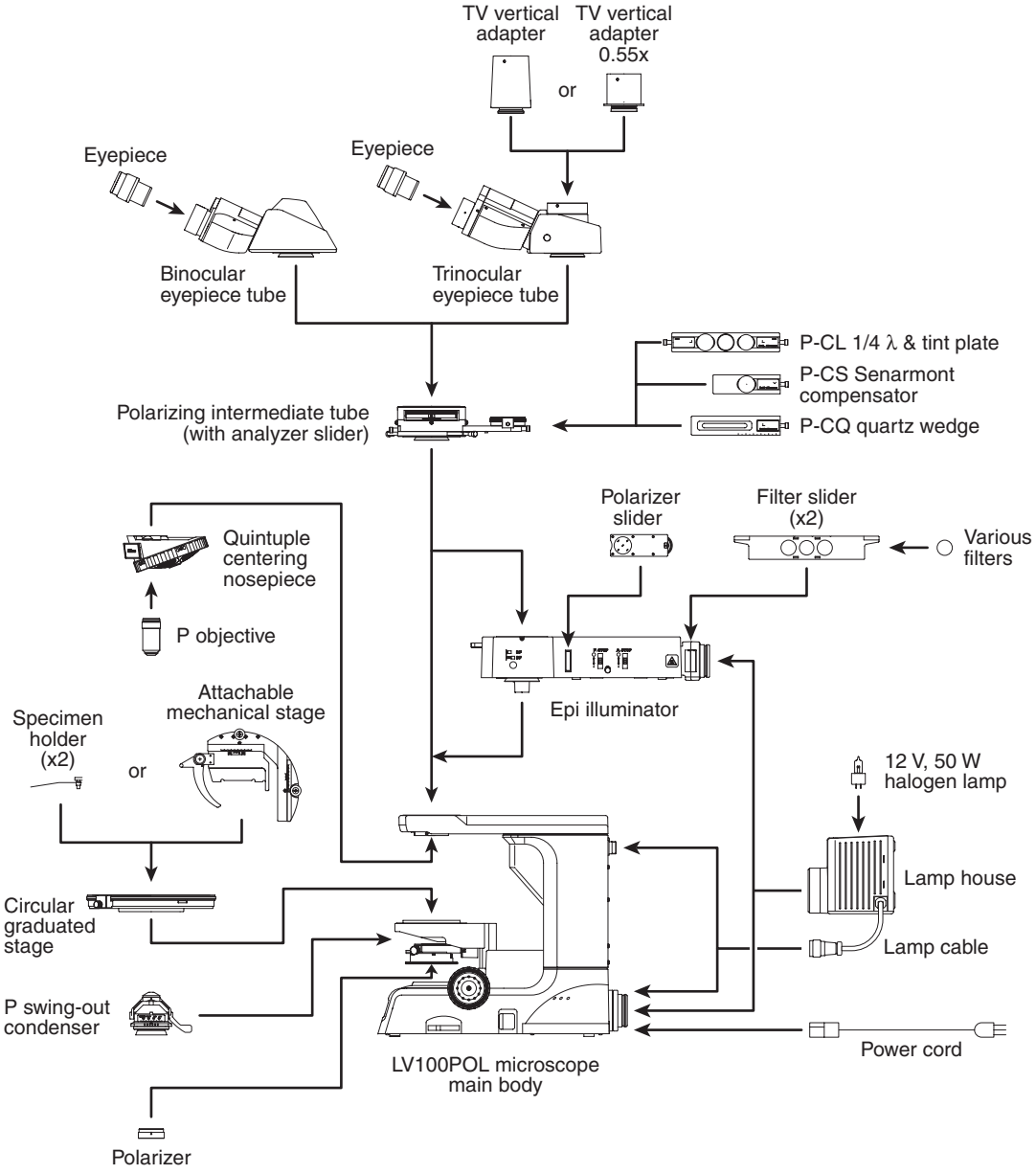
- Two hexagonal screwdrivers (2 mm) (provided with the microscope)
- One hexagonal wrench (2.5 mm) and one hexagonal wrench (3 mm) (provided with the microscope)
  When not using, place these in the tool holder at the right side of the microscope base.

▶ Installation location

This microscope system is a precision optical instrument. The usage or storage in an inappropriate environment may result in malfunctions or poor performance. Consider the following factors when selecting an installation location:

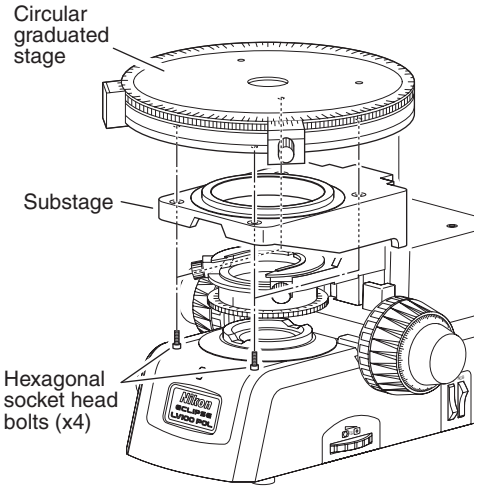
- Avoid a brightly lit location, such as exposed to direct sunlight or directly under a room light. The image quality deteriorates if there is excessive ambient light.
- Choose a location that is free from considerable dust or dirt.
- Choose a flat surface with little vibration.
- Choose a sturdy desk or table that is able to bear the weight of the instrument.
- Do not install the microscope in a hot and humid location.
- For details about the operating environment and storage environment, see "VII. Specifications."

Assembling the ECLIPSE LV100POL



1 Attaching the Circular Graduated Stage

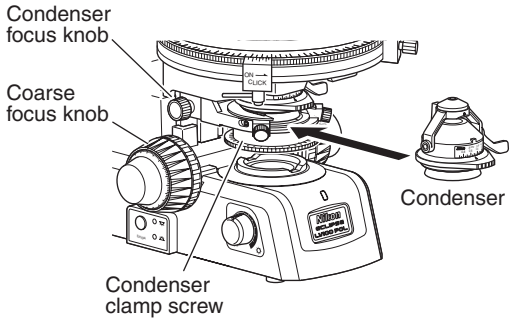
1. Remove the cushioning material from the substage section and turn the coarse focus handle until the elevating section is brought to the uppermost position.
2. Place the circular graduated stage on the substage. The stage must be level and both stage rotation clamp screws must be located in 45° directions from the microscope front when fixed.
3. Fix the circular graduated stage with four hexagonal socket head bolts via the substage in the upward direction. Use the hexagonal wrench (2.5 mm) provided with the microscope to screw the bolts.
4. If necessary, attach the specimen holders into the hole on the stage.
   For information about the optional attachable mechanical stage, see Page 26, "Attachable Mechanical Stage (Option)."



2 Attaching the Condenser

To perform the polarization microscopy, the P swing-out condenser must be attached.

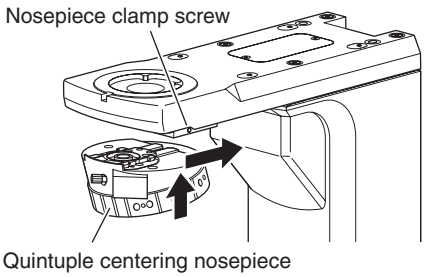
1. Turn the coarse focus knob until the elevating section is raised to the uppermost position.
2. Turn the condenser focus knob until the condenser holder is brought to the lowermost position.
3. Insert the condenser and adjust its orientation so that it faces toward the front. Secure in place using the tool provided with the microscope.
4. Turn the condenser focus knob until the condenser holder is raised to the uppermost position.



3 Attaching the Nosepiece

Attach the P-N quintuple centering nosepiece on this microscope.

1. Fully loosen the nosepiece clamp screw located on the right side of the microscope arm using the hexagonal screwdriver.
2. Insert the nosepiece along the guide groove located on the lower side of the microscope arm. And slide the nosepiece toward the back as far as it goes.
3. Fix the nosepiece with the nosepiece clamp screw.



To remove the nosepiece, reverse the attaching procedure. At this time, lower the stage fully, and remove the specimen and all objectives. Then hold the nosepiece by hand to prevent falling and remove the nosepiece.

4 Attaching Objectives

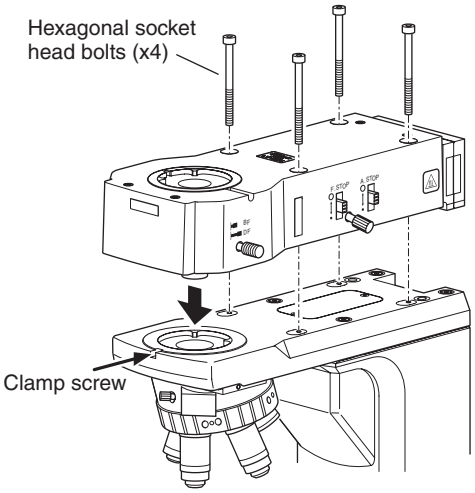
To perform the polarization microscopy, objectives exclusively designed for the polarization microscopy must be attached.
Lower the stage completely. Screw objectives into the nosepiece so that the magnification increases with the clockwise rotation (as viewed from above the microscope) of the nosepiece.

Caution when removing objectives

When removing the objectives, remove the specimen from the stage. Lower the stage completely, and hold each objective using both hands so that it does not fall during the removal.

5 Attaching the Epi Illuminator (for the Episcopic Microscopy)

1. Loosen sufficiently the illuminator clamp screw on the front of the microscope arm using the hexagonal screwdriver.
2. Mount the epi illuminator onto the microscope arm and tighten the illuminator clamp screw.
3. Tighten the hexagonal socket head bolts provided with the illuminator to fix the illuminator to the microscope arm Use the hexagonal wrench to tighten the bolts.
4. Cover the screw holes with the protective stickers supplied with the illuminator.

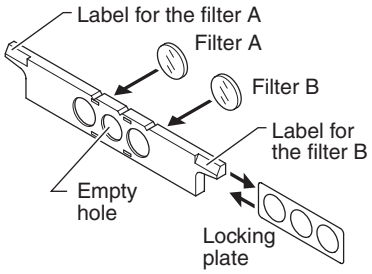


▶ Attaching sliders (dummy slider and polarizer slider)

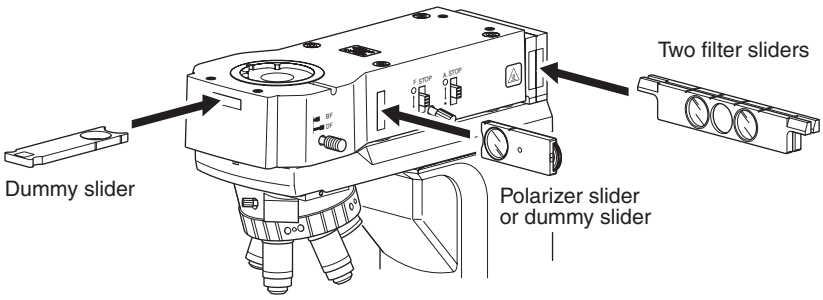
The sliders are to be inserted into the slots on the front and the right side of the illuminator. In case of dummy sliders, slide them in to the limit (so that the empty hole will be set in the optical path).

▶ Filter sliders and filters

1. Remove each filter slider from the illuminator. (Two filter sliders are used for the epi illuminator.)
2. Pull out the locking plate from the filter slider.
3. Insert the desired filter. (Two filters can be set on the filter sliders.)
4. Reinstall the locking plate to its original position.
5. Affix labels to the appropriate lugs of the filter sliders.
6. Insert the filter sliders to the illuminator.



ND4, ND16, and NCB filters are already set on the filter sliders at the factory. You can set an additional filter into an unoccupied position.



6 Attaching the Lamp House and Replacing Lamps

CAUTION

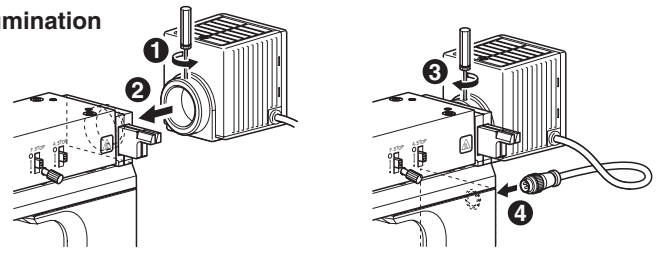
- To prevent electrical shock and damage to the microscope, always turn off the power switch (flip it to the "○" side) and unplug the power cord from the outlet before attaching or detaching the lamp house.
- To prevent burn injury, allow the lamp and the lamp house to cool down sufficiently (for at least 30 minutes after the lamp is turned off), before replacing lamps.
- Use the Nikon LV-LH50PC Halogen Lamphouse for the lamp house.
- Use the Nikon LV-HL50W 12V 50W LONGLIFE Halogen Lamp or non-Nikon 12V 50W SHORTLIFE halogen lamp (model OSRAM HLX 64610, OSRAM HLX 64611, or PHILIPS 7027) for the lamp. If you wish to buy these lamps, please contact your nearest Nikon representative.
- Never touch the glass surface of the lamp with bare hands. Doing so will cause fingerprints, grease, etc. to burn onto the lamp surface, reducing the illumination. If you do get any fingerprints or dirt on the lamp, wipe them clean.
- Make sure the lamp house cover is securely fitted to the lamp house after replacing lamps. Never turn on the lamp with the lamp house cover removed.
- When you dispose of the replaced lamp, do not break it up. Instead, dispose of the used lamp as special industrial waste or dispose of it according to the local regulations and rules.

1. Attaching the lamp house

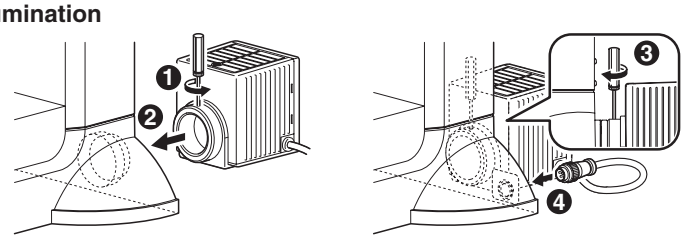
Before performing the following procedures, turn off the power supply for the microscope (press the "○" side) and unplug the power cord from the wall outlet.

1. Loosen the clamp screw sufficiently on the upper side of the lamp house connector by using the hexagonal screwdriver provided with the microscope.
2. Mount the lamp house to the connection port on the rear of the illuminator or on the rear of the microscope body and insert the lamp house as far as it goes.
3. Using the hexagonal screwdriver supplied with the microscope, tighten the clamp screw on the upper side of the connector of the lamp house to secure it.
4. Plug the cable coming from the lamp house into the lamp connector on the rear of the microscope and tighten the ring of the connector to secure the connection.

For episcopic illumination



For diascopic illumination



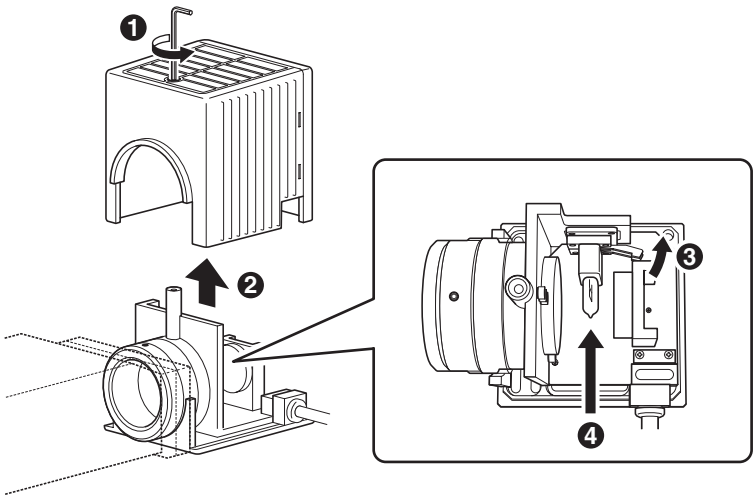
To remove the lamp house, reverse the above procedure.

2. Replacing lamps

Lamps can be replaced without having to detach the lamp house from the microscope.

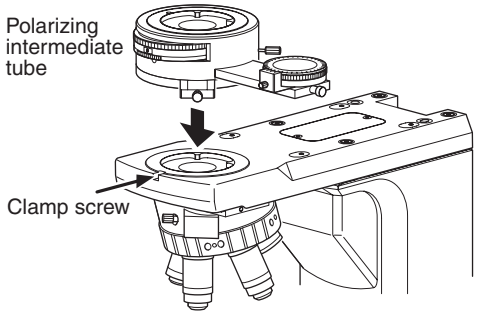
Before performing the following procedures, turn off the power supply for the microscope (press the "○" side) and unplug the power cord from the wall outlet. And check that the lamp and the lamp house are sufficiently cooled down.

1 Loosen the lamp house cover clamp screw using the hexagonal wrench.
2 Remove the lamp house cover.
3 Push down the lamp clamp lever and remove the old lamp.
4 With the lamp clamp lever held down, insert the electrodes of a new lamp into the holes of the socket. Insert the lamp as far as it goes, and then release the lamp clamp lever to secure the lamp.
Be careful not to touch the glass surface of the lamp with bare hands.
When releasing the lamp clamp lever, take care so that the lamp does not tilt.
5 Close the lamp house cover and secure it by tightening the clamp screw.



7 Attaching the Polarizing Intermediate Tube

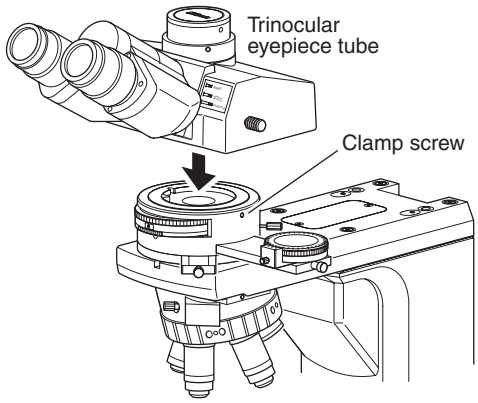
1. Loosen sufficiently the clamp screw for the intermediate tube on the microscope arm (or on the illuminator).
   Use the tool provided with the microscope to loosen the clamp screw for the epi illuminator.
2. Fit the circular dovetail of the polarizing intermediate tube into the circular dovetail groove of the microscope arm (or of the epi illuminator).
   When fitting, insert the positioning pin on the polarizing intermediate tube into the receiving groove on the arm (or the epi illuminator).
3. Secure the polarizing intermediate tube by tightening the clamp screw.



Remove any looseness between the positioning pin and groove by pushing in the polarizing intermediate tube while rotating in the clockwise direction.

8 Attaching the Eyepiece Tube

Loosen the eyepiece tube clamp screw on the intermediate tube with the provided tool sufficiently. Attach the eyepiece tube onto the mount part on the illuminator and fix it with eyepiece tube clamp screw using the hexagonal screwdriver.



▶ Caution to remove the eyepiece tube

Hold the eyepiece tube by hand when loosing the clamp screw to prevent a sudden disconnection and falling.

9 Attaching Eyepieces

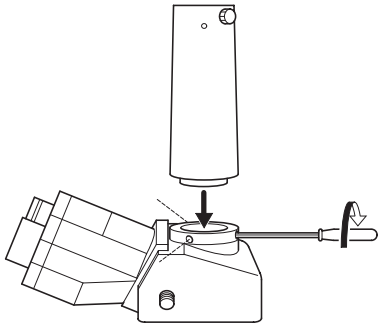
Attach eyepieces of the same magnification and the same field number.
There are positioning protrusions on the binocular part sleeve of the eyepiece tube. Align the notches of the eyepieces with the protrusions on the sleeve and slide the eyepieces into the eyepiece sockets.

10 Attaching a Camera (for the Trinocular Eyepiece Tube)

To attach a photomicrography device such as a camera onto the vertical tube of the trinocular eyepiece tube, you must use two adapters: First, attach the TV vertical tube adapter onto the trinocular eyepiece tube. Second, attach a suitable adapter for the camera mount part (C mount adapter or so on) onto the TV vertical adapter.

Check the mount part type of your camera and prepare the suitable adapter beforehand.

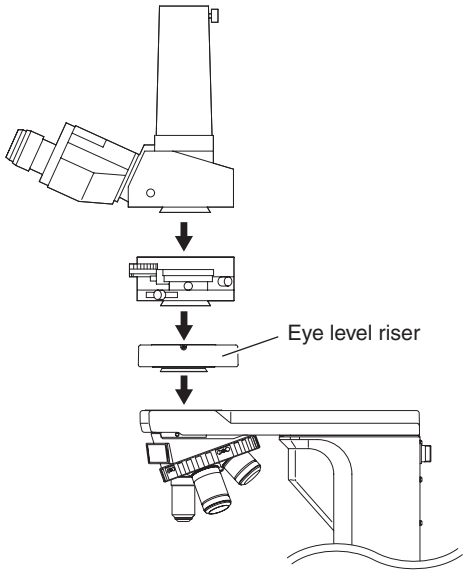
1. Mount the TV vertical tube adapter or the TV vertical tube adapter 0.55x onto the vertical tube section of the trinocular eyepiece tube.
2. Attach the suitable adapter for the camera onto the tip of the TV vertical tube adapter.
3. Attach the camera head to the adapter tip.
4. Attach the camera cable to the camera head.



Adjust the camera head position before using the camera.

11 Attaching Eye Level Risers

Optional eye level risers are used for the adjustment of the height of the eyepiece tube to fit the observer's eye point. Up to two eye level risers can be attached in piles. When one eye level riser is attached, the eyepiece height rises 25 mm.



▶ Attaching an eye level riser

1. Loosen the clamp screw for the eyepiece sufficiently, then insert the eye level riser with fitting the dovetail junctions of the eye level riser and the illuminator.
2. Secure the eye level riser by tightening the clamp screw.
3. Attach the eyepiece tube on the eye level riser.

12 Connecting the Power Cord

WARNING Be sure to use the specified power cord. Using a wrong power cord may result in malfunctions or fire. Also, the product is classified as subject to Class I protection against electrical shock. Make sure it is connected to an appropriate ground terminal (protective earth terminal).

For specifications of the power cord, refer to “VII. Specification.”

Turn off the power switch on the microscope (flip it to the “○” side).
Insert the socket of the power cord into the AC inlet on the back of the microscope. Then, securely plug the power cord to the wall outlet.

V Troubleshooting

Improper use of the microscope may adversely affect performance, even if the microscope is not damaged. If any of the problems listed in the table below arise, take the countermeasures indicated.

1 Viewing Problems and Control Problems

Problem		Cause	Countermeasure
The viewfield is invisible, vignetted, or uneven in brightness.		The lamp is not attached correctly.	Install the lamp correctly. (p. 51 to 52)
		The optical path selector lever on the eyepiece tube is in an intermediate position.	Set the optical path selector lever to 100% (or 20%) distribution to the binocular part correctly. (p. 27)
		The optical path selector lever on the eyepiece tube is not set to 100% (or 20%) distribution to the binocular part.	
		A filter is in an intermediate position.	Move the filter slider to a clickstop position. (p. 24)
		The field diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (p. 32 and 43)
		The nosepiece is not attached correctly.	Install the nosepiece correctly. (p. 49)
		The nosepiece is not set to a click-stop position. (The objective is not placed in the optical path)	Rotage the nosepiece to a click-stop position. (Set the objective into the optical path.)
		The Bertrand lens is in the optical path.	Remove the Bertrand lens from the optical path.
		The P-CL, P-CS, or P-CQ plate is not inserted correctly.	Move it to the correct position.
	Episcopic microscopy	The dummy slider, polarizer slider, or analyzer slider is in an intermediate position.	Move the slider to a clickstop position.
		The bright-field/dark-field illumination selector lever on the LV-UEPI is in an intermediate position.	Push in or pull out the lever to the limit. (p. 42)
	Diascopic microscopy	The condenser position is too low.	Adjust the condenser focus knob so that the field diaphragm image is focused on the specimen surface. (p. 30)
		The condenser has not been centered.	Center the condenser. (p. 30)
		The condenser is not attached correctly.	Install the condenser correctly. (p. 48)
		The top lens of the P swing-out condenser is wrongly placed.	Move the top lens to the correct position. (p. 29)

Problem		Cause	Countermeasure
Dirt or dust is seen in the viewfield.		The aperture diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (p. 31 and 44)
		Dirt or dust exists on the lens, eyepiece, filter, or specimen.	Clean the components. (p. 61)
	Diascopic microscopy	The upper surface of the condenser is not clean.	Clean the components. (p. 61)
		The condenser position is too low.	Adjust the condenser focus knob so that the field diaphragm image is focused on the specimen surface. (P.30)
The viewing is poor (too much or too little contrast, or poor resolution).		Dirt or dust exists on the lens, eyepiece, filter, or specimen.	Clean the components. (P.61)
		The used objective is not suitable for the microscopy.	Use the designated objective. (P.49)
		The aperture diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (P.31 and 44)
	Diascopic microscopy	The condenser position is too low.	Adjust the condenser focus knob so that the field diaphragm image is focused on the specimen surface. (P.30)
The focus is uneven.		The nosepiece is not attached correctly.	Install the nosepiece correctly. (P.49)
		The nosepiece is not set to a click-stop position. (The objective is not placed in the optical path).	Rotage the nosepiece to a click-stop position.
		The specimen holer is slanted.	Install the specimen holder correctly.
The image is elongated.		The nosepiece is not attached correctly.	Install the nosepiece correctly. (P.49)
		The nosepiece is not set to a clickstop position.	Rotage the nosepiece to a click-stop position.
		The stage is tilting.	Install the stage correctly. (P.48)
		The microscope is not installed on a flat surface.	Install the microscope on a flat and level surface.
	Diascopic microscopy	The condenser has not been centered.	Center the condenser. (P.30)
The image is tinged yellow.		The NCB11 filter is not used.	Locate the NCB 11 filter into the optical path. (P.24)
		The lamp voltage is too low.	Rotate the brightness control knob to increase the intensity of the light source and adjust the brightness with ND filters. (P.23 and 24)
The image is too bright.		The lamp voltage is too high.	Adjust the brightness with the brightness control knob. Or, locate a ND filter into the optical path. (P.23 and 24)

Problem		Cause	Countermeasure
The brightness is insufficient. (Refer to the troubleshooting for the electric system too.)		The lamp voltage is too low.	Adjust the brightness with the brightness control knob. (P.23)
		A ND filter is placed in the optical path.	Remove the ND filter from the optical path. (P.24)
		The aperture diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (P.31 and 44)
		A polarizer or an analyzer is placed in the optical path although the bright-field microscopy is intended to be performed.	Remove the polarizer or the analyzer from the optical path. (P.36 and 37)
		The used objective is not suitable for the microscopy.	Use the designated objective. (P.49)
	Diascopic microscopy	The condenser position is too low.	Adjust the condenser focus knob so that the field diaphragm image is focused on the specimen surface. (P.30)
The objective hits the specimen when switched from low to high magnification. The specimen goes out of focus by switching objectives.		The eyepiece diopters are not adjusted.	Adjust the diopters. (P.28)
		The eyepieces are not attached correctly.	Mount the eyepieces correctly by aligning the positioning grooves. (P.53)
		The specimen is placed upside-down.	Set the specimen on the stage with the cover glass facing up.
		The cover glass is too thick.	Use the specified type of cover glass (thickness: 0.17 mm).
The specimen does not move smoothly.		The specimen holder is not secured correctly on the stage.	Secure the specimen holder correctly.
When viewing through the binocular eyepiece, the image does not resolve into a single image.		The interpupillary distance is not adjusted.	Adjust the interpulillary distance. (P.28)
		The eyepiece diopters are not adjusted.	Adjust the diopters. (P.28)
Eye strain develops while viewing.		The interpupillary distance is not adjusted.	Adjust the interpulillary distance. (P.28)
		The eyepiece diopters are not adjusted.	Adjust the diopters. (P.28)
		The brightness is not appropriate.	Adjust the brightness with the brightness control knob or the combination of ND filters. (P.23 and 24)
		Eyepieces with different viewfield numbers are used for the left and right eyes.	Use eyepieces having the same viewfield number.

Problem	Cause	Countermeasure
The coarse focus knob is heavy in rotation.	The coarse torque adjustment ring is tightened too much.	Loosen the torque adjustment ring adequately. (P.25)
	The coarse focus stopper ring is locked to restrict the upper limit.	Turn the coarse focus stopper ring to release the stopper function. (P.25)
The stage falls on its own weight and the image goes out of focus.	The coarse torque adjustment ring is loosened too much.	Tighten the torque adjustment ring adequately. (P.25)
The stage cannot be raised by the coarse focus knob.	The coarse focus stopper ring is locked at the lower limit.	Turn the coarse focus stopper ring to release the stopper function. (P.25)

2 Electrical System Problems

Problem	Cause	Countermeasure
The lamp does not light even though the power switch is turned on.	The power supply is not plugged in.	Plug the power cord into a wall outlet. (P.55)
	The power cord is not connected to the microscope main body.	Connect the power cord. (P.55)
	The cable of the lamp house is not connected to the connector on the microscope.	Connect the cable of the lamp house. (P.51)
	No lamp is attached.	Attach a lamp. (P.51 and 52)
	The lamp is blown.	Replace the lamp with a new one. (P.52)
	A wrong lamp is used.	Use the specified lamp. (See “VII. Specifications.”)
The lamp flickers, or its brightness is unstable.	The lamp is about to blow.	Replace the lamp with a new one. (P.52)
	The power cable or the cable of the lamp house is not connected securely.	Connect the power cord and the lamp house cable securely. (P.51 and 55)
	The lamp is not securely inserted into the socket.	Insert the lamp securely. (P.52)
	The lamp house is not connected securely.	Connect the lamp house securely. (P.51)

VI Care and Maintenance

Nikon recommends daily care and maintenance for maintaining the performance as long as possible.

Do not let dust, fingerprint, etc. get on the lenses. Dirt on the lenses, filters, and the like will adversely affect the optical performance of the microscope.

If lenses are contaminated, clean them according to the procedure described in “1. Cleaning the lenses and Filters.” When cleaning, be sure to turn off the power switch (flip the switch to “○” side) to avoid malfunction.

▶ Daily care and maintenance

Clean the parts frequently manipulated by hands, such as eyepieces and glass plate according to the procedure described in “1. Cleaning Lenses and Filters” without removing them from the microscope. Nikon recommends cleaning them frequently.

Clean the objectives, filters, and the like to maintain the optical performance. When cleaning the objectives, remove them from the microscope. Clean them whenever they are contaminated.

Microscopes and stages are contaminated with use. When you find the microscope is contaminated, clean them according to the description in “2. Cleaning the Painted, Plastic, and Printed Parts.”

▶ Cleaning tool and supplies (consumables)

- **Cleaning tool**
  Brush (with soft tip) (Use a cleanroom wiper in a cleanroom.)
- **Cleaning supplies (consumables)**
  Ethyl or methyl alcohol
  Lens tissue (Use a cleanroom wiper in a cleanroom.)

1 Cleaning Lenses and Filters

Do not let dust, fingerprint, etc. get on the lenses and filters. Dirt on the lenses, filters, etc. will adversely affect the view of image. If any lens gets dirty, clean it as described below.

- Either brush away dust with a soft brush, or else gently wipe it off with a piece of gauze.
- Only if there are fingerprints or grease on a lens, dampen lightly a piece of soft, clean cotton cloth, lens tissue, or gauze with absolute alcohol (ethyl or methyl) and gently wipe off the dirt.
- Absolute alcohol is highly flammable. Be careful when handling it, when around open flames, when turning the power switch on/off, etc.
- Follow the instructions provided by the manufacturer when using absolute alcohol.

2 Cleaning the Painted, Plastic, and Printed Parts

Do not use organic solvents such as alcohol, ether, or paint thinner on painted components, plastic components, or printed components. Doing so could result in discoloration or in peeling of the printed characters. For persistent dirt, dampen a piece of gauze with neutral detergent and wipe gently.

3 Storage

- Store this product in a dry place where mold is not likely to form.
- Store the objectives and eyepieces in a desiccator or similar container with a drying agent.
- Put the dust-proof cover over this product to protect it from dust.
- Before putting on the dust-proof cover, turn off the power switch of the microscope (flip it to the "○" position) and wait until the lamp house gets cool sufficiently

4 Regular Inspection

Periodical inspections of this product are recommended in order to maintain peak performance. Contact your nearest Nikon representative for details.

VII Specifications

Model	ECLIPSE LV100POL
Optical system	CFI60 system (chromatic aberration free infinity system)
Illumination system	Epi/dia selector type Episcopic illumination: Built-in type lamp power supply Specified illuminator: LV-UEPI Universal Epi Illuminator (NCB11, ND4, and ND16 are installed and can be replaced by users) Diascopic illumination: Built-in type lamp power supply, fly's eye lens, NCB11 and ND8 are installed but cannot be replaced by users Lamp ratings: 12 VDC, 50 W halogen lamp Specified lamp: LV-HL50W, 12 V, 50 W longlife halogen lamp Specified lamp house: LV-LH50PC precentered lamp house
Focusing mechanism	Manual operation type single axis coarse/fine focus knob mechanism (calibration marking for fine focus: 1 µm/marking) Stroke: 30 mm with coarse focus stopper mechanism Coarse focus knob: 14 mm/revolution Fine focus knob: 0.1 mm/revolution
Eyepiece	10x, field number: 22
Stage	Circular graduated stage Provided with two verniers Provided with a rotation mechanism with a clamp Provided with 45° click-stop mechanism Provided with two specimen holders
Nosepiece	Quintuple type (five sockets) Provided with objective centering mechanism
Input ratings	Input voltage: 100-240 VAC ±10% 50/60 Hz Rated current: 1.2 A maximum
Power cord	When the supply voltage is 100 V to 120 V UL Listed detachable cord set, 3 conductor grounding Type (3 conductor grounding Type SVT, No.18 AWG, 3m long maximum, rated at 125V AC minimum) When the supply voltage is 220 V to 240 V Approved according to EU/EN standards, 3 conductor grounding Type (3 conductor grounding Type H05VV-F, 3m long maximum, rated at 250V AC minimum)
Operating conditions	Temperature: 0°C to +40°C Humidity: 85% relative humidity maximum (no condensation) Altitude: 2000 m maximum Pollution degree: Degree 2 Installation category: Category II Electric shock protection class: Class 1 Indoor use only
Storage conditions	Temperature: -20°C to +60°C Humidity: 90% relative humidity maximum (no condensation)

Safety standards compliance	• This is UL-listed product. (UL61010-1) • This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15B of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense. • This class A digital apparatus complies with Canadian ICES-003. Cet appreil numérique de classe A est conforme à la norme NMB-003 du Canada. • This product meets Australian EMI. (AS/NZS CISPR11 Group 1 Class B) CE marking • This product meets EU Low Voltage Directive requirements. • This product meets EU EMC Directive requirements. (EN61326)