M351 E 05.4.NF.1

Nikon

Industrial Microscope
ECLIPSE LV100D

Instructions

Thank you for purchasing the Nikon products.
This instruction manual has been prepared for the users of Nikon's industrial microscope "ECLIPSE LV100D."
To ensure correct usage, read this manual carefully before operating the instrument.

- 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.
- Although every effort has been made to ensure the accuracy of this manual, if you note any points that are unclear or incorrect, contact your nearest Nikon representative.
- Some of the products described in this manual may not be included in the set you have purchased.
- Be sure to read the instruction manual for any other products that may be used in combination with the microscope.

Warning/Caution Symbols Used in This Manual

Although Nikon products are designed to provide you with the utmost safety during use, incorrect usage or disregard of the instructions can cause personal injury or property damage. For your safety, read this instruction manual carefully and thoroughly before using the instrument. Do not discard this manual, but keep it near the product for easy reference.
In this manual, safety instructions are indicated with the symbols shown below. Be sure to follow the instructions indicated with these symbols to ensure correct and safe operation.

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

Meaning of Symbols Used on the Equipment

Symbol	Meaning
	**Caution for heat.** This marking on the rear of the lamphouse, and near the lamphouse clamp screw on the illuminator (LV-UEPI and LV-UEPI2), calls your attention on the following. For the symbol position, see pages 8 and 10. • The lamphouse is very hot during and immediately after illumination. • Risk of burns. Do not touch the lamphouse during and immediately after illumination. • Make sure that the lamphouse has sufficiently cooled before replacing the lamp.

WARNING

1. Intended product use

This microscope should only be used for microscopic observation. Do not use it for any other purpose. Do not observe such a large sample as to stick out of the stage.

2. Do not disassemble.

Disassembly may cause malfunction, electrical shock, and/or injury. Any injury or damage due to such an act will not be warranted. Do not disassemble any part other than those described in this manual. If you experience any problem with the microscope, notify your nearest Nikon representative.

3. Read the instruction manuals carefully.

For your safety, carefully read this manual and the manuals provided with the other products to be used with the system. Be sure to read warnings and cautions at the beginning of each manual in particular.

When the external light source is used:

When you use the external light source using a mercury lamp or so on, handle the lamp with extreme caution. Read the manual for the light source carefully and observe handling precautions.

4. Ratings of power supply

The power circuit in this instrument is rated for AC power supplies of 100 to 240 V, 50/60 Hz. When connecting the instrument to a power line, check that the line conforms to the voltage and frequency ratings mentioned above.

Use of a power line that does not satisfy the ratings may lead to equipment malfunction or damage or a fire.

5. Power cord

Use only the supplied power cord. Using the wrong power cord could result in damage or a fire. Also, connect the microscope to a PE (protective earth) terminal, since the microscope complies with the electric shock protection class I.

And besides, to prevent electrical shock, always turn off the power switch (flip it to "○" side) before connecting or disconnecting the power cord.

For details about the specified power cord, see "VII. Specifications."

6. Specified light source

This microscope must be used with a specified light source. The following light source combinations are specified for this microscope.

- Illuminator (for the epi-illumination):
  Nikon LV-UEPI Universal Epi Illuminator (model LV-UEPI) or Nikon LV-UEPI2 Universal Epi Illuminator (model LV-UEPI2)
- Lamphouse (for the epi-illumination and dia-illumination):
  Nikon LV-LH50PC precentered lamphouse 12V 50W (model LV-LH50PC).
- Lamp
  Nikon LV-HL50W 12V 50W LONGLIFE halogen lamp (model LV-HL50W), or non-Nikon 12V 50W SHORTLIFE halogen lamp (model OSRAM HLX 64610, OSRAM HLX 64611, or PHILIPS 7027).

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

WARNING

7. Light source other than the specified ones

To perform the epi-fl microscopy with the LV-UEPI2 illuminator, the specified light source brightness may be less than the desired brightness. In this case, a light source other than the specified ones, an external light source, can be used for the LV-UEPI2.
Use the X-Cite 120 (manual type) or X-Cite 120PC (motorized type) manufactured by EXFO Electro-Optic Engineering Inc. for the external light source.
Note that if a light source other than the specified ones are attached to this microscope, this microscope system will not be treated as a UL-Listed product.

8. Heat from the light source

The lamp and the lamphouse become extremely hot. To avoid burns, do not touch the lamphouse 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 lamphouse while the lamp is lit or for about thirty minutes after it is turned off.

9. Air vents

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

10. Ultraviolet light from a light source other than the specified ones

If you use a light source other than the specified ones and that has a mercury lamp or so on, the light source radiates ultraviolet light that is harmful to the eyes and skin from the emission port. Direct viewing of light from these lamps may result in snow blindness at a light case or blindness at worst. To prevent injury, follow the guidelines below.

1) **Insert the UV collector lens into the optical path of the microscope unless the UV excitation light is necessary.**
   On the illuminator LV-UEPI2, the UV filter automatically enters the optical path when turning the microscopy selection knob to BF (bright-field) or DF (dark-field). The UV filter is removed from the optical path when turning the knob to FL1 (epi-fl 1) or FL2 (epi-fl 2).
2) **When performing the epi-fl microscopy by using the UV excitation light, attach the filter cube dedicated to the UV excitation light. And then, if you must see the objective or its surroundings, be sure to see through the ultraviolet light shield.**
3) **Attach the light source to the microscope during use.**
   Always attach the light source to the microscope when the light source is ready to turn on. Do not turn on the light source unattached to the microscope, or remove the light source from the microscope while the light source is lit. When removing the light source from the microscope, turn off the power to the light source, and then unplug the power code from the wall outlet.

11. 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. When you use the illuminator LV-UEPI2, be sure to view it through the ultraviolet light shield.

CAUTION

1. Handle the system gently.

Components of this system are precision optical instruments. Handle them carefully, and do not subject them to any shocks.
The precision of the objectives in particular can be adversely affected even by weak shocks.

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 away the moisture using a dry cloth or the like. If water gets inside the microscope, do not use it; instead, notify your nearest Nikon representative.

3. Weak electromagnetic waves

This microscope emits weak electromagnetic waves. The accuracy of any precision electronic equipment may be adversely affected if positioned too close. If the microscope affects TV or radio reception, move the radio or TV farther away from the microscope.

4. Installation location

Being a precision optical instrument, the microscope may get damaged or loose accuracy if it is used or stored under unsuitable conditions. When selecting the installation location, note the following:

- 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 that is able to bear the weight of the instrument.
- Do not install the microscope in a hot and humid location.
- Select a layout that allows easy removal of the power cord from the microscope'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

- The microscope 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 stage and the lamphouse. Then, securely hold the microscope by the root of the arm from the back.
  (Information) The microscope with the stage, eyepiece tube, lamphouse, and other parts attached, weighs approx. 20 kg.
- Do not hold the focusing knobs, eyepiece tube, lamphouse, sub-stage, etc., when carrying the microscope. They may come off and may cause serious injury or malfunction.
- Before carrying the stage, attach the fixing metals to hold the movement of the stage plate.
- Be careful not to pinch your fingers or hands during transportation.

6. Cautions on assembling the microscope

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

CAUTION

7. Cautions on lamp replacement

- To prevent burn injury, allow the lamp to cool down sufficiently (for at least 30 minutes after it is turned off) before replacing the lamp.
- 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 wall outlet before connecting or disconnecting the lamphouse.
- Do not touch the glass surface of the lamp with bare hands. Fingerprints or grease on the bulb surface will reduce the illumination intensity of the lamp. Wipe out any fingerprints or grease attached to the surface.
- Securely attach the lamphouse cover to the lamphouse after replacing the lamp. Never light the lamp while the lamphouse cover is open.
- 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.

8. Handing of filter cubes

When using the microscope configured with the illuminator LV-UEPI2, a filter cube can be attached to enable epi-fl microscopy. Note the following precautions for handling a filter cube.

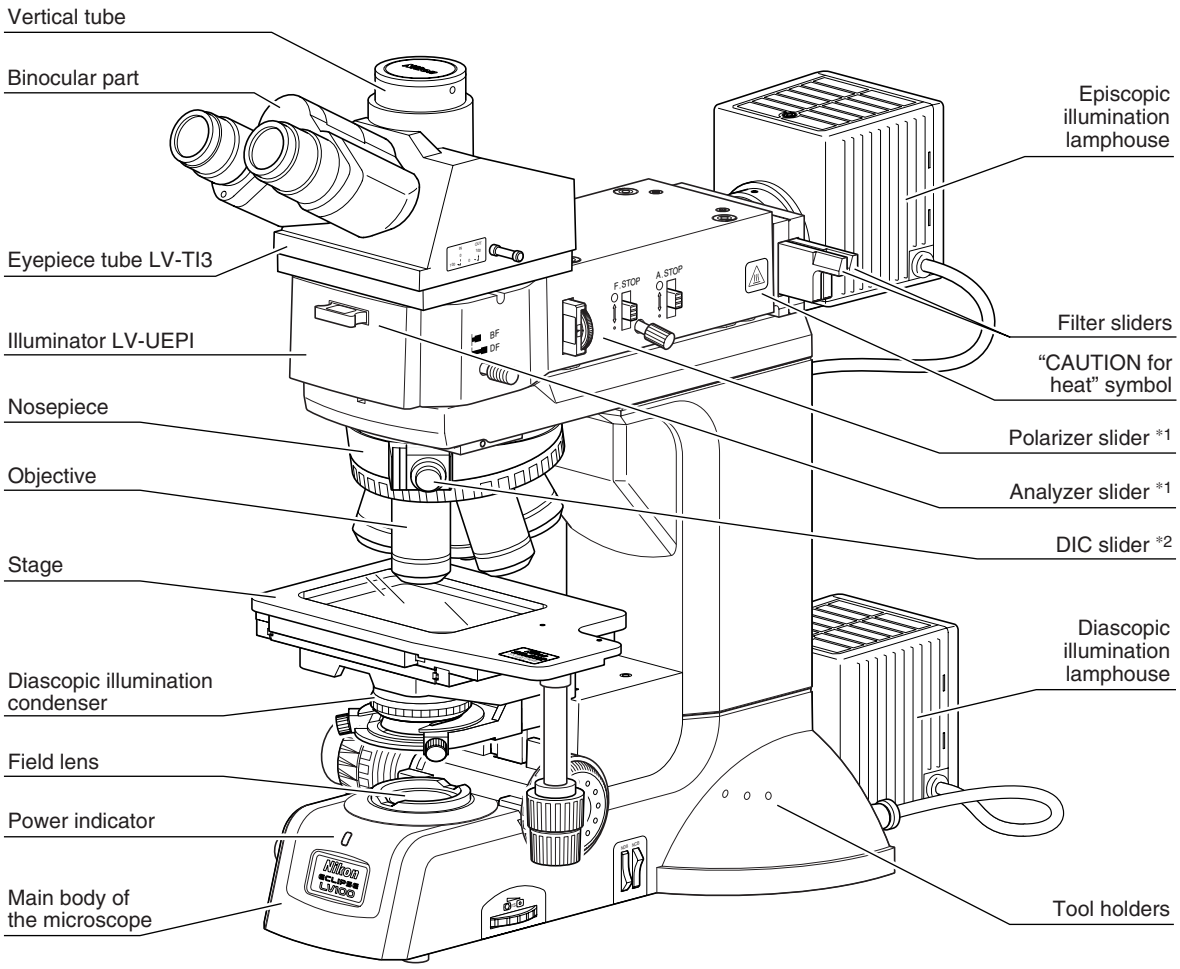
- Interference filters (in particular, excitation filters exposed to intense light) are subject to aging. Replace them depending on their total operating hours.
- Filters can change in characteristics under high humidity. To avoid changes in characteristics and quality, do not use or store filters at high temperatures or high humidity, or expose them to rapid temperature changes. When not using filters, they should be stored with a drying agent in desiccators or sealed containers.
- The filters fitted in the nine types of filter cubes listed below have sharper wavelength characteristics than ordinary filters. However, these filters should be handled with care as they are applied with complicate coating. In particular, be cautious against wear during cleaning. (Observe the procedures described in "1. Cleaning Lenses and Filters" of "VI. Care and Maintenance.")
  Single-band filter cubes: DAPI, FITC, TxRed, and GFP
  Multi-band filter cubes: F-R, F-T, D-F, D-F-R, and D-F-T.

CONTENTS

I Names of Each Part

1 When Configured with the Illuminator LV-UEPI

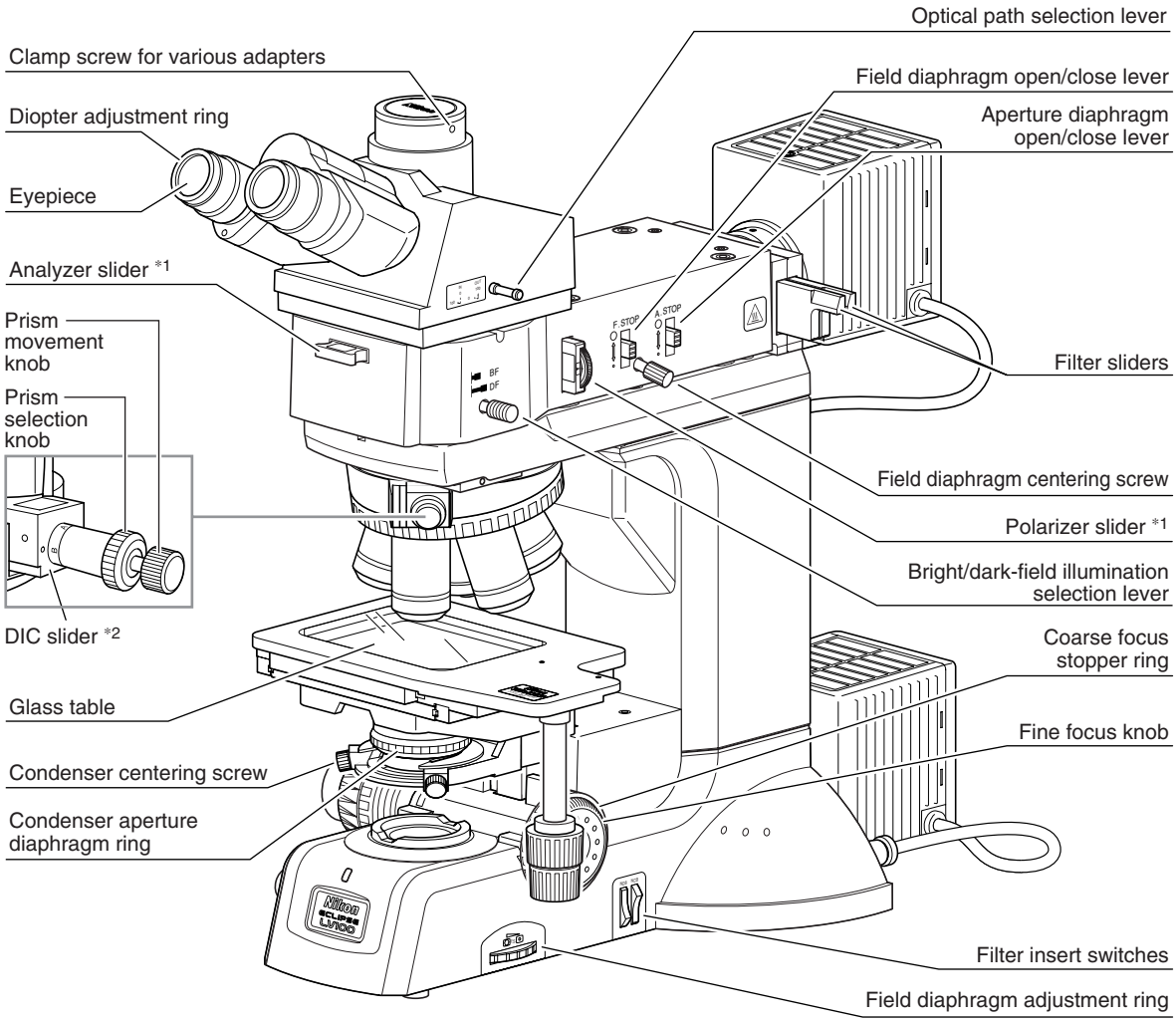
▶ Names of Parts

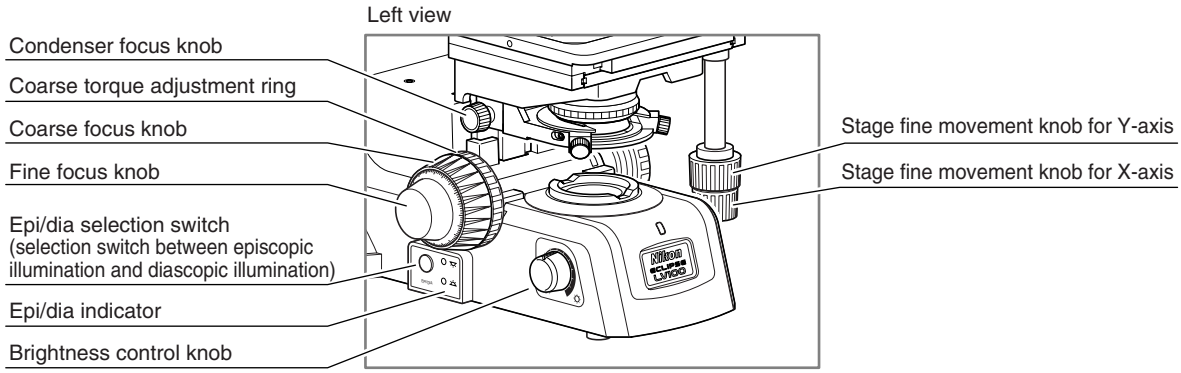


*1: For DIC microscopy or simplified polarization microscopy.
*2: For DIC microscopy.

This drawing depicts the ECLIPSE LV100D microscope configured with the LV-UEPI illuminator, LV-TI3 eyepiece tube, 3x2 stage, episcopic illumination lamphouse, diascopic illumination lamphouse, diascopic illumination condenser (LWD condenser), and attachments for DIC microscopy.

▶ Names of Operational Parts





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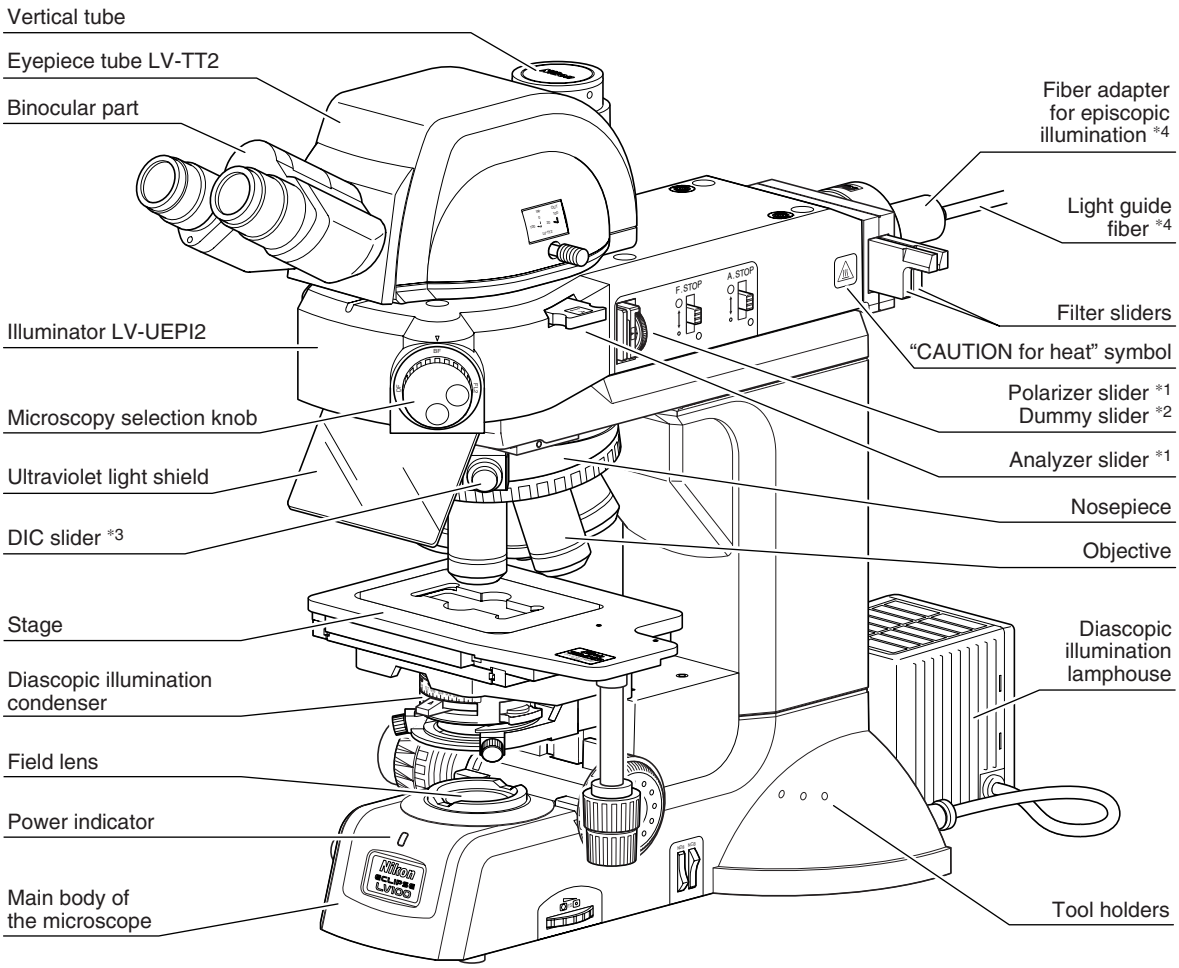
This drawing depicts the ECLIPSE LV100D microscope configured with the LV-UEPI illuminator, LV-TI3 eyepiece tube, 3x2 stage, episcopic illumination lamphouse, diascopic illumination lamphouse, diascopic illumination condenser (LWD condenser), and attachments for DIC microscopy.

2 When Configured with the Illuminator LV-UEPI2

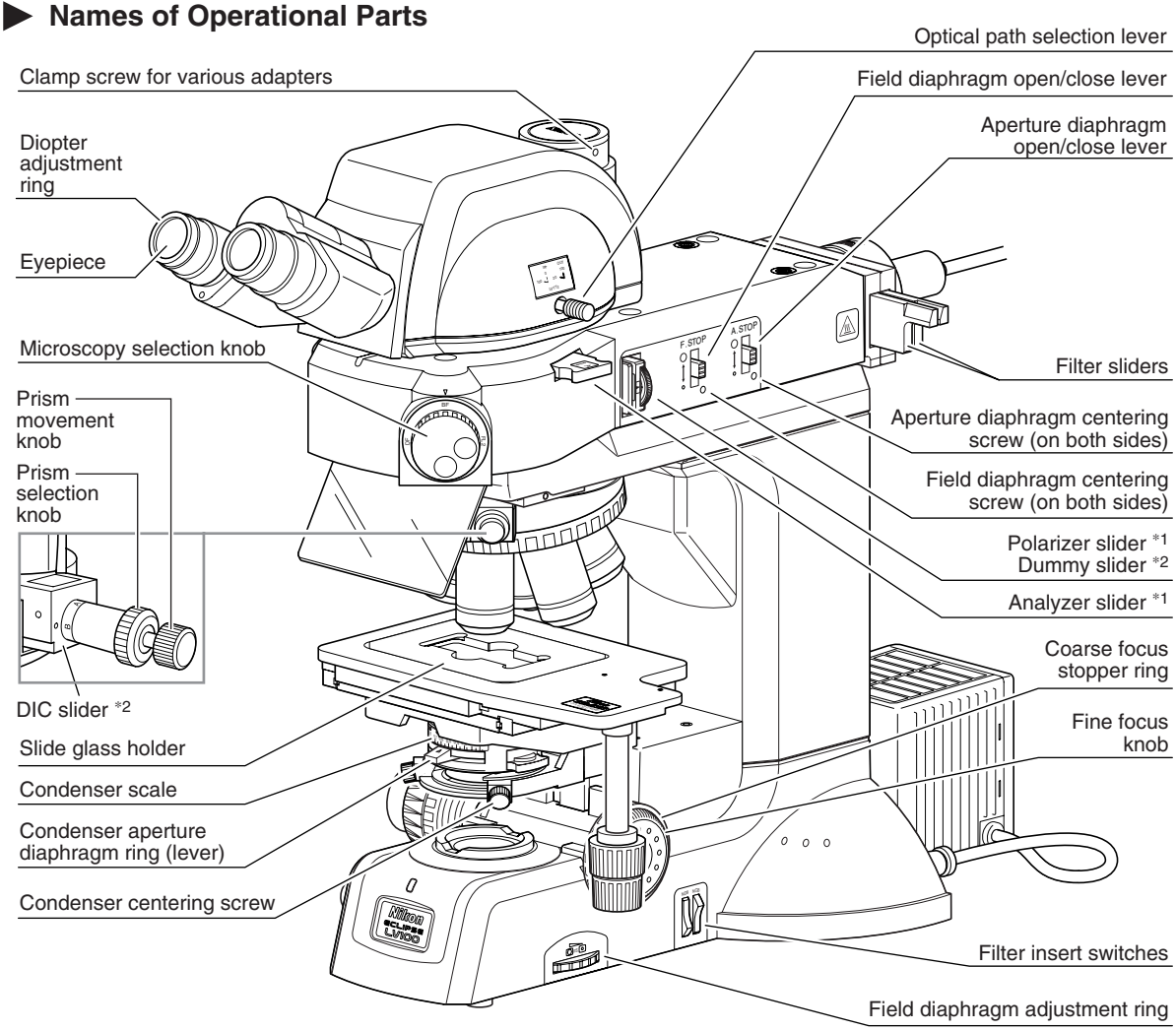
▶ Names of Parts



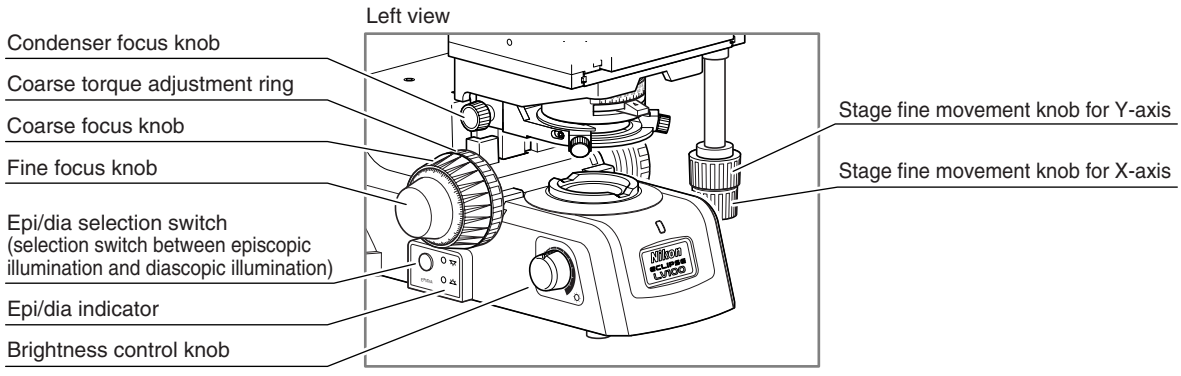
*1: For DIC microscopy, simplified polarization microscopy, or sensitive polarization microscopy.
*2: Lambda plate slider in case of sensitive polarization microscopy.
*3: For DIC microscopy.
*4: It is installed if the brightness of the specified light source is less than the desired brightness for the episcopic microscopy or so on. (Please take note that if a light source other than the specified ones are installed onto this microscope, this microscope system will not be treated as a UL-listed product.).

This drawing depicts the ECLIPSE LV100D microscope configured with the LV-UEPI2 illuminator, LV-TT2 eyepiece tube, 3x2 stage, slide glass holder, diascopic illumination condenser (slide condenser), fiber adapter for the episcopic illumination (light guide fiber), diascopic illumination lamphouse, and attachments for DIC microscopy.

▶ Names of Operational Parts



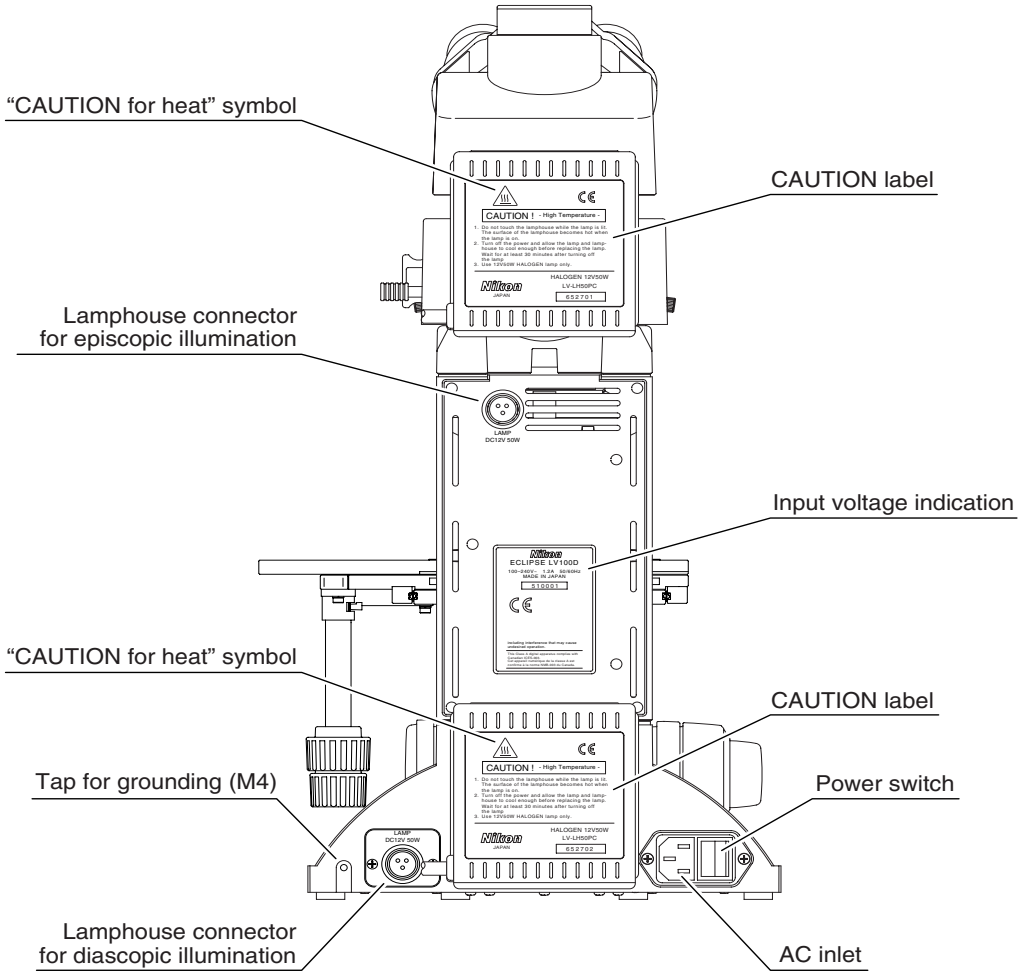
Left view



*1: For DIC microscopy, simplified polarization microscopy, or sensitive polarization microscopy.
*2: Lambda plate slider in case of sensitive polarization microscopy.
*3: For DIC microscopy.

This drawing depicts the ECLIPSE LV100D microscope configured with the LV-UEPI2 illuminator, LV-TT2 eyepiece tube, 3x2 stage, slide glass holder, diascopic illumination condenser (slide condenser), fiber adapter for the episcopic illumination (light guide fiber), diascopic illumination lamphouse, and attachments for DIC microscopy.

3 Rear View



This drawing depicts the ECLIPSE LV100D microscope configured with the LV-UEPI illuminator, LV-TI3 eyepiece tube, 3x2 stage, episcopic illumination lamphouse, and diascopic illumination lamphouse.

II Microscopy

This chapter describes the procedures for each microscopy.
This microscope can be configured with two types of illuminators, LV-UEPI or LV-UEPI2. See the table below for the microscopies available with each illuminator, as well as the optional accessories required for each microscopy.

● If the microscope has not yet been assembled, see “IV. Assembly” on p.50 first.

● See “III. Operation of Each Part” on p.28 for how to operate each part of the microscope.

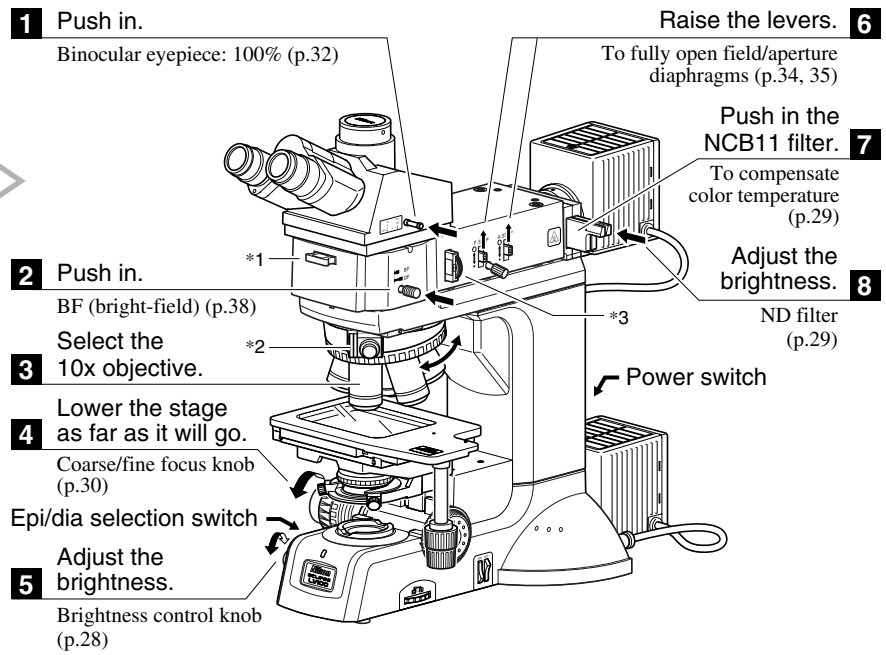
Microscopy	Procedure	Illuminators	Required accessories (optional)
Bright-field microscopy under epi-illumination	p.14 and 15	LV-UEPI LV-UEPI2	–
Dark-field microscopy under epi-illumination	p.16 and 17	LV-UEPI LV-UEPI2	BD objective BD quintuple nosepiece or universal quintuple nosepiece (The standard sextuple nosepiece cannot be used for dark-field microscopy.)
Differential interference contrast microscopy under epi-illumination	p.18 and 19	LV-UEPI LV-UEPI2	Polarizer Analyzer DIC slider Universal quintuple nosepiece Objectives marked “LU” (Objectives marked “LU” are suitable for DIC microscopy.)
Simplified polarization microscopy under epi-illumination	p.20 and 21	LV-UEPI LV-UEPI2	Polarizer Analyzer
Sensitive polarization microscopy under epi-illumination	p.22	LV-UEPI2	Polarizer Lambda plate Analyzer
Epi-fluorescence microscopy	p.23	LV-UEPI2	Filter cube (Up to two cubes can be attached.) Fluorescence excitation light balancer (optional)
Bright-field microscopy under dia-illumination	p.24 and 25	LV-UEPI LV-UEPI2	–
Dark-field microscopy under dia-illumination	p.26 and 27	LV-UEPI LV-UEPI2	Polarizer for dia-illumination Analyzer

1 Bright-field Microscopy under Epi-illumination

▶ When configured with the LV-UEPI

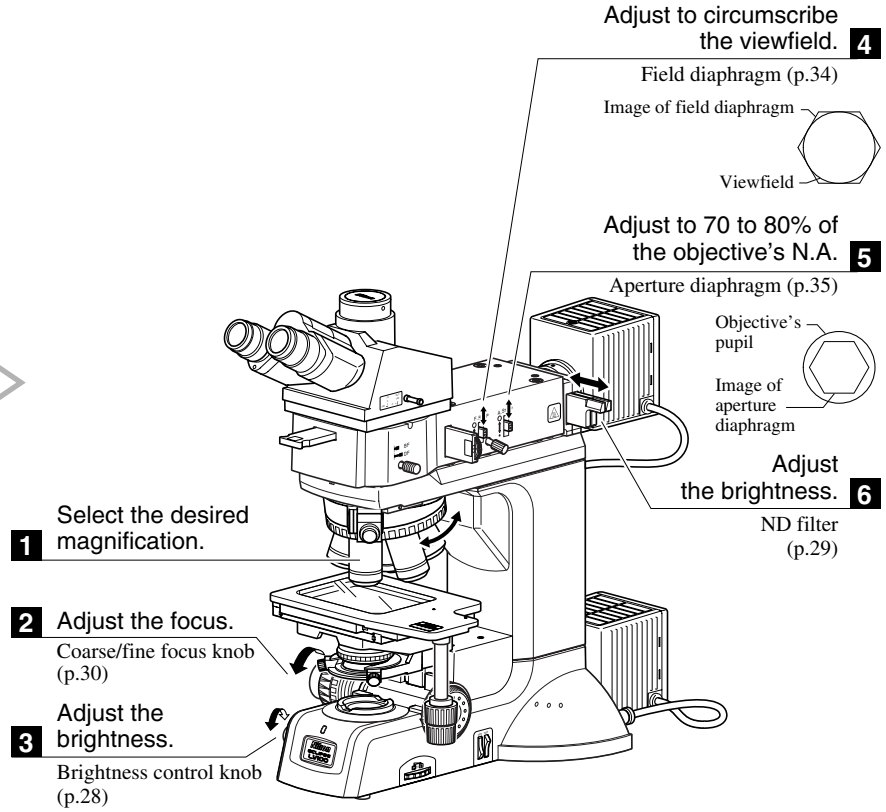
1. Turn on the power. And select the epi-illumination. (p.28)
2. Set the microscope for the bright-field microscopy under the epi-illumination.

   If accessories for DIC microscopy (*1 to *3) are in place, pull them out of the optical path.



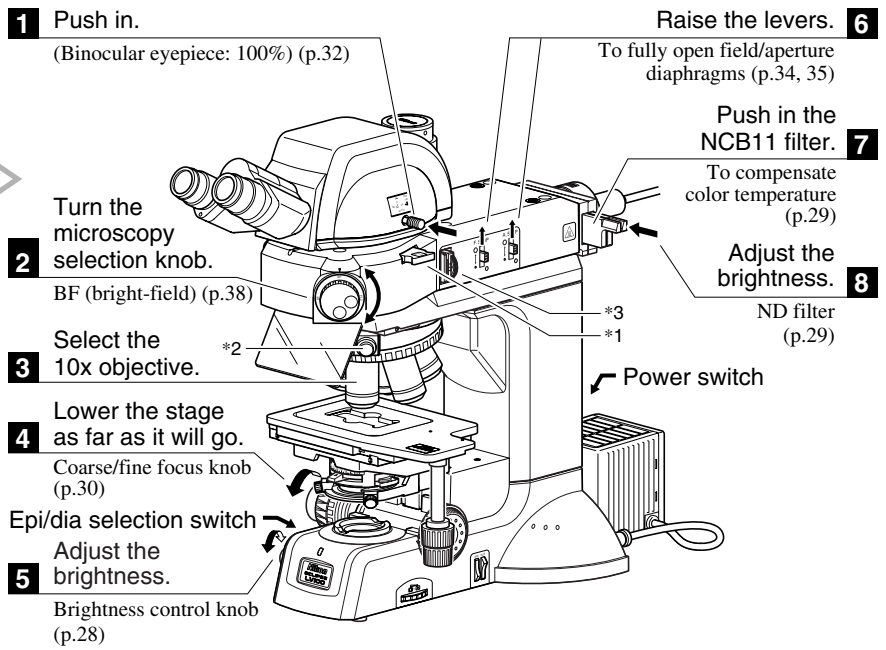
3. Place the sample on the stage and focus on it. (p.30)
4. Adjust the diopter. (p.33)
5. Adjust the interpupillary distance. (p.33)
6. Change the magnification and observe the sample.

   Hint:
   It may be difficult to focus on a sample with small contrast, such on a polished surface. In a case like this, stop down the field diaphragm so that its image can be seen in the viewfield, and try to focus on the rim of the diaphragm image. When the rim is in focus, the sample is in focus just as well.

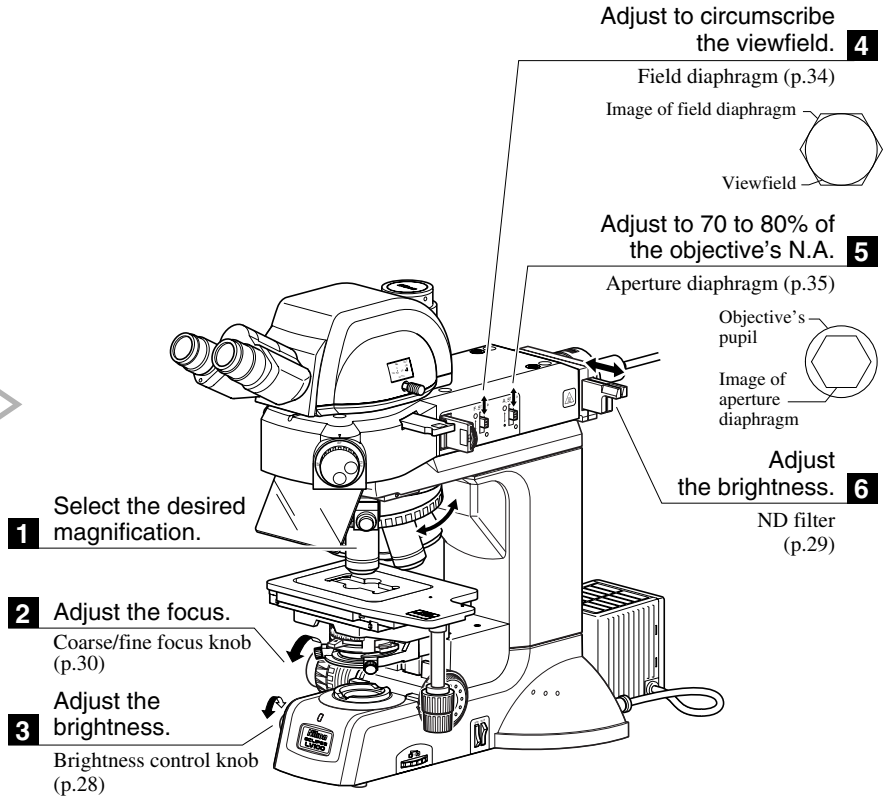


▶ When configured with the LV-UEPI2

1. Turn on the power. And select the epi-illumination. (p.28)
2. Set the microscope for the bright-field microscopy under the epi-illumination.
   If accessories for DIC (*1 to *3) are in place, pull them out of the optical path.



3. Place the sample on the stage and focus on it. (p.30)
4. Adjust the angle of the binocular part. (p.32)
5. Adjust the diopter. (p.33)
6. Adjust the interpupillary distance. (p.33)
7. Change the magnification and observe the sample.
   Hint:
   It may be difficult to focus on a sample with small contrast, such on a polished surface. In a case like this, stop down the field diaphragm so that its image can be seen in the viewfield, and try to focus on the rim of the diaphragm image. When the rim is in focus, the sample is in focus just as well.



2 Dark-field Microscopy under Epi-illumination

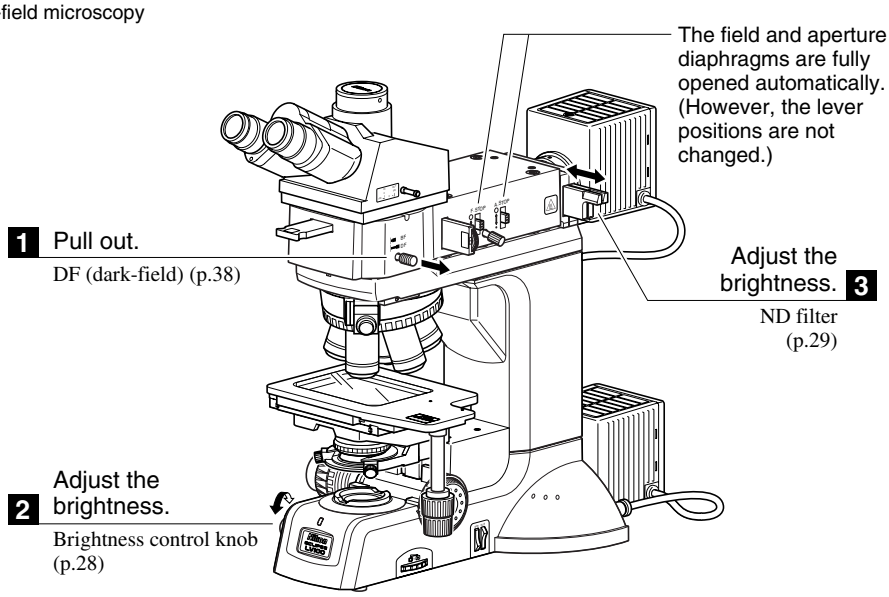
▶ When configured with the LV-UEPI

1. Mount BD objectives and a BD quintuple nosepiece (or universal quintuple nosepiece). (p.53, 60)

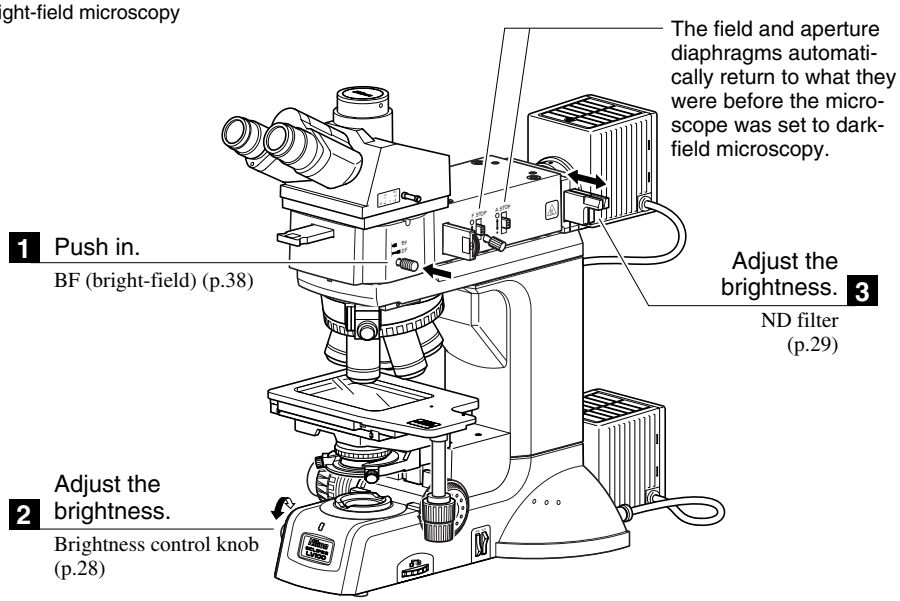
   The standard sextuple nosepiece cannot be used for the dark-field microscopy.

2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.14)

3. Set the microscope for the dark-field microscopy under the epi-illumination.



4. Return the microscope to the bright-field microscopy under the epi-illumination.



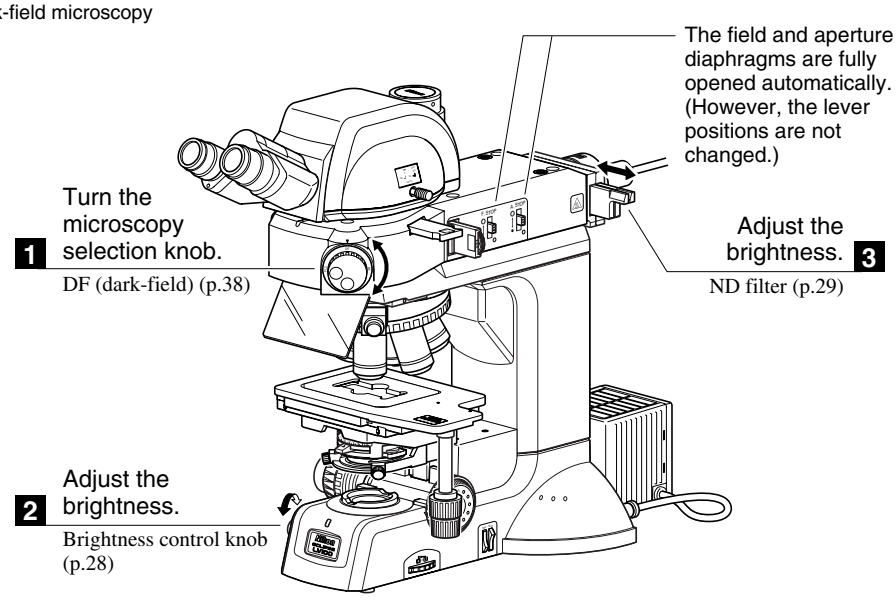
▶ When configured with the LV-UEPI2

1. Mount BD objectives and a BD quintuple nosepiece (or universal quintuple nosepiece). (p.53, p60)

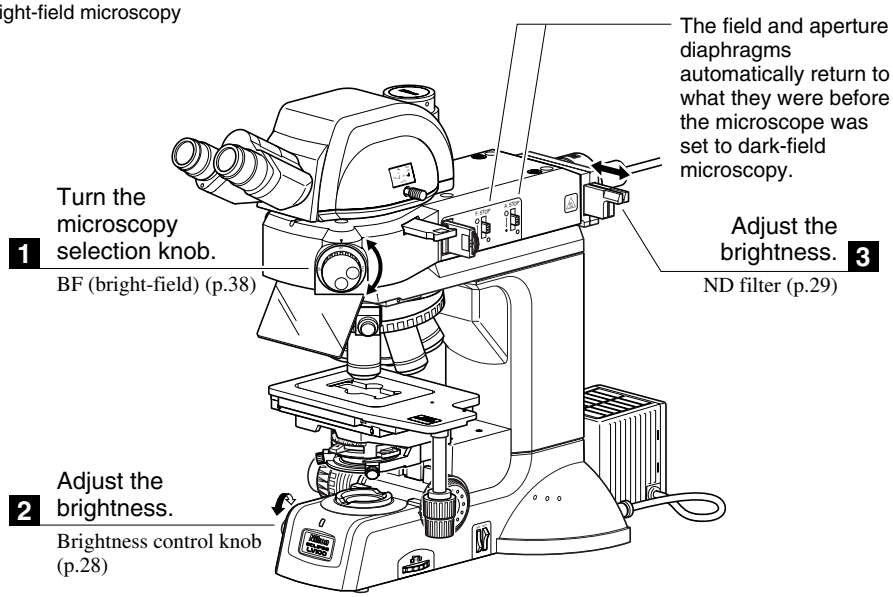
   The standard sextuple nosepiece cannot be used for the dark-field microscopy.

2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.15)

3. Set the microscope for the dark-field microscopy under the epi-illumination.



4. Return the microscope to the bright-field microscopy under the epi-illumination.



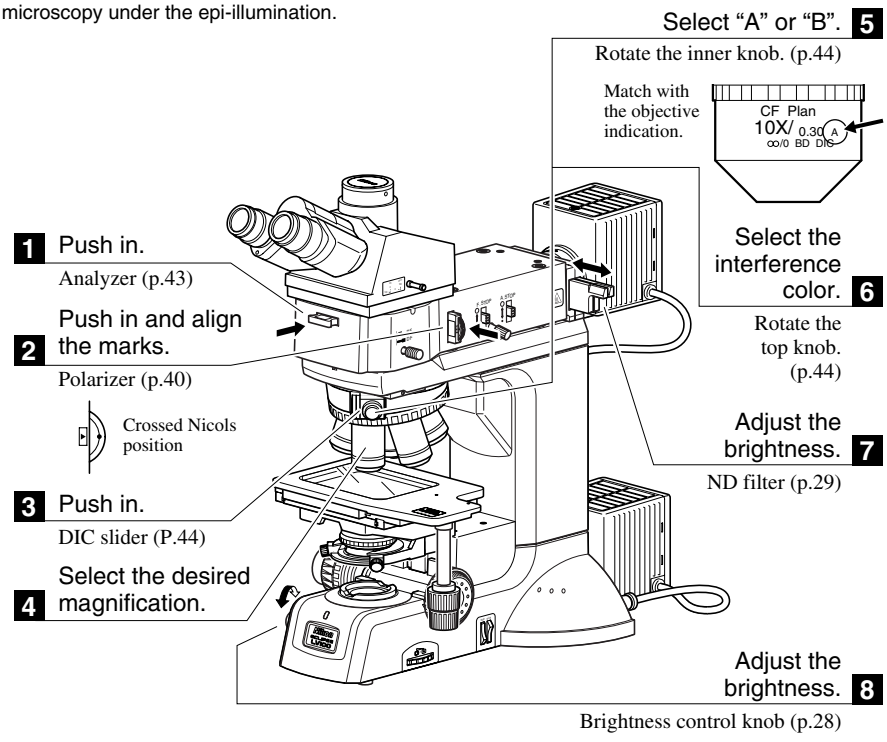
3 Differential Interference Contrast (DIC) Microscopy under Epi-illumination

▶ When configured with the LV-UEPI

1. Mount objectives marked “LU”, universal quintuple nosepiece, polarizer, analyzer, and DIC slider. (p.40, p.43, p.44, p.53, p.60)

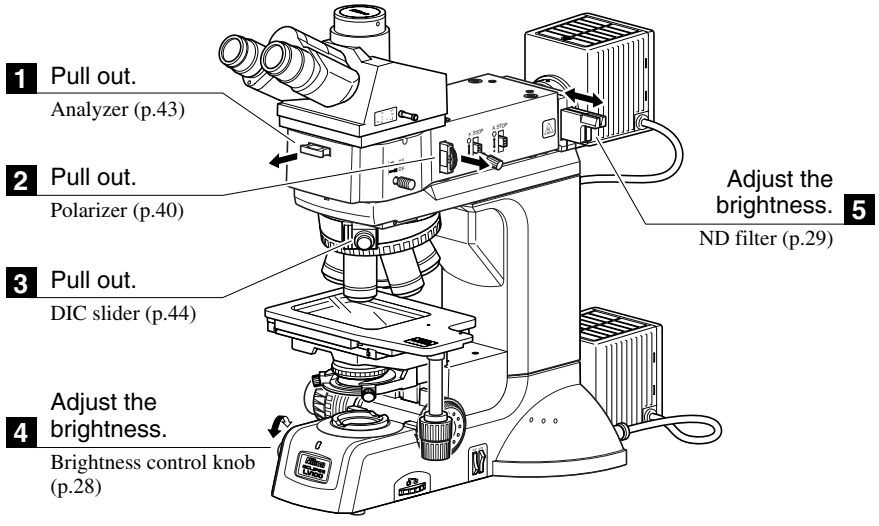
2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.14)

3. Set the microscope for the DIC microscopy under the epi-illumination.



Information:
The DIC slider can be operated to enable various microscopies, including sensitive DIC.

4. Return the microscope to the bright-field microscopy under the epi-illumination.

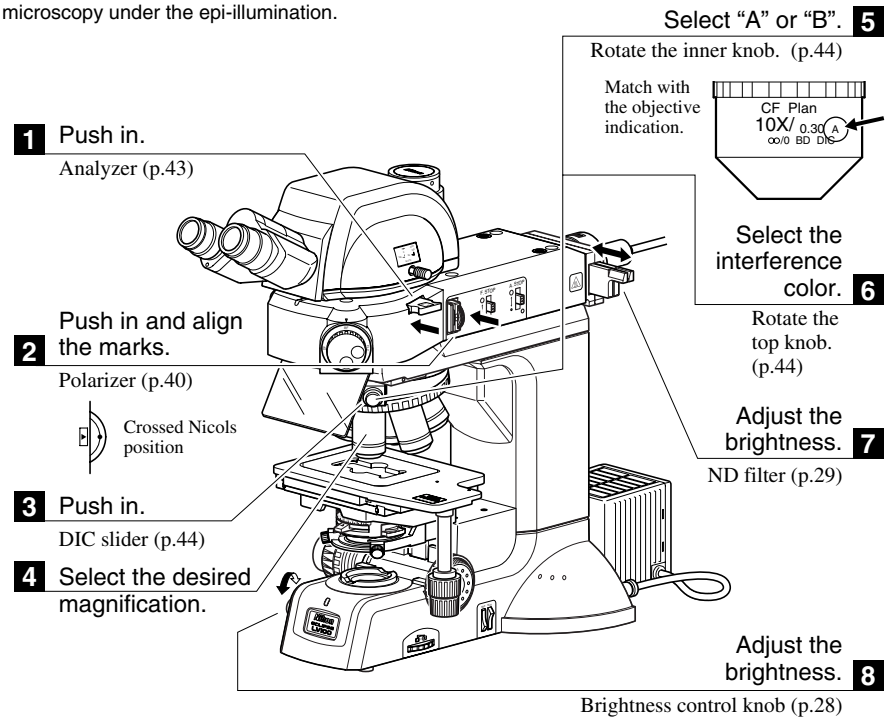


▶ When configured with the LV-UEPI2

1. Mount objectives marked “LU”, universal quintuple nosepiece, polarizer, analyzer, and DIC slider. (p.40, p.43, p.44, p.53, p.60)

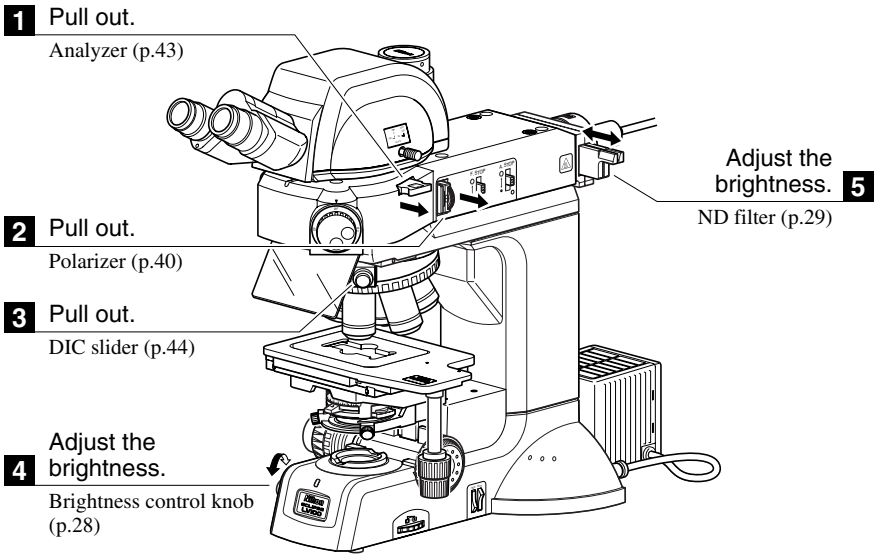
2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.15)

3. Set the microscope for the DIC microscopy under the epi-illumination.



Information:
The DIC slider can be operated to enable various microscopies, including sensitive DIC.

4. Return the microscope to the bright-field microscopy under the epi-illumination.



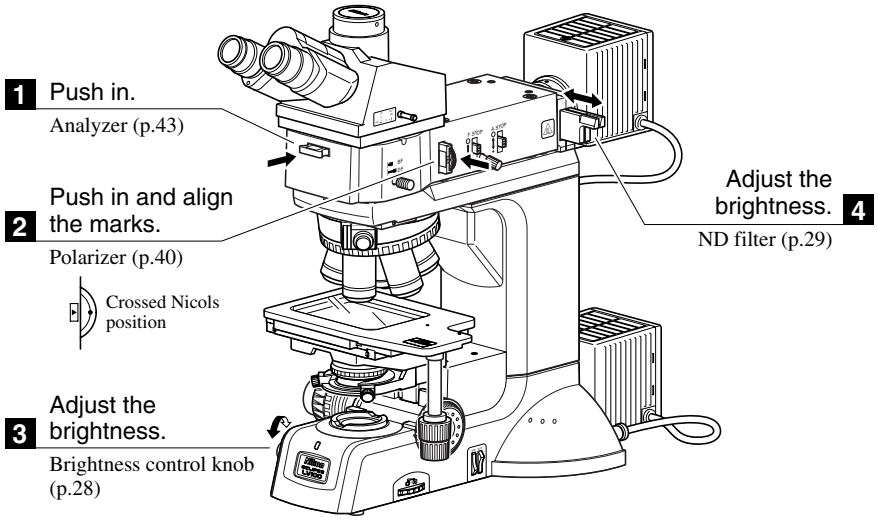
4 Simplified Polarization Microscopy under Epi-illumination

▶ When configured with the LV-UEPI

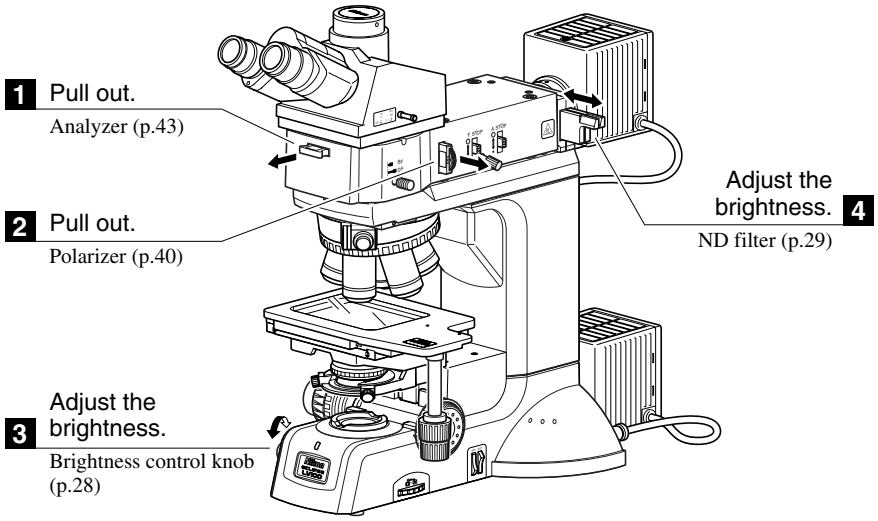
1. Mount a polarizer and an analyzer. (p.40, 43)

2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.14)

3. Set the microscope for the simplified polarization microscopy under the epi-illumination.



4. Return the microscope to the bright-field microscopy under the epi-illumination.

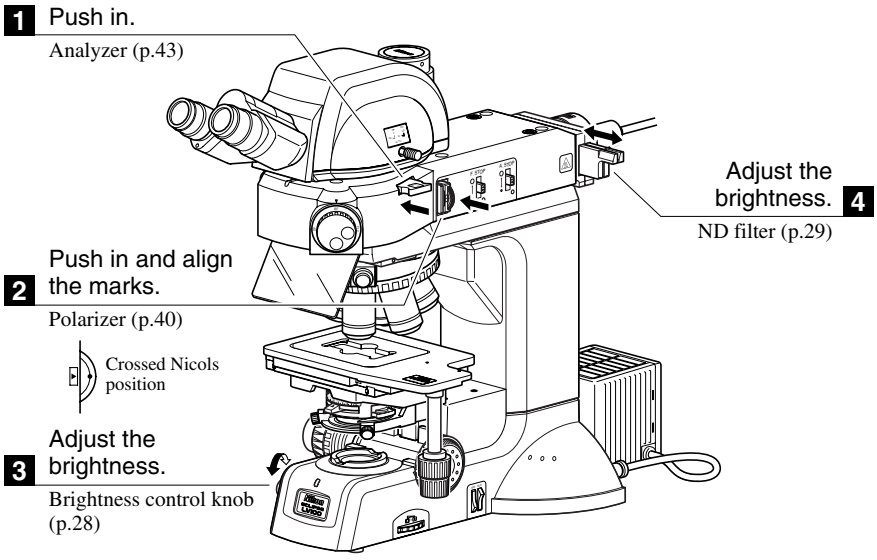


▶ When configured with the LV-UEPI2

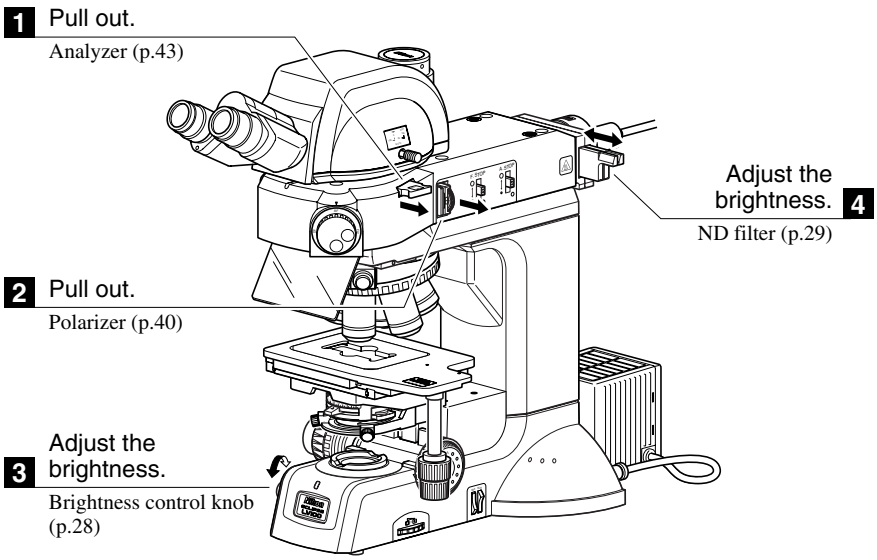
1. Mount a polarizer and an analyzer. (p.40, 43)

2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.15)

3. Set the microscope for the simplified polarization microscopy under the epi-illumination.



4. Return the microscope to the bright-field microscopy under the epi-illumination.



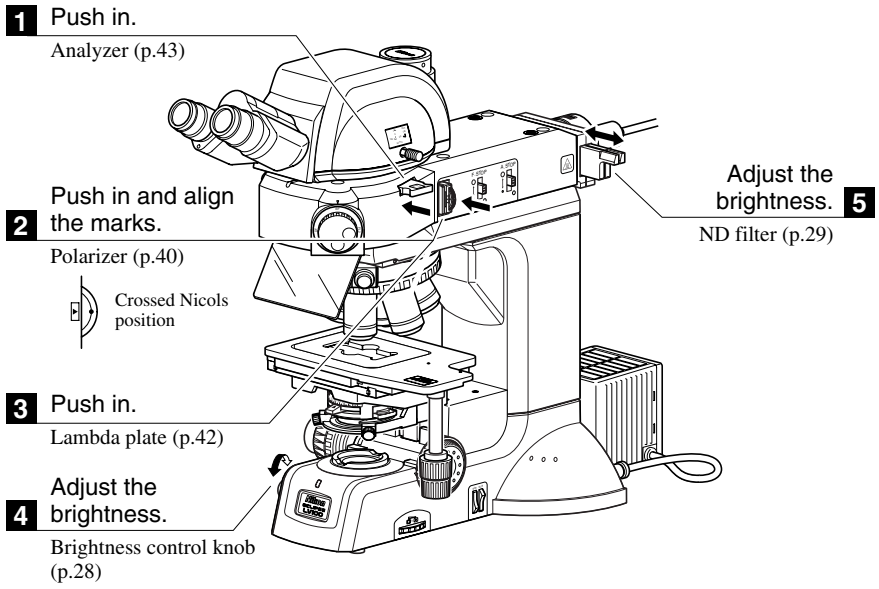
5 Sensitive Polarization Microscopy under Epi-illumination

▶ Only when configured with the LV-UEPI2

1. Mount a polarizer, lambda plate, and analyzer. (p.40, 42, 43)

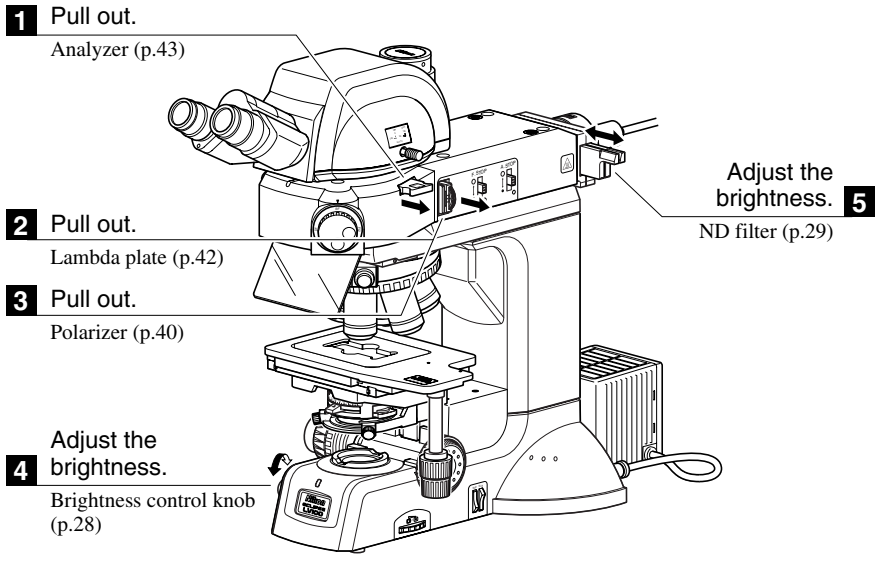
2. Focus on the sample with the bright-field microscopy under the epi-illumination. (p.15)

3. Set the microscope for the sensitivity polarization microscopy under the epi-illumination.



Information:
Turn the polarizer knob to adjust the polarization while observing the image.

4. Return the microscope to the bright-field microscopy under the epi-illumination.



6 Epi-fluorescence Microscopy

▶ Only when configured with the LV-UEPI2

1. Attach the filter cube to the turret in the illuminator. (p.56)

   Up to two filter cubes can be attached.

2. Install the suitable illuminator for the excitation method as necessary. (p.59)

   To perform the epi-fl microscopy, the brightness of the specified light source (halogen lamp) may be less than the desired brightness. An external light source other than the specified ones can be installed for this purpose.

   * Please take note that if a light source other than the specified ones are installed onto this microscope, this microscope system will not be treated as a UL-listed product.

3. Find the object using the bright-field or dark-field microscopy under the epi-illumination, and then focus on the sample. (p.15, 17)

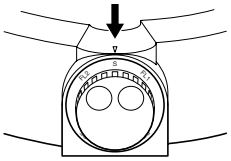
4. Set the microscope for the epi-fl microscopy.

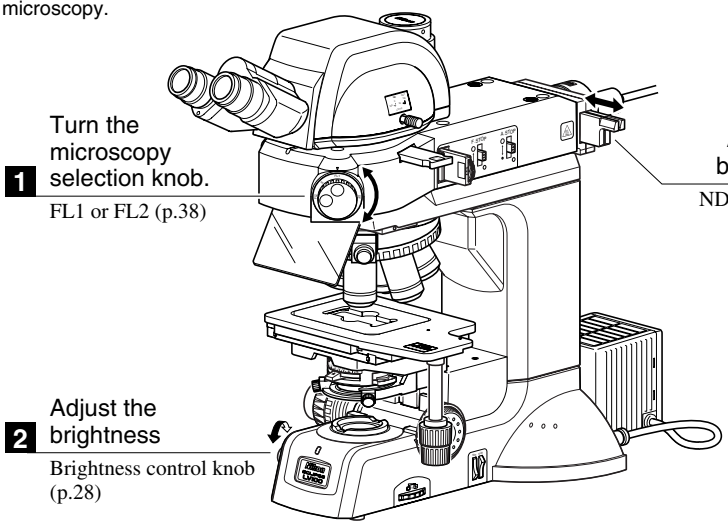
   Information:

   When the microscopy selection knob is turned to the "S" position, the shutter closes the optical path of illumination.

   To prevent fading of the sample, be sure to close the shutter when moving your eyes away from the binocular part.

   S (shutter) position

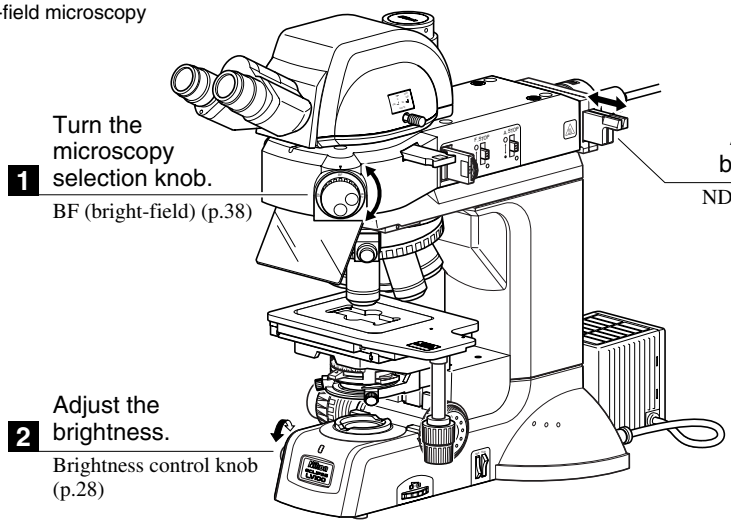
   



5. Return the microscope to bright-field microscopy under the epi-illumination.

   Information:

   When performing the epi-fl microscopy, the UV filter is removed from the optical path. And when performing the bright-field or dark-field microscopy, the UV filter is placed into the optical path. The UV filer moves in synchronization with the operation of the microscopy selection knob.

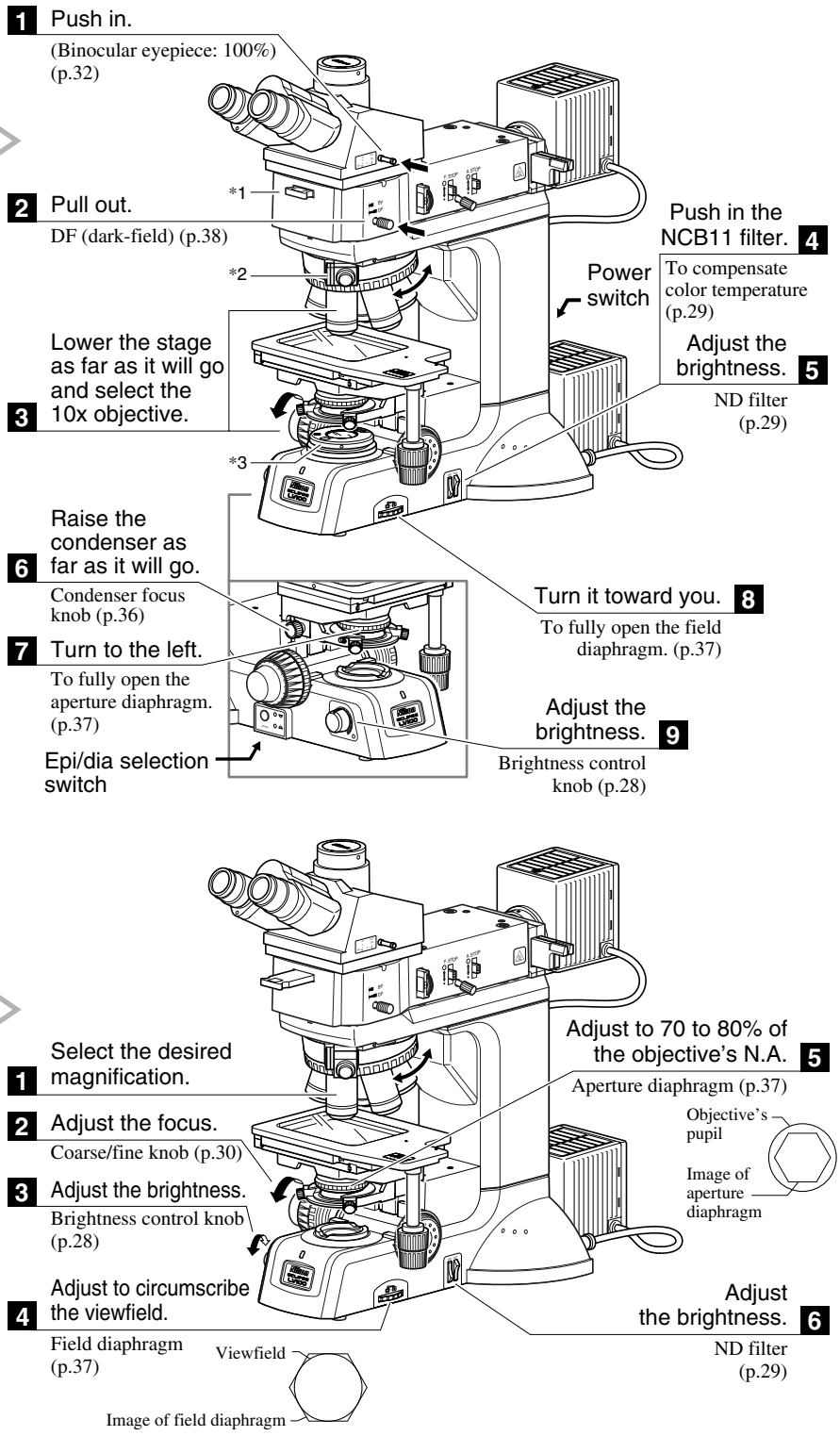


7 Bright-field Microscopy under Dia-illumination

▶ When configured with the LV-UEPI

1. Turn on the power. And select the dia-illumination. (p. 28)
2. Set the microscope for the bright-field microscopy under the dia-illumination.

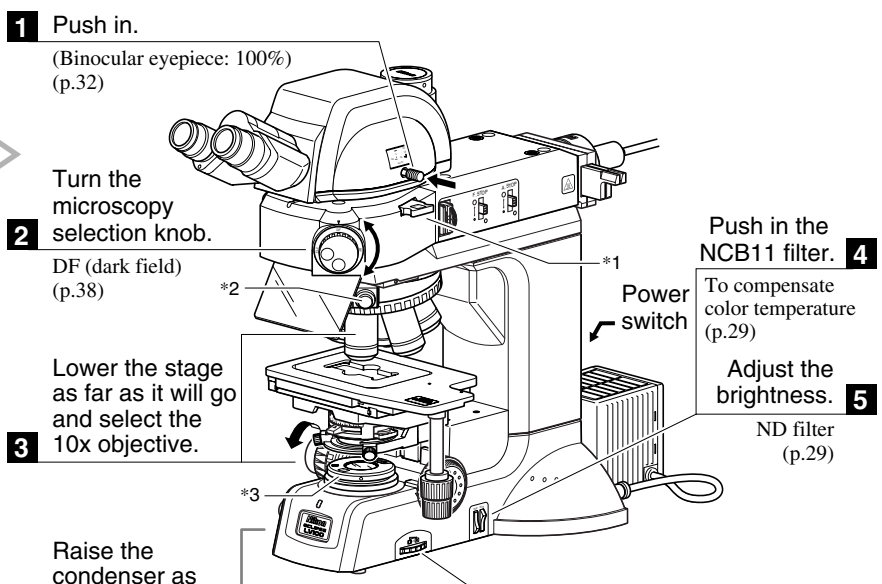
   If accessories for DIC microscopy (*1 to *3) are in place, pull them out of the optical path.

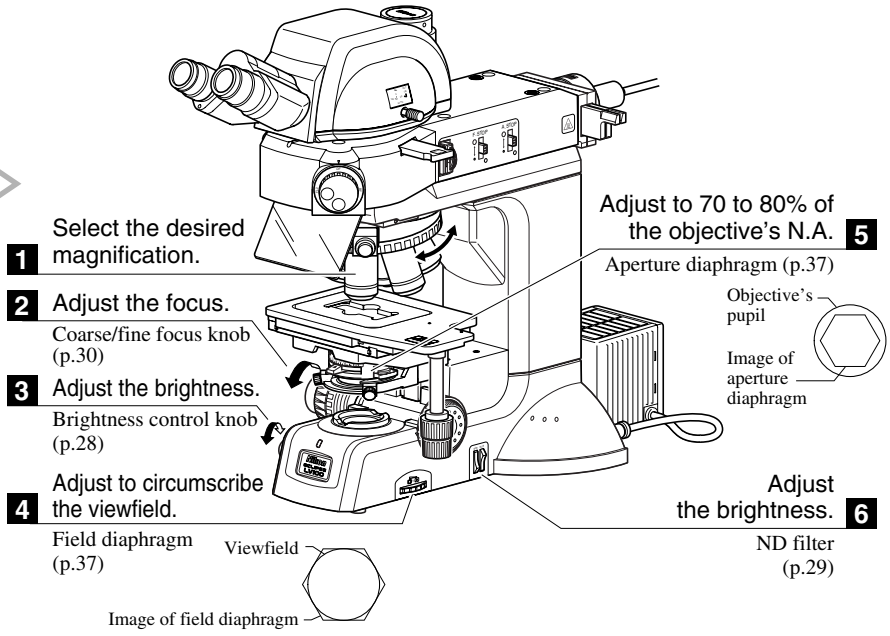


3. Place the sample on the stage and focus on it. (p.30)
4. Adjust the diopter. (p.33)
5. Adjust the interpupillary distance. (p.33)
6. Change the magnification and observe the sample.

▶ When configured with the LV-UEPI2

1. Turn on the power. And select the dia-illumination. (p. 28)
2. Set the microscope for the bright-field microscopy under the dia-illumination.
   If accessories for DIC microscopy (*1 to *3) are in place, pull them out of the optical path.
3. Place the sample on the stage and focus on it. (p.30)
4. Adjust the angle of the binocular part. (p.32)
5. Adjust the diopter. (p.33)
6. Adjust the interpupillary distance. (p.33)
7. Change the magnification and observe the sample.





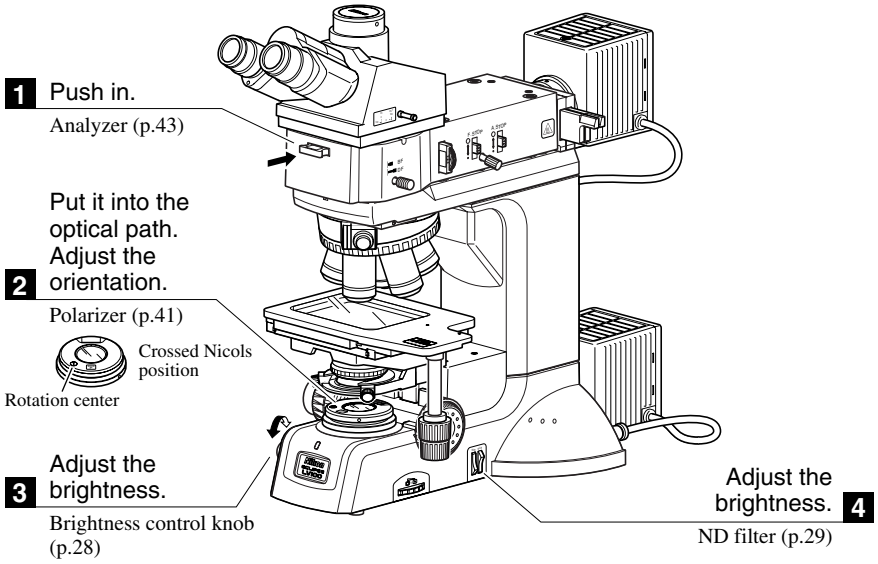
8 Simplified Polarization Microscopy under Dia-illumination

▶ When configured with the LV-UEPI

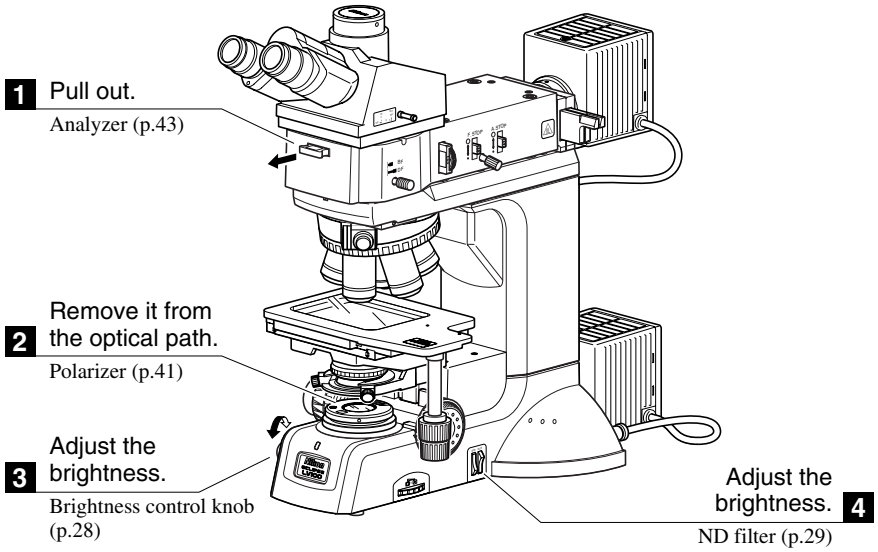
1. Mount a polarizer and an analyzer. (p.41 and p. 43)

2. Focus on the sample with the bright-field microscopy under the dia-illumination. (p.24)

3. Set the microscope for the simplified polarization microscopy under the dia-illumination.



4. Return the microscope to the bright-field microscopy under the dia-illumination.

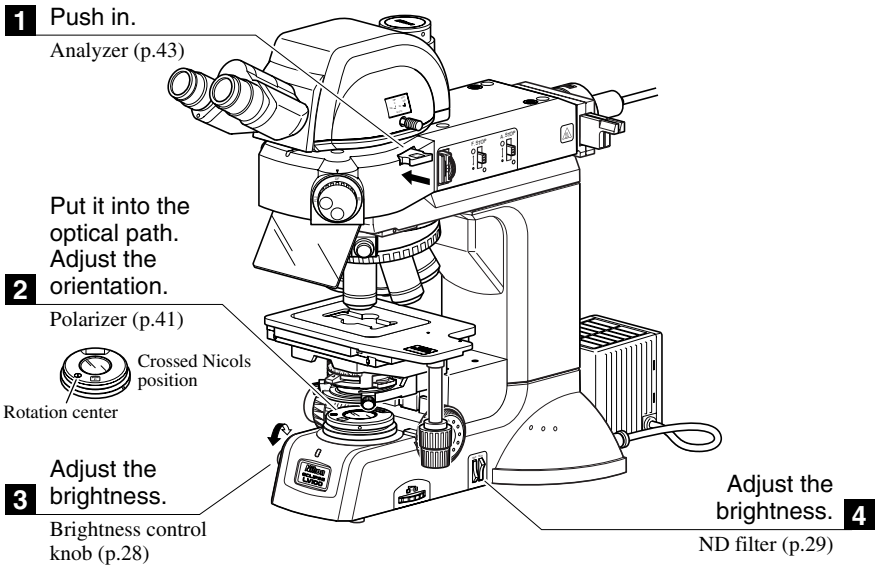


▶ When configured with the LV-UEPI2

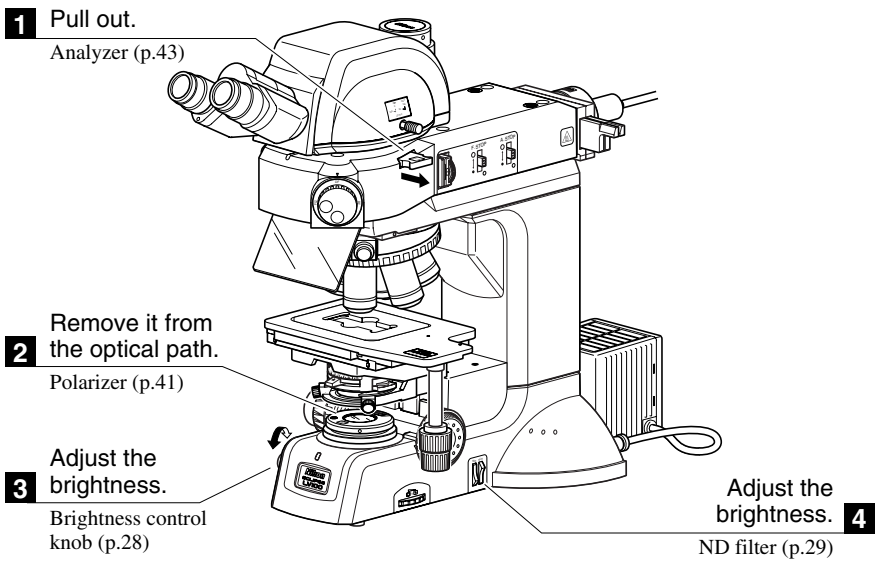
1. Mount a polarizer and an analyzer. (p.41 and p. 43)

2. Focus on the sample with the bright-field microscopy under the dia-illumination. (p.25)

3. Set the microscope for the simplified polarization microscopy under the dia-illumination.



4. Return the microscope to the bright-field microscopy under the dia-illumination.

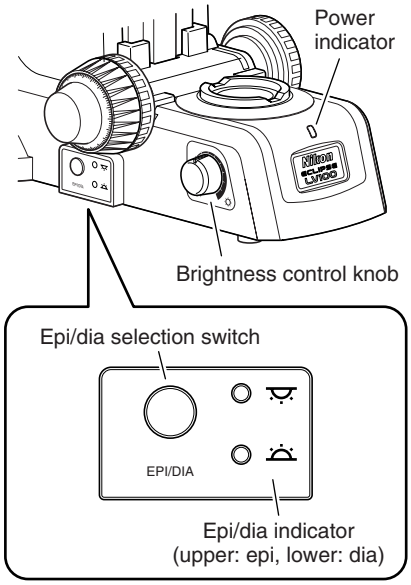


III Operation of Each Part

1 Operation for Illumination

▶ Selection between epi-illumination and dia-illumination

The illumination path can be selected between the epi-illumination and the dia-illumination by operating the epi/dia selection switch that is located on the left side of the microscope when the specified lamphouse LV-LH50PC is used.
The illumination switches each time you push the switch, and the indicator of the selected illumination turns on.



▶ Light control

When the specified lamphouse LV-LH50PC is used as the light source, the illumination light selected by the epi/dia selection switch can be controlled by rotating the brightness control knob.

* When an external light source is used, the brightness is controlled by the external light source or the ND filters on the microscope.

▶ Turning on/off the lamp

The illumination can be turned on/off by the switch of brightness control knob. The halogen lamp selected by the epi/dia selection switch is turned off when the specified lamphouse LV-LH50PC is used, the brightness control knob is rotated to the far side (counter clockwise direction), and set to the OFF position.

▶ Power indicator

The power indicator color changes according to the halogen lamp status. When the halogen lamp is lit, it is green. When the brightness control knob is positioned at OFF, it is orange.

2 Filters

▶ For epi-illumination

There are two filter sliders in the end of the illuminator. Two filters can be set on each filter slider. The desired filters can be brought into the optical path by sliding the filter sliders in and out.
For attaching the filters, refer to p.55.

Filters	Usage
NCB11 (neutral color balancing filter)	Color balance adjustment and color photomicrography.
ND4 (ND filter)	Brightness adjustment. (transmittance: 25%)
ND16 (ND filter)	Brightness adjustment. (transmittance: 6%)
GIF (green interference filter)	Contrast adjustment.
IF (interference filter)	For interference.

▶ For dia-illumination

The following two filters are built into the base part of the microscope.
Filter insert switches are placed on the right side of the microscope. To place 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.

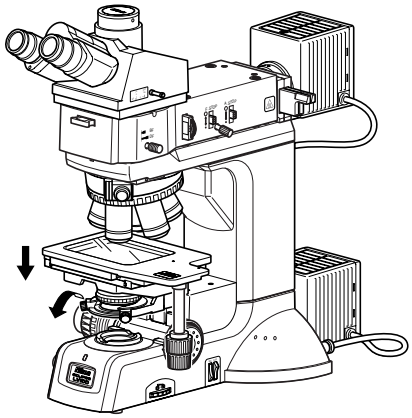
Filters	Usage
NCB11 (neutral color balancing filter)	Color balance adjustment and color photomicrography.
ND8 (ND filter)	Brightness adjustment. (transmittance: 12.5%)

3 Coarse/Fine Focus Knobs

▶ Relationship between focus knob rotation and stage vertical movement

The relationship between the direction of coarse/fine focus knob rotation and the stage vertical movement is shown in the figure.

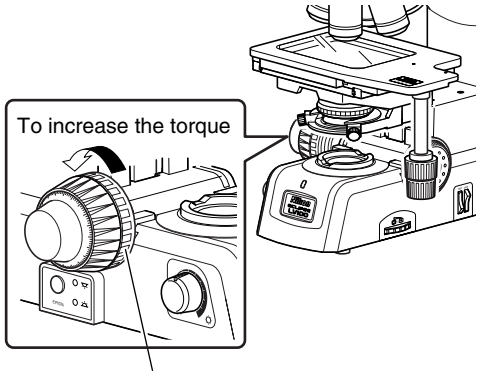
- The stage moves approximately 14.0 mm per one full rotation of the coarse focus knob.
- The stage moves 0.1 mm per one full rotation of the fine focus knob.
- The stage moves 1 µm per one step of the fine focus knob graduations.
- The stroke (range) of stage vertical movement is 1 mm up and 29 mm down from the standard position (stage surface).



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

▶ 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 (labeled "TORQUE→", located at the root of the coarse focus knob) in the direction shown by the arrow on the microscope base. To decrease the torque, turn it opposite to the arrow.

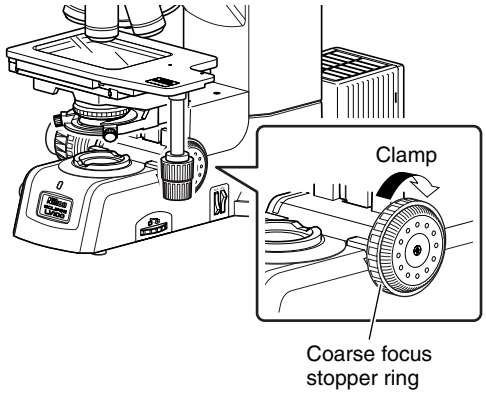


Coarse focus stopper

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.



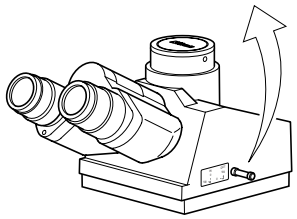
4 Eyepiece Tube

▶ Optical path selection

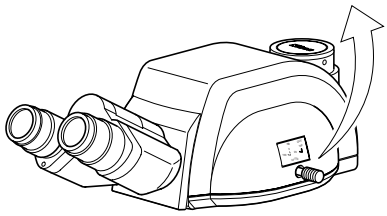
The optical path selection lever can be used to switch between the proportions of light reaching the binocular part and the vertical tube.

Lever position	Light proportion	
	Binocular part	Vertical tube
IN	100	0
OUT	0	100

Lever position	Light proportion	
	Binocular part	Vertical tube
IN	100	0
OUT	20	80



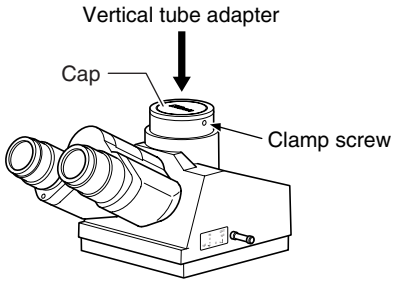
Eyepiece tube LV-TI3



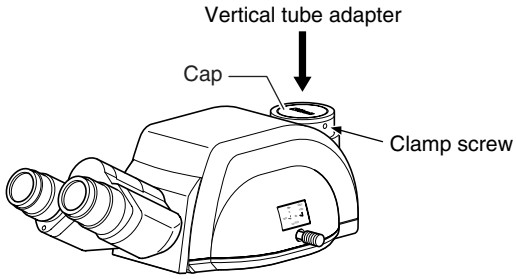
Eyepiece tube LV-TT2

▶ Vertical tube adapters

When attaching photomicrographic equipment or TV camera to the vertical tube of the trinocular eyepiece tube, you must first mount the adapter (photomicrographic vertical tube adapter or direct C-mount; both sold separately). Insert the adapter into the vertical tube and secure it with the clamp screw using a hexagonal screwdriver.



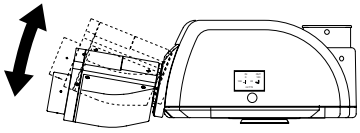
Eyepiece tube LV-TI3



Eyepiece tube LV-TT2

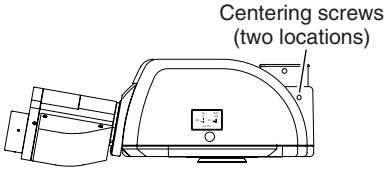
▶ Angular adjustment of binocular part (for the LV-TT2 only)

With the trinocular eyepiece tube LV-TT2, the angle of the binocular part can be adjusted. Adjust it to an easily viewable angle.



▶ Centering the binocular part (for the LV-TT2 only)

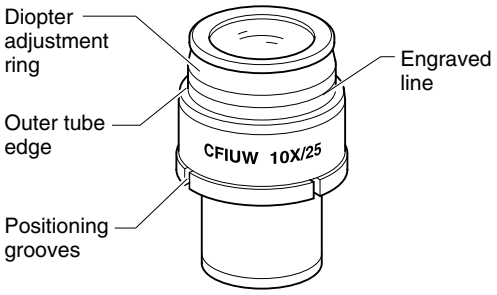
The binocular part and the vertical tube of the eyepiece tube are centered before the shipping, so usually they can be used with no adjustment.
But some cameras are not aligned the CCD centers to the mount. You can center the vertical tube by adjusting two centering screws on the back of the vertical tube for such cameras.



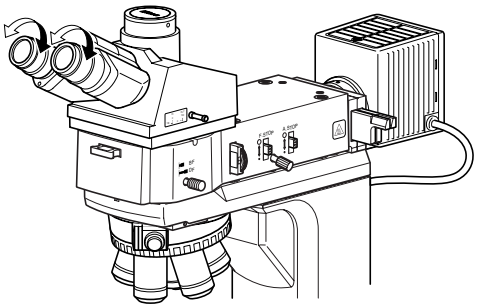
5 Diopter Adjustment

Diopter adjustment compensates for differences in eyesight between your left and right eyes. After the correct adjustment, you will find the observation with both eyes easier and the focus shift is reduced when switched to different objectives. Be sure to adjust the diopter adjustment rings on both eyepieces.

1. Turn the diopter adjustment rings on both eyepieces to align their engraved lines with the edge of the outer tube of the eyepiece. (This is the standard position for diopter adjustment.)
2. Focus on the sample with the 10x objective following the steps of bright-field microscopy under the epi-illumination (p.14, 15) or under the dia-illumination (p.24, 25).
3. Bring the 50x objective into the optical path and focus on the sample by turning the coarse/fine focus knobs.
4. Bring the 5x or 10x objective into the optical path.
5. Focus on the sample by turning the diopter adjustment ring on the right eyepiece (not the coarse/fine focus knobs).
   Look through the left eyepiece with your left eye, and the right eyepiece with your right eye, to focus on the sample with the diopter adjustment rings.
6. Repeat steps **3** to **5** with the 50x and 5x (or 10x) objectives until the image stays in focus even though the objective magnification is changed.

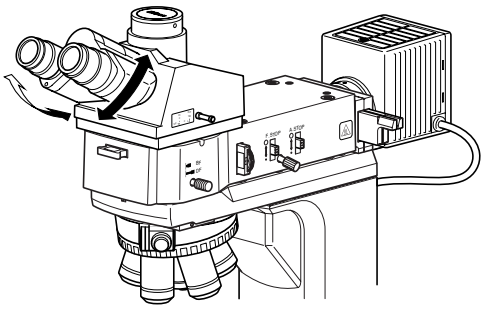


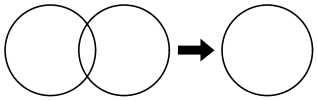
Diopter adjustment standard position



6 Interpupillary Distance Adjustment

Before adjusting the interpupillary distance, perform the steps of bright-field microscopy under the epi-illumination (p.14, 15) or under dia-illumination (p.24, 25) and focus on the image with the 10x objective.
Adjust the interpupillary distance so that the viewfields for both eyes are at the same position on the sample.
Doing so will make observation through the binocular eyepieces with both eyes easier.
The scale on the binocular part is useful in order to memorize your interpupillary distance for the next time.



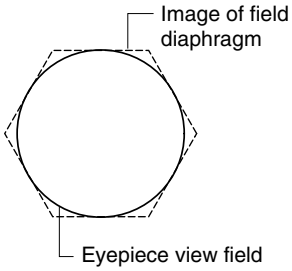


Merge the view fields into one.

7 Adjusting the Epi-illumination (Field Diaphragm and Aperture Diaphragm)

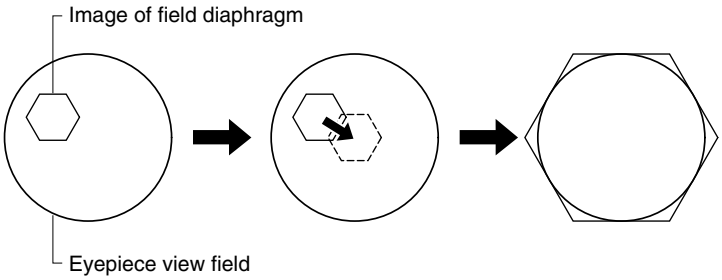
▶ Field diaphragm

The field diaphragm restricts illumination on the sample to the area being observed.
The field diaphragm open/close lever changes the size of the field diaphragm. Adjust the size of the diaphragm until it circumscribes or inscribes the viewfield.
Illuminating an area larger than necessary can let in stray light, creating flaring and reducing the contrast of the optical image.
Proper operation of the field diaphragm is important for the photomicrography. Generally, the field diaphragm should be set to an area slightly larger than the area to be exposed on film, that is, the photographed area.
Be sure to adjust the field diaphragm after centering it.



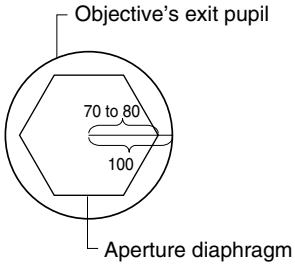
▶ Centering the field diaphragm

1. Focus on the sample with the 10x objective by following the steps of the bright-field microscopy under the epi-illumination (p.14, 15).
2. Lower the field diaphragm open/close lever to reduce the field diaphragm opening.
3. Turn the two field diaphragm centering screws on both sides to move the center of the field diaphragm image to the center of the viewfield.
   When the illuminator LV-UEPI2 is used, insert a hexagonal wrench into the field diaphragm centering holes on both sides and turn the internal adjustment screws.
4. Use the field diaphragm open/close lever and centering screws so that the field diaphragm image is inscribed in the viewfield.
5. When starting observation, raise the field diaphragm open/close lever so that the field diaphragm image is slightly larger the viewfield.



Aperture diaphragm

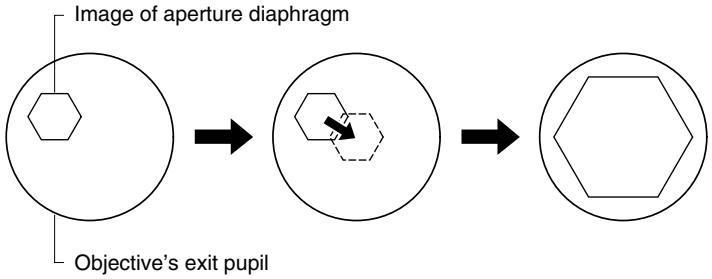
Since the aperture diaphragm is for adjusting the numerical aperture of the illumination system, this diaphragm is related to the resolution, contrast, and depth of focus of the optical image. The aperture diaphragm open/close lever will change the opening of the aperture diaphragm. Remove one of the eyepieces, and then adjust the aperture diaphragm opening while observing the objective's exit pupil in the eyepiece tube.Generally, the aperture diaphragm should be adjusted to about 70 to 80% of the numerical aperture of the objective.
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.
For the illuminator LV-UEPI, the aperture diaphragm centering has been adjusted at the factory and dose not need to be adjusted.



Centering the aperture diaphragm (for the LV-UEPI2 only)

When the illuminator LV-UEPI2 is used, the aperture diaphragm centering can be adjusted through these steps:

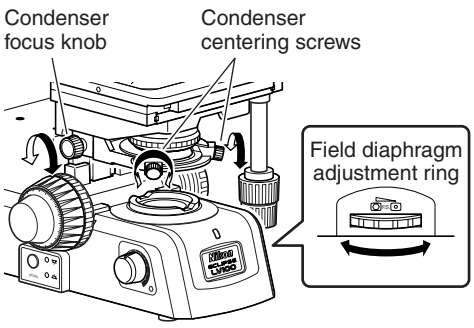
1. Focus on the sample with the 10x objective by following the steps of the bright-field microscopy under the epi-illumination (p.14, 15).
2. Remove one of the eyepieces. Check that the aperture diaphragm image is seen within the objective's exit pupil in the eyepiece tube.
3. Lower the aperture diaphragm open/close lever to reduce the field diaphragm opening.
4. Insert a hexagonal wrench into the aperture diaphragm centering holes on both sides and turn the internal adjustment screws to bring the aperture diaphragm image to the center of the objective's exit pupil.
5. Use the diaphragm open/close lever and centering screws so that the aperture diaphragm image is inscribed in the objective's exit pupil.
6. When starting observation, adjust the aperture diaphragm open/close lever so that the aperture diaphragm image is 70 to 80% of the numerical aperture of the objective. (Adjust the aperture diaphragm for each objective.)



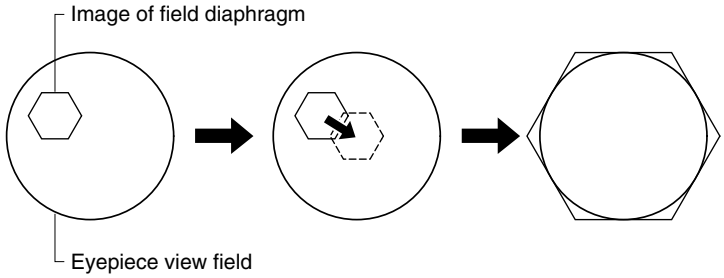
8 Adjusting the Dia-illumination (Focusing and Centering the Condenser and Adjusting the Field Diaphragm and Aperture Diaphragm)

Focusing and centering the condenser

To use the dia-illumination for the first time and after the replacement of the condenser, focus and center the condenser to get the correct image formation. The light through the condenser must be focused on the sample surface of the correct position (the center of the optical path).

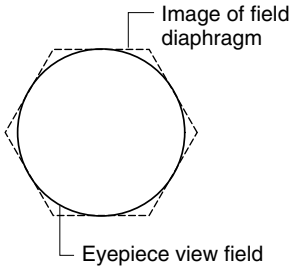


1. Focus on the sample with the 10x objective by following the steps of the bright-field microscopy under the dia-illumination (p. 24 and 25).
2. Rotate the field diaphragm adjustment ring on the base of the microscope to reduce the field diaphragm opening.
3. Rotate the condenser focus knob to form the field diaphragm image on the sample surface.
4. Turn the two condenser centering screws on both sides to move the center of the field diaphragm image to the center of the viewfield.
5. Enter the 50x objective into the optical path and focus on the sample by rotating the fine focus knob.
6. Rotate the condenser focus knob to form the field diaphragm image on the sample surface.
7. Use the field diaphragm adjustment ring and the field diaphragm centering screws so that the field diaphragm image is inscribed in the viewfield.
8. When starting observation, adjust the field diaphragm adjustment ring so that the field diaphragm image is slightly larger the viewfield. (Adjust it for each objective.)



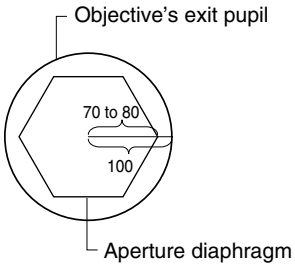
Field diaphragm

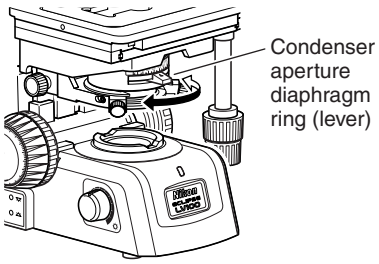
The field diaphragm restricts illumination on the sample to the area being observed. The field diaphragm adjustment ring changes the opening of the field diaphragm. Adjust the opening of the diaphragm until it circumscribes or inscribes the viewfield.
Illuminating an area larger than necessary can let in stray light, creating flaring and reducing the contrast of the optical image.
Proper operation of the field diaphragm is important for the photomicrography. Generally, the field diaphragm should be set to the area to be exposed on film, that is, to an area slightly larger than the picture composition frame representing the photographed area.
Be sure to adjust the field diaphragm after focusing and centering the condenser.



Aperture diaphragm

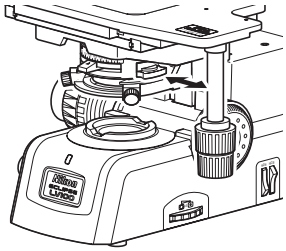
Since the aperture diaphragm is for adjusting the numerical aperture of the illumination system, this diaphragm is related to the resolution, contrast, and depth of focus of the optical image.
The condenser aperture diaphragm ring (lever) will change the opening of the aperture diaphragm. Generally, the aperture diaphragm should be adjusted to about 70 to 80% of the numerical aperture of the objective.
The scales are indicated as numerical aperture values for the condenser. Check the value for the adjustment.
Be sure to adjust the field diaphragm after focusing and centering the condenser.





Handling the slide condenser

If the slide condenser is used for 2.5x objective, the vignetting in the field may occurs. So, push in the slide condenser for 2.5x objective.
Pull out the slide for 5x objective or more.

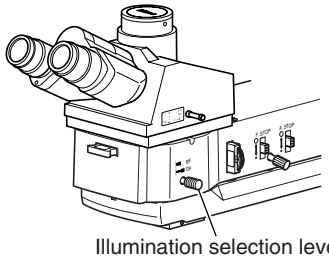


9 Illumination Selection Lever and Microcopy Selection Knob

1. Illumination selection lever (for the LV-UEPI)

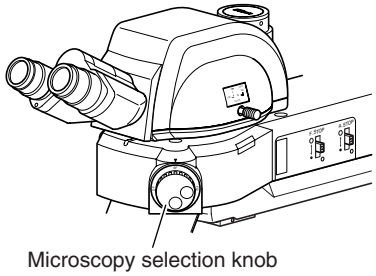
When the illuminator LV-UEPI is used, the illumination selection lever on the right side can be used to alternate the microscopy illumination between the bright-field (BF) and the dark-field (DF) under the epi-illumination.
Push the lever in to select the bright-field illumination (BF), or pull it out to select the dark-field illumination (DF) under the epi-illumination.

* To use the dia-illumination, select the DF side with this lever.



2. Microscopy selection knob (for the LV-UEPI2)

When the illuminator LV-UEPI2 is used, the microscopy selection knob at the front right of the illuminator can be turned to rotate the turret in the illuminator to the position of the desired microscopy mode under the epi-illumination.
The microscopy selection knob has five clickstop positions, BF, DF, FL1, S, and FL2, which correspond to the microscopy modes listed below.



Position	Microscopy
BF	**Bright-field microscopy** This is used for the usual bright-field microscopy. It is used also for the differential interference contrast (DIC) microscopy and simplified/sensitive polarization microscopies. The UV filter enters into the optical path when the BF position is selected.
DF	**Dark-field microscopy** Setting the knob to DF selects the dark-field illumination, so that the aperture diaphragm and field diaphragm open fully together. The positions of the diaphragm levers do not change. When the knob is set to a position away from DF, the aperture diaphragm and field diaphragm are restored to what they were before setting to DF. The UV filter enters into the optical path when the DF position is selected.
FL1	**Epi-fluorescence 1** The filter cube inserted into the “FL1” position in the illuminator enters the optical path. And, the UV filter is removed from the optical path.
S	**Shutter** The shutter stops the optical path of illumination. This clickstop position is between FL1 and FL2, so that the shutter is readily available to prevent fading of the sample.
FL2	**Epi-fluorescence 2** The filter cube inserted into the “FL2” position in the illuminator enters the optical path. And, the UV filter is removed from the optical path.

If no filter cube is set on the turret in the illuminator, nothing is seen when the knob is turned to the FL1 or FL2 position.

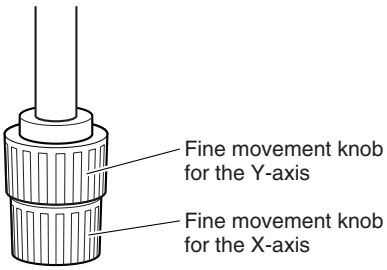
* To use the dia-illumination, select the DF side with this knob.

10 Stage

▶ Stage movement

To move the 3x2 stage, turn the stage fine movement knobs for the X-axis and Y-axis.
Upper knob is for the Y-axis and lower knob is for the X-axis. Use these knobs to move the specimen minutely.

* If you move the stage plate directly, the stage will be damaged. Use these fine movement knobs to move the stage.



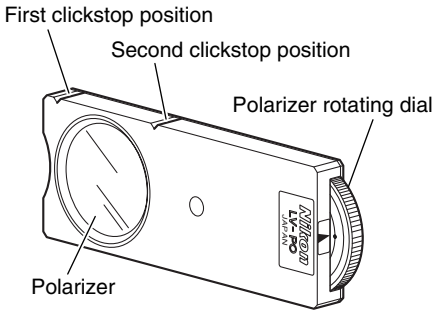
▶ Slide glass usage

To observe a specimen by using a slide glass on the 3x2 stage, replace the stage glass to the optional slide glass holder.
Loosen the clamp screw on the left side of the stage to remove the standard stage glass. Then, mount the slide glass holder and secure it by the clamp screw.

* When a high N.A. condenser such as slide condenser is used, do not use the standard stage glass. They can collide with each other. Be sure to use the slide glass holder.

11 Polarizer Slider (for Epi-illumination)

The polarizer slider can be used together with the analyzer slider to enable the simplified polarization microscopy under the epi-illumination. Likewise, the polarizer slider can be combined with the analyzer slider and DIC slider to perform DIC microscopy under the epi-illumination, and with the analyzer slider and lambda plate slider to perform the sensitive polarization microscopy under the epi-illumination (with the LV-UEPI2 only).



▶ Placing the polarizer in the optical path

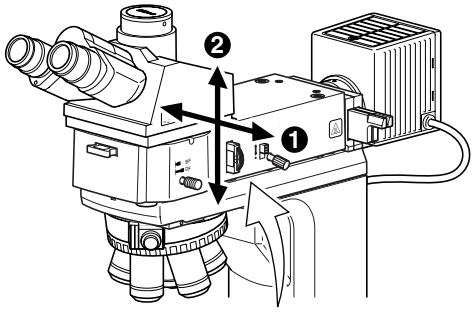
- **For the LV-UEPI:**
  Remove the dummy slider at the right side of the illuminator, and in its place, insert the polarizer slider with its orientation indication facing toward the eyepieces. (p.55)
- **For the LV-UEPI2:**
  Remove the vertically oriented cover at the right side of the illuminator. Insert the polarizer slider into the rear slot with its orientation indication facing toward the eyepieces. In the front slot, insert a dummy slider or lambda plate slider. (p.55)
- **Insertion to the optical path:**
  Pushing the polarizer slider in to the first clickstop position inserts the empty hole into the optical path. Pushing it further in to the second clickstop position inserts the polarizer into the optical path. Set the orientation of the polarizer by turning the polarizer rotating dial.

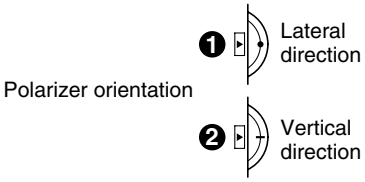
▶ Removing the polarizer out of the optical path

With the polarizer placed in the optical path, pull it out in the right direction to the first clickstop position. The polarizer has been removed out of the optical path (instead, the empty hole is now in the optical path).

▶ Adjusting the orientation of the polarizer

Turning the polarizer rotating dial changes the orientation of the polarizer. Here is how to bring the polarizer and the analyzer into the crossed Nicols position.
Place the polarizer and the analyzer in the optical path. Place a sample with a flat and plain surface on the stage and set the microscope for simplified polarization microscopy under the epi-illumination.
Remove one eyepiece from the microscope and look inside the open sleeve. You can see the objective's exit pupil as a bright circle.
Turn the polarizer rotating dial in either direction until the dark cross appears in the viewfield. This is the crossed Nicols position.
(Matching the marks on the polarizer rotation dial as shown in ❶ on the illustration will bring about the crossed Nicols position as well.)





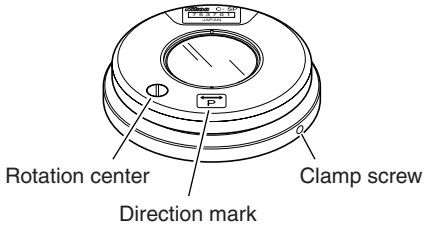
Dark cross

UV polarizer slider

The UV polarizer slider is used for the epi-microscopy under the UV excitation light to make the excitation light to the linear polarization. The UV polarizer will deteriorate over time, so change it as necessary.

12 Polarizer for Dia-illumination

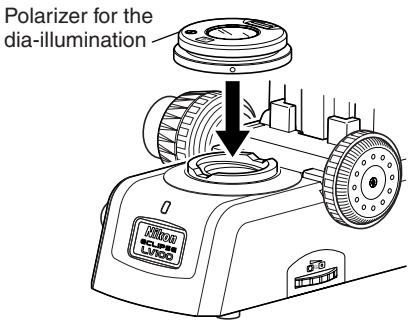
The polarizer for the dia-illumination can be used together with the analyzer to enable the simplified polarization microscopy under the dia-illumination.



Installing the polarizer for the dia-illumination

Face the direction mark on the polarizer for the dia-illumination to the front side. And then, put the polarizer to the field lens on the microscope base.

To change the orientation of the polarizer, rotate the whole polarizer. Adjust the polarizer and the analyzer as follows to get the crossed Nicols position.

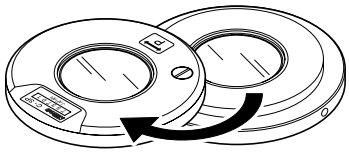


1. Place the polarizer and analyzer into the optical path, and open the aperture diaphragm fully.
2. Remove one eyepiece from the microscope and look inside the open sleeve. You can see the objective's exit pupil as a bright circle and black patterns.
3. Rotate the whole polarizer for the dia-illumination in either direction until the dark cross appears in the viewfield. This is the crossed Nicols position.
4. Secure the polarizer for the dia-illumination by the clamp screw.


Dark cross

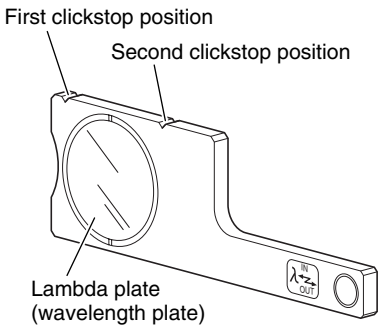
Removing the polarizer for the dia-illumination out of the optical path

To remove the polarizer for the dia-illumination from the optical path, rotate the upper part of the polarizer around the rotation center to swing it out.



13 Lambda Plate Slider (for the LV-UEPI2 only)

If the LV-UEPI2 is used for the illuminator, the lambda plate slider can be used together with the polarizer slider and analyzer slider to perform sensitive polarization microscopy under the epi-illumination.



▶ Placing the lambda plate in the optical path

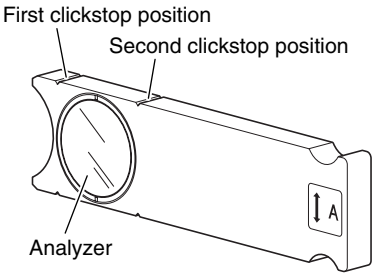
Remove the dummy slider found in front of the polarizer slider, and in its place, insert the lambda plate slider. (p.55)
Pushing the lambda plate slider in to the first clickstop position inserts the empty hole into the optical path. Pushing it further in to the second clickstop position inserts the lambda plate into the optical path.

▶ Removing the lambda plate out of the optical path

With the lambda plate placed in the optical path, pull it out in the right direction to the first clickstop position. The lambda plate is now out of the optical path.

14 Analyzer Slider

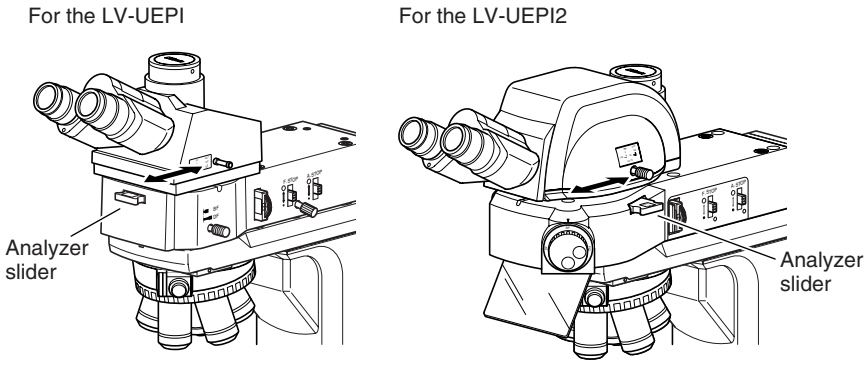
The analyzer slider can be used together with the polarizer slider to enable the simplified polarization microscopy under the epi-illumination. And with the polarizer for the dia-illumination, the simplified polarization microscopy under the dia-illumination can be performed. Likewise, the analyzer slider can be combined with the polarizer slider and DIC slider to perform DIC the microscopy under the epi-illumination, and with the polarizer slider and lambda plate slider to perform sensitive polarization microscopy under the epi-illumination (with the LV-UEPI2 only).



▶ Placing the polarizer in the optical path

- **For the LV-UEPI:**
  Remove the dummy slider at the front of the illuminator, and in its place, insert the analyzer slider with its marking facing up. (p.55)
- **For the LV-UEPI2:**
  Remove the horizontally oriented cover at the right side of the illuminator. Insert the analyzer slider into the horizontal slot with its marking facing up. (p.55)
- **Insertion to the optical path:**
  Pushing the analyzer slider in to the first clickstop position inserts the empty hole into the optical path. Pushing it further in to the second clickstop position inserts the analyzer into the optical path.

  * The orientation of the analyzer is as indicated by the arrow on the slider.



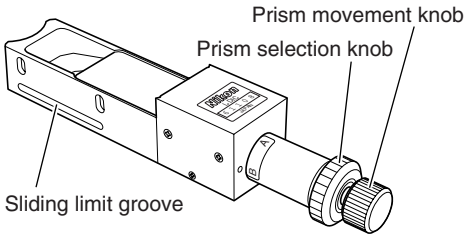
Analyzer orientation

▶ Removing the polarizer out of the optical path

With the analyzer placed in the optical path, pull it out toward you to the first clickstop position. The analyzer has been removed out of the optical path (instead, the empty hole is now in the optical path).

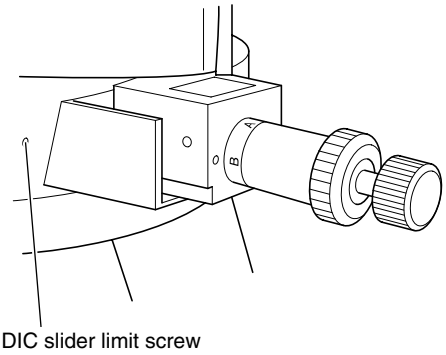
15 DIC Slider

The DIC slider can be used together with the polarizer slider(or the polarizer for the dia-illumination) and analyzer slider to perform the DIC microscopy.



▶ Attaching/removing the DIC slider

Use a hexagonal screwdriver to loosen the DIC slider limit screw on the nosepiece.
Insert the DIC slider into the slot on the nosepiece and screw in the DIC slider limit screw.
When removing the DIC slider from the nosepiece, fully loosen the DIC slider limit screw using a hexagon screwdriver, and then pull out the slider.



▶ Placing the DIC prism in the optical path

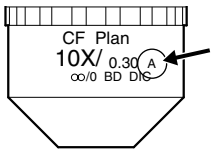
Push in the slider to the second clickstop position to place the DIC prism in the optical path.

▶ Removing the DIC prism out of the optical path

Pull out the slider to the first clickstop position to remove the DIC prism out of the optical path.

▶ Selecting the DIC prism position

The correct position of the prism selection knob is indicated on the objective barrel after the magnification and the objective N.A. indications. In the objective shown in the figure on the right, the letter “A” on the objective indicates that the correct DIC prism position for this objective is “A”. Thus, when you use this objective, turn the prism selection knob on the DIC slider to match the letter “A” with the white circle.



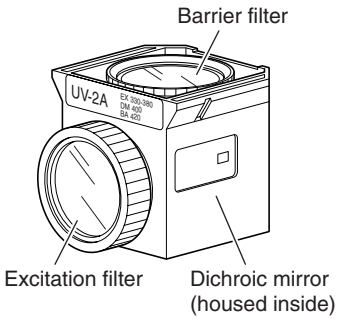
▶ Selecting an interference color

Turn the prism movement knob to change the interference colors continuously.

Interference color	Characteristics
Dark	Observation similar to dark-field microscopy can be performed.
Gray	This color enables observation of the phase difference distribution for the whole sample.
Sensitive red-violet	Observation with the highest color contrast can be performed.

16 Filter Cubes for Fluorescence Observation (for the LV-UEPI2 only)

The illuminator LV-UEPI2 accommodates two filter cubes for epi-fluorescence observation.
The filter cube consists of an excitation (EX) filter, barrier (BA) filter, and dichroic mirror (DM). Note the following considerations as a guideline and choose the right combination of filters that are most suitable for the characteristics of the sample and fluorescent stain.

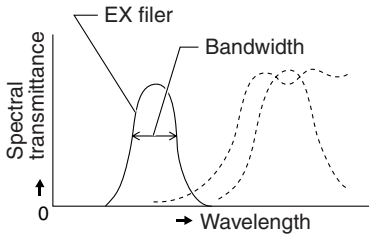


- Different combinations of excitation filter and barrier filter are available for the same excitation method.
- Excitation filters, barrier filters, and dichroic mirrors can be purchased separately.
- Excitation filters will deteriorate over time since they are exposed to intense light. Replace them as necessary.
- For the procedures to attach filter cubes, see page 56 of "IV. Assembly."

Light source for the epi-fl microscopy
To perform the epi-fl microscopy with the LV-UEPI2 illuminator, the specified light source brightness may be less than the desired brightness. An external light source suitable for the excitation method can be installed into the LV-UEPI2 for this purpose.
** Please take note that if a light source other than the specified ones are installed onto this microscope, this microscope system will not be treated as a UL-listed product. Nikon recommends that the light source to be installed onto this microscope should have been tested by a safety certification organization.*

▶ Selecting an excitation (EX) filter

The excitation filter selectively transmits only the light of the wavelength range required for the sample to fluoresce, while blocking the other light. The wavelength range of light that can pass through the filter is called the bandwidth. The bandwidth of an excitation filter determines the brightness of fluorescence image, the occurrence of self-fluorescence (fluorescence generated by materials other than the fluorescent stain), and the degree of fading. A wider bandwidth delivers more excitation light to the sample and makes the image brighter, but it induces more self-fluorescence and therefore more fading A narrower bandwidth delivers less excitation light to the sample and makes the image darker, but it induces less self-fluorescence and therefore less fading. If self-fluorescence is too intense, use an excitation filter of narrower bandwidth. (The fluorescence image becomes darker, however.)



Excitation filters will deteriorate over time since they are subject to intense light. Replace them as necessary depending on their total operating hours.

	Narrow	Bandwidth of excitation filter	Wide
Brightness of fluorescence image	Dark		Bright
Occurrence of self-fluorescence	Less frequent		Frequent
Degree of fading	Small		Large

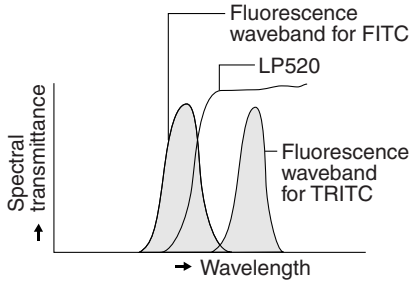
Selecting a barrier (BA) filter

The barrier filter transmits only the fluorescence emitted by the sample, blocking the excitation light. This enables observation of fluorescence images having less unnecessary light (darker background).
BA filters are available in two types: long-pass (LP) and band-pass (BP). The LP filter blocks all the light of shorter wavelength than a given value. The BP filter transmits light in a given wavelength range. Use the suitable types in accordance with your purposes.

- **Long-pass (LP) filter**

The LP filter blocks all the light of shorter wavelength than a given value, called the cut-on wavelength.

1) Some sample may be stained with a fluorescent color for which the fluorescence waveband and the excitation waveband (the light that the sample absorbs to emit fluorescence) are very close to each other. Then, fluorescence microscopy generally will be more efficient by selecting a filter for which the cut-on wavelength is as short as feasible.
A longer cut-on wavelength tends to result in a more complete separation between excitation light and fluorescent light, rendering a darker background of the fluorescence image. With the recent advancement in filter performance, however, shorter cut-on wavelengths are used more often than before.

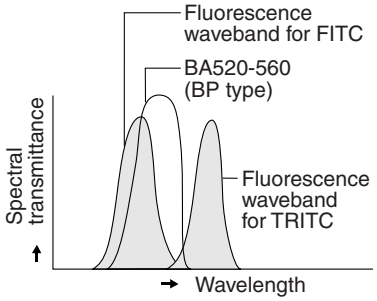


Both fluorescence images due to FITC and TRITC are seen.

2) LP filters are used for samples stained in multiple colors where fluorescence images for all the colors are desired.
However, the usual combination of a dichroic mirror, an excitation mirror, and a barrier filter of LP filter type, may not be sufficient to excite a stain that emits fluorescence of longer wavelength (for example, TRIC when the sample is stained with FITC and TRITC), making the fluorescence image for TRITC very dark. In a case like this, a multi-band filter is recommended.

- **Band-pass (BP) filter**

The BP filter transmits light of a certain wavelength range. This type of filter is used for samples stained in multiple colors where fluorescence images due to a certain stain are desired. (For example, in the case of a dual-stained sample, say FITC and TRITC, and fluorescence images due only to FITC are desired, then BA520-560 should be selected.)
If a BP filter is used, however, any self-fluorescence cannot be discriminate (because the fluorescence image will be green all over for the above combination).
The LP filter is more useful when you wish to discriminate self-fluorescence by a subtle difference of hue.



Only fluorescence image due to FITC is seen.

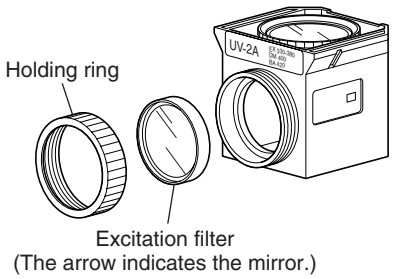
Replacing the excitation filter, barrier filter, and dichroic mirror

The excitation filter, barrier filter, and dichroic mirror can be removed from the filter cube and replaced with different parts.
When handling these parts, put on gloves and do not touch the surface of filters and mirrors with bare hands. And be careful not to let dust or fingerprints get on them.

• Replacing the excitation filter

The excitation filter is secured by a screwed type holding ring to the filter cube.

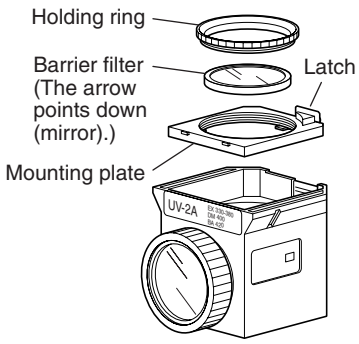
1. Rotate the holding ring in counterclockwise direction to remove it.
2. Replace the excitation filter and secure it by the holding ring.
   Check and see the arrow mark on the rim of the excitation filter is directed to the dichroic mirror side when attaching the excitation filter.
   If a filter made by other manufacturer is used, check and see the indication on the rim of the filter.



• Replacing the barrier filter

The barrier filter is secured by a screw type holding ring to the mounting plate on the upper side of the filter cube.

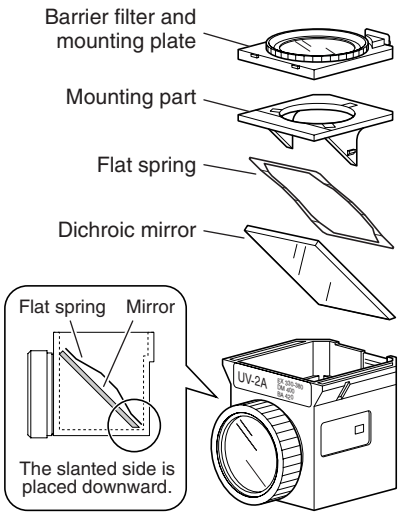
1. Press the latch to inside and detach the mounting plate and barrier filter together.
2. Rotate the holding ring to remove it from the mounting plate.
3. Replace the barrier filter and secure it in reverse order.
   Check and see the arrow mark on the rim of the barrier filter is directed to downward (dichroic mirror side) when attaching the barrier filter.
   If a filter made by other manufacturer is used, check and see the indication on the rim of the filter.



• Replacing the dichroic mirror

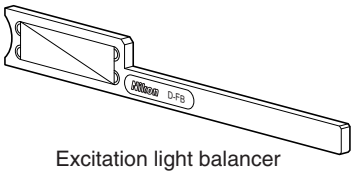
The dichroic mirror is fixed with a flat spring and a mounting part inside the filter cube.

1. Detach the mounting plate and barrier filter together.
2. Pull the mounting part upward to remove it. (It is clamped with latches on both sides.)
3. Remove the flat spring and dichroic mirror.
4. Replace the dichroic mirror and put it back to the original position with the flat spring.
   One side of the edge of the dichroic mirror is slanted to distinguish the reflection surface. The slanted edge is placed to downward to fit the bottom surface of the dichroic mirror.
   And the flat spring is placed to hold the both side of the dichroic mirror.
5. Put the mounting part and barrier filter back to their original positions.



17 Excitation Light Balancer (for the LV-UEPI2 Only)

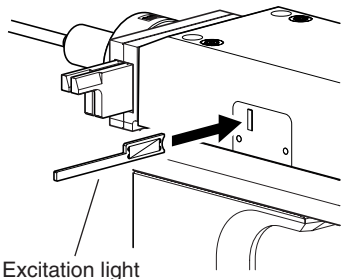
When the illuminator LV-UEPI2 is used, the optional D-FB excitation light balancer can be attached for the epi-fl microscopy to observe specimens stained in multiple colors.
The excitation light balancer enables the continuous change of the wavelength characteristics for the excitation light without replacing filter cubes.
The excitation light balancer is used in concert with a dual-band characteristic filter cube.



Excitation light balancer

▶ Excitation light balancer usage

Remove the vertically oriented cover on the left side of the illuminator, and insert the excitation light balancer with its indication faces back.
When the excitation light balancer is inserted to the limit position, it enters into the optical path. You can adjust the excitation light by sliding the excitation light balancer horizontally.

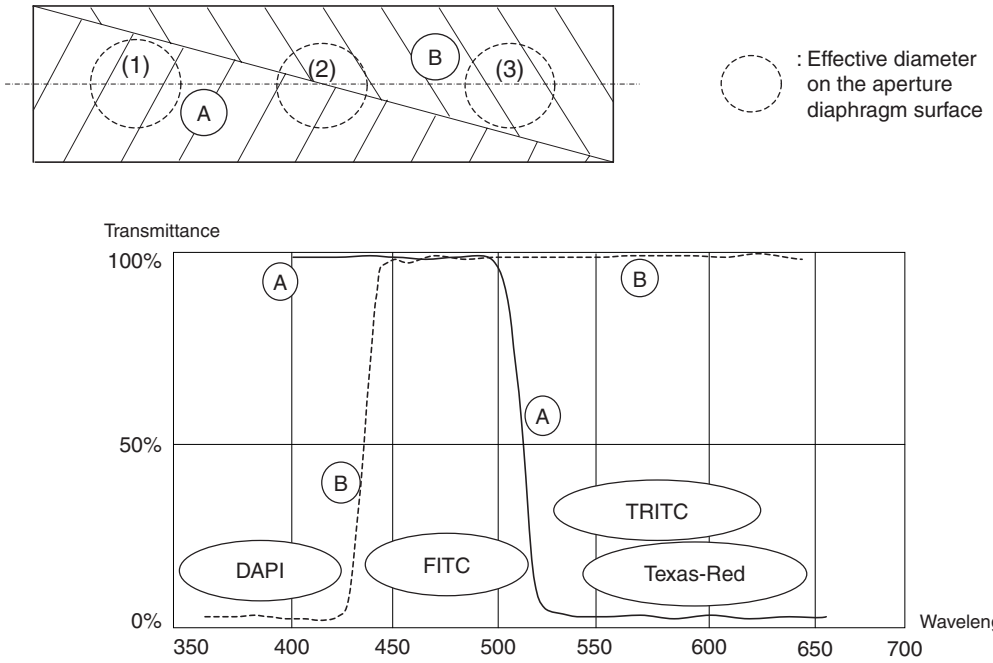


▶ Objectives

To use the excitation light balancer, use the following objectives in combination. If other objective is used, uneven image may be observed in the view field.

Plan Fluor	40x/0.75	40xH/1.3	100xH/1.3
S Fluor	40x/0.9	40xH/1.3	100xH/1.3
Plan Apo	40x/0.95	60xH/1.3	100xH/1.4

Detailed specification of excitation light balancer



The transmittance for the FITC is designed to keep approximately 100%, because the FITC is usually dark fluorescent image.

Optical path position	DAPI	FITC	TRITC / Texas-Red
(1)	100%	100%	0%
Between (1) and (2)	Variable (100% to 50%)	100%	Variable (0% to 50%)
(2)	50%	100%	50%
Between (2) and (3)	Variable (50% to 0%)	100%	Variable (50% to 100%)
(3)	0%	100%	100%

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 lens surface will adversely affect the microscope image. Be careful not to scratch or touch the lens surfaces. If lenses are contaminated with fingerprint or such, clean them according to the procedure described in "VI. Care and Maintenance."
- The microscope 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

- Hexagonal screwdriver 2 mm × 2 (supplied with the microscope)
- Hexagonal wrench 3 mm × 1 (supplied with the microscope)

When not using, place these in the tool holder at the right side of the microscope base.

▶ Installation location

Being a precision optical instrument, this product may get damaged or loose accuracy if it is used or stored under unsuitable conditions. When selecting the installation location, note the following:

- 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."

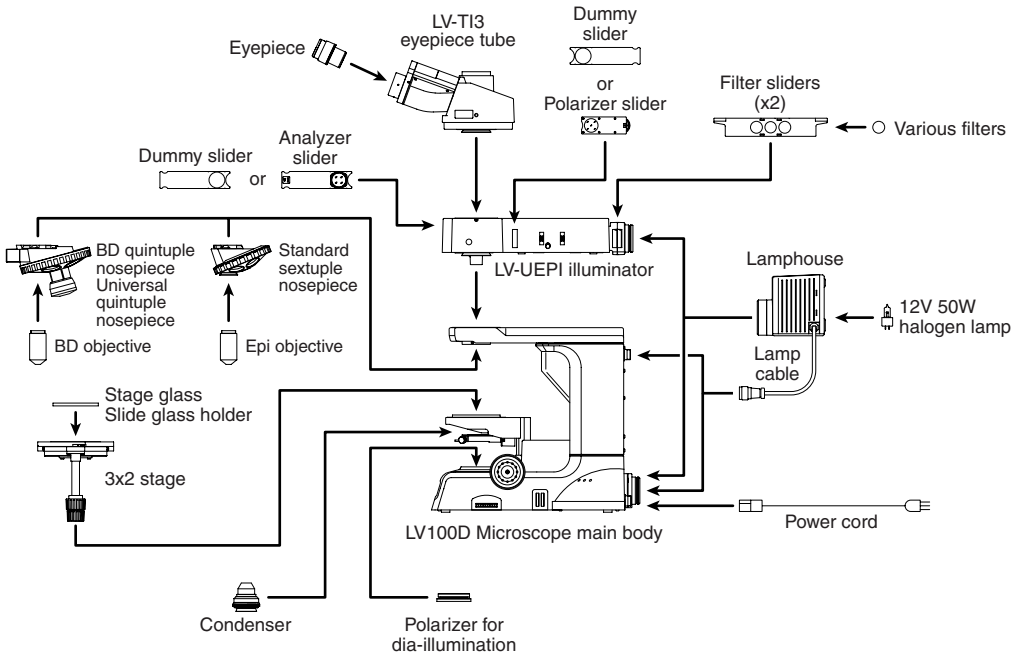
▶ Combination of the illuminator and the light source

This microscope system is UL-listed only in the combination of the illuminator and the light source describe below. Please take note that if a light source other than the specified ones are installed onto this microscope, this microscope system will not be treated as a UL-listed product.

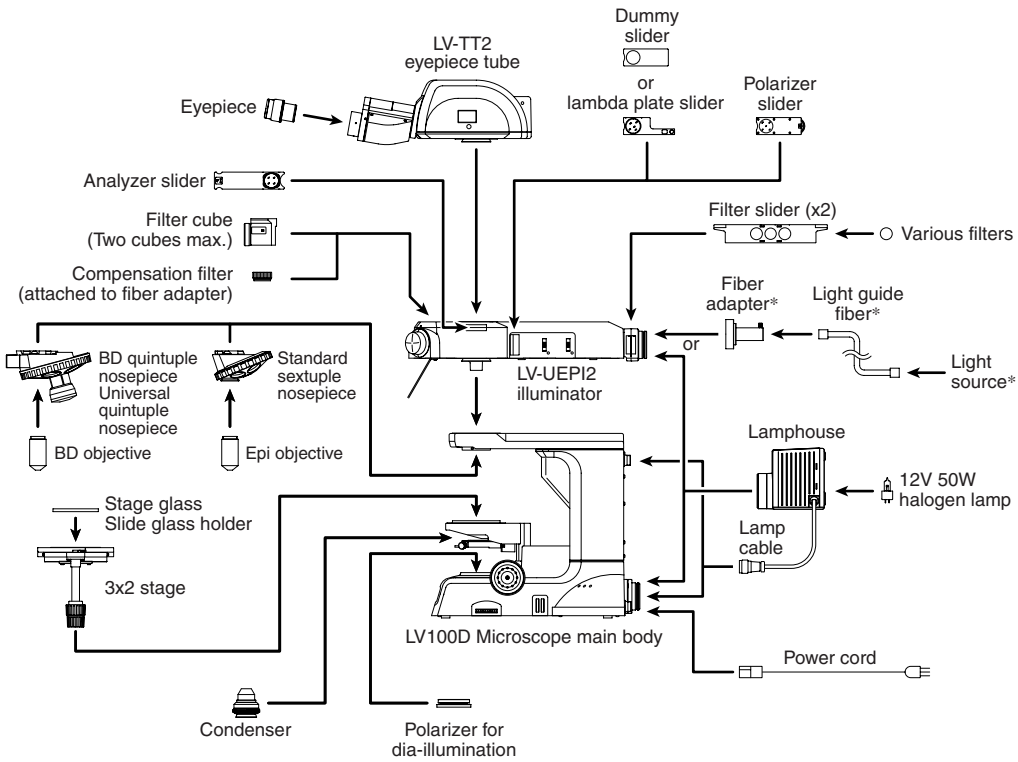
- Illuminator: Nikon LV-UEPI Universal Epi Illuminator or Nikon LV-UEPI2 Universal Epi Illuminator
- Lamphouse: Nikon LV-LH50PC precentered lamphouse 12V 50W
- Lamp: Nikon LV-HL50W 12V 50W LONGLIFE halogen lamp or non-Nikon 12V 50W SHORTLIFE halogen lamp (model OSRAM HLX 64610, OSRAM HLX 64611, or PHILIPS 7027)

Assembling the ECLIPSE LV100D

- **When using the illuminator LV-UEPI**



- **When using the illuminator LV-UEPI2**



* It is installed if the brightness of the specified light source is less than the desired brightness for the episcopic microscopy or so on. (Please take note that if a light source other than the specified ones are installed onto this microscope, this microscope system will not be treated as a UL-listed product.)

1 Assembling the Stage and Attaching the Condenser

1. Assembling the stage

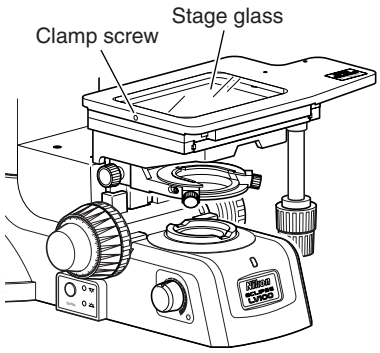
- **Attaching the stage:**

1 Lower the substage completely with the coarse focus knob.
2 Place the stage on the substage and fix it with the four M4 screws that are attached with the stage. Use the 3 mm hexagonal wrench.

- **Attaching the stage glass or slide glass holder:**

The 3x2 stage comes with a stage glass as standard. And when a slide glass or high N.A. condenser is used for the observation of the specimen, an optional slide glass holder must be attached in place of the stage glass. Refer to the followings to attach the stage glass or slide glass holder.

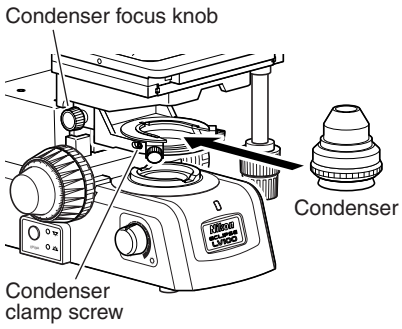
1 Loosen the clamp screw on the left side of the stage upper plate by using the hexagonal wrench.
2 Place the stage glass (or slide glass holder) on the stage and fit it in position so that it is level.
3 Tighten the clamp screw to fix the stage glass (or slide glass holder).
Take care not to lift up the stage glass by tightening the clamp screw too much.



2. Attaching the condenser

Attach the condenser as described below.

1 Lower the substage completely with the coarse focus knob.
2 Insert the condenser into the condenser holder with fitting the dovetail joints on the condenser holder and the condenser.
When scales are labeled on the condenser, face the scales to the front side.
3 Tighten the clamp screw on the left side of the condenser holder to fix the condenser.
Use a hexagonal wrench to tighten the screw.

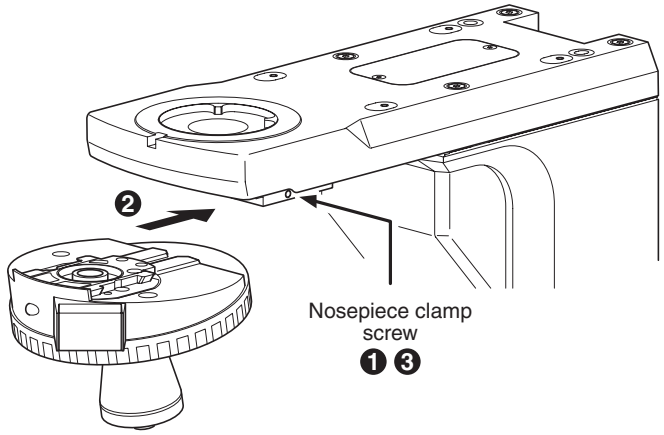


* To use a high N.A. condenser such as slide condenser, remove the standard stage glass attached with the stage and attach the slide glass holder in place of it. A high N.A. condenser and the standard stage glass can collide with each other. Be sure to change the stage glass to the slide glass holder.

2 Assembling the Nosepiece

1. Assembling the manual nosepiece

1 Fully loosen the nosepiece clamp screw on the right side of the microscope arm using the hexagonal screwdriver.
2 Fit the nosepiece from the front by aligning it to the groove in the bottom of the microscope arm and push it all the way.
3 Secure the nosepiece by tightening its clamp screw.



2. Removing the nosepiece

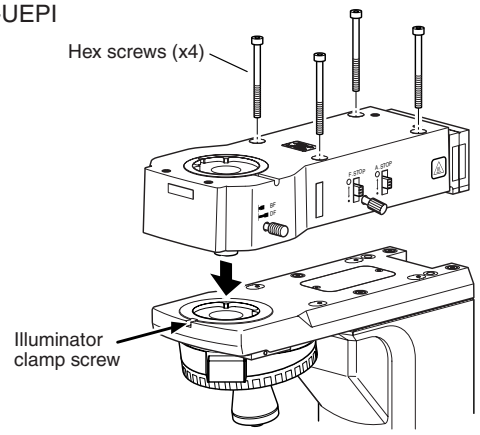
Removing the nosepiece is the reverse order of the above procedure. When removing the nosepiece, lower the stage completely, remove the sample and all objectives, and hold the nosepiece in your hand so that it does not fall when you remove it.

3 Attaching the Illuminator

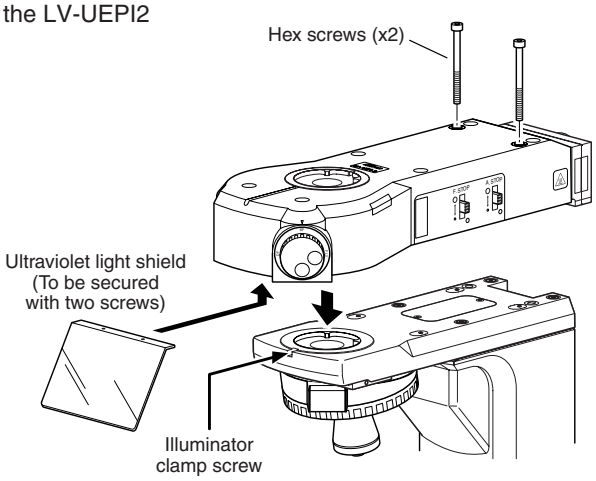
1. Illuminator main unit

1. Loosen sufficiently the illuminator clamp screw on the front of the microscope arm using the hexagonal screwdriver.
2. Mount the illuminator onto the microscope arm and fix it by tightening the illuminator clamp screw.
3. Secure the illuminator on the microscope arm. Do this by tightening the hex screws supplied with the illuminator (four screws for LV-UEPI, or two screws for LV-UEPI2) using the hexagonal wrench.
4. Cover the screw holes with the protective stickers supplied with the illuminator.
5. For the LV-UEPI2, attach the ultraviolet light shield to the front bottom of the illuminator using the two screws supplied.

For the LV-UEPI



For the LV-UEPI2



Ultraviolet light shield

* *Harmful light or strong light may be emitted from objectives with some excitation methods. Be sure to attach the ultraviolet light shield to the LV-UEPI2.*

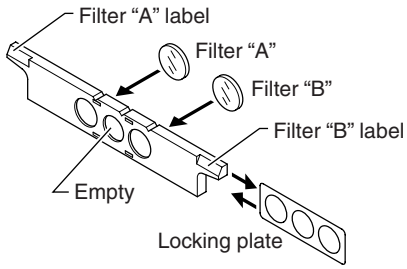
* *Be sure to use the attached screws to fix the ultraviolet light shield. If other screws are used or only screws are attached without the light shield, malfunctions occur at the inner mechanism.*

2. Sliders (dummy sliders, polarizer slider, lambda plate slider, and analyzer slider)

- **For the LV-UEPI:**
  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 till the limit (so that the empty hole will be set in the optical path).
- **For the LV-UEPI2:**
  The LV-UEPI2 has covers over the slider slots. Remove the covers before inserting sliders.
  For sliders that are not in use, the covers can be set in place, eliminating the need of inserting dummy sliders.
  Note that the slots for polarizer slider and lambda plate slider share a single cover. When using only a polarizer, therefore, insert a dummy slider in front of the polarizer slider.

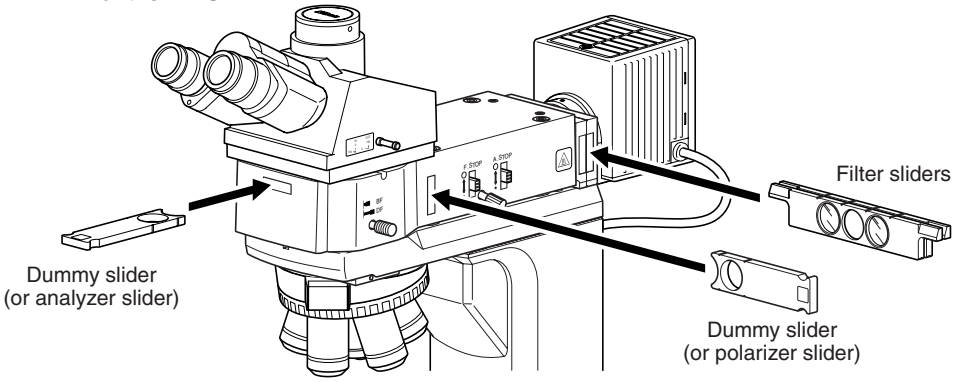
3. Filter sliders and filters

1. Remove each filter slider from the illuminator. (There are two sliders.)
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.
5. Affix the label to the appropriate lug of the filter slider.
6. Attach the filter sliders to the illuminator.

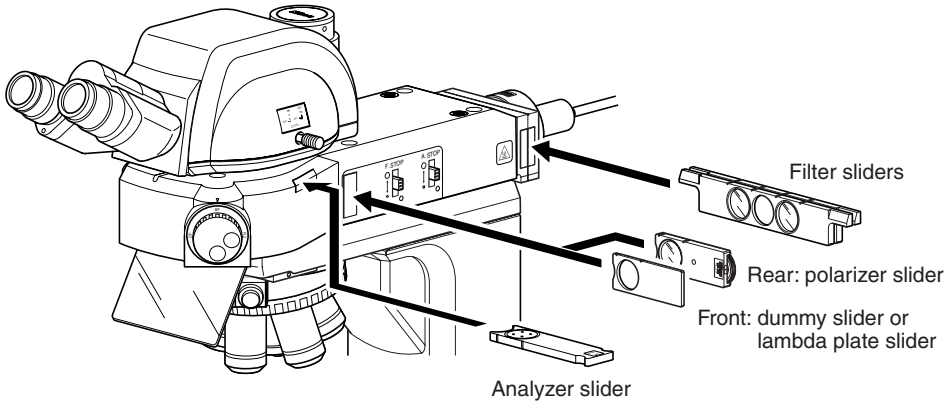


ND4, ND16, and NCB filters are already set on the filter sliders at the factory. You can set an additional filter in the empty position.

For the LV-UEPI



For the LV-UEPI2

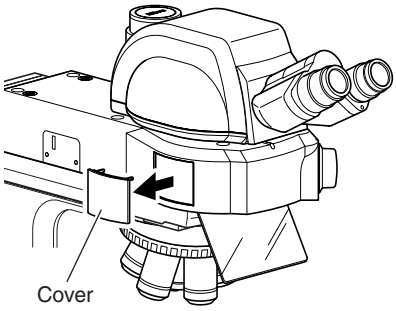


4. Filter cubes for fluorescence observation (for the LV-UEPI2 only)

The LV-UEPI2 accommodates two filter cubes for epi-fluorescence microscopy.

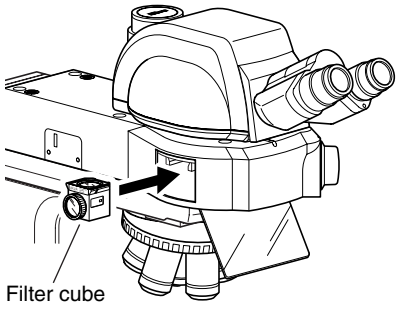
1 Verify that the illumination shutter is closed and the power supplies to the microscope and light source are off.

2 Remove the cover from the left side of the illuminator.



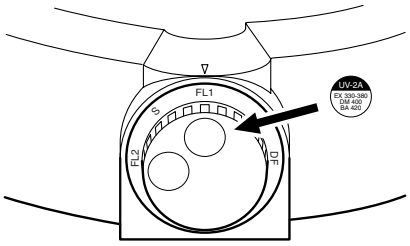
3 Turn the microscopy selection knob so that the position indication “FL1” or “FL2” on the turret in the illuminator faces the opening.

4 Insert the desired filter cube into the dovetail of the turret and push it in to the clickstop position. Make sure that the filter cube has its excitation filter facing out.

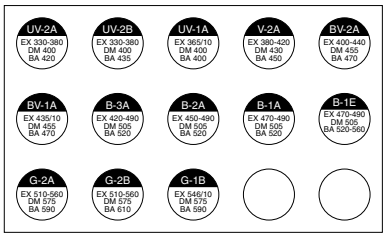


5 Now that the filter cube is installed in the position FL1 or FL2, refit the cover.

6 Check the stickers of excitation method supplied with the illuminator and find the one that corresponds to the filter cube just installed. Affix it to the position FL1 or FL2 on the microscopy selection knob.
If there is no sticker corresponding to the excitation method of the filter cube, write the excitation method in a blank sticker and affix it.



Sticker to be affixed to the microscopy selection knob



Stickers of excitation method

4 Attaching the Lamphouse and Replacing the Lamp

CAUTION

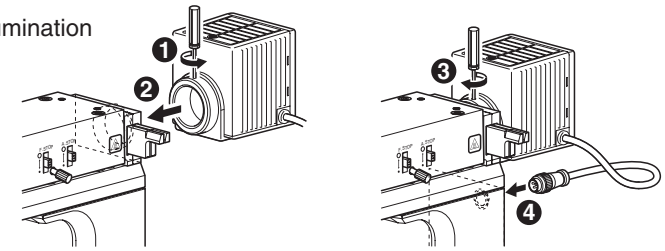
- To prevent electrical shock and damage to the microscope, always turn off the power switch (flip it to the "○" side) and unplug the power cord from the outlet before connecting or disconnecting the lamphouse.
- To prevent burn injury, allow the lamp and the lamphouse to cool down sufficiently (for at least 30 minutes after the lamp is turned off), before replacing the lamp.
- Use the Nikon LV-LH50PC halogen lamphouse for the lamphouse.
- 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.
- Do not touch the glass surface of the lamp with bare hands. Fingerprints or grease on the bulb surface will reduce the illumination intensity of the lamp. Wipe clean any fingerprints or grease attached to the surface.
- Securely attach the lamphouse cover to the lamphouse after replacing the lamp. Never light the lamp with the lamphouse 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 lamphouse

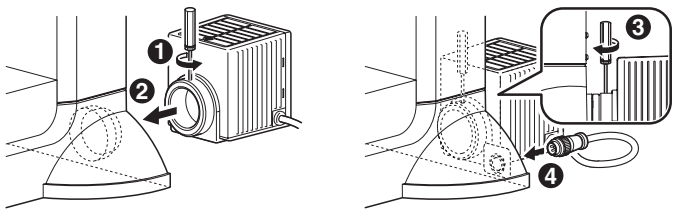
Before performing the following procedures, turn off the power supply for the microscope (press the "○" side) and unplug the power cable from the wall outlet.

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

For epi-illumination



For dia-illumination



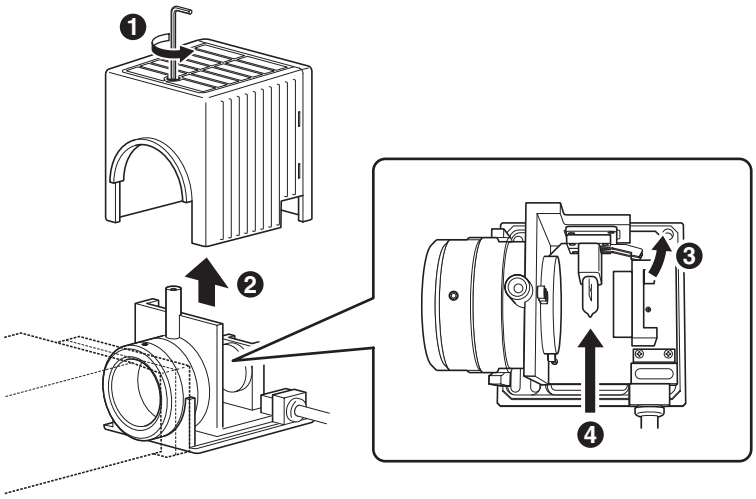
To remove the lamphouse, reverse the above procedure.

2. Replacing the lamp

The lamp can be removed without having to detach the lamphouse from the microscope.

Before starting the procedure below, verify that the power switch on the microscope is turned off (flip the switch to "○" side) and that both the lamp and lamphouse have cooled down.

1. Loosen the lamphouse cover clamp screw using the hexagonal wrench.
2. Remove the lamphouse 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 pin holes of the socket. Press 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 with bare hands.
   When releasing the lamp clamp lever, use care so that the lamp does not tilt.
5. Close the lamphouse cover and secure it by tightening the clamp screw.



5 Attaching the Fiber Adapter and External Light Source

To perform the epi-fl microscopy with the LV-UEPI2 illuminator, the specified light source brightness may be less than the desired brightness. In this case, a light source other than the specified ones, an external light source, can be used for the LV-UEPI2. The following light sources can be attached through the light guide fiber when the optional LV-HGFA HG fiber adapter is mounted on the light source mount part.

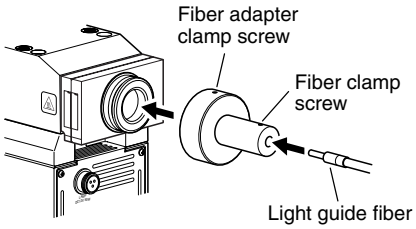
- External light source: EXFO X-Cite 120 (manual type) or EXFO X-Cite 120PC (motorized type)

CAUTION

- If a light source other than the specified ones are installed onto this microscope, this microscope system will not be treated as a UL-listed product.
- Carefully read the instruction manual for an external light source to use it, and follow their instructions.
- A light source emits very strong light including ultraviolet light that is harmful to the eyes and skin. Never turn on the power for the light source before completion of assembling and connecting parts.
- To assemble and connect parts, check that the power supplies for the light source and microscope are turned off and that the power cable is unplugged from the wall outlet.

▶ Attaching the fiber adapter

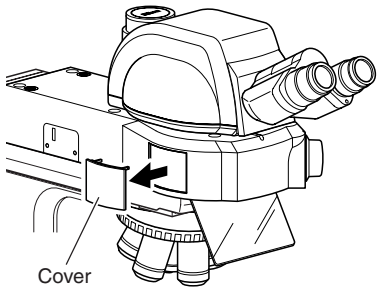
Loosen the clamp screw on the fiber adapter by using the hexagonal screw driver. And then, attach the HG fiber adapter onto the mount part of the illuminator. Push in the adapter to the limit position, and then tighten the clamp screw to fix it.
Next, insert the light guide fiber tip through the hole of the fiber adapter, and then tighten the clamp screw to fix it by using the hexagonal screw driver.
At last, connect the light guide fiber to the light source.

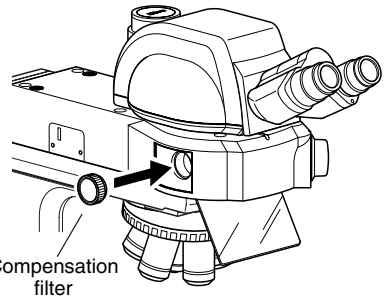


▶ Attaching the compensation filter (only for LV-UEPI2)

A designated compensation filter comes with the HG fiber adapter. Attach it into the bright field block in the LV-UEPI2.
The compensation filter is used to compensate the color balance and brightness. If this filter is not used with, extremely strong light will be radiated for the bright-field microscopy. Be sure to attach the filter.

1. Check that the shutter of the illumination is closed and power supplies to the microscope and the light source are turned off.
2. Remove the cover on the left of the illuminator.
3. Check the position indicator of the turret in the microscope, and rotate the microscopy selection knob to locate the "BF" label into the opening.
4. Screw in the compensation filter attached with the fiber adapter to the block in the illuminator.
5. Put the cover back to its original position.

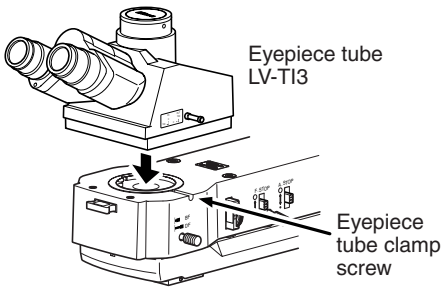




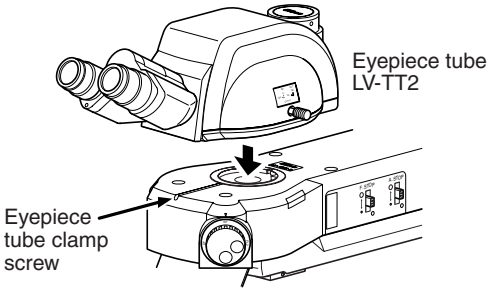
6 Attaching the Eyepiece Tube

Fully loosen the eyepiece tube clamp screw with the hexagonal screwdriver. Fit the eyepiece tube onto the mount on the top of the illuminator and tighten the eyepiece tube clamp screw with the hexagonal screwdriver.

When using the LV-UEPI



When using the LV-UEPI2



▶ Note on removing the eyepiece tube

Take hold of the eyepiece tube when loosening the eyepiece tube clamp screw since the eyepiece tube may come off suddenly.

7 Attaching Eyepieces

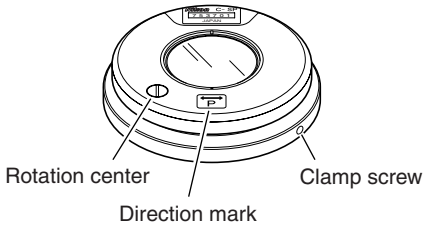
Attach eyepieces of the same magnification and of the same viewfield number to the left and the right eyes.
There are positioning pins on the eyepiece sleeve. Insert the eyepiece so that its positioning grooves match the pins.

8 Attaching Objectives

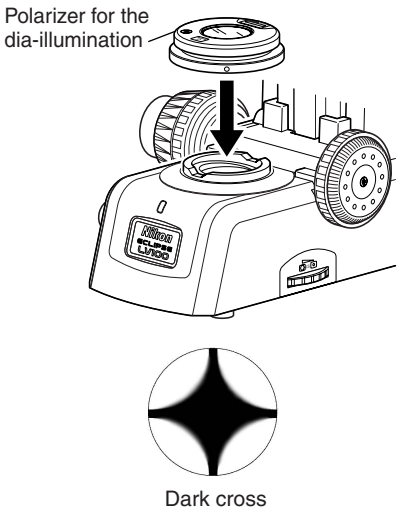
1. Lower the stage completely.
2. Screw objectives into the nosepiece so that the magnification increases with the clockwise rotation (as viewed from above the microscope) of the nosepiece.
3. When removing the objectives, remove the sample, lower the stage completely, and hold each objective using both hands so that it does not fall during the removal.

9 Attaching the Polarizer for Dia-illumination

To perform the simplified polarized light microscopy under the dia-illumination, the polarizer for the dia-illumination must be attached onto the field lens on the base of the microscope. Adjust the orientation of the polarizer to be at right angles to the analyzer when attached (crossed Nicols position).

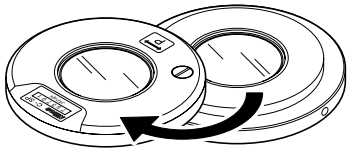


1. Turn on the microscope and select the dia-illumination.
2. Remove the specimen from the optical path. And then enter the analyzer into the optical path.
3. Put the polarizer onto the field lens on the microscope base.
4. Rotate the condenser aperture diaphragm ring to open the aperture diaphragm fully.
5. Remove one eyepiece from the microscope and look inside the open sleeve. You can see the objective's exit pupil as a bright circle and black patterns.
6. Rotate the whole polarizer for the dia-illumination in either direction until the dark cross appears in the viewfield. This is the crossed Nicols position.
7. Secure the polarizer for the dia-illumination by the clamp screw.



▶ Removing the polarizer for the dia-illumination out of the optical path

To remove the polarizer for the dia-illumination from the optical path, rotate the upper part of the polarizer around the rotation center to swing it out.

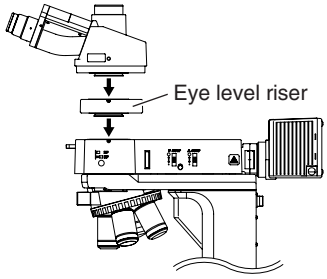


10 Attaching Eye Level Riser

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

▶ Attaching eye level riser

1. Loosen the clamp screw for the eyepiece sufficiently. And then, insert the eye level riser with fitting the dovetail junctions of the eye level riser and illuminator.
2. Tighten the clamp screw for the eyepiece to fix the eye level riser.
3. Attach the eyepiece tube on the eye level riser.

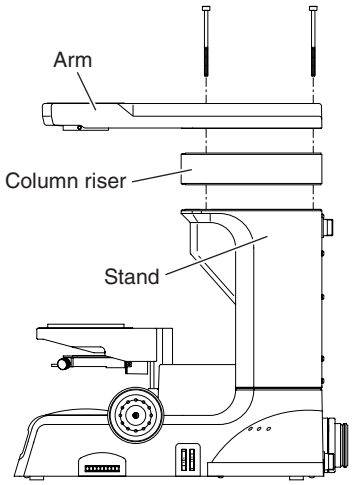


11 Attaching Column Riser

The optional column riser is used for the adjustment of the distance between the objective and the stage when observing a thick specimen. It is attached between the arm and the stage of the microscope. When one column riser is attached, the objective height rises 35 mm.

▶ Attaching column riser

1. Remove the illuminator, eyepiece, and nosepiece if they are attached onto the microscope. Be careful not to drop them.
2. Remove four hex screws, which fix the arm of the microscope to the stand. And then, remove the arm.
3. Mount the column riser and arm on the stand and fix them by four hex screws attached with the column riser.
   Do not use four hex screws that were used to fix the arm.
4. Put the removed parts back to their original positions.



12 Connecting the Power Cord

WARNING Use only the supplied power cord. Using the wrong power cord could cause hazards or fire. Also, connect the microscope to a PE (protective earth) terminal, since the microscope complies with the electric shock protection class I. For specifications of the supplied power cord, refer to "VII. Specification."

Turn off the power switch of the microscope (flip it to the "○" side).
Insert the socket into the AC inlet connector at the rear of the microscope, and then firmly insert the plug into the wall outlet.

13 Installing Separately Sold Accessories

Install photomicrographic equipment and other separately sold accessories by referring to the system diagram or the instruction manual for each accessory.

14 Anti-static Treatment

Many parts of the microscope have anti-static finishes, which should be very useful when observing electrostatically sensitive samples. The anti-static parts include: LV100D microscope main body, LV-UEPI/LV-UEPI2 illuminator, LV-TI3/LV-TT2 trinocular tube, L-W10X eyepieces, 3x2 stage, ESD plate, BD quintuple nosepiece, universal quintuple nosepiece, and objectives. The ground is taken through the 3-conductor power cord of the microscope. If the power of the microscope is not used at all, as when using an external light source, the ground can be taken by connecting the grounding line to the grounding tap at the rear of the microscope.

V Troubleshooting

Improper use of the microscope may adversely affect its performance even though there is no damage on itself. If any of the problems listed below arises, take the countermeasures indicated.

1 Viewing and Control Problems

Problems		Cause	Countermeasures
The viewfield is invisible, vignetted, or uneven in brightness.		The lamp is not installed properly.	Install the lamp securely. (p. 57 to 59)
		The optical path selection lever on the eyepiece tube is in an intermediate position.	Set the optical path selection lever to 100% (or 20%) binocular eyepiece. (p. 32)
		The optical path selection lever on the eyepiece tube is not set to 100% (or 20%) binocular eyepiece.	
		A filter slider is in an intermediate position.	Move the filter slider to a clickstop position. (p. 29)
		The field diaphragm is stopped down too far.	Open the diaphragm to a suitable size. (p. 34 and 37)
		The nosepiece is not installed properly.	Install the nosepiece securely. (p. 53)
		The nosepiece is not rotated to a clickstop position. (The objective is not in the optical path.)	Rotate to a clickstop position. (Place the objective into the optical path.)
	Episcopic microscopy	One of the dummy, DIC, polarizer, lambda plate, or analyzer slider is in an intermediate position.	Move it to a clickstop position. (p. 40, 42 to 44)
		The bright/dark-field illumination selection lever (for LV-UEPI) or the microscopy selection knob (for LV-UEPI2) is in an intermediate position.	Push in or pull out the lever to the limit. Set the knob to a clickstop position. (p. 38)
		The microscopy selection knob is at "S" position (when LV-UEPI2 is used).	Change to the microscopy position. (p. 38)
		The filter cube is not in place or is attached to a wrong position (when LV-UEPI2 is used).	Attach the filter cube to the correct position. (p. 56)
		A wrong filter cube is selected (when LV-UEPI2 is used).	Select the appropriate filter cube. (p. 45 and 46)
	Diascopic microscopy	The condenser position is too low.	Adjust the condenser focus on the specimen surface. (p. 36)
		The condenser is not centered.	Center the condenser. (p. 36)
		The condenser is not attached correctly.	Attach the condenser correctly. (p. 52)

Problems		Cause	Countermeasures
Dirt or dust in the viewfield		The aperture diaphragm is stopped down too far.	Open the aperture diaphragm to a suitable size. (p. 35 and 37)
		Dirt or dust exists on the lens, eyepiece, filter, or specimen.	Clean it. (p. 68)
	Diascopic microscopy	The upper surface of the condenser is unclean.	Clean it. (p. 68)
		The condenser position is too low.	Adjust the condenser focus on the specimen surface. (p. 36)
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 it. (p. 68)
		The used objective is not suitable for the microscopy.	Use the specified objective. (p. 60)
		The aperture diaphragm is stopped down too far.	Open the aperture diaphragm to a suitable size. (p. 35 and 37)
	Episcopic microscopy	The used filter cube is not suitable for the specimen.	Use a filter cube suitable for the specimen. (p. 45 and 46)
		No cover glass is attached.	Attach a cover glass. (But it is not required for NCG objective.)
		Fluorescence lights are emitted from the slide glass.	Use a nonfluorescent slide glass.
	Diascopic microscopy	The condenser position is too low.	Adjust the condenser focus on the specimen surface. (p. 36)
Uneven focus		The nosepiece is not installed correctly.	Install the nosepiece securely. (p. 53)
		The nosepiece is not rotated to a clickstop position. (The objective is not in the optical path.)	Rotate the nosepiece to a clickstop position.
		The specimen holder is slanted.	Install the specimen holder correctly. (p. 52)
Elongated image		The nosepiece is not installed correctly.	Install the nosepiece securely. (p. 53)
		The nosepiece is not rotated to a clickstop position.	Rotate the nosepiece to a clickstop position.
		The stage is tilting.	Install the stage correctly. (p. 52)
		The microscope is not installed on a flat surface.	Install the microscope on a flat and level surface.
	Diascopic microscopy	The condenser is not centered.	Center the condenser. (p. 36)
Yellowish image		The NCB11 filter is not used.	Place the NCB11 filter into the optical path. (p. 29)
		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. 28 and 29)

Problems		Cause	Countermeasures
Too bright image		The lamp voltage is too high.	Adjust the brightness with the brightness control knob or ND filters. (p. 28 and 29)
Dark image (See also troubleshooting for electrical.)		The lamp voltage is too low.	Adjust the brightness with the brightness control knob. (p. 28 and 29)
		A ND filter is placed in the optical path.	Remove the ND filter out of the optical path. (p. 29)
		The aperture diaphragm is stopped down too far.	Open the aperture diaphragm to a suitable size. (p. 35 and 37)
		A polarizer or an analyzer exists in the optical path for the bright-field microscopy.	Remove the polarizer and the analyzer out of the optical path. (p. 14 and 15)
		A halogen illumination is used for a dark specimen.	Replace the light source to more bright one. (p. 59)
		The used objective is not suitable for the microscopy.	Use the specified objective. (p. 60)
		The ambient light is too bright (for the dark-field or epi-fl microscopy).	Darken the ambient light.
	Diascopic microscopy	The condenser position is too low.	Adjust the condenser focus on the specimen surface. (p. 36)
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. 33)
		The eyepieces are not mounted correctly.	Mount the eyepieces correctly by aligning the positioning grooves. (p. 60)
The specimen does not move smoothly.		The specimen holder is not secured correctly on the stage.	Secure the specimen holder correctly. (p. 52)
Viewfields do not merge into one when observed with both eyes.		The interpupillary distance is not adjusted.	Adjust the interpupillary distance. (p. 33)
		The eyepiece diopters are not adjusted.	Adjust the diopters. (p. 33)
Eye fatigue arises from the observation.		The interpupillary distance is not adjusted.	Adjust the interpupillary distance. (p. 33)
		The eyepiece diopters are not adjusted.	Adjust the diopters. (p. 33)
		The brightness is not suitable.	Adjust the brightness with the brightness control knob or the combination of ND filters. (p. 28 and 29)
		Eyepieces with different viewfield numbers are used for the left and right eyes.	Use eyepieces having the same viewfield number.

Problems	Cause	Countermeasures
Coarse focus knob is heavy in rotation.	The coarse torque adjustment ring is tightened too much.	Loosen the torque adequately. (p. 30)
	The coarse focus stopper ring is locked at the upper limit.	Release the coarse focus stopper ring. (p. 31)
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 adequately. (p. 30)
The stage cannot be raised by the coarse focus knob.	The coarse focus stopper ring is locked at the bottom limit.	Release the coarse focus stopper ring. (p. 31)
No interference color is seen on the DIC microscopy.	No analyzer or no polarizer is placed in the optical path.	Put the analyzer and polarizer into the optical path. (p. 40, 41, and 43)
	No DIC prism is placed in the optical path.	Put the DIC prism into the optical path. (p. 44)
Uneven colors or low contrast on the DIC microscopy	The used objective is not suitable for the microscopy.	Use objectives marked “LU Plan” or “LU Plan Apo.”
	The used objective and the DIC prism do not match for the microscopy.	Match the prism selection according to the objective. (p. 44)
No sensitive color is seen on the polarization microscopy.	No lambda plate is placed in the optical path.	Put the lambda plate into the optical path. (p. 42)

2 Electrical Problems

Problems	Cause	Countermeasures
The lamp does not light when switched on.	The electric power is not supplied.	Plug the power cable into a wall outlet. (p. 63)
	The power cable is not connected to the microscope.	Connect the power cable. (p. 63)
	The cable of the lamphouse is not connected to the connector on the microscope.	Connect the cable of lamphouse. (p. 57)
	No lamp is installed.	Install the lamp. (p. 57 and 58)
	The lamp is blown.	Replace the lamp. (p. 58)
	The used lamp is not the specified type.	Use the specified lamp. (“VII. Specifications”)
The lamp flickers, or its brightness is unstable.	The lamp is about to blow	Replace the lamp. (p. 58)
	The power cable or the cable of lamphouse is not connected securely.	Connect them securely. (p. 57 and 63)
	The lamp is not securely inserted into the socket.	Insert the lamp securely. (p. 59)
	The lamphouse is not connected securely.	Connect the lamphouse securely. (p. 58)

VI Care and Maintenance

Nikon recommends daily care and maintenance for maintaining the performance as long as possible.
Do not let dust, fingerprints, and the like, 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 bottom ends of 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, fingerprints, etc., get on lenses and filers. Dirt on lenses, filters, etc., will adversely affect the view of the image. If any lens gets dirty, clean it as described below.

- Either brush away dust with a soft brush, or wipe it away gently with gauze.
- Only in cases of fingerprints or grease, dampen a piece of soft, clean cotton cloth, lens tissue, or gauze with absolute alcohol (ethyl or methyl alcohol) and wipe.
- Absolute alcohol requires care in handling as it is highly flammable. Be careful when using fire or turning on/off the power switch nearby.
- Follow the instructions provided by the manufacturer when using absolute alcohol.

2 Cleaning the Painted, Plastic, and Printed Parts

Do not use organic solvents (alcohol, ether, and paint thinner, etc.) on painted, plastic, or printed parts. Doing so could result in discoloration or in the peeling of printed characters. If the dirt is hard to remove, wipe it gently using a piece of gauze dampened with a neutral detergent solvent.

3 Storage

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

4 Regular Inspections

Regular inspections of this microscope are recommended in order to maintain peak performance. Contact your nearest Nikon representative for details about regular inspections.

VII Specifications

Model name	ECLIPSE LV100D
Optical system	CFI60 optical system (infinity-corrected CF optical system)
Illumination	Epi/dia illumination selection type Epi-illumination system: The power source for the lamp, NCB11, ND4, and ND16 are built-in. (exchangeable) (specified illuminator: LV-UEPI universal epi illuminator or universal epi LV-UEPI2 illuminator 2.) Dia-illumination system: The power source for the lamp, fly's eye lens, NCB11, and ND8 are built-in. (not exchangeable) Lamp ratings: 12 VDC, 50 W halogen lamp Specified lamp: LV-HL50W 12V 50W longlife halogen lamp Specified lamphouse: LV-LH50PC precentered lamphouse
Focusing mechanism	Manual operation type single axis coarse/fine focus knob mechanism (left side with coarse/fine focus, right side with coarse focus, 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, 25
Input ratings	Input voltage: 100 to 240 VAC ±10% 50/60 Hz Rated current: 1.2 A max.
Power cable	When the supply voltage is 100 V to 120 V UL Listed detachable cord set, 3 conductor grounding Type SVT, No.18 AWG, 3 m long maximum, rated at 125 V AC minimum. When the supply voltage is 220 V to 240 V Approved according to EU/EN standards, 3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250 V AC minimum.
Operating environment	Temperature: 0°C to +40°C Relative humidity: 85% RH max. (no condensation) Altitude: 2000 m max. Pollution degree: Degree 2 Installation category: Category II Electric shock protection class: Class 1 Indoor use only
Storage environment	Temperature: -20°C to +60°C Relative humidity: 90% RH max. (no condensation)

Safety standards compliance	• This is UL-listed product. (UL61010A-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)