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M402EN01

Nikon

Inverted Metallurgical Microscope

ECLIPSE MA100

Instructions

Introduction

Thank you for purchasing the Nikon product.

This instruction manual is written for the users of the Nikon Inverted Metallurgical Microscope ECLIPSE MA100.

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 operation manual for any other products used in combination with this microscope.
- Not following the instructions specified by the manufacturer may adversely affect the safety of the production.

Safety Precautions

(Be sure to read the precautions before operation.)

To ensure correct and safe operation, read this manual before using the product.

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 and will lead to the forfeiture of all claims against warranty. For your safety, read the instruction manual carefully and thoroughly before using the product. 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.

Symbol	Details
⚠ **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 Product

The symbols used on the product indicate the need for caution during use. Refer to the instruction manual and read the relevant instructions before manipulating any part to which the symbols have been affixed.

Symbol	Details
	**Caution for heat** This symbol label attached on the lamp house cover reminds you of the following: • Lamp and its surrounding areas (including the lamp house cover) become very hot during and immediately after illumination. • Risk of burns. Do not touch the lamp or surrounding areas during and immediately after illumination. • When replacing a lamp, be sure to turn off the power and allow the lamp and surrounding area to cool sufficiently.
	**Caution** This symbol label attached on the area near the AC inlet reminds you of the following: • Check the input voltage before turning on the microscope. The input voltage is indicated on the “nameplate” and the “right of the AC inlet” of the rear panel of the microscope. • If the input voltage shown differs from the local voltage level, do not turn on the microscope. Do the following instead: - Different voltage on the nameplate: Contact your nearest Nikon representative. - Different voltage on the right side of the AC inlet: Change the input voltage setting; refer to “Input Voltage Selection” in p.29.

See the figure shown in chapter 1, “Part Name and Function” for the symbol attaching location.

Warning

1. Intended Application

This product is used for observing and photographing the metallographic structures using episcopic illumination.

This product is mainly used to observe the metallographic structure for the inspection of the material cross section and material analysis in the production and material research fields.

2. Do Not Disassemble.

Disassembling may cause electrical shock or damage to the product and will lead to the forfeiture of all claims against warranty. Do not disassemble the section that is not indicated in this manual. If you notice any abnormalities, contact your nearest Nikon representative.

3. Read the Instruction Manual Carefully.

For your safety, be sure to read the instruction manual for any other products used in combination with this microscope as well as this manual. Especially be sure to follow the warnings and cautions indicated in the beginning of this manual.

4. Check the Input Voltage.

Before turning on the microscope, check the input voltages indicated on both the “nameplate” and the “right of the AC inlet” on the rear panel of the microscope. If an input voltage indicated on the places differs from the local voltage, do not turn on the microscope. Use of the microscope under the incorrect voltage may cause over-heating due to over-current, possibly resulting in a fire and damaging the microscope. Do the following:

(1) When the voltage on the nameplate differs from the local voltage:

Do not turn on the microscope. Contact your nearest Nikon representative.

(2) When the voltage on the right of the AC inlet differs from the local voltage:

Do not turn on the microscope. Change the input voltage setting; refer to “Input Voltage Selection” in p.29.

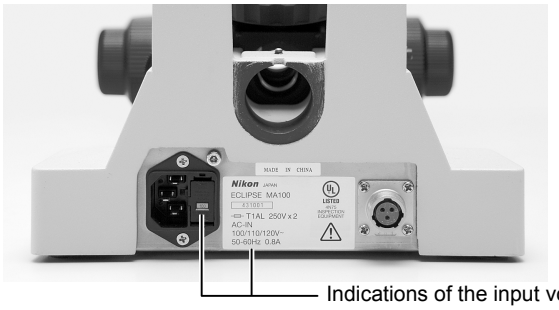
Applicable voltages are specified as follows:

- **For the model indicating “100/110/120 V” on the nameplate:**

  Selection from 100, 110 or 120 VAC (Factory default setting 120 VAC)

- **For the model indicating “220/230/240 V” on the nameplate:**

  Selection from 220, 230 or 240 VAC (Factory default setting 240 VAC)



Indications of the input voltage

Warning

5. Use the Specified Lamp and Fuse.

Use the specified lamp and fuse. Use of other lamp or fuse may result in damage or fire.

- **Specified lamp:** Halogen lamp 6 V - 30 W (PHILIPS 5761)
- **Specified fuse:** **For the model indicating "100/110/120 V" on the nameplate:**
  250 V, 1 A, time-lag, low-breaking type, 5x20 miniature fuse x 2

  For the model indicating "220/230/240 V" on the nameplate:
  250 V, 0.5 A, time-lag, low-breaking type, 5x20 miniature fuse x 2

6. Caution in the Power Cord

- **For the model indicating "100/110/120 V" on the nameplate:**

  Use the power cord provided with the microscope. Use of other power cord may result in damage or fire.
- **For the model indicating "220/230/240 V" on the nameplate:**

  Use the specified power cord. Use of other power cord may result in damage or fire.

  See chapter 7, "Specifications" for the power cord.

7. Pay Attention to Heat from the Light Source

Lamp and its surrounding areas (including the lamp house cover) become very hot during and immediately after illumination. To avoid damage such as burns or fire, follow the cautions indicated below.

- Do not touch the lamp or its surroundings while the lamp is lit or for 30 minutes after turning off the power.
- Be sure to use the microscope with the lamp house cover attached.
- Cool down the lamp and its surrounding areas (for approximately 30 minutes after being turned off) before replacing the lamp.
- Do not allow cloth, paper, or highly flammable volatile materials, such as gasoline, petroleum benzine, thinner, or alcohol, to come near the lamp house while the lamp is lit or for approximately 30 minutes after the lamp has been turned off.
- Do not turn on the lamp with the microscope covered with a vinyl cover or a cloth. Additionally, do not put anything on the lamp house.

Caution

1. **Turn off the power when assembling the microscope, replacing lamps and fuses, plugging or unplugging the power cord, and maintaining the microscope.**

   To prevent electrical shock and/or fire, be sure to turn off the power of the microscope by pressing down the “O” side of the power switch before plugging or unplugging the power cord. Also, be sure to turn off the power of the microscope by pressing down the “O” side of the power switch and unplug the power cord when assembling the microscope, replacing lamps or fuses, plugging or unplugging the lamp cable, or maintaining the microscope such as cleaning of the microscope or objective.

2. **Do not wet the microscope nor allow foreign matter intrusion.**

   Do not wet the microscope. If the microscope becomes wet, a short circuit may occur that can damage it or make it extremely hot. Also, a short circuit may occur if a foreign matter intrudes. If you accidentally spill a liquid on the microscope, immediately turn off the power of the microscope by pressing down the “O” side of the power switch and unplug the power cord. (Take care not to touch the cord with wet hands at this time.) After unplugging the microscope, wipe it with a dry cloth. Check that the connectors such as the AC inlet on the rear panel are dry. If a connector is wet, wipe them. If any liquid or foreign matters intrude, do not use the microscope, but contact your nearest Nikon representative.

Notes on Handling the Product

1. Carefully Handle the Product

This product is a precision optical instrument. Handle it carefully and do not subject it to physical shock or vibrations. Especially, the accuracy of the objective may be adversely affected by even a slight physical shock.

Precautions for Transporting

- Securely hold the microscope at the front bottom and rear bottom when carrying it.
- Do not grasp the lamp house, focus knobs, binocular part, rectangular stage*, etc. when carrying the microscope for fear of separation, adverse effect on its performance or breakage.

  * The plane stage has a handle. Using the handle on the plane stage and the lower front part of microscope enables carrying the microscope.

2. Installation or Storage Location

The microscope is a precision optical instrument. Using or storing the product under unsuitable conditions may damage it or may have an adverse effect on its performance. The following conditions should be considered when selecting the installation or storage location.

- Select an installation location with a temperature from 0 to 40°C and a relative humidity of 85% or less (there should be no condensation).

  Select a storage location with a temperature from -20 to 60°C and a relative humidity of 90% or less (there should be no condensation).

  If installed or stored in a location subject to high temperatures and humidity, mold or condensation may form on the lens, resulting in lowered performance and possible damage to the microscope.
- Avoid installing in a place exposed to direct sunlight, or directly under room lights or any other bright place. The image quality deteriorates in bright surroundings because of the extraneous light entering the objective.
- Install in a place with little dust and dirt.
- Install in a place with little vibrations.
- Install and store the microscope on a sturdy desk or table that can bear the weight of the microscope.
- Install the microscope in the location of 10 cm or more away from the surrounding walls.
- Do not install in a narrow space such as a shelf or locker.
- Do not place anything on the product.
- Cover the product to avoid dust when storing.
- Install the microscope in the place that allows easy detachment of the power cord from the AC inlet in the event of emergency.

3. Weak Electromagnetic Wave

The microscope emits weak electromagnetic waves. Do not locate any precision electronic equipment near the microscope because its precision may be adversely affected. If the microscope affects TV or radio reception, move the radio or TV set further away from the microscope.

4. Optical Parts Handling

If an optical part such as lens or filter is damaged or contaminated with soil such as fingerprints, the image quality will be reduced.

Carefully use the optical parts without scratching. If contaminated with soil, clean the parts according to the procedure of chapter 6, “Maintenance”.

5. Lamp Handling

- Do not touch the lamp glass with bare hands. Doing so may soil the glass surface, degrade performance, damage the lamp, and/or reduce the life expectancy of the lamp. Wear gloves or use a cloth when handling the lamp. If the glass surface becomes dirty, wipe with a clean cloth lightly moistened with alcohol.
- Do not subject the lamp to shocks or vibrations as this may damage the lamp or shorten its life expectancy.
- When replacing the lamp, check that the contacts are not damaged. If they are damaged, the lamp may not light or may overheat. Also, be sure to insert the lamp into the socket as far as it will go. If the lamp is installed improperly, it may fall out, overheat, or smoke due to poor contact. Be sure to securely install the lamp house cover after replacing the lamp.
- Do not break the used lamps; instead dispose of them as special industrial waste or according to the laws applicable to your municipal waste system.

6. Focus Knob Handling

- Rotation of the right and left focus knobs in opposite directions at the same time will result in damage. Do not rotate the focus knobs in such a way.
- Also, do not continue to rotate the coarse focus knob after the stage has reached the upper or lower limit of its motion. These actions will damage the microscope. Do not rotate it forcefully.

7. Protection of the Camera Port

This product accommodates the trinocular eyepiece tube. Be sure to cover the camera port (vertical tube port) with the provided cap when not using it. If not covered with a cap, ambient light or dust may enter into the product.

Contents

1 Part Name and Function

Side View

Filter slider

Two filter sliders of NCB11 and ND4 are attached.

Push in the slider to enter the filter into the optical path or pull out the slider to remove the filter from the optical path.

Lamp house cover

When replacing the lamp, detach the cover by loosening two screws. Warning symbol “Caution for heat” is marked on the upper surface.

Nosepiece

Manual nosepiece with five sockets

It moves upward and downward in response to the operation of the focus knobs.

Aperture diaphragm lever

Adjust the aperture diaphragm of episcopic illumination.

The field diaphragm is fixed.

Stage

The plane stage, the plane stage and the mechanical stage together, or the rectangular stage can be attached.

Objective

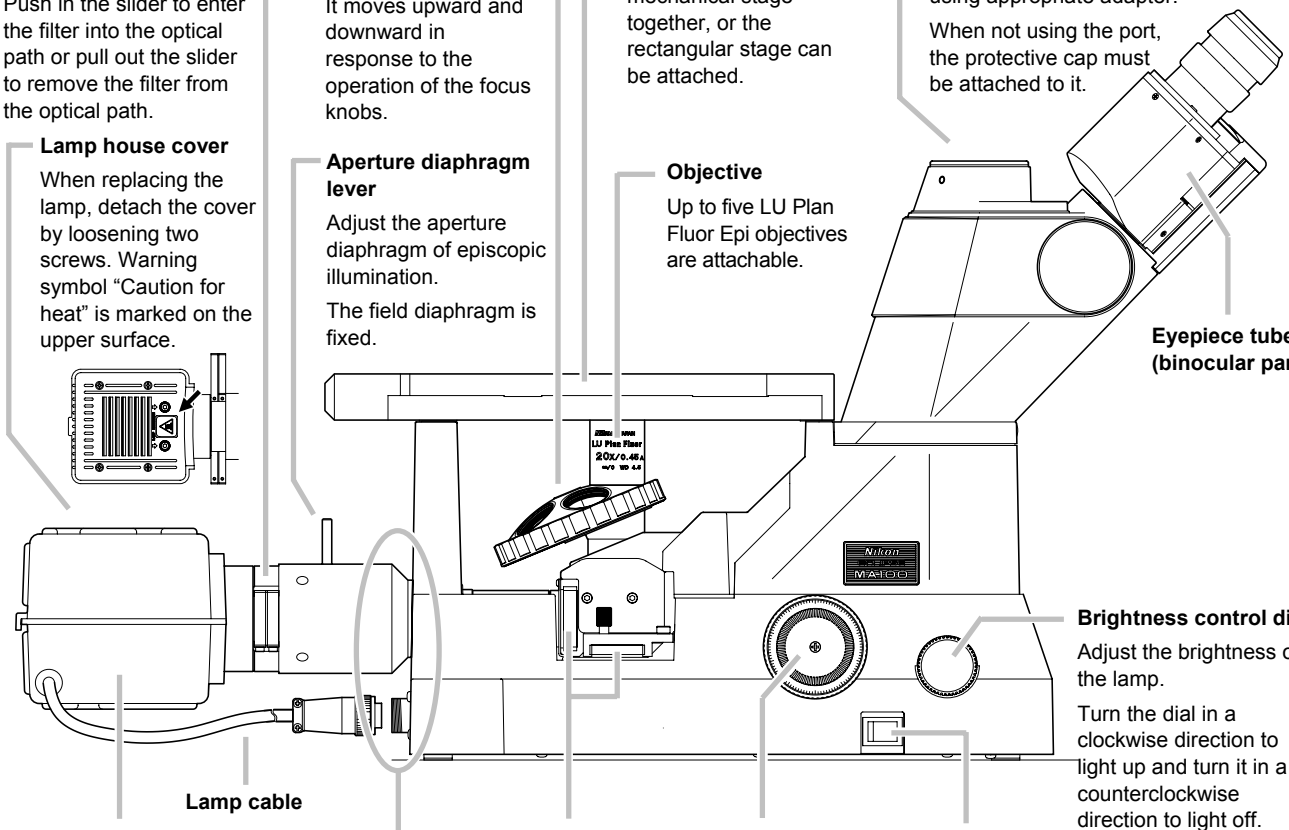
Up to five LU Plan Fluor Epi objectives are attachable.

Vertical tube port

Equipment such as a camera can be attached using appropriate adapter.

When not using the port, the protective cap must be attached to it.

Eyepiece tube (binocular part)



Brightness control dial

Adjust the brightness of the lamp.

Turn the dial in a clockwise direction to light up and turn it in a counterclockwise direction to light off.

Lamp cable

Lamp house

It is used for episcopic illumination. Turn the power switch on and off to turn the lamp on and off.

6 V - 30 W halogen lamp (PHILIPS 5761) is fitted inside.

Polarizer slider and analyzer slider

Used when performing the simplified polarization microscopy.

These sliders are interlocked so that both sliders can be inserted or detached in one operation.

Focus knobs (both sides)

Used for focusing specimens.

Use the coarse focus knob for rough adjustment and the fine focus knob for fine adjustment.

Power switch

Used for turning the microscope on and off.

As viewed from the front of the microscope, press down the rear-half of the power switch to turn on and press down the front-half to turn off.

This switch controls the episcopic illumination lamp.

The power switch also has the function of the power indicator. The switch body lights on when turning on the switch.

The power switch is marked with “ I ” and “O”, indicating ON/OFF status. The mark “ I ” appears when the power switch is turned on and the mark “O” appears when it is turned off.

Body back view

AC inlet

Fuse holder (Including a voltage switch)

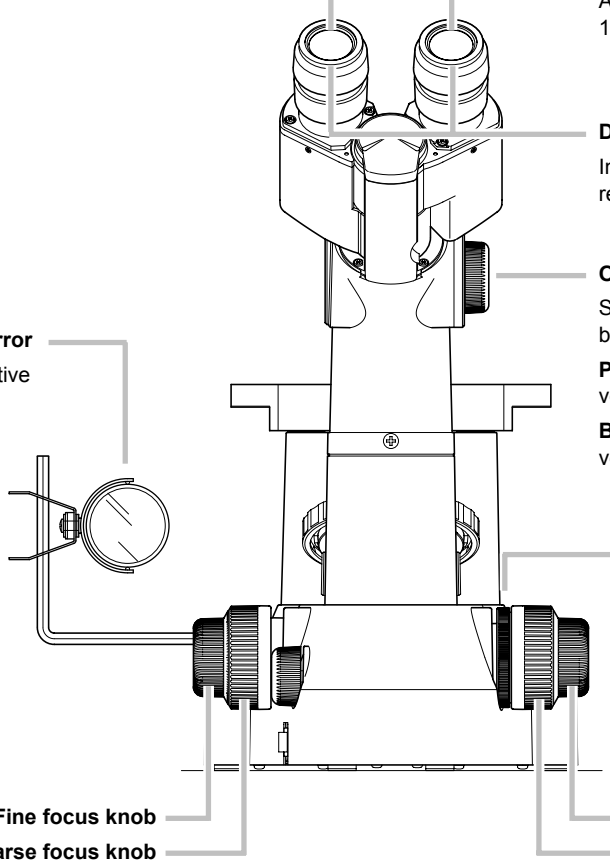
Lamp cable connector

Caution symbol

Safety label

The input voltage specifications are indicated here.

Front View



Eyepiece

10x and 15x eyepieces are applicable.

A Grain-size reticle can be fitted with 10x eyepiece.

Diopter adjustment ring(s)

Independently adjust the rings with respect to your right and left visions.

Optical path changeover knob

Switch the optical path between the binocular eyepiece and vertical tube.

PHOTO: Binocular eyepiece 0% and vertical tube 100%

BINO: Binocular eyepiece 100% and vertical tube 0%

Objective checking mirror

Used to check the objective during operation.

Coarse torque adjustment knob

Adjust the torque of the coarse focus knob.

Fine focus knob

Coarse focus knob

Fine focus knob

Coarse focus knob

2 Microscopy Procedures

2.1 Standard Microscopy Procedure

~ Preparation for microscopy ~

This section indicates the standard procedure for the microscopy.

1 **Switch the optical path to the binocular part.**

Rotate the optical path changeover knob to the BINO position.

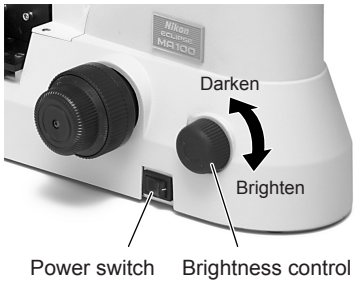
2 **Set a specimen.**

Set a specimen on the stage.

Select a plate or a specimen holder according to the shape of the specimen and set it so that the observation position is located at the center of the view field.

3 **Adjust the brightness of the lamp.**

- Turn on the lamp by pressing the power switch to the far side.
- Rotate the brightness control dial to adjust the brightness of the lamp. Rotate the dial clockwise to brighten the lamp and rotate it counterclockwise to darken. Adjust the brightness for easy observation by looking through the eyepieces on the binocular part.

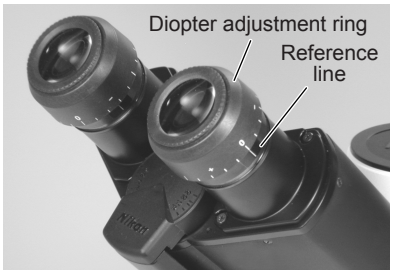


4 **Adjust the interpupillary distance.**

Look through the eyepieces and adjust the interpupillary distance so that the view fields for the right and left eyes coincide.

5 **Align the diopter adjustment ring with the reference line.**

Rotate the diopter adjustment ring on the right and left eyepieces to align the zero line on the ring with the reference line.



6 **Adjust the diopters.**

Adjust the diopter adjustment rings on the eyepiece according to the user's eyesight.

(1) When the polarizer and analyzer are in the optical path, remove them from the optical path.

(2) Place the objective of x10 in the optical path and rotate the focus knob to focus on the specimen.

(3) Place the objective of x40 into the optical path and rotate the focus knob to focus on the specimen.

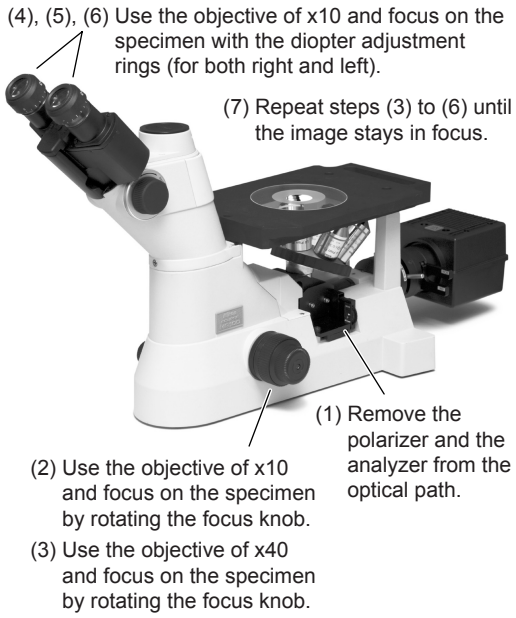
(4) Place the objective of x10 into the optical path.

(5) Look through the right eyepiece with your right eye, not touching the focus knob, and focus on the specimen by rotating the diopter adjustment ring on the right eyepiece.

(6) Likewise, look through the left eyepiece with your left eye, not touching the focus knob, and focus on the specimen by rotating the diopter adjustment ring on the left eyepiece.

(7) Repeat the steps from (3) to (6) until the image stays in focus even when the objective is changed.

Not adjusting the diopter may affect the performance of the objective and increase the focal deviation when the objective is switched.



7 Observe the specimen.

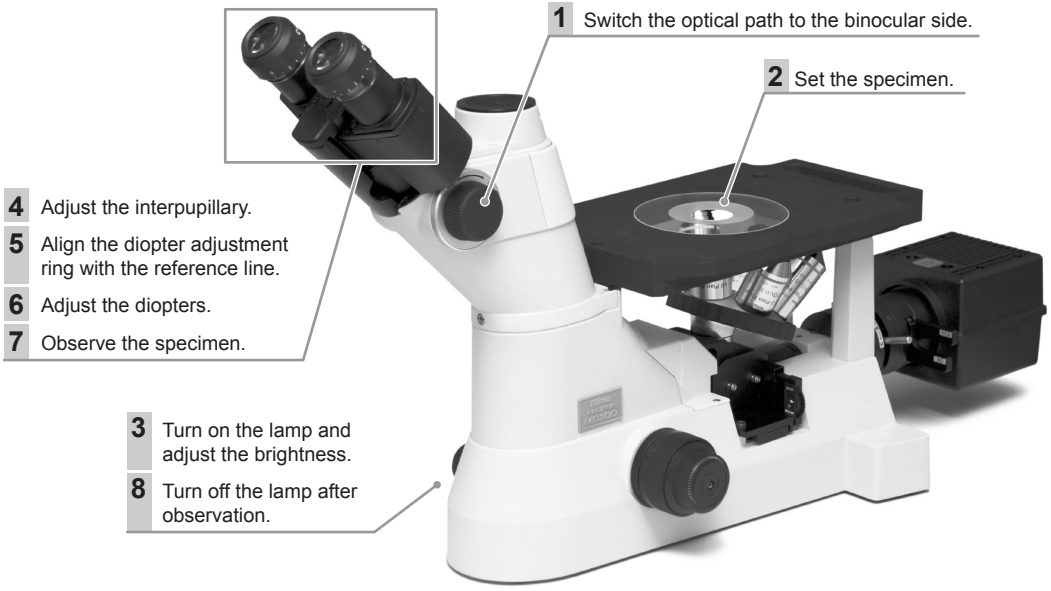
Observe the specimen according to the following methods:

- Bright-field microscopy (Refer to “2.2 Bright-Field Microscopy Procedure.”)
- Simplified polarization microscopy (Refer to “2.3 Simplified Polarization Microscopy Procedure.”)

8 Turn off the lamp.

- When the observation is finished, turn off the power by pressing the power switch to the front side. The lamp is turned off.
- To put a cover over the microscope, cool down the lamp house sufficiently.

■ Standard Microscopy Procedure



2.2 Bright-Field Microscopy Procedure

1

Preparation

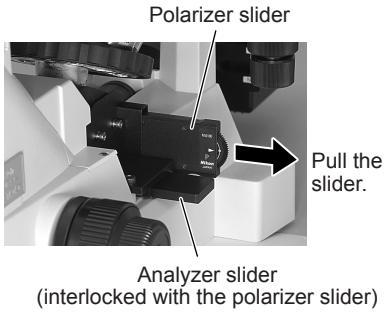
Prepare the microscope and a specimen according to the steps from (1) to (6) of “2.1 Standard Microscopy Procedure.”

2

Remove the polarizer and the analyzer from the optical path.

When the polarizer slider and the analyzer slider are attached, pull a slider to the click-stop position to remove the sliders from the optical path.

- Operating either the polarizer slider or the analyzer slider enables to move both the sliders together because they are interlocked.

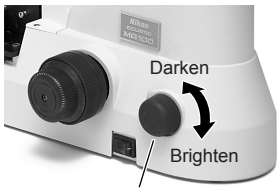


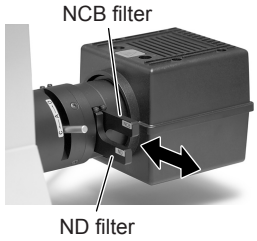
3

Adjust the brightness.

Adjust the brightness of the lamp with the brightness control dial and the ND filter.

- Adjusting the brightness with the brightness control dial affects the color temperature of the lamp. To observe under white light, place the NCB filter in the optical path, adjust the brightness control dial until the illumination becomes white, and then adjust the brightness with the ND filter.

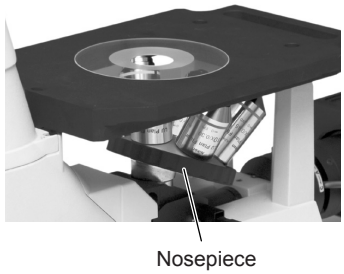




4

Place the desired objective into the optical path.

Rotate the nosepiece to the click-stop position to place the desired objective into the optical path.

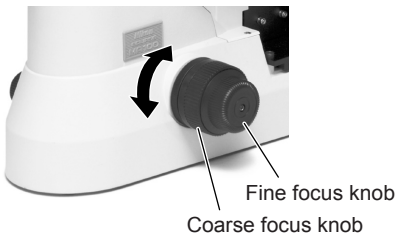


5

Focus on the specimen.

Rotate the focus knob to focus on the specimen.

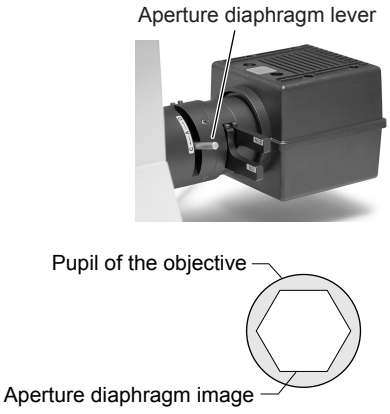
- The coarse focus knob and the fine focus knob are provided. For details on focusing, refer to “3.7 Focusing the Specimen.”



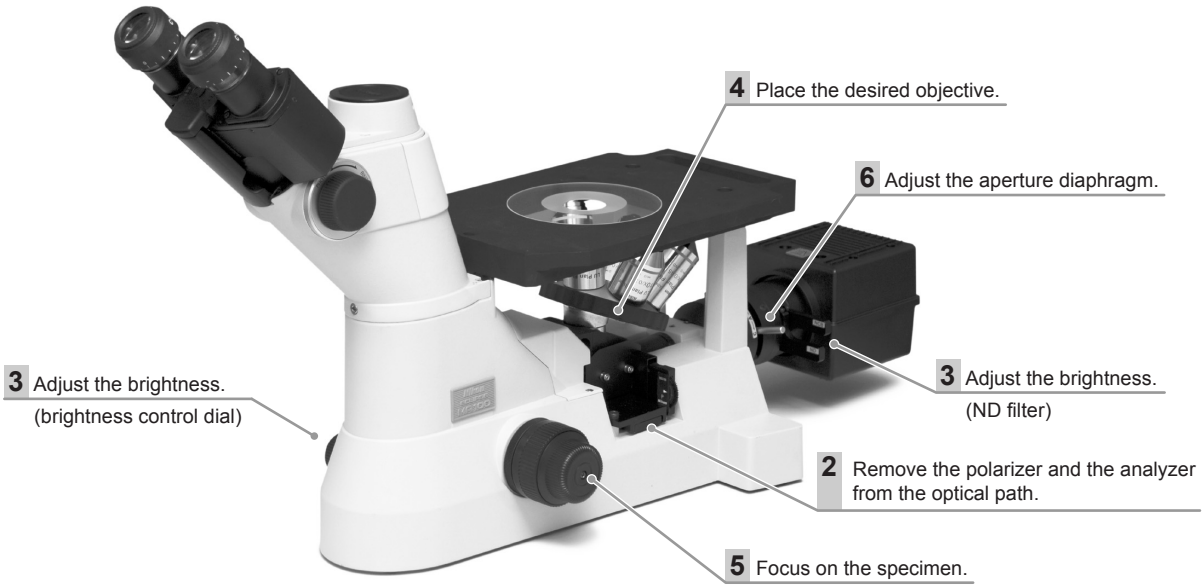
6 Adjust the aperture diaphragm.

Adjust the aperture diaphragm of the illumination system with the aperture diaphragm lever.

- Normally, adjust the aperture diaphragm to 70 to 80% of the numerical aperture of the objective. For details on aperture diaphragm, refer to “3.4 Adjusting the Aperture Diaphragm.”



■ Bright-field microscopy



2.3 Simplified Polarized Microscopy Procedure

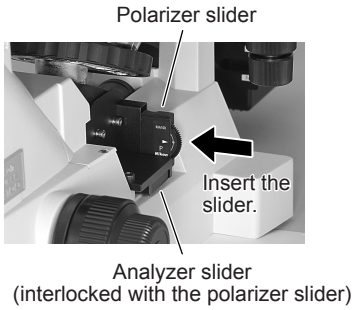
1 **Preparation**

Prepare the microscope and a specimen according to the steps from (1) to (6) of “2.1 Standard Microscopy Procedure.”

2 **Place the polarizer and the analyzer into the optical path.**

Insert the polarizer slider and the analyzer slider into the click-stop position to place the polarizer and the analyzer into the optical path.

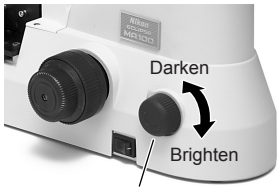
- Operating either the polarizer slider or the analyzer slider enables to move both the sliders together because they are interlocked.

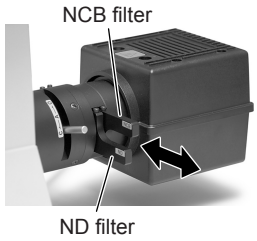


3 **Adjust the brightness.**

Adjust the brightness of the lamp with the brightness control dial and the ND filter.

- Adjusting the brightness with the brightness control dial affects the color temperature of the lamp. To observe under white light, place the NCB filter in the optical path, adjust the brightness control dial until the illumination becomes white, and then adjust the brightness with the ND filter.

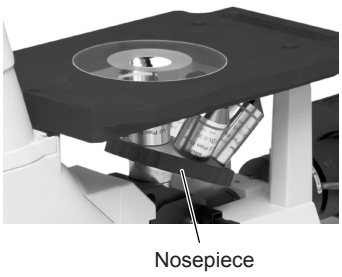




4 **Place the desired objective into the optical path.**

Rotate the nosepiece to the click-stop position to place the desired objective into the optical path.

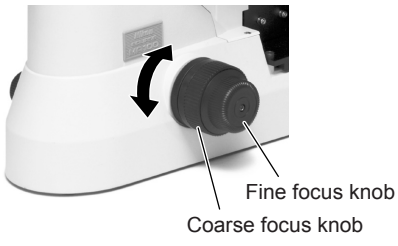
- For the simplified polarization microscopy, use the objective whose body is marked with “P”.



5 **Focus on the specimen.**

Rotate the focus knob to focus on the specimen.

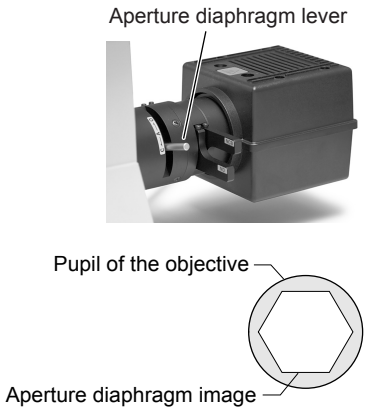
- The coarse focus knob and the fine focus knob are provided. For details on focusing, refer to “3.7 Focusing the Specimen.”



6 Adjust the aperture diaphragm.

Adjust the aperture diaphragm of the illumination system with the aperture diaphragm lever.

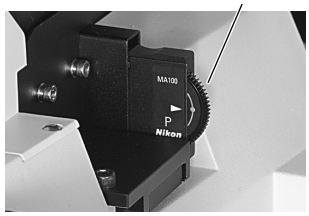
- Normally, adjust the aperture diaphragm to 70 to 80% of the numerical aperture of the objective. For details on aperture diaphragm, refer to “3.4 Adjusting the Aperture Diaphragm.”



7 Adjust the polarizer orientation and observe the specimen.

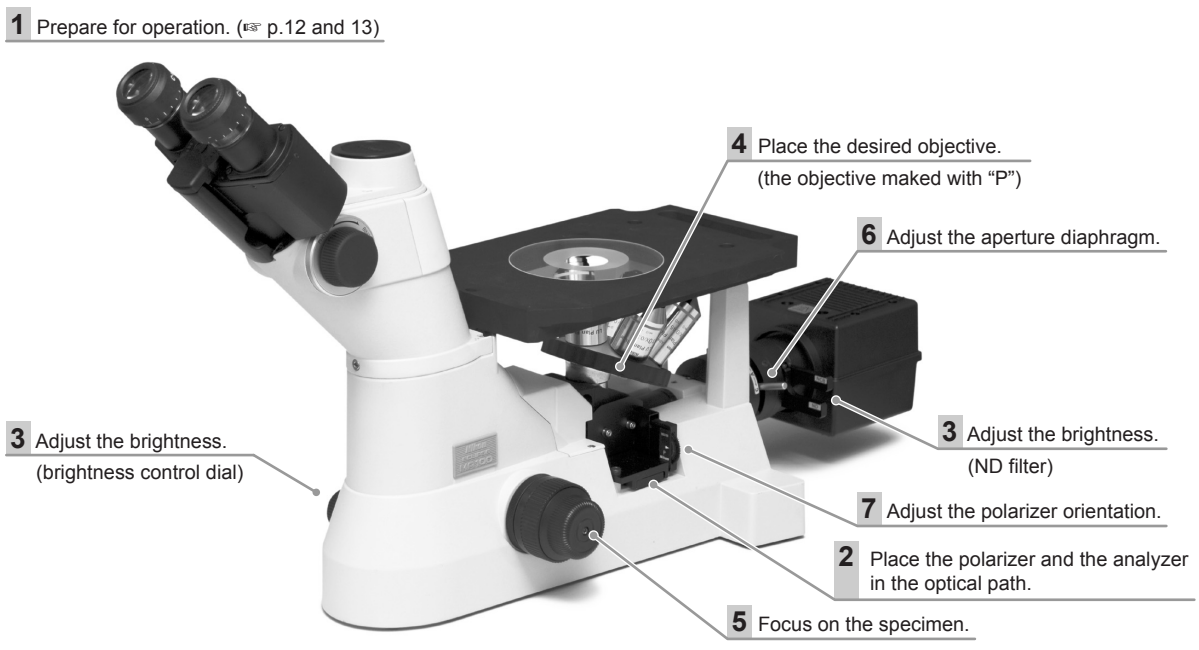
Adjust the polarizer orientation by rotating the polarizer rotation ring.

- The view of image changes depending on the polarizer orientation.
- The polarizer orientation ring is marked with “●” and “–”. When adjusting the ring to “●”, the polarizer orientation changes to the horizontal direction and the polarizer and the analyzer are set to the crossed Nicols position.
- For details on using the polarizer, refer to “3.8 Operation of the Polarizer and the Analyzer.”



Mark	Polarizer orientation
	Horizontal direction ↔
	Vertical direction ↕

■ Simplified Polarization Microscopy



3 Operation Details

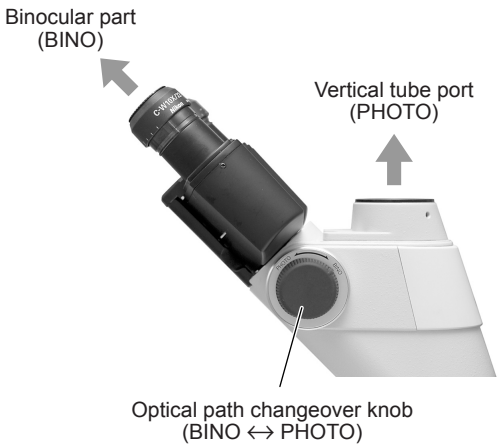
3.1 Operation of the Eyepiece Tube

Switching the Optical Path

The trinocular eyepiece tube is attached to this microscope and the optical path can be switched with the optical path changeover knob on the right of the microscope.

Rotate the optical path changeover knob to the BINO side to use the optical path for the binocular part and to the PHOTO side to use the optical path for the vertical tube port.

Knob position	Distribution of light	
	Binocular part	Vertical tube port
BINO	100	0
PHOTO	0	100



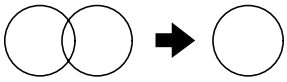
A video camera or a digital camera can be attached to the vertical tube port with the C-mount adapter. For the attaching method, refer to “4.9 Attaching the Camera.”

Adjusting the Interpupillary

Interpupillary adjustment means that the distance between the eyepieces is adjusted according to the distance between user’s eyes.

Look through the eyepieces and adjust the binocular part until the view fields for the right and left eyes coincide.

The binocular part has a scale for interpupillary. It is recommended to memorize or record your interpupillary for easy interpupillary adjustment next time.



The view fields coincide.

Adjusting the Diopters

Diopter adjustment means that the diopter adjustment rings on the eyepieces are adjusted according to the user's right and left visions. Diopter adjustment compensates for the differences in visual acuity between the right and left eyes, improving binocular observation.

> Not adjusting the diopters affects the performance of the objective and increases the focal deviation when the objective is switched.

(1) If the polarizer and the analyzer are located in the optical path, remove them from the optical path by pulling a slider.

(2) Focus on the specimen with the objective of x10 according to "2.2 Bright-Field Microscopy."

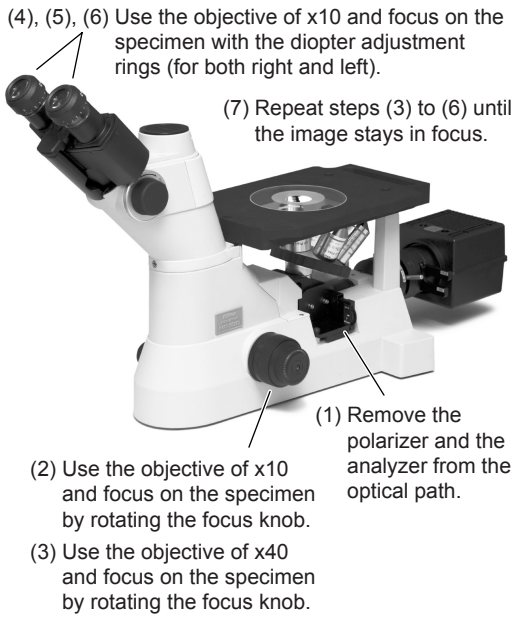
(3) Place the objective of x40 in the optical path and rotate the focus knob to focus on the specimen.

(4) Place the objective of x10 in the optical path.

(5) Look through the right eyepiece with your right eye, not touching the focus knob, and focus on the specimen by rotating the diopter adjustment ring on the right eyepiece.

(6) Look through the left eyepiece with your left eye, not touching the focus knob, and focus on the specimen by rotating the diopter adjustment ring on the left eyepiece.

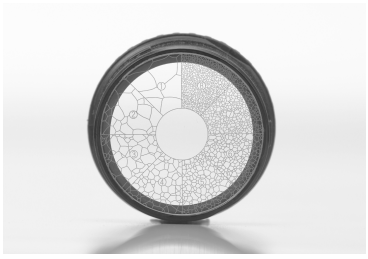
(7) Repeat the steps from (3) to (6) until the image stays in focus even when the objective is changed.



Using the Grain-Size Reticle (Option)

Grain-size reticle is a scale attached on an eyepiece for checking the size of the specimen visually. (Refer to the right figure.)

For attaching method of the grain-size reticle, refer to "Attaching the Grain-Size Reticle (Option)" in "4.7 Attaching the Eyepiece."



Grain-size reticle (option)

3.2 Adjusting the Brightness of the Lamp

A halogen lamp with brightness control function is attached to the rear of this microscope. Procedures for turning on/off the lamp and adjusting the brightness are described as follows:

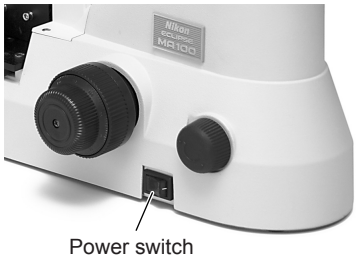
Turning On/Off the Lamp (ON/OFF Switch)

Turn on/off the lamp with the power switch on the left of the microscope.

Turning on the lamp

Press the power switch to the far side to show the mark " I ". The microscope is turned on and the lamp is lit.

The power switch has the function of the power indicator. The power indicator is lit when the lamp is turned on.



> The lamp and its surroundings are heated while the lamp is lit and it may result in burns and fire. Do not touch the lamp house nor place any flammable materials near the lamp.

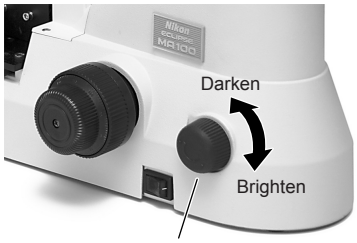
Turning off the lamp

Press the power switch to the front side to show the mark "O". The microscope is turned off and the power indicator and the lamp are turned out.

> To attach a cover to the microscope, turn off the lamp and cool down sufficiently.

Adjusting the Brightness (Brightness Control Dial)

Adjust the brightness of the lamp with the brightness control dial on the left of the microscope. Rotate the brightness control dial counterclockwise to darken the lamp and rotate the dial clockwise to brighten the lamp. Adjust the brightness for easy observation.



Color temperature of illuminator

When the brightness is adjusted with the brightness control dial, the voltage supplied to the halogen lamp changes and the color temperature of the illuminator changes.

When observation under white light is required for the color distinction, photomicrography, or videomicroscopy, place the NCB11 filter into the optical path and adjust the brightness control dial until the color of the illumination becomes white. In this case, adjust the brightness of the illuminator by inserting or removing the ND filter.

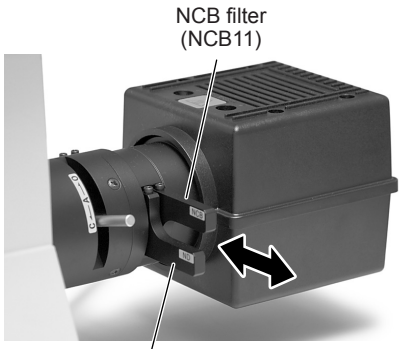
For details on inserting or removing the filters, refer to "3.3 Operating Filters."

3.3 Operating Filters

This microscope is equipped with two filter sliders, one for the NCB filter (NCB11) and another for the ND filter (ND4).

Inserting and removing a filter

To place a filter into the optical path, push in the filter slider as far as it goes. To remove a filter from the optical path, pull the filter slider fully. (An empty hole is placed in the optical path.)



Insert: place the filter in the optical path.
Pull: remove the filter from the optical path.

Filter type

Filter	Type	Intended application
NCB (NCB11)	**Neutral color balancing filter**	For color balancing and color photomicrography
ND (ND4)	**ND filter**	For brightness control (transmittance: 25%)

3.4 Adjusting the Aperture Diaphragm

Aperture diaphragm

The aperture diaphragm controls the numerical aperture of the illumination system, and is closely related to the resolution of the optical image, the brightness, the contrast, and the depth of focus.

When the size of the aperture diaphragm is reduced, the resolution and the brightness are reduced while the contrast and the depth of focus are increased. Conversely, when the size of the aperture diaphragm is increased, the resolution and the brightness are increased while the contrast and the depth of focus are reduced.

The resolution, the brightness, the contrast, and the depth of focus are related each other and cannot be changed independently. Set the conditions to fit the requirements of the specimen and the intended application.

Adjusting the aperture diaphragm

The aperture diaphragm is adjusted by operating the aperture diaphragm lever in front of the halogen lamp. Adjust the aperture diaphragm properly according to the following procedure:

(1) Place a specimen with a flat and plain surface onto the stage.

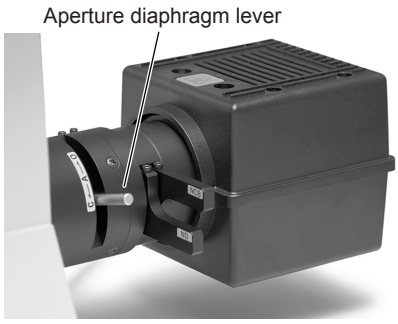
A specimen with high reflectance such as a mirror surface is recommended.

(2) Set the microscope for the bright-field microscopy and focus on the specimen with the objective of x10.

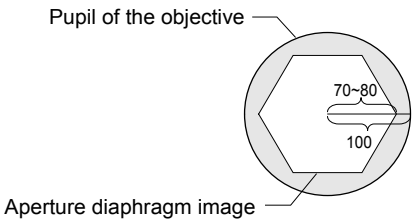
(3) Remove an eyepiece and look through the eyepiece tube to check that the aperture diaphragm image is shown in the pupil of the objective.

If the aperture diaphragm image cannot be seen, reduce the size of the aperture diaphragm by moving the aperture diaphragm lever to “C”.

(4) Adjust the aperture diaphragm image to 70% to 80% of the pupil of the objective with the aperture diaphragm lever.



O (OPEN): open the aperture diaphragm.
C (CLOSE): close the aperture diaphragm.

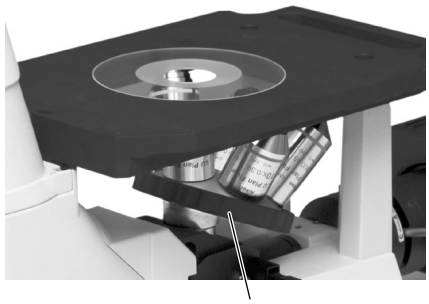


3.5 Switching the Objective

Rotating the nosepiece

To switch the objective, rotate the nosepiece until the required objective is placed into the optical path. A click-stop position is provided to where each objective enters the optical path. Rotate the nosepiece to the click-stop position.

> Do not stop rotating the nosepiece at an intermediate position. Be sure to rotate the nosepiece to the click-stop position.

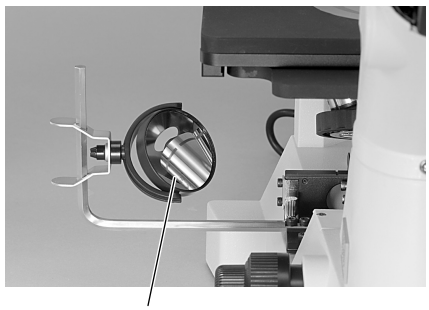


Nosepiece

Using the objective checking mirror

The objective checking mirror is attached to the left of the microscope so that the objective in the optical path can be checked even when the specimen is on the stage.

Adjust the angle of the mirror so that the objective in the optical path can be checked from the place around the eyepiece.



Objective checking mirror

3.6 Operating the Specimen and the Stage

Changing the Observation Position

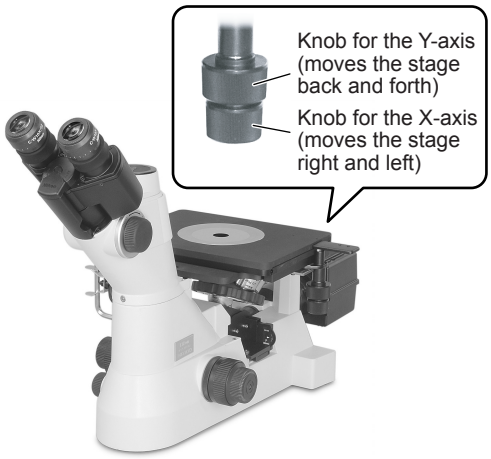
Plane stage

The plane stage cannot be moved for the observation position. Move the specimen to change the observation position.

Rectangular stage / Mechanical stage

The rectangular stage and the mechanical stage have stage movement mechanisms. Those stages can be moved by operating the stage movement knobs with the specimen placed on.

Two stage movement knobs for the X-axis and the Y-axis are provided. Rotate the knob for the X-axis to move the stage right and left and rotate the knob for the Y-axis to move the stage back and forth.

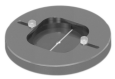


Stage movement knobs (on the rectangular stage)

Setting a Specimen

A specimen can be set on one of the following plates or holders. But on the plane stage and the rectangular stage, a specimen can be set directly on the stage without any plate or holder. Even a heavy specimen can be set on the plane stage and the rectangular stage.

Type and use of plates (for the plane stage and the rectangular stage)

Plate	Shape	Remark
Stage ring (accessory of the plane stage)		Two transparent acrylic rings (outer diameter: ø118 mm): circular opening type (hole diameter: ø30 mm) and crescent opening type
Stage ring (accessory of the rectangular stage)		Two metallic rings (outer diameter: ø118 mm): circular opening types (hole diameter: ø20 mm or ø40 mm)
MA-SRSH1 specimen holder 1		Metallic ring, with a wedge hole
MA-SH3 specimen holder 3		Slit width adjustable • Use the objective with a working distance (WD) of 0.8 mm or more. • To prevent images from becoming unfocused, adjust the slit symmetrically.

Type and use of holders (for the mechanical stage)

Holder	Shape	Remark
MA-SH1 specimen holder 1		With a wedge hole
MA-SH2 specimen holder 2		With a large hole
C-HU universal holder		With specimen clamping function, enables to clamp a circular specimen

3.7 Focusing the Specimen

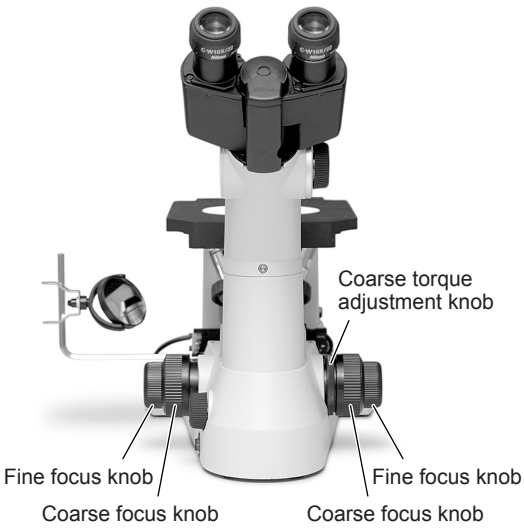
Using the Focus Knobs (Coarse Focus Knob and Fine Focus Knob)

Move up and down the objective by rotating the focus knobs on the right and left of the microscope to focus on the specimen. The coarse focus knob for rough movement and the fine focus knob for fine movement are provided.

- One revolution of the coarse focus knob allows the nosepiece to move by approximately 37.7 mm.
- One revolution of the fine focus knob allows the nosepiece to move by approximately 0.2 mm.
- The fine focus knob is marked in 2 µm increments.
- The vertical stroke of the nosepiece is 8.5 mm.

Caution
Make sure that the objective does not hit the specimen while the focus knob is rotated.

Caution
Do not perform the following operations because they may damage the product.
- **Do not rotate the right and left focus knobs in opposite directions at the same time.**
- **Do not rotate the focus knobs over the rotation limits.**



Focus knob

Adjusting the Torque for the Coarse Focus Knob

Torque required to rotate the coarse focus knob can be adjusted.

Adjust the torque by rotating the coarse torque adjustment knob on the right of the microscope. Rotating the knob in the direction of the arrow (TORQUE →) marked on the microscope base part increases the torque.

If the torque is too low, the elevating part may descend with the weight of the nosepiece and the objective, resulting in focal deviation during observation. Adjust the torque properly.

3.8 Operating the Polarizer and the Analyzer

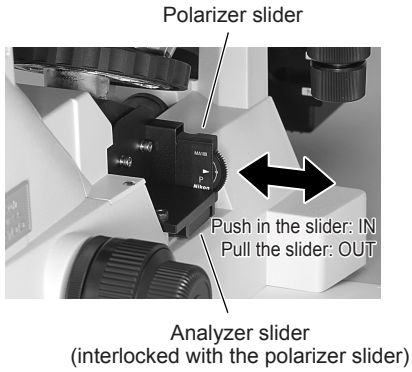
Attaching the polarizer slider and the analyzer slider enables to perform the simplified polarization microscopy under the epi illumination.

For details on attaching method, refer to “4.8 Attaching the Polarizer and the Analyzer.”

Inserting and removing the polarizer and the analyzer

The polarizer slider and the analyzer slider are interlocked. The polarizer and the analyzer can be placed in or moved away from the optical path at the same time by operating either slider.

Push in a slider to the inner click-stop position to place the polarizer and the analyzer in the optical path. Pull the slider to the outer click-stop position to remove the polarizer and the analyzer from the optical path. At this time, empty holes are placed in the optical path.



Adjusting the orientation of the polarizer

Adjust the orientation by rotating the polarizer rotation ring. Set the polarizer and the analyzer to the crossed Nicols position according to the following procedure.

(1) Place the polarizer and the analyzer in the optical path and set a specimen with flat and plain surface on the stage.

(2) Set the microscope for the simplified polarization microscopy.

(3) Remove an eyepiece and check the pupil of the objective by looking through the eyepiece tube.

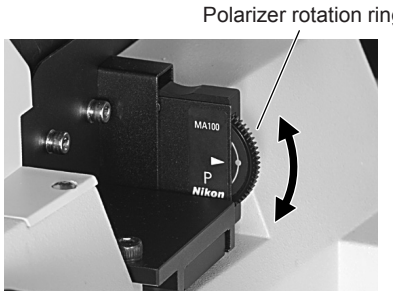
The pupil of the objective is seen as a bright circle.

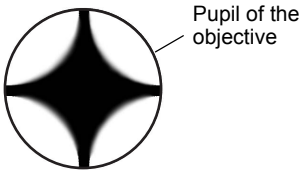
(4) Adjust the polarizer rotation ring so that a dark cross image appears in the pupil as shown in the right figure.

The condition that a dark cross image appears is the crossed Nicols.

The polarizer rotation ring has marks identifying its orientation. When the ring is set to “●” position, the polarizer is orientated to the horizontal direction. When the ring is set to “–” position, the polarizer is orientated to the vertical direction.

When the ring is set to “●”, the polarizer and the analyzer are set to the crossed Nicols position.





Dark cross image

Mark	Polarizer orientation
	Horizontal direction ↔
	Vertical direction ↕

Marks on the rotation ring and the orientation of the polarizer

Crossed Nicols

The crossed Nicols is the condition that the orientation of the polarizer is orthogonal to the orientation of the analyzer.

3.9 Photographing Images

The microscope is equipped with the trinocular eyepiece tube. Attaching the optional C-mount adapter to the vertical tube port enables to photograph images with a digital camera or observe images on TV screen with a video camera.

For details on attaching the C-mount adapter or a camera, refer to “4.9 Attaching the Camera.”

Switching the optical path

After attaching a camera, switch the optical path from the eyepiece tube side to the vertical tube side by rotating the optical path changeover knob to the PHOTO side.

(Refer to “3.1 Operation of the Eyepiece Tube.”)

Adjusting the illumination light

For photomicrography or videomicroscopy, adjust the illumination light to be white light. Place the NCB11 filter in the optical path and adjust the brightness control dial until the illumination light becomes white. Adjust the brightness of the illumination light by inserting or removing the ND filter.

(Refer to “3.2 Adjusting the Brightness of the Lamp” and “3.3 Operating Filters.”)

Operating a camera

Decide composition with a camera finder or TV screen, focus on the specimen, and adjust exposure.

When photographing images with a single-lens reflex camera, attach an eyepiece cap to prevent ambient light from intruding. Additionally, use a release or adjust the light intensity so that the shutter speed is 1/8 second or less to prevent vibration.

For details on operating photomicrography device, refer to the instruction manual for the device in use.

4 Assembly

Be sure to read “Safety Precautions” at the beginning of this manual and follow all instructions given there before assembling the microscope. Additionally, in order to avoid electrical shock, be sure to press down the “O” side of the power switch and turn off the power before assembly.

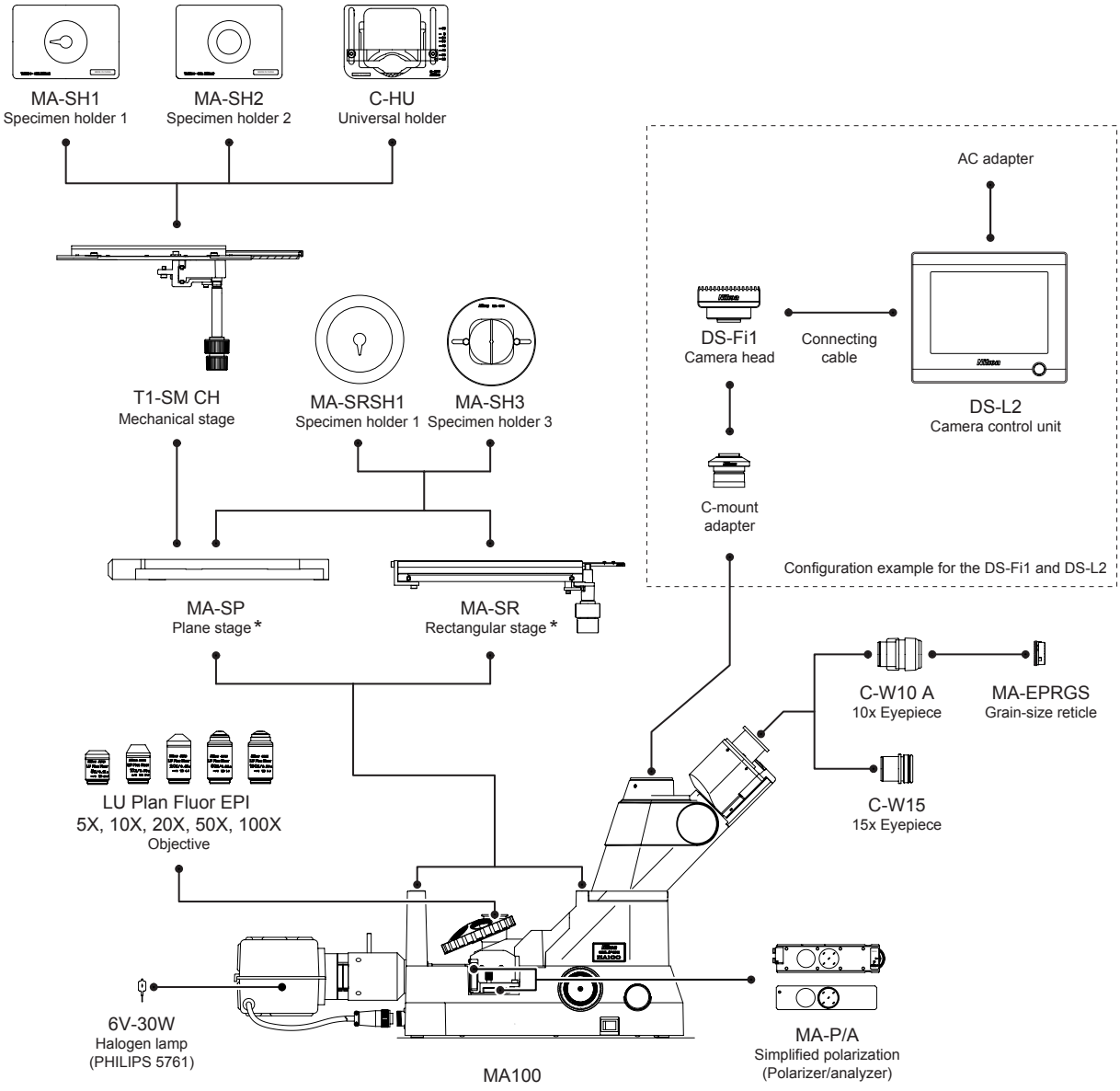
Necessary tools

The following tools are required to assemble the microscope:

- Flat blade screwdriver (Used to change the input voltage setting.)
- Hexagonal wrench

4.1 System Configuration

The system configuration of the microscope is shown below.



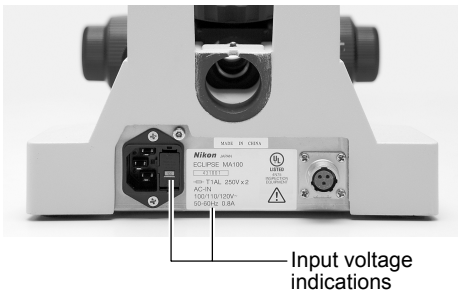
* For the plane stage, two acrylic stage rings are provided.
For the rectangular stage, two metallic stage rings are provided.

MA100 system configuration

4.2 Input Voltage Check

Input Voltage Check

Check the input voltages indicated on the nameplate on the rear panel of the microscope and on the right of the AC inlet. If indicated input voltage differs from the local voltage, do not turn on the microscope. Take the following measures. Use of the microscope under an incorrect voltage may cause over-heating due to over-current, possibly resulting in fire and damaging the microscope.



The voltage on the nameplate differs from the local voltage.

Do not turn on the microscope. Contact your nearest Nikon representative.

The voltage on the right of the AC inlet differs from the local voltage.

Change the input voltage setting as described below before turning on the power. Applicable voltages are specified as follows:

For the model indicating "100/110/120 V" on the nameplate	Select 100, 110 or 120 VAC
For the model indicating "220/230/240 V" on the nameplate	Select 220, 230 or 240 VAC

Input Voltage Selection

(1) Press down the front-half of the power switch to turn off the power and unplug the power cord.

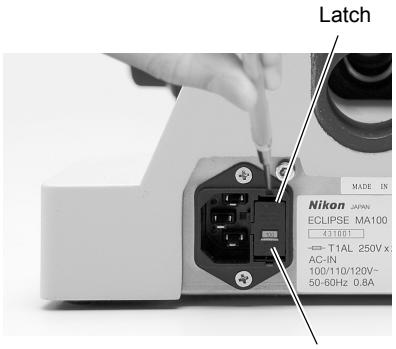
(2) Remove the fuse holder using a flat blade screwdriver.

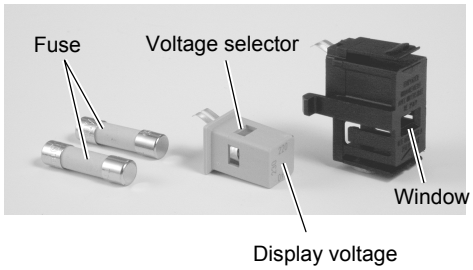
Use the tip of the flat blade screwdriver to push the two latches toward the center of the fuse holder. The fuse holder pops out from the AC inlet.

(3) Remove the fuses and pull out the voltage selector inside the fuse holder.

(4) Re-attach the voltage selector so that the local voltage to be used can be seen through the fuse holder window.

(5) Re-attach the fuses and fuse holder in their original locations.





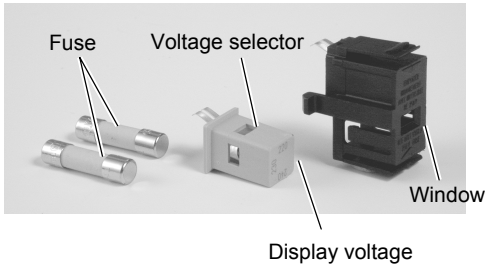
4.3 Replacement of Fuse

To avoid electrical shock and/or damage, be sure to turn off the power of the microscope (press down the front-half of the power switch) and unplug the power cord before the fuse replacement.

Specified fuse

Always use the specified fuse. Use of another fuse may result in damage or fire.

- **For the model indicating "100/110/120V" on the nameplate:**
  250V, 1A, time lag, low-breaking type,
  5 x 20 miniature fuse x 2 pieces
- **For the model indicating "220/230/240V" on the nameplate:**
  250V, 0.5A, time lag, low-breaking type,
  5 x 20 miniature fuse x 2 pieces



(1) Make sure that the microscope is turned off and the power cord is unplugged.

(2) Remove the fuse holder using the flat blade screwdriver. (Refer to p.29.)

(3) Remove the old fuses and attach new fuses.

(4) Check that the voltage displayed in the fuse holder window matches the input voltage to be used.

If it differs, change the voltage selector setting according to "Input Voltage Selection" in "4.2 Check the Input Voltage Check."

(5) Re-attach the fuse holder in its original location.

4.4 Attaching and Replacing the Lamp House

Attaching the Lamp House

The microscope is shipped without the lamp house attached. Therefore, attach the lamp house to the microscope body according to the following procedures:

(1) Make sure that the microscope is turned off and the power cord is unplugged.

(2) Sufficiently loosen the clamp screw of the lamp house using the provided hexagonal wrench.

The clamp screw of the lamp house is located between the two stage pillars on the rear of the microscope.

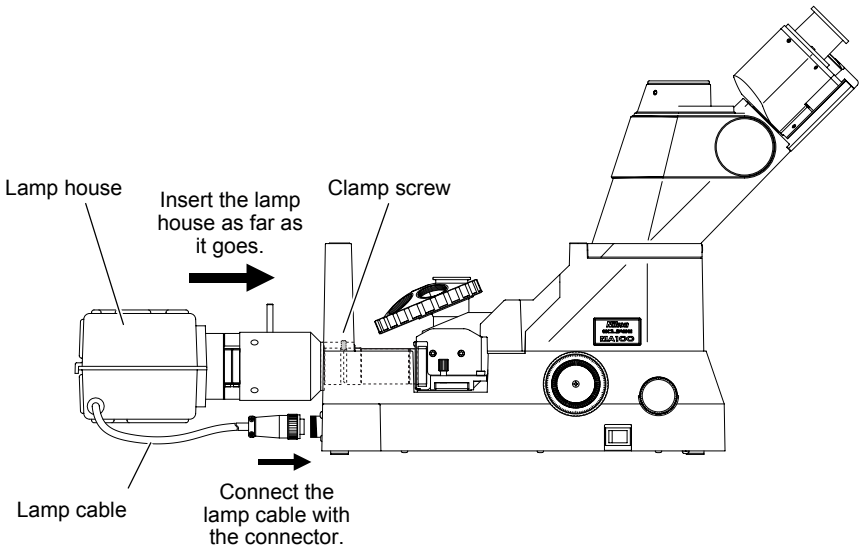
(3) Insert the lamp house into the connection hole on the rear of the microscope.

Insert the lamp house as far as it goes.

(4) Secure the lamp house by tightening the clamp screw.

(5) Connect the lamp cable from the lamp house to the connector of the rear panel of the microscope.

A screw type securing ring is attached on the lamp cable connector. Be sure to tighten the securing ring when connecting.



Attaching the lamp house

Attaching and Replacing the Lamp

Caution

Wear gloves or use a cloth when handling the lamp. Do not touch the lamp glass with bare hands. Any marks on the surface such as fingerprints may degrade performance, damage the lamp, and/or reduce the life expectancy of the lamp.

Specified lamp

Be sure to use the specified lamp. Use of another lamp may result in damage or fire.

Halogen lamp 6 V - 30 W (PHILIPS 5761)

(1) Make sure that the microscope is turned off and the power cord is unplugged.

Make sure the lamp and its surrounding areas have cooled sufficiently (approximately 30 minutes) before replacing the lamp.

(2) Loosen the two clamp screws for the lamp house cover on the top of the lamp house with the provided hexagonal screwdriver. Then, remove the lamp house cover.

Near the clamp screws on the lamp house cover, “LAMP EXCHANGE” is indicated. Do not detach or loosen other screws.

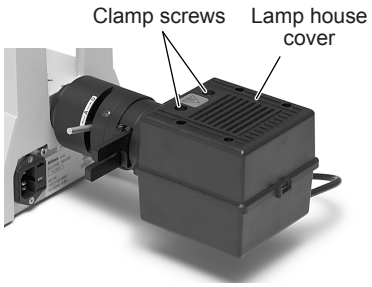
(3) When replacing the lamp, remove the used lamp from the socket.

Deal with the used lamp according to the instructions in p.7 “5. Notes on Handling Lamps”.

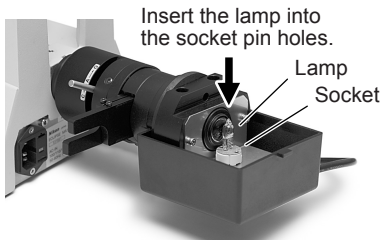
(4) Handle the lamp with gloves or a cloth and firmly plug the lamp into the socket pin holes as far as it goes.

(5) Attach the lamp house cover in the original position and secure it with two screws.

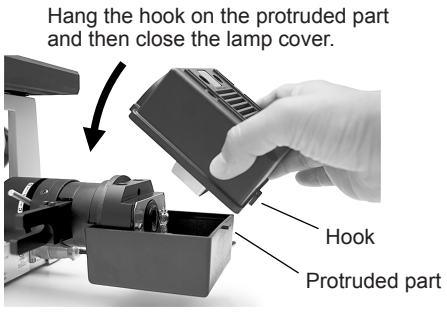
When attaching the lamp house cover, hang the rear hook on the protruded part on the lower part of the lamp house to close a gap between the lamp house and the cover.



Clamp screw for the lamp house cover



Attaching the lamp



Attaching the lamp house cover

4.5 Attaching the Stage

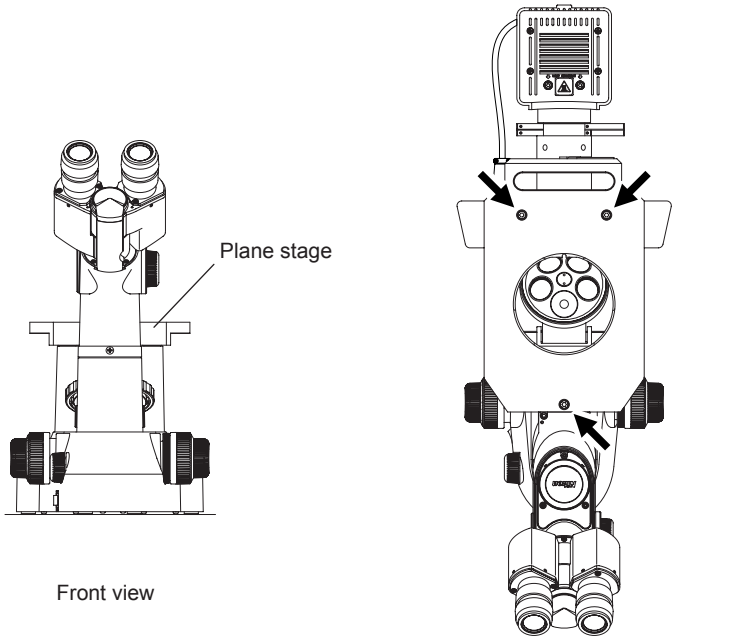
The plane stage or the rectangular stage is attached to the microscope. To use the mechanical stage, mount it on the plane stage.

Attaching the Plane Stage (MA-SP)

(1) Place the stage on the pillars of the microscope body.

(2) Tighten three M5 hexagonal socket head bolts using the provided hexagonal wrench and secure the stage.

Attach the stage so that its upper surface is in a horizontal position.



Attaching the plane stage

Attaching the stage ring/specimen holder

For the plane stage, two acrylic stage rings are provided. Attach a ring to the stage center hole.

Optional specimen holder can be also attached. Refer to the instructions on “3.6 Operating the Specimen and the Stage” and “4.1 System Configuration” for the specimen holder.

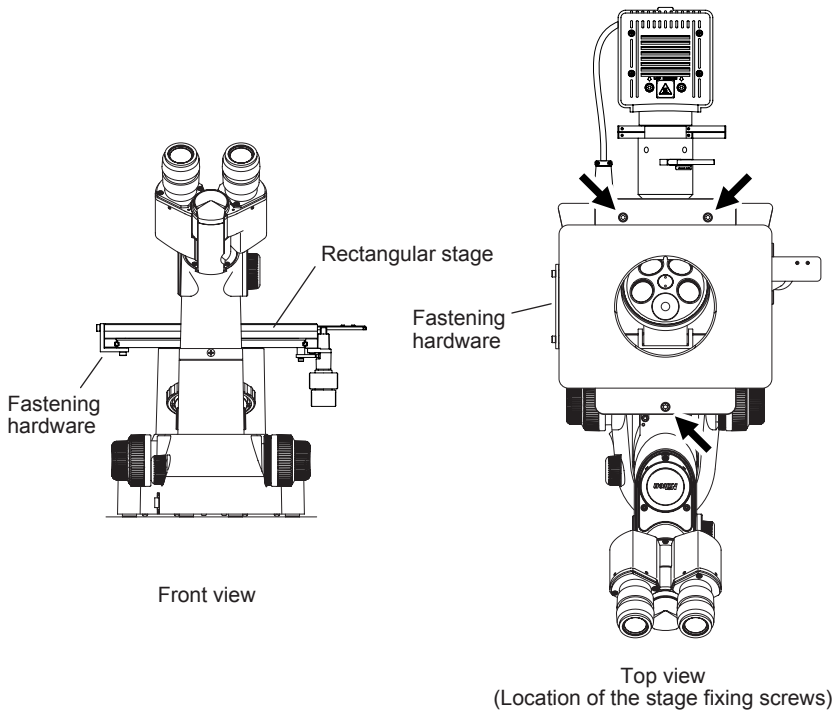
Attaching the Rectangular Stage (MA-SR)

(1) Place the rectangular stage on the pillars of the microscope body so that the stage handle is positioned on the right side of the microscope.

(2) Tighten three M5 hexagonal socket head bolts using the provided hexagonal wrench and fix the stage.

Attach the stage so that its upper surface is located in a horizontal position.

(3) Remove the four fixing screws and detach the fastening hardware from the stage.



Attaching the rectangular stage

Attaching the stage ring/specimen holder

Two metallic stage rings are provided with the rectangular stage. Attach a ring to the stage center hole.

Optional specimen holder can be also attached. Refer to the instructions on “3.6 Operating the Specimen and the Stage” and “4.1 System Configuration” for the specimen holder.

Attaching the Mechanical Stage (T1-SM CH)

The mechanical stage is attached on the plane stage.

(1) Mount the plane stage on the microscope according to the procedure on p.33 “Attaching the Plane Stage (MA-SP)”.

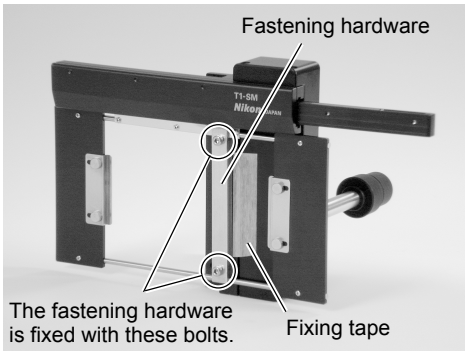
If any specimen holder or a plate is attached on the plane stage, remove it in advance.

(2) Peel off the fixing tape for shipping from the mechanical stage backside surface.

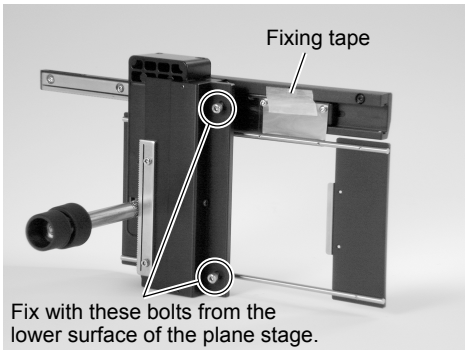
(3) Loosen the bolts of the fastening hardware for three turns.

(4) Place the mechanical stage on the plane stage and fix them from the lower surface of the plane stage using two hexagonal socket head bolts.

(5) Remove the fastening hardware from the mechanical stage.



Remove the fastening hardware



Attaching screw of the mechanical stage

Attaching the specimen holder

Use the mechanical stage with the specimen holder attached.

Refer to the instructions on “3.6 Operating the Specimen and the Stage” and “4.1 System Configuration” for the specimen holder of the mechanical stage.

4.6 Attaching the Objectives

Attaching the Objectives

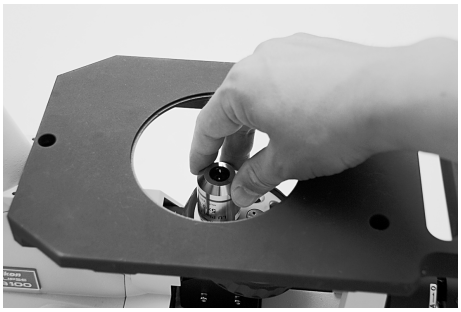
LU Plan Fluor Epi objectives (5 pieces maximum) can be attached to the nosepiece.

(1) Remove the stage ring (or the specimen holder) from the stage.

The objectives are attached to the nosepiece through the stage hole.

(2) Screw the objective into the socket of the nosepiece.

Attach the objectives so that the magnification increases when the nosepiece is turned clockwise as viewed from above.



Attaching the objectives

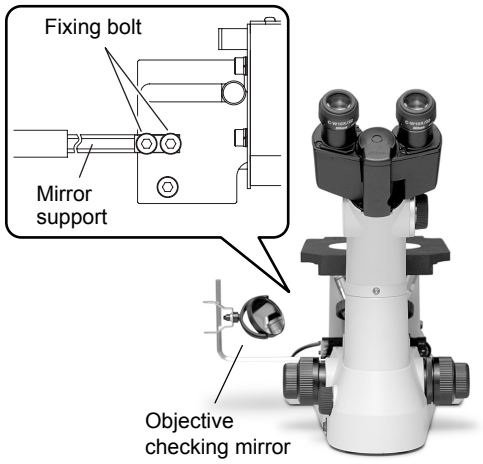
Attaching the Objective Checking Mirror

Attach the objective checking mirror to the left side of the microscope. With the mirror, the objective in the optical path can be checked easily.

(1) Attach the objective checking mirror to the left side of the microscope using the provided two bolts.

Refer to the right figure for the mirror attaching location.

(2) Adjust the mirror angle so that the objective can be checked when viewed from the location near the binocular eyepiece.



Attaching the objective checking mirror

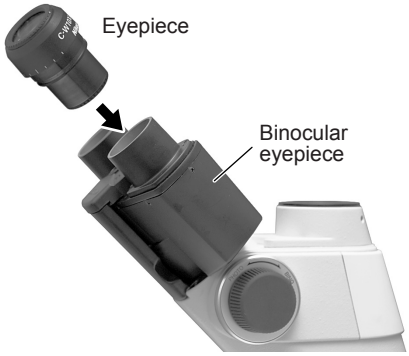
4.7 Attaching the Eyepieces

Attaching the Eyepieces

The 10x or 15x eyepiece can be attached to the binocular eyepiece. Attach the eyepieces with the same magnification and field number.

(1) Check the position of the positioning protuberance of the binocular eyepiece sleeve.

(2) Insert the eyepiece with its groove aligned with the protuberance.



Attaching the eyepiece

Attaching the Grain-Size Reticle (Option)

When the 10x eyepiece used, visual measurement of grain sizes can be performed using the optional grain-size reticle.

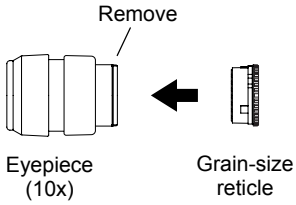
The grain-size reticle cannot be attached to the15x eyepiece.

(1) When the eyepieces are attached to the binocular part, remove the right or left eyepiece.

Attach the grain-size reticle to the right or left eyepiece.

(2) From the eyepiece removed from the binocular part, detach the part on the attaching side of the eyepiece.

Keep the removed part in a secure position for future use.



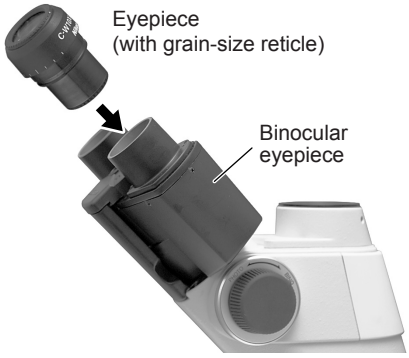
Attaching the grain-size reticle

(3) Attach the grain-size reticle to the place where the part was removed in procedure (2).

Screw in the grain-size reticle with aligned to the groove of the eyepiece.

(4) Attach the eyepiece to the binocular part.

Make sure that the scale of the grain-size reticle is visible when viewed through the eyepieces with both eyes.



Attaching the eyepiece

4.8 Attaching the Polarizer and the Analyzer

The simplified polarization microscopy can be performed with the polarizer and the analyzer.

In the factory-default configuration, dummy sliders are attached to the attachment holes of the polarizer and the analyzer. Remove the dummy sliders according to the following procedures, and then attach the polarizer and the analyzer.

(1) Detach the knurled screw fixing the dummy sliders to the slit on the left side of the microscope.

Be sure to store the knurled screw because it is used to join the polarizer and analyzer.

(2) Detach the two dummy sliders.

One dummy slider is inserted into the horizontal attachment hole and the other is inserted into the vertical attachment hole. Remove the sliders from both attachment holes.

(3) Insert the analyzer slider into the horizontal attachment hole from the left of the microscope so that the hole in the analyzer slider comes left and the screw hole faces up.

Make sure that the screw hole of the analyzer can be seen when viewed through the slit indicated in procedure (1).

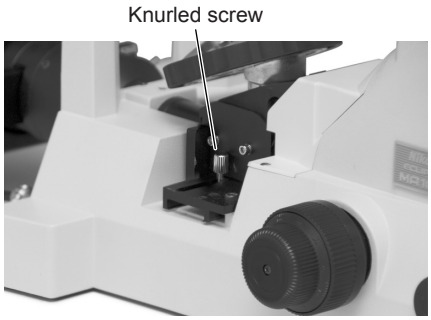
(4) Insert the polarizer slider into the vertical attachment hole from the left of the microscope so that the polarizer adjustment ring comes to right and the indications face the observer.

The connecting hardware of the polarizer slider is located at the left of the microscope.

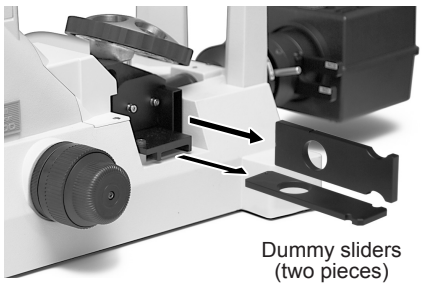
(5) Align the connecting hardware of the polarizer slider with the screw hole of the analyzer slider. Then connect the polarizer and analyzer using the knurled screw removed in procedure (1).

Be sure to put the knurled screw through the two-pronged parts of the connecting hardware when attaching the knurled screw to the screw hole of the analyzer.

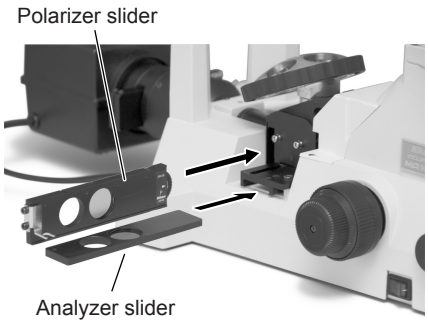
Two click-stop positions are provided to the polarizer slider: one for the polarizer and another for the hole to be located into the optical path. After connecting the sliders, the polarizer and analyzer can be placed in or moving away from the optical path at the same time by locating the polarizer slider with the click-stop position.



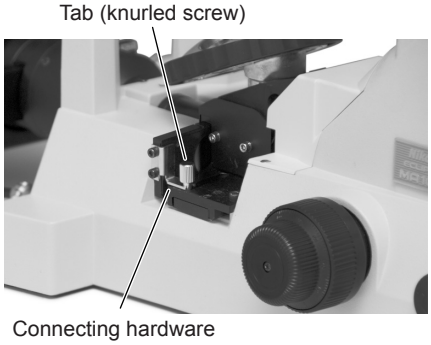
(1) Remove the clamp screw for the dummy slider



(2) Remove the dummy sliders.



(3) and (4) Attaching the polarizer and the analyzer



(5) Connecting of the polarizer and analyzer

4.9 Attaching the Camera

The microscope is equipped with the trinocular eyepiece tube. Attaching the photomicrographic equipment such as CCD camera to the vertical tube port makes the photomicrography to be performed easily. To mount the photomicropraphic equipment, attach the adapter such as C-mount adapter to the vertical tube port considering the camera to be used, then attach the camera to the adapter.

The procedure for attaching the DS-Fi1 to the vertical tube port using C-mount adapter is described as an example:

(1) Remove the cap from the vertical tube port.

(2) Sufficiently loosen the clamp screw of the side of the vertical tube port.

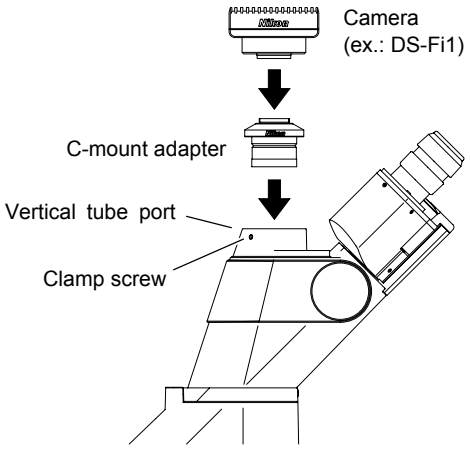
(3) Insert the C-mount adapter into the hole of the vertical tube port and secure it by tightening the clamp screw.

Insert the C-mount adapter to the limited position.

(4) Screw the DS-Fi1 into the mounting section of the C-mount adapter and secure it.

(5) Connect the DS-F1i to the equipment such as the DS-L2.

See the instruction manual on the DS-Fi1 and DS-L2 for the connecting and operating procedures.



Attaching the camera (DS-Fi1)

4.10 Connecting the Power Cord

Connect the power cord according to the following procedures depending on the power specifications of the microscope.

For the Model Indicating “100V/110V/120V” on the Nameplate:

Caution

Be sure to use the provided power cord. Use of other cord may result in damage to the microscope or fire. For details on the power cord, refer to chapter 7, “Specifications”.

(1) Press down the front-half (“O” side) of the power switch.

(2) Plug the socket side of the provided power cord into the AC inlet of the microscope back side.

(3) Plug the plug side of the power cord into an AC outlet.

Be sure to plug it completely.

For the Model Indicating “220V/230V/240V” on the Nameplate:

Caution

Be sure to use the specified power cord. Use of other cord may result in damage to the microscope or fire. For details on the power cord, refer to chapter 7, “Specifications”.

(1) Press down the front-half (“O” side) of the power switch.

(2) Plug the socket side of the specified power cord into the AC inlet of the microscope back side.

(3) Plug the plug side of the power cord into an AC outlet.

Be sure to plug it completely.

5 Troubleshooting

Misuse of the product, although it does not cause a malfunction, may adversely affect performance.
If any of the following troubles come, be sure to check the following table for possible causes before requesting service.

Contact your nearest Nikon representative if the troubles cannot be resolved by taking the following measures.

5.1 Troubleshooting on Image Viewing

Trouble	Cause	Measures
Viewfield vignetting, viewfield only partially visible, uneven brightness, or dark image	Lamp is not installed correctly.	Install the lamp correctly. (p.31, 32)
	Analyzer or polarizer is not installed correctly.	Install the analyzer or polarizer correctly. (p.38)
	Filter slider or analyzer/polarizer slider in midway position.	Slide the sliders to the clickstop position or the limited position. (p.21, 26)
	Nosepiece is not rotated to the clickstop position.	Be sure to rotate the nosepiece to the clickstop position and place the objective in the optical path. (p.23)
	Optical path changeover knob is not adjusted correctly.	Adjust the knob considering the optical path to be used. (p.18)
	The plate or specimen holder of the stage is placed in the optical path.	Move the plate or holder. (p.24)
	Dirt such as dust particles is attached to the lens (objective or eyepiece).	Clean the lens. (p.44)
	Unnecessary filter is placed in the optical path.	Place only the necessary filters in the optical path by adjusting the filter slider and analyzer/polarizer slider. (p.21, 26)
Dirt such as dust particles interrupts the viewfield.	Dirt such as dust particles is attached to the lens (objectives or eyepieces).	Clean the lens. (p.44)
	Dirt such as dust particles is attached to the specimen.	Clean the specimen.
	The opening of the aperture diaphragm is excessively reduced.	Open the aperture diaphragm to the appropriate size. (p.22)
Inferior image (Poor contrast or resolution.)	Dirt such as dust particles is attached to the lens (objective or eyepiece).	Clean the lens. (p.44)
Image is partially dim.	Nosepiece is not rotated to the clickstop position.	Be sure to rotate the nosepiece to the clickstop position. (p.23)
	The specimen is separated from the stage.	Place the specimen on the stage properly. (p.24)
	The stage is inclined.	Install the stage correctly. (p.33-35)
Image moves while being focused.	Nosepiece is not rotated to the clickstop position.	Be sure to rotate the nosepiece to the clickstop position. (p.23)
	The specimen is inclined with respect to the stage surface.	Place the specimen on the stage properly. (p.24)
	The stage is inclined.	Install the stage correctly. (p.33-35)

Trouble	Cause	Measures
The image is yellow-tinged.	Neutral color balance (NCB) filter is not used.	Place the NCB11 filter in the optical path. (p.21)
	Lamp voltage is low.	Obtain proper color using the brightness level and adjust the light level using the ND filter. (p.20, 21)
Extremely bright	Lamp voltage is excessively high.	Lower the lamp voltage using the brightness level. (p.20)
	The ND filter is not in the optical path.	Place the ND filter in the optical path. (p.21)
Insufficiently bright	Lamp voltage is low.	Increase the lamp voltage using the brightness level. (p.20)
	The ND filter is placed in the optical path.	Remove the ND filter from the optical path. (p.21)
	The opening of the aperture diaphragm is excessively reduced.	Open the aperture diaphragm to the appropriate size. (p.22)
	Analyzer and polarizer are in the optical path when the bright-field microscopy.	Remove the analyzer and polarizer from the optical path. (p.26)

5.2 Troubleshooting on Operation

Trouble	Cause	Measures
Cannot focus even by moving the objective to the upper limit.	Specimen surface is too far from the stage surface.	Place the specimen surface closer to the stage surface.
After changing the objective with low magnification to the one with higher magnification, it strikes the specimen. Their focuses are extremely different.	Diopter has not been adjusted properly.	Adjust the diopter. (p.19)
The image viewed from the binocular eyepieces does not merge into one.	Interpupillary adjustment is not performed.	Perform the interpupillary adjustment. (p.18)
	Diopter adjustment is not performed.	Adjust the diopter. (p.19)
Eyes get tired during observations.	Interpupillary adjustment is not performed.	Perform the interpupillary adjustment. (p.18)
	Diopter adjustment is not performed.	Perform the diopter adjustment to the right and left eyepieces. (p.19)
	Brightness is not appropriate.	Adjust the brightness using the brightness level or ND filter. (p.20, 21)
Hard to rotate the coarse focus knob	The coarse torque adjustment ring is tightened considerably.	Loosen the ring properly. (p.25)
Out of focus over time (The revolving eyepiece falls off and out of focus during observation.)	The coarse torque adjustment ring is extremely loosened.	Tighten the coarse torque adjustment ring so that the revolving eyepiece does not fall off by itself. (p.25)

5.3 Troubleshooting on the Electrical Equipment

Trouble	Cause	Measures
Cannot light up the lamp by turning on the switch	The power cord is not connected or is not connected completely.	Insert the power cord into the AC inlet of the microscope and electrical outlet. (p.40)
	The lamp house cable is not connected to the microscope body.	Connect the cable to the body. (p.31)
	Lamp is not installed properly.	Use the specified lamp. (p.32)
	The lamp is burned out.	Replace the lamp. (p.32)
	The specified lamp is not used.	Use the specified lamp. (p.32)
Lamp flickers. **Brightness is unstable.**	The lamp is about to burn out.	Replace the lamp. (p.32)
	The power cord or lamp house cable is not connected properly.	Connect them correctly. (p.31)
	The lamp is not attached to the socket correctly.	Attach the lamp properly. (p.32)
	The lamp house is not attached to the microscope body properly.	Attach the lamp house correctly. (p.31)
Lamp burns out immediately.	The specified lamp is not used.	Use the specified lamp. (p.32)
	Not match the input voltage of the power source.	Change the input voltage to the one of the power source using the voltage selector. (p.29)

6 Maintenance

6.1 Cleaning the Lens

Keep the lens from dust particles or fingerprints. Dirt on the lens or filter adversely affects the viewing of the image. If the lens becomes dirty, clean it according to the following instructions.

- Remove dust with a soft brush or lightly wipe off with gauze.
- Only when fingerprints or oily substances are attached, use soft clean lens tissue, cotton cloth or gauze with a little absolute alcohol (ethyl alcohol or methyl alcohol) moistened to remove the dirt.
- Do not use any solvents other than absolute alcohol as they may damage the lens adhesion surfaces. Especially, do not use petroleum benzine for the lens or filter.
- Absolute alcohol is extremely flammable. Keep these flammable solvents away from fire or sparks emitted when turning on/off the power switch.
- Use absolute alcohol according to the instructions provided by the manufacturer.

6.2 Cleaning the Product

- We recommend that you use a silicon cloth to clean the product.
- For persistent dirt, dampen a piece of gauze with neutral detergent and wipe lightly.
- Use of organic solvent could result in discoloration of the plastic parts.

6.3 Storage of the Product

- Store the product in a dry place where mold hardly grow.
- We especially recommend that the objectives and eyepieces be stored in a container (such as a desiccator) with desiccant in it.
- Cover the product with a dust protection cover when storing so that it will not get dusty.
- Cover a dust protection cover after turning off the power source (press the front-half of the power switch) and the lamp cools sufficiently.

6.4 Regular Inspections (With Charge)

Regular inspection (with charge) is recommended to maintain the performance of the product. Contact your nearest Nikon representative for details.

7 Specifications

Type	ECLIPSE MA100
Optical system	Chromatic aberration free infinity system Magnification: 1x Objective: CFI60 (Corresponding to LU Plan Fluor Epi) Eyepiece: Field number: 22 (10x), 16 (15x) Nosepiece 5 sockets (With the objective checking mirror)
Binocular eyepiece	Type: Siedentopf type Interpupillary distance adjustment: 50 mm to 75 mm Diopter adjustment: Depend on the eyepiece adjustment system. Eyepoint height: 400 mm Eyepiece depression angle: 45°
Vertical tube	The photo adapter and C-mount direct adapter can be attached. Optical path change: 100% binocular part and 0% vertical tube, 0% binocular part and 100% vertical tube
Stage (Option)	The plane stage, plane stage and mechanical stage, or rectangular stage can be attached.
Focusing system	With the coaxial coarse and fine focus knobs and its torque adjustment system Scale of the fine focus knob: 2 µm per scale Displacement of the objective (Fine focus knob): 0.2 mm in the vertical direction per rotation Displacement of the objective (Coarse focus knob): Approximately 37.7 mm in the vertical direction per rotation Displacement of the nosepiece: 8.5 mm
Episcopic illumination system	Köhler episcopic illumination system (With a heat insulating filter and diffuser) Output rating: 6 V 5 A maximum Output voltage: 1.5 V - 6.0 V (Brightness level) Lamp rating: 6 V- 30 W halogen lamp (PHILIPS 5761) Average lamp life 100 h Aperture diaphragm: ø1.6 to ø9.5 mm Field diaphragm: ø10 mm (Fixed)
Filter	Standard filters: NCB11 and ND4 (not changeable)
Input rating (Equipment corresponding to 100, 110 and 120 VAC)	Input voltage: Selection from 100, 110 or 120 VAC by replacing the fuse holder in the AC inlet. Voltage fluctuation: ±10% Frequency: 50/60 Hz Rated current: 0.8 A maximum
Input rating (Equipment corresponding to 220, 230, and 240 VAC)	Input voltage: Selection from 220, 230 or 240 VAC by replacing the fuse holder in the AC inlet. Voltage fluctuation: ±10% Frequency: 50/60 Hz Rated current: 0.4 A maximum

Power cord	For the 100 - 120 V area (For the equipment corresponding to 100, 110, and 120 VAC) Attachable and detachable power cord set approved by the UL (3 conductor grounding Type SVT, No. 18 AWG, 3 m long maximum, rated at 125 VAC minimum.) For the 220 - 240 V area (For the equipment corresponding to 220, 230, and 240 VAC) Triplex power cord set approved by the EU/EN standards (3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250 VAC minimum.)
Dimension and weight	Dimensions: 230 (W) X 664 (D) X 381 (H) mm, excluding the stage. Weight Approximately 9 kg
Conditions during operation	Temperature: 0 to 40°C Humidity: 85% RH maximum (Non-condensing) Altitude: 2000 m maximum Pollution degree: Degree 2 Installation category: Category II Electric shock protection class: Class I, limited to the use in a room
Conditions for storage	Temperature: -20 to 60°C Humidity: 90% RH maximum (Non-condensing)
Applicable standard (Equipment corresponding to 100, 110 and 120 VAC)	• This is UL-listed product. (UL61010-1 (Second Edition))

Applicable standard (Equipment corresponding to 220, 230, and 240 VAC)	• CE marking
	  • The product meets EU Low Voltage Directive requirements.
	  • The product meets EU EMC Directive requirements. (EN61326)
	• The product complied with Australian EMC standard. (AS/NZS C1SPR11 Group1 Class B)