

M608 E 13.5.NF.1



\*M608EN01\*

# ***Nikon***

**Research Stereo Microscope**

**SMZ25/SMZ18**

**Instruction Manual**



## Introduction

Thank you for purchasing a Nikon product.

This instruction manual is written for users of the Nikon research stereo microscopes for SMZ25 Zooming Body/SMZ18 Zooming Body. To ensure correct usage, read this manual carefully before operating this product.

- No part of this manual may be reproduced or transmitted in any form without prior written permission from Nikon.
- The contents of this manual are subject to change without notice.
- The equipment described in this manual may differ from the actual product in its appearance.
- Although every effort has been made to ensure the accuracy of this manual, errors or inconsistencies may remain. If you note any points that are unclear or incorrect, please contact your nearest Nikon representative.
- Some of the equipment described in this manual may not be included in the set you have purchased.
- If you intend to use any other equipment with this product, read the manual for that equipment too.
- If this equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

## Contents of the Manual

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Chapter 1, “Components” in this instruction manual is presented, based on the system configuration examples of SMZ25 Zooming Body and SMZ18 Zooming Body. Chapter 2, “Microscopy Procedures” describes three different microscopy procedures in accordance with the configuration examples in Chapter 1. Chapter 3, “Operations for Each Purpose” describes which operations are to be performed, followed by Chapter 4, “Functions and Operations of the Devices.”

Chapter 5, “Assembling” lists the components of this microscopy system, considering that the system allows various combination. Devices needed for each illumination method can be identified.

## Symbols Used in This Manual

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The following symbols are used in this manual.

### ◆ Symbols for Safety



#### **WARNING**

Highlights important information that should be noted for safety. Read “Safety Precautions” for details.



#### **CAUTION**

### ◆ Other Symbols



Indicates information you should note or comply with to prevent defects or malfunction of this product.



Indicates information you should be aware of in using this product, as well as other useful information.

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## Safety Precautions

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

### WARNING and CAUTION Symbols

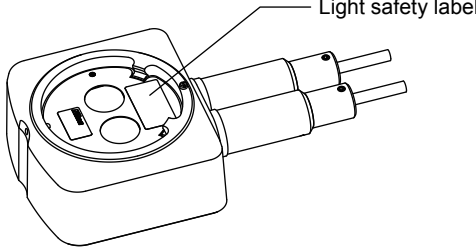
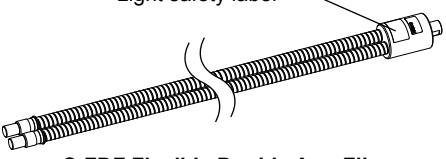
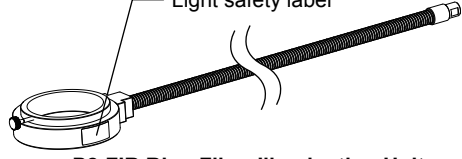
Although this product is designed and manufactured to be completely safe during use, incorrect usage or failure to follow the safety instructions provided may cause personal injury or property damage. To ensure correct usage, read this manual carefully before using this product. Do not discard this manual and keep it handy for easy reference.

Safety instructions in this manual are marked with the following symbols to indicate their importance. For your safety, always follow the instructions marked with these symbols.


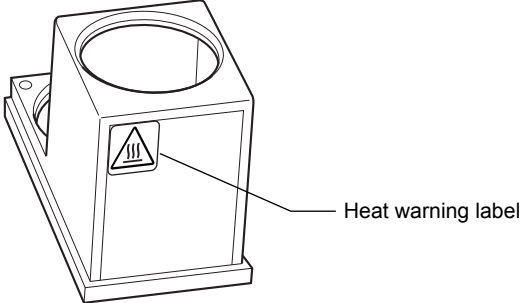



Symbol	Description
 <b>WARNING</b>	Disregarding instructions marked with this symbol may lead to serious injury or death.
 <b>CAUTION</b>	Disregarding instructions marked with this symbol may lead to injury or property damage.

### Label Attached to the Product

The label attached to the products shown below indicates that attention should be paid to use of these products. Before using a product with the label attached, be sure to carefully read the manual.

<p><b>Light safety label</b></p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>IEC62471 RISK GROUP2  <b>CAUTION</b>                  Possibly hazardous optical radiation emitted from this product.                  Do not stare at operating lamp.                  May be harmful to the eyes.</p> </div>	<p><b>Caution: Do not look into the LED light.</b></p> <p>Possibly hazardous optical radiation emitted from this product.                  Do not stare at operating lamp.                  May be harmful to the eyes.                  RISK GROUP 2 IEC62471: 2006</p> <p style="text-align: center;"><b>Label Position</b></p> <div style="text-align: center;">  <p><b>P2-CI Coaxial Epi Illuminator</b></p> </div> <div style="display: flex; justify-content: space-around; margin-top: 20px;"> <div style="text-align: center;">  <p><b>C-FDF Flexible Double Arm Fiber Illumination Unit</b></p> </div> <div style="text-align: center;">  <p><b>P2-FIR Ring Fiber Illumination Unit</b></p> </div> </div>
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<p><b>Heat warning label</b></p> 	<p><b>Caution: Heat of the empty cube</b></p> <p>Immediately after diascope observation using an epi-fluorescence attachment, the front face of the empty cube may become hot, resulting in burns. Do not touch the front face of the empty cube. Replace the empty cube several minutes after finishing the diascope observation.</p> <p style="text-align: center;"><b>Label Position</b></p> 
<p><b>Light leakage warning label</b></p> 	<p><b>Caution: Light leakage</b></p> <p>Do not use the epi-fluorescence attachment while the filter cube replacement cover is open. Harmful light including ultraviolet light may leak and affect fluorescence observation.</p> <p style="text-align: center;"><b>Label Position</b></p> <div style="display: flex; justify-content: space-around;"> <div style="text-align: center;">  <p><b>P2-EFLM Motorized Epi Fluorescence Attachment</b></p> </div> <div style="text-align: center;">  <p><b>P2-EFLI Epi Fluorescence Attachment</b></p> </div> </div>

**WARNING****1 Do not disassemble.**

Disassembling this product may result in electric shock or malfunction. Malfunction and damage due to disassembling or modification are unwarranted.

Do not disassemble parts other than those described in this manual. If you experience problems with this product, contact your nearest Nikon representative.

**2 Read the instruction manuals carefully.**

To ensure safety, carefully read this manual and the manuals for other equipment to be used with this product. Particularly, all warnings and cautions given at the beginning of each manual must be observed.

Safety is a top design priority for Nikon products. Safety is ensured as long as the user observes all of the warnings and cautions given in the manuals, and uses the system only for its intended purpose. However, failure to heed the warnings and cautions given in the manuals, subjecting the system to shock or impact, or attempting to disassemble the system may result in unexpected accidents and injury.

**Product with an epi-fluorescence attachment:**

The light source used for Epi-fluorescence microscopy (HG Precentered Fiber Illuminator) requires special care during handling because of its characteristics.

Be sure to refer to the manual for the light source being used.

**3 Checking the input rating**

For a device which uses a power supply, check that the input rating of the device matches the power supply to be used. If the input rating does not match, do not use the power supply and contact your local representative. Using the device with the power supply can cause the device to be damaged.

**4 Notes on the power cord**

Be sure to use the specified power cord. Use of other power cords may result in malfunction or fire. This product is classified as having Class I protection against electric shock. Make sure this product is connected to an appropriate protective earth terminal.

See Chapter 8, "2 Performance Properties" for the specified power cords.

- To prevent electric shock, always turn off the power switch (Press to the "O" position.) for the device before connecting or disconnecting the power cord.

**5 Heat from the illuminator**

During and immediately after a period of illumination, the lamp and surrounding areas (including the lamp house) are very hot if the light source of the illumination device is a mercury lamp.

- Do not touch the lamp or surrounding areas during or immediately after a period of illumination. There is a risk of burn if you touch the hot area.
- Always attach the lamp house cover when using this product.
- Make sure the lamp and surrounding areas have cooled sufficiently (which may take approximately 30 minutes) before attempting to replace the lamp.
- Do not place fabric, paper, or highly flammable volatile materials (i.e. gasoline, petroleum benzene, paint thinner, and alcohol) near the lamp house while the lamp is on or for about thirty minutes after it was turned off. Because the lamp is very hot, ignition or fire may be induced.

**WARNING****6 Hazards of mercury lamps  
(when using the epi-fluorescence attachment)**

The light source used with the epi-fluorescence attachment (HG Precentered Fiber Illuminator) requires special care during handling because of its characteristics. For safe and correct use of this system, carefully read the warnings below. Keep in mind all potential hazards. Additionally, carefully read the manual for the illuminator and the manual from the lamp manufacturer (if provided), then follow the instructions given therein. Failure to heed the warnings and cautions given in the manuals, subjecting the system to shock or impact, or attempting to disassemble the system may result in unexpected accidents and injury.

- **Ultraviolet light**

When lit, mercury lamps radiate ultraviolet light that can damage the eyes and skin. Do not directly look at the light of the lamp. Doing so may cause your eyesight to be lost.

When changing filter cubes, always turn off the light source. Leaving the lamp turned on during filter cube replacement may result in ultraviolet exposure.

- **High-pressure gas**

The lamps contain sealed gas under very high pressure. And the pressure increases when the lamp is on. Crack or dirt of the lamp tube, strong external force or impact, or use beyond the tube's life may cause the encapsulated gas to leak or the lamp to blow up. If this happens, an accident such as gas inhalation or injury with glass may take place.

- **Heat**

When the lamp is lit, the lamp and surroundings will become extremely hot. Do not touch the lamp with bare hands or place flammable materials near the lamp. Failure to comply may result in burns or fire.

- **Designated lamp**

Be sure to use the designated lamp. Using other types of lamps may result in accidents, including bursting of the lamp.

**7 Hazardous sample handling**

This product can also be used for microscopy and imaging of biological samples (cells/tissues) in a petri dish.

Check to determine whether a sample is hazardous before handling. If the sample is hazardous, handle it in accordance with the standard procedure specified for your laboratory. If the sample is potentially infectious, wear rubber gloves and avoid direct contact with the samples. If such a sample is spilled onto this product, the portion must be decontaminated in a safety manner. Consult your safety supervisor or safety standard of your facility.



**CAUTION**

<p><b>1 Power shutdown</b> To prevent electric shock and/or malfunction, always turn off the power switch(es) for this product and the peripheral devices (press to the “O” position) and unplug the power cord from the wall outlet before assembling this product, connecting or disconnecting cables, replacing lamps, or cleaning the zooming body and the objective.</p> <p><b>2 Do not look into the LED light</b> The P2-CI Coaxial Epi Illuminator, C-FDF Flexible Double Arm Fiber Illumination Unit and P2-FIR Ring Fiber Illumination Unit use LEDs as the light source. A label indicating light safety is attached to these devices in order to pay attention to the following. (For details about the label attachment position, see “Label Attached to the Product” on page vi.) “Possibly hazardous optical radiation emitted from this product. Do not stare at operating lamp. May be harmful to the eyes. RISK GROUP 2 IEC62471: 2006”</p> <p><b>3 Be careful of the heat of the empty cube</b> Immediately after diascopic observation using an epi-fluorescence attachment, the front face of the empty cube may become hot, resulting in burns. Do not touch the front face of the empty cube. Replace the empty cube several minutes after diascopic observation.</p> <p><b>4 Caution on light leakage</b> Do not use the epi-fluorescence attachment while the filter cube replacement cover is open. Harmful light including ultraviolet light may leak and affect fluorescence observation.</p> <p><b>5 Specification of a light source</b> Be sure to use the specified light source for an illumination device. Using a light source not specified can cause malfunction and induce an accident. For the specified light source, see Chapter 8, “2 Performance Properties” or the instruction manual for the light source.</p> <p><b>6 Movement of motorized device</b> The microscope system contains motorized devices. To avoid accidental injury by the movements of the motorized devices, be careful with the following when controlling the movements of motorized device with remote controls or personal computers.</p> <ul style="list-style-type: none"> <li>• Before operation, check the state of the entire microscope system to ensure safety when operating the motorized devices.</li> </ul>	<ul style="list-style-type: none"> <li>• If having touched the zooming body, focus knob, objective, stage, or devices or samples placed on the stage, your hand or fingers may be caught and injured. Before starting to operate, keep your hands away from these items.</li> </ul> <p><b>7 Avoid contact with water or chemical solutions.</b> Never expose this product to water or chemical solutions, and avoid using this product in circumstances where there is risk of exposure to water or chemical solutions. Exposure of electric parts (such as the HG Precentered Fiber Illuminator) to liquids may cause a short circuit, resulting in malfunction or abnormal heating. If water or a chemical solution is splashed onto a device, immediately turn off the power switch for the device (press to the “O” position) and remove the power cord from the receptacle. Then wipe off moisture with a piece of dry cloth or something similar. If water or a chemical solution enters this product, stop using the product, and contact your nearest Nikon representative.</p> <p><b>8 Remove any covers from the product before switching on.</b> Do not use a device while it is covered with a piece of cloth, etc., Especially for a light source, which is heated, the disturbance of heat release may cause abnormal heat generation, inducing ignition or fire. Do not cover the device with a piece of cloth or similar while in use.</p> <p><b>9 Notes on laying cables</b> Connect and route the cables in accordance with the specified methods. If not connecting and routing the cables properly, the devices may not function correctly.</p> <p><b>10 Do not place any object on top of the product.</b> Do not place any object on top of this product.</p> <p><b>11 Cautions on assembling and installing the product</b></p> <ul style="list-style-type: none"> <li>• Take care to avoid pinching your fingers or hands during product assembly and installation.</li> <li>• Scratches or fouling optical components (such as lens and filters) with fingerprints, etc. will degrade microscope images. Be careful to avoid scratches or direct contact with the lens and filters when assembling.</li> </ul>
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## CAUTION

- The total weight of the microscope system is over 20 kg. When moving the system to another location, separate the removable devices temporarily and carry the system while firmly holding the hand holding portions of the base, with multiple persons. Do not lift the system while holding the binocular part of the tube or putting hands under the objective.
- Do not place this product in a locker or cabinet.

### 12 Cautions on sustained observations

To relieve fatigue resulting from long observation sessions, limit continuous observations to one hour. Take at least 10 to 15-minute breaks between observation sessions. Adjust the layout of other equipment used and the height of your chair.

### 13 Cautions on use, transportation, and storage

This product must be operated, transported, or stored in accordance with the following conditions. If you install the product at a location with high temperature and high humidity, mold and/or condensation may be generated on the lenses. Furthermore, performance deterioration and malfunction may be resulted.

- Operating conditions:  
temperature: 0 to +40°C, humidity:  
60% RH max. (no condensation)
- Transporting/storage conditions:  
temperature: -20 to +60°C,  
humidity: 90% RH max. (no  
condensation)

### 14 Cautions on the disposal of the product

When disposing of this product, follow the rules of the facility.

## Notes on Handling the Product

### 1 Handle the product carefully.

This product is a precision instrument. Avoid subjecting it to sudden impacts and shocks.

Even relatively minor impacts are capable of affecting the precision of the objective.

### 2 Scratches, dirt, and foreign particles on the lens

Scratches or fouling optical components (such as lens and filters) with fingerprints, etc. will degrade microscope images.

If these parts become dirty, clean them as described in Chapter 7, "1.1 Cleaning Lenses."

### 3 Installation location

This product is a precision instrument. Usage or storage of this product in an inappropriate environment may result in malfunction or a degradation in precision. Consider the following factors when selecting an installation location:

- Select a location free of vibration. Install this product on a level surface.
- Install this product at least 10 cm away from walls.
- Select a location less exposed to hazards in the event of collisions, earthquakes, or other potential disasters. To keep this product from falling, use a strong rope or other means if necessary to secure it to the working desk or other heavy, stable item.
- Select a layout that allows easy removal of the power cord from the device's AC inlet in the event of an emergency.
- Do not use a desk mat or similar.
- Avoid locations exposed to direct sunlight, locations immediately under room lights, and other bright locations.
- Light from room lights just above this product may enter the objective as extraneous light. If possible, switch off the room lights directly above this product when making observations.
- Select a location with minimal dust.
- To avoid splashes, do not use this product near water.
- Make sure the ambient temperature is 0 to + 40°C and humidity is 60% or less. When transporting or storing this product, the ambient temperature must be -20 to +60°C, with the humidity at 90% RH max (with no condensation). If you install the product at a location with high temperature and high humidity, mold and/or condensation may be generated on the lenses. Furthermore, performance deterioration and malfunction may be resulted.
- Do not place this product in a locker or cabinet.

### 4 Handling a focus knob

- Never turn the focus knobs in opposite directions at the same time. Doing so may damage the product.

### 5 Protect the ports from dust and extraneous light

If not using the vertical tube of the trinocular tube, be sure to attach the supplied cap. Otherwise, extraneous light and dust may be trapped inside the product.

### 6 Handling of filters (when using the epi-fluorescence attachment)

- Excitation filters inside a filter cube are exposed to strong light and degrade over time. Replace them after the appropriate number of hours of use.
- Filter characteristics may alter if the filter is exposed to high humidity. To prevent changes or degradation of filter characteristics, avoid using or storing the filters under conditions of high humidity or high temperature. Avoid subjecting filters to rapid temperature changes. When a filter is not in use, store in a desiccator or hermetically sealed container with a drying agent.
- Especially the filters in GFP type filter cubes offer sharp, high-resolution waveform characteristics superior to normal filters. However, due to their sophisticated coatings, they must be handled with special care. Be sure to handle the filters carefully. Take care to avoid abrasion from cleaning. Follow the description in Chapter 7, "1.1 Cleaning Lenses."

### 7 Motorized devices

When using motorized devices, do not force the motorized devices to move/stop by hand.

## Chapter

# 1

# Components

---

In the stereo microscopes SMZ25 and SMZ18, the SMZ25 Zooming Body or SMZ18 Zooming Body is attached to a motorized or manual focus mount. In addition, arbitrary models can be selected and combined from such device models as bases, objectives, tubes and episcopic illuminators.

This chapter introduces the names of the devices and operation sections with the following three types of system configuration as examples.

- 1 Microscopy system under episcopic illumination with an SMZ18 Zooming Body
- 2 Microscopy system under diascopic illumination and epi-fluorescence illumination with an SMZ25 Zooming Body
- 3 Compact system with an SMZ18 Zooming Body

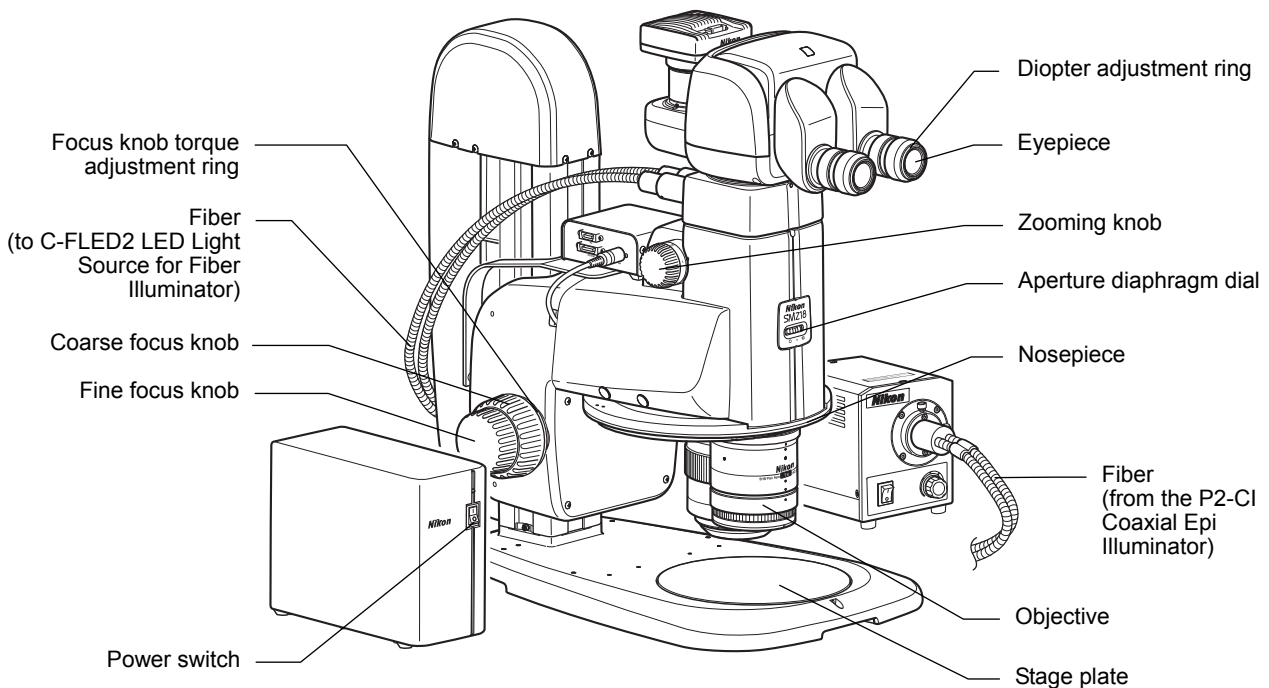
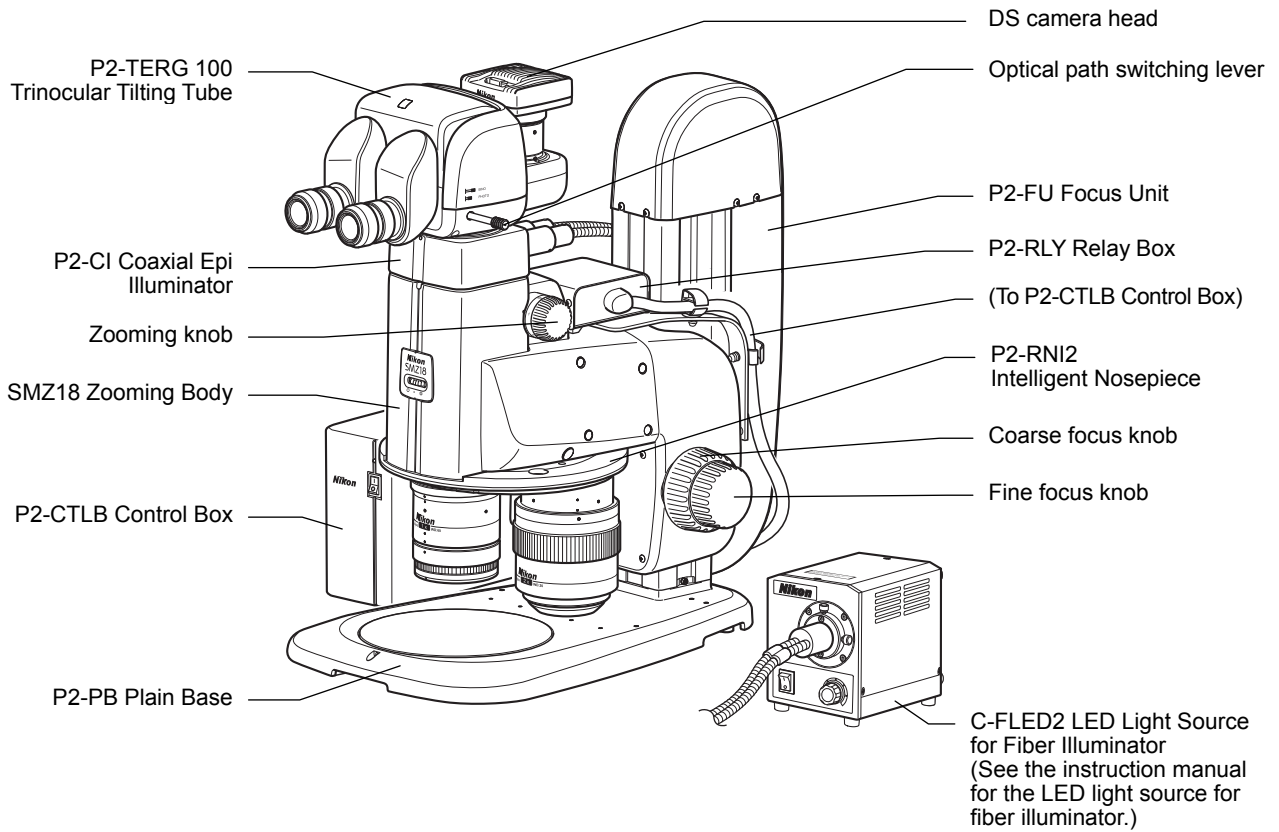
For details about the overall system configuration, see Chapter 5, "1 System Configuration."

1

Microscopy System under Episcopic Illumination

1.1

Names of the Devices and Operation Sections



For the names of the components needed for assembly and connections such as the fixing screws and connectors, see Chapter 5, "3 Assembly Procedures."

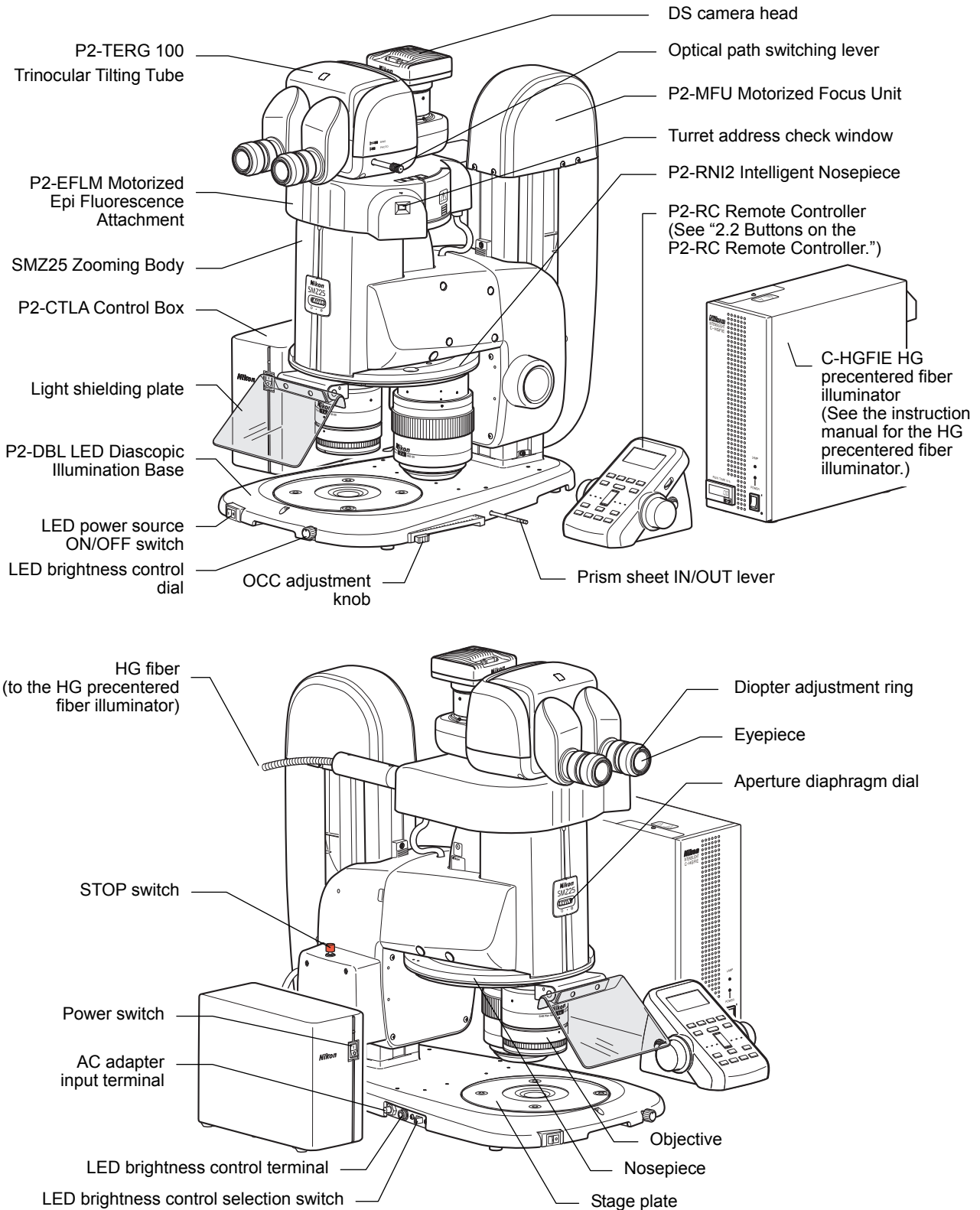


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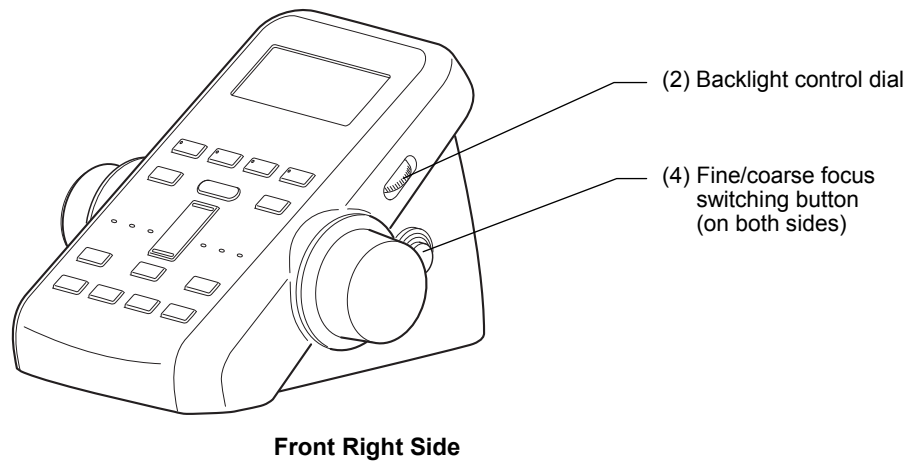
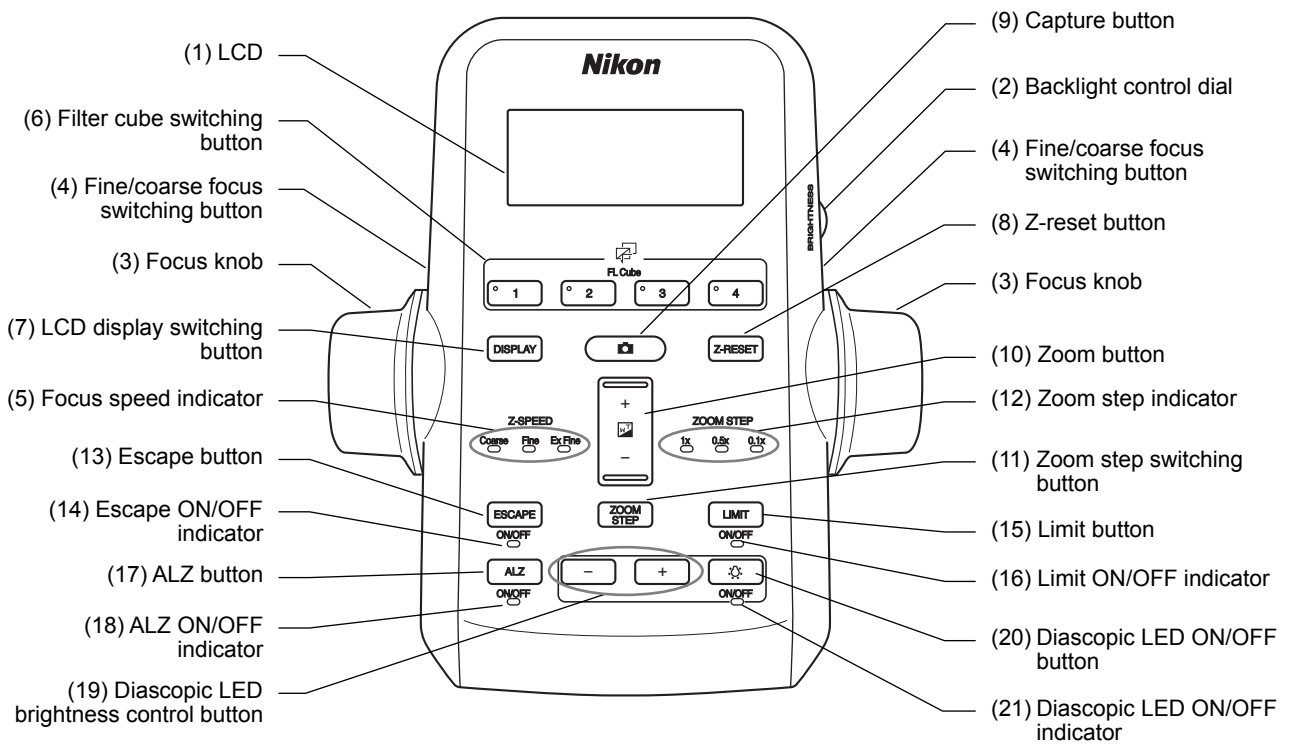
**Microscopy System under Diascopic Illumination and Epi-fluorescence Illumination**

2.1

**Names of the Devices and Operation Sections**



For the names of the components needed for assembly and connections such as the fixing screws and connectors, see Chapter 5, "3 Assembly Procedures."



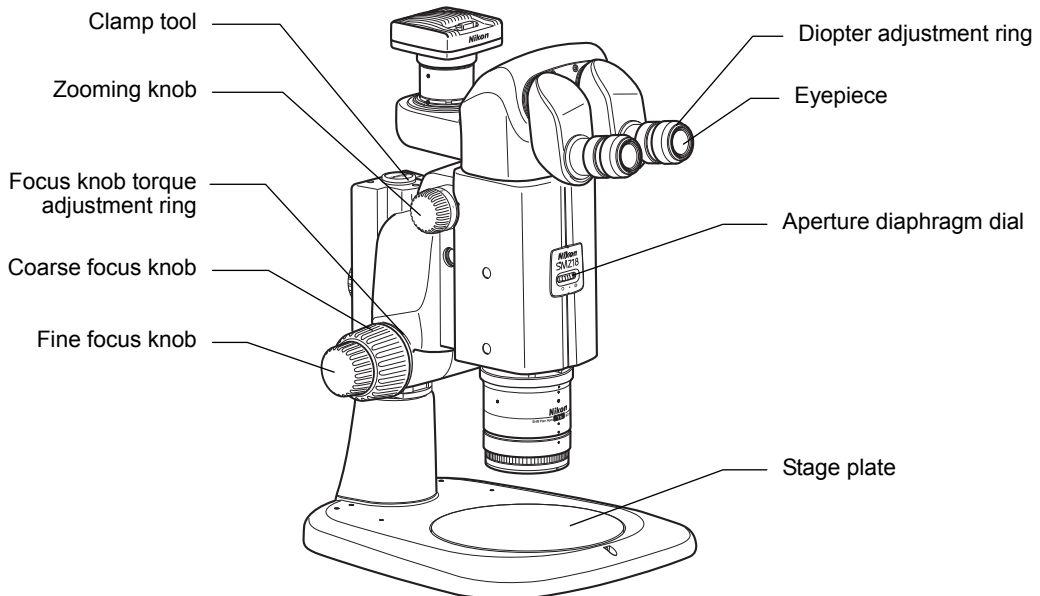
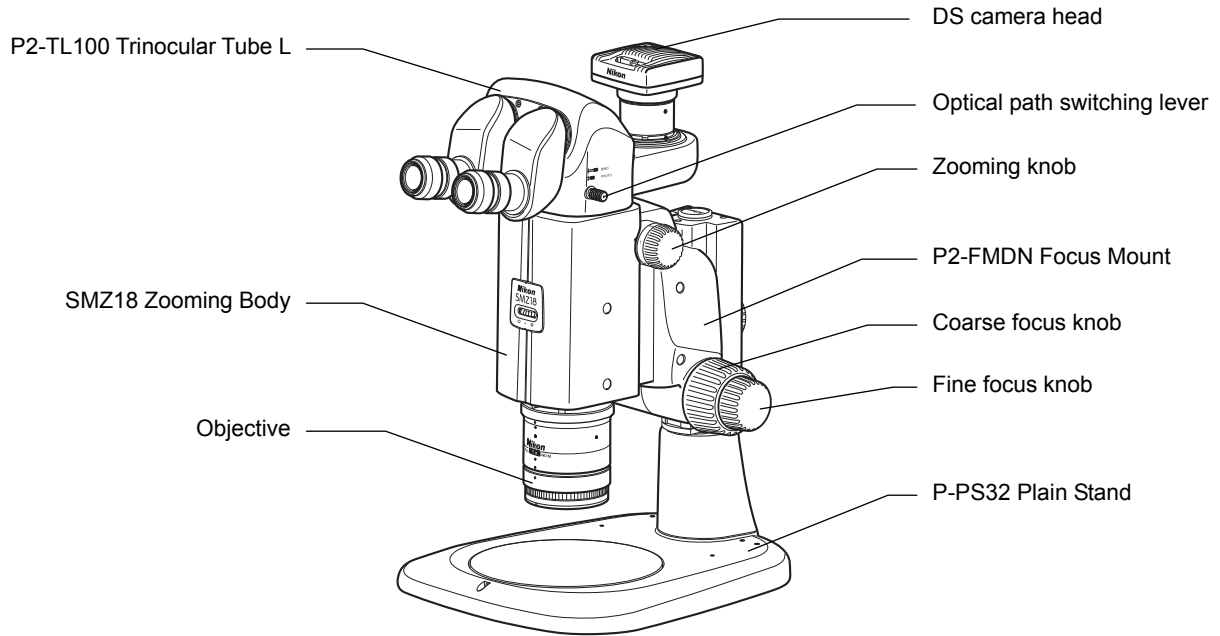
For details about the buttons' functions, see "Functions and indications of the operation buttons" in Chapter 4, "10.1 P2-RC Remote Controller."

3

Compact System

3.1

Names of the Devices and Operation Sections



For the names of the components needed for assembly and connections such as the fixing screws and connectors, see Chapter 5, "3 Assembly Procedures."

☆☆☆

Chapter

# 2

## Microscopy Procedures

---

This chapter describes the microscopy procedures listed below.

The devices used in the descriptions are based on the configuration examples given in the previous chapter.

Procedure 1: Procedure for microscopy under episcopic illumination

Procedure 2: Procedure for microscopy under diasopic illumination

Procedure 3: Procedure for epi-fluorescence microscopy

It is assumed that all required components are attached to the microscope with all necessary cables properly connected.

If assembly of the microscopy system has not yet been completed, complete assembly as described in Chapter 5, “3 Assembly Procedures.”

When using the motorized system or intelligent system for microscopy, see Chapter 3, “16 Internally Saved Information.”

**1** Operation Flowchart

**Microscopy under episcopic illumination or diascopic illumination**

<b>1</b>	Turn on the power.
<b>2</b>	Set a sample.
<b>3</b>	Bring an objective into the optical path.
<b>4</b>	Turn on the illumination and adjust the brightness.
<b>5</b>	Set the optical path to 100% to the binocular part.
<b>6</b>	Adjust the depression angle of the tilting tube.
<b>7</b>	Adjust the diopter.
<b>8</b>	Adjust the interpupillary.
<b>9</b>	Adjust the focus.
<b>10</b>	Change the magnification using the zooming knobs.
<b>11</b>	Turn off the power after completing microscopy.

- \* In microscopy under diascopic illumination using an epi-fluorescence attachment, attach an empty cube (supplied with the microscope) to the epi-fluorescence attachment and bring it into the optical path.
- \* In a compact system of an SMZ18 Zooming Body combined with a P-PS32 Plain Stand and P2-FMDN Focus Mount, perform the steps above in the order of [2], [5], [6], [7], [8], [9], and [10].

**Epi-fluorescence microscopy**

After locating the target in the sample with microscopy under diascopic illumination, follow the procedure below:

<b>11</b>	Turn off the diascopic LED illumination.
<b>12</b>	Bring the filter cube into the optical path.
<b>13</b>	Adjust the angle of the light shielding plate.
<b>14</b>	Turn on the HG precentered fiber illuminator and adjust the brightness.
<b>15</b>	Adjust the focus.
<b>16</b>	Change the magnification by zooming in and out.
<b>17</b>	Turn off the power after completing microscopy.

## 2

## Procedure for Microscopy under Episcopic Illumination

This section describes the procedure for performing microscopy under episcopic illumination using the SMZ18 Zooming Body combined with the P2-CI Coaxial Epi Illuminator.

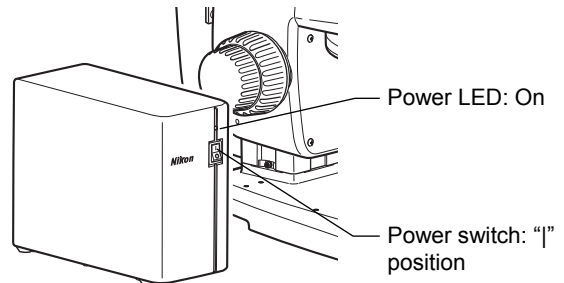
### 1 Turn on the power.

Turn on the P2-CTLB Control Box by pressing the power switch to the "I" position.

Check that the power LED on the control box lights.

#### ✔ Power supply to the DS-L3 DS Camera Control Unit

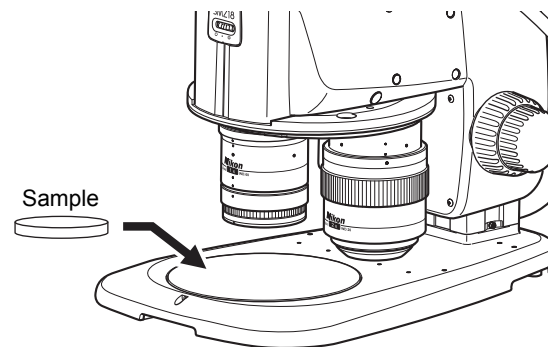
When the DS-L3 DS Camera Control Unit is connected, turn on the control box and then the DS-L3.



Power on

### 2 Set a sample.

Place a sample on the stage plate and immediately under the objective.



Setting the sample

### 3 Bring an objective into the optical path.

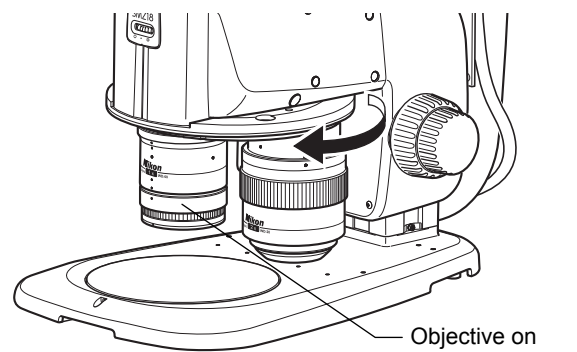
Turn the nosepiece to bring the objective to be used into the optical path.

Check that the objective falls into the click position when turning the nosepiece.

(See Chapter 3, "8.2 Switching Objectives.")

#### ✔ P2-CI Coaxial Epi Illuminator

- The P2-CI Coaxial Epi Illuminator is supplied with a 1/4 lambda plate. When using the 0.5x or 1x objective, attach the 1/4 lambda plate to the tip of the objective. Turn the 1/4 lambda plate so that the white circle (indicator) is at the front.
- For the P2-CI Coaxial Epi Illuminator, available objectives and zooming ratios are restricted. For details, see Chapter 4, "7.1 P2-CI Coaxial Epi Illuminator."



Rotating the nosepiece

**4 Turn on the illumination and adjust the brightness.**

Refer to the instruction manual for the C-FLED2 LED Light Source for Fiber Illuminator.

**✔ Aperture diaphragm**

The SMZ18 Zooming Body is equipped with an aperture diaphragm. Turn the aperture diaphragm dial counterclockwise (O side) to fully open the aperture. (For details about using the aperture diaphragm, see Chapter 3, “10 Using the Aperture Diaphragm.”)

**5 Set the optical path to 100% to the binocular part.**

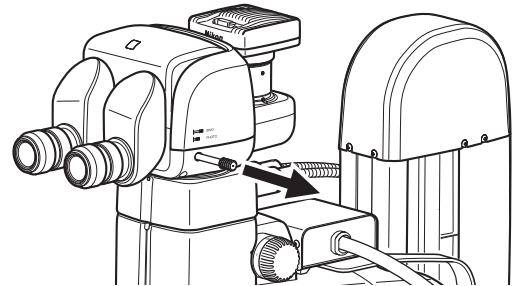
Pull out the optical path switching lever of the tube to set the optical path to 100% to the binocular part.

**✔ Moving the optical path switching lever**

Pulling out the optical path switching lever: 100% to the binocular part

Pushing in the optical path switching lever: 100% to the vertical tube

The division ratio of the light amount differs depending on the tube types. (See Chapter 3, “3 Switching the Optical Path of the Tube.”)

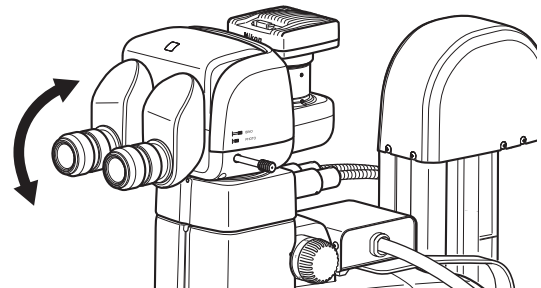


**Optical path to the binocular part: 100%**

**6 Adjust the depression angle of the tilting tube.**

When using the P2-TERG 100 or P2-TERG 50 Trinocular Tilting Tube, change and adjust the angle of the binocular part to facilitate microscopy.

(The low eye level P2-TL100 Trinocular Tube L does not have a mechanism for adjusting the angle of depression.)



**Adjusting the angle of depression**

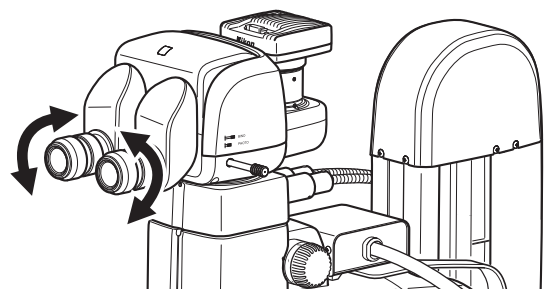
**ⓘ Notes on adjusting the angle of depression**

- Do not apply excessive force to the binocular part during depression angle adjustment. It may cause unexpected failure or malfunction.
- When moving the binocular part, be careful not to catch your fingers in the rotary section at the bottom of the binocular part.

**7 Adjust the diopter.**

Adjust to match your diopter. For details, see Chapter 3, “5 Adjusting the Diopter.”

This adjustment is required for each user.



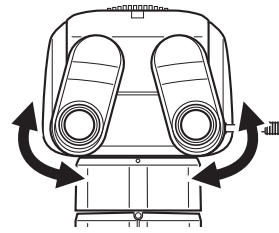
**Adjusting the diopter**



**8 Adjust the interpupillary.**

Adjust to match the distance between your right and left eyes. Look into both eyepieces and move the binocular part of the tube so that the right and left fields of view merge into a single circle.

This adjustment is required for each user.



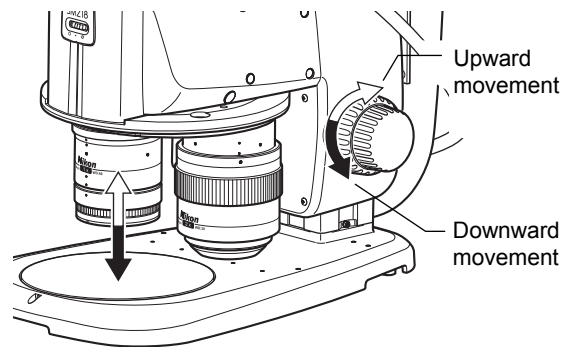
**Adjusting the interpupillary distance**

**9 Adjust the focus.**

Turn the focus knobs (coarse/fine control) on the right and left of the focus unit to move the focus mount of the focus unit vertically and focus on the sample. The figure shows the turning directions of a knob and the corresponding vertical movements of the focus mount (zooming body).

- **Turning the knob backward: Upward movement**
- **Turning the knob forward: Downward movement**

(See Chapter 3, “7 Focusing on the Sample.”)



**Focusing**

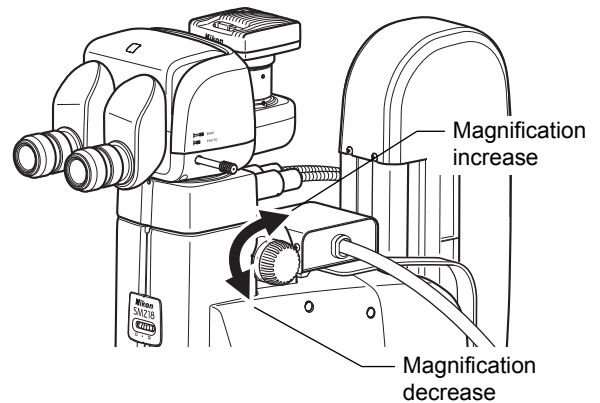
**10 Change the magnification using the zooming knobs.**

Turn the zooming knobs on the right and left of the SMZ18 Zooming Body to change the magnification. The figure shows the turning directions of a knob and the corresponding changes in magnification.

- **Turning the knob backward: Magnification increase**
- **Turning the knob forward: Magnification decrease**

The magnification continuously changes from 0.75x to 13.5x.

Zoom magnification values are marked on the zooming knobs.



**Zoom operation**

**✔ Click stop during image zooming**

It is also possible to cause a click stop to occur at predetermined magnification positions during image zooming.

(See Chapter 4, “1.1 SMZ18 Zooming Body.”)

**✔ P2-CI Coaxial Epi Illuminator**

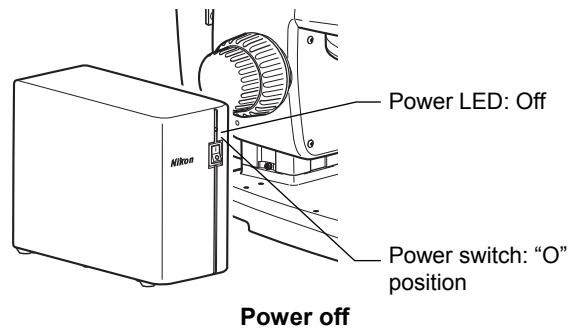
For the P2-CI Coaxial Epi Illuminator, available objectives and zooming ratios are restricted. For details, see Chapter 4, “7.1 P2-CI Coaxial Epi Illuminator.”

**11 Turn off the power after completing microscopy.**

Turn off the P2-CTLB Control Box by pressing the power switch to the “O” position.

Check that the power LED on the control box turns off.

Also turn off the LED light source for fiber illuminator.



### 3 Procedure for Microscopy under Diascopic Illumination

This section describes the procedure for microscopy under diascopic illumination using the SMZ25 Zooming Body combined with the P2-DBL LED Diascopic Illumination Base.

For the same operations as in “2 Procedure for Microscopy under Episcopic Illumination,” details are omitted.

#### 1 Turn on the power.

Turn on the P2-CTLA Control Box by pressing the power switch to the “I” position.

Check that the power LED on the control box lights.

##### ✔ P2-MFU Motorized Focus Unit

When the power is turned on, the motorized focus unit is initialized as follows:

- (1) The focus mount rises to the upper sensor limit.
- (2) This is followed by downward movement to the position when power was turned on.

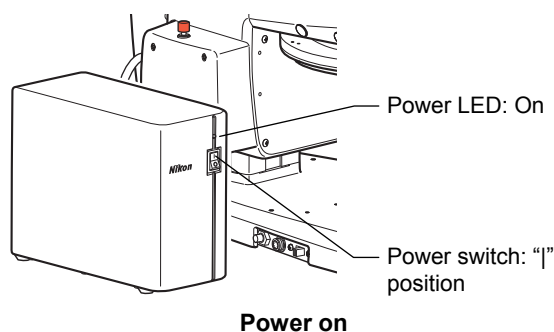
\* Other motorized devices also perform internal initialization.

##### ✔ Power supply to the P2-DBL LED Diascopic Illumination Base

For a system configuration where a control box has been connected, the control box supplies power to the P2-DBL LED Diascopic Illumination Base. The P2-DBL therefore need not be connected to a power supply. (See Chapter 4, “8.1 P2-DBL LED Diascopic Illumination Base.”)

##### ✔ Power supply to the DS-L3 DS Camera Control Unit

When the DS-L3 DS Camera Control Unit is connected, turn on the control box and then the DS-L3.



#### 2 Set a sample.

→ Step 2 in “2 Procedure for Microscopy Under Episcopic Illumination”

##### ⓘ Empty cube

When an epi-fluorescence attachment is mounted, check that the empty cube of the attachment is in the optical path.

#### 3 Bring an objective into the optical path.

→ Step 3 in “2 Procedure for Microscopy Under Episcopic Illumination”

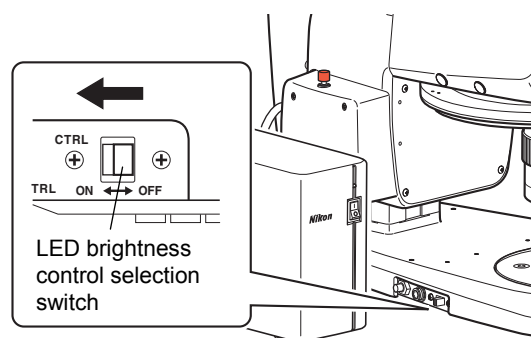
**4 Turn on the illumination and adjust the brightness.**

Check that the brightness control selection switch on the LED diascope illumination base is set to the ON position.

Press the diascope LED ON/OFF button on the remote controller to turn on the LED illumination.

Check that the LED ON/OFF indicator lights.

Press the diascope LED brightness control buttons to adjust the brightness. Press [+] to increase the brightness and [-] to decrease the brightness.



**Setting brightness control right to the control box**

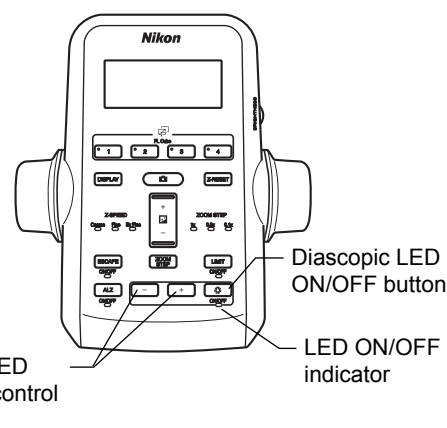
**✔ Illumination on and brightness control rights**

To turn on the diascope illumination and perform brightness control directly with the LED diascope illumination base, set the LED brightness control selection switch to the OFF position.

For details about using the diascope illumination base, see Chapter 4, “8.1 P2-DBL LED Diascope Illumination Base.”

**✔ Aperture diaphragm**

The SMZ25 Zooming Body is equipped with an aperture diaphragm. Turn the aperture diaphragm dial counterclockwise (O side) to fully open the aperture. (For details about using the aperture diaphragm, see Chapter 3, “10 Using the Aperture Diaphragm.”)



**Remote on/brightness control**

**5 Set the optical path to 100% to the binocular part.**

→ Step 5 in “2 Procedure for Microscopy Under Episcopic Illumination”

**6 Adjust the depression angle of the tilting tube.**

→ Step 6 in “2 Procedure for Microscopy Under Episcopic Illumination”

**7 Adjust the diopter.**

→ Step 7 in “2 Procedure for Microscopy Under Episcopic Illumination”

**8 Adjust the interpupillary.**

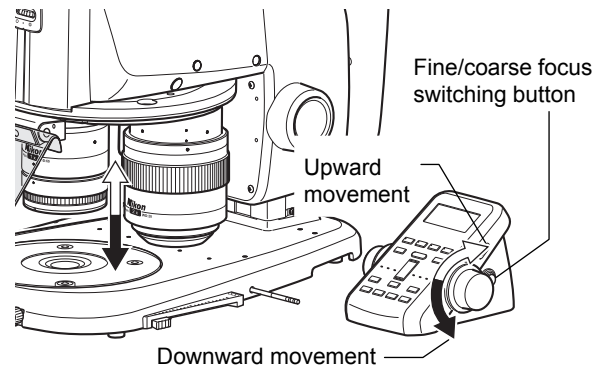
→ Step 8 in “2 Procedure for Microscopy Under Episcopic Illumination”

## 9 Adjust the focus.

Turn the focus knobs of the remote controller to move the focus mount of the focus unit vertically and focus on the sample. The figure shows the turning directions of a knob and the corresponding vertical movements of the focus mount (zooming body).

- Turning the knob backward: Upward movement
- Turning the knob forward: Downward movement

(See Chapter 3, “7 Focusing on the Sample.”)



### ✔ Focus speed switching

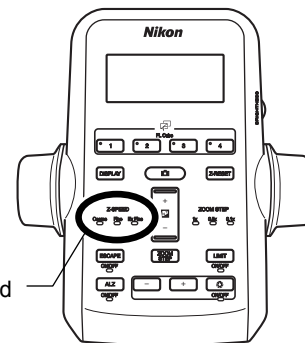
The focus speed can be switched between coarse, fine, and extra fine control.

Use the fine/coarse focus switching button on the remote controller to switch the speed.

Each time the button is pressed, the focus speed is cyclically switched in the order of coarse, fine, and extra fine.

When the focus speed is changed, the corresponding indicator (Coarse/Fine/ExFine) lights.

- Coarse: 2 to 10 mm/second
- Fine: 0.2 to 5 mm/second
- Extra fine: 0.01 to 0.1 mm/second



Focus speed indicator

Focus operation

## 10 Change the magnification by zooming in and out.

Press the zoom buttons on the remote controller to change the magnification of the zooming body.

- Upper zoom button: Magnification increase
- Lower zoom button: Magnification decrease

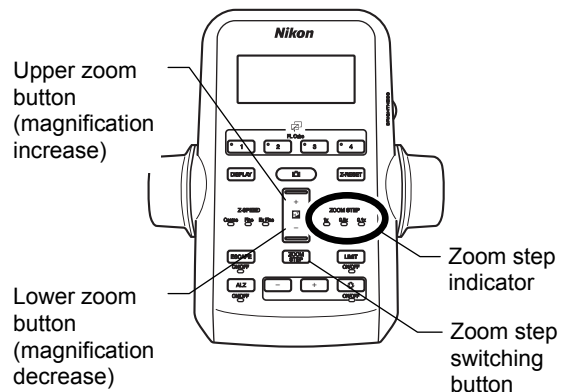
The magnification changes in the range from 0.63x to 15.75x.

Pressing and holding the buttons causes the magnification to change continuously.

### ✔ Magnification step size

Each time the zoom step switching button is pressed, the step size changes in the following order: 1x, 0.5x then 0.1x. When a step size is selected, the corresponding step LED indicator lights.

(See Chapter 4, “1.2 SMZ25 Zooming Body.”)

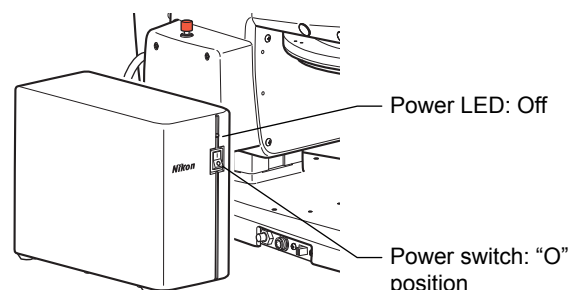


Zoom operation

## 11 Turn off the power after completing microscopy.

Turn off the P2-CTLA Control Box by pressing the power switch to the “O” position.

Check that the power LED on the control box turns off.



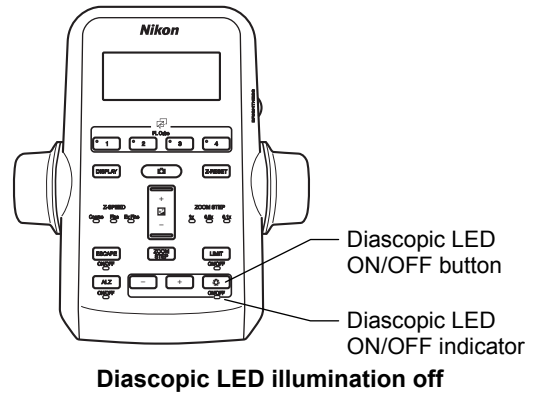
Power off

**4 Procedure for Epi-fluorescence Microscopy**

After locating a target in a sample in “3 Procedure for Microscopy Under Diascopic Illumination” (steps 1 to 10), follow the procedure below:

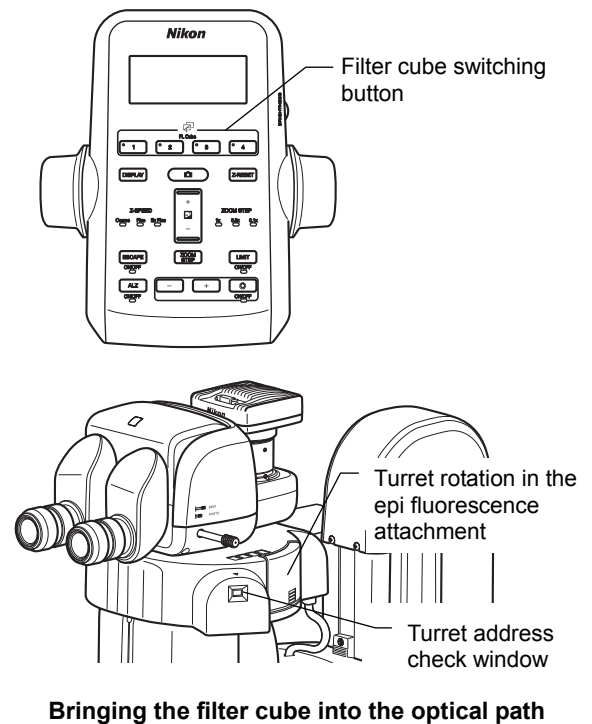
**11 Turn off the diascopic LED illumination.**

Press the diascopic LED ON/OFF button on the remote controller to turn off the LED illumination.  
Check that the diascopic LED ON/OFF indicator turns off.



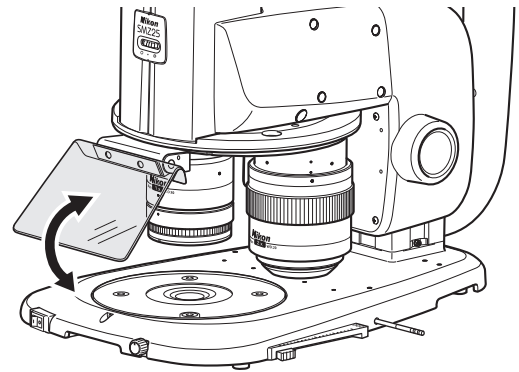
**12 Bring the filter cube into the optical path.**

Press the filter cube switching buttons (FL1 to FL4) on the remote controller to bring the desired filter cube into the optical path. FL1 to FL4 designate the turret addresses of the epi fluorescence attachment. The LED of the pressed button lights so that the turret address on the optical path can be identified. The address on the optical path can be identified also through the turret address check window of the epi fluorescence attachment.



**13 Adjust the angle of the light shielding plate.**

Change the angle of the light shielding plate to 45° to prevent light reflected from the objective from entering your eyes.



**Adjusting the angle of the light shielding plate**

**14 Turn on the HG precentered fiber illuminator and adjust the brightness.**

Refer to the instruction manual for the fiber light source.

**15 Adjust the focus.**

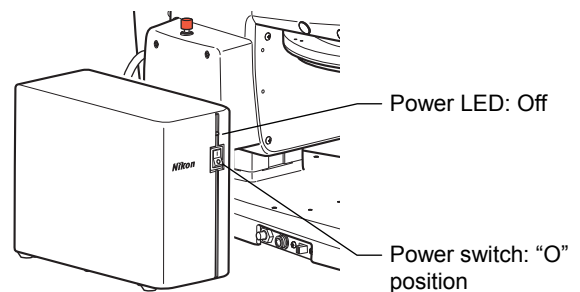
→ Step 9 in “3 Procedure for Microscopy Under Diascopic Illumination”

**16 Change the magnification by zooming in and out.**

→ Step 10 in “3 Procedure for Microscopy Under Diascopic Illumination”

**17 Turn off the power after completing microscopy.**

Turn off the HG precentered fiber illuminator and P2-CTLA Control Box by pressing their power switches to the “O” position. Check that their power LEDs go off.



**Power off**

☆☆☆



Chapter

3

# Specific Operations

---

This chapter describes how to work with this microscope system in order to observe samples.

For details about using the individual devices, see Chapter 4.

## 1

## Turning On the Power

When using this microscope system, power to the following devices must be turned on:

- P2-CTLA Control Box
- P2-CTLB Control Box
- P2-DBL LED Diascopic Illumination Base

✔ **12 V AC adapter**

For a system configuration where a control box has been connected, the P2-DBL LED Diascopic Illumination Base need not be connected to a power supply. The control box supplies the power. If a control box is not used, connect the 12 V AC adapter to the P2-DBL.

✔ **LED power On/Off control right**

If the LED brightness control selection switch on the base has been set to ON to assign the control right to the control box, the LED power On/Off switch and LED brightness control dial on the base need not be used. They can be remotely controlled using the remote controller connected to the control box or a personal computer (software: NIS-Elements).

- P2-FIRL LED Ring Illumination Unit (See the instruction manual for the P2-FIRL LED Ring Illumination Unit.)
- P-DF LED Dark Field Unit (See the instruction manual for the P-DF LED Dark Field Unit.)

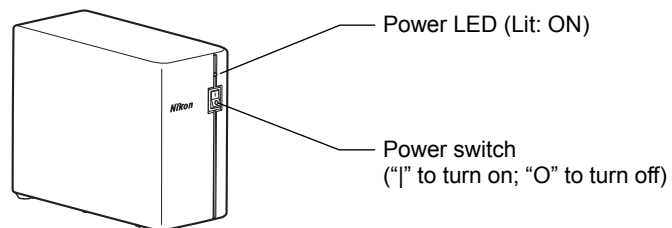
When using an illuminator whose light source is an HG precentered fiber illuminator or fiber illumination LED light source, also turn on the power to the light source. (See the instruction manual for the light source.)

When using multiple power supplies, they need not be turned on in a particular order except for the following cases:

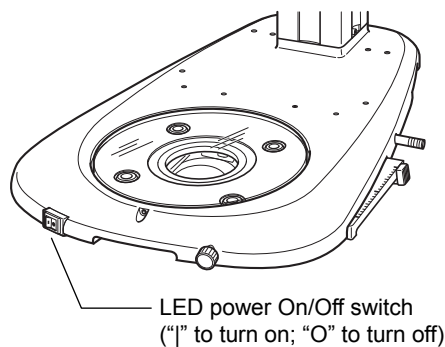
- When using a DS camera control unit to capture images, power on the DS camera control unit at the end.
- When controlling a C-HGFIE HG Precentered Fiber Illuminator from NIS-Elements, etc. via a control box, power on the HG precentered fiber illuminator before the control box.

Press the power switch to the “I” position to turn the power on and to the “O” position to turn the power off.

When power is turned on, the power LED lights.



**Power switch of the control box**



**Power switch of the P2-DBL LED Diascopic Illumination Base**

## 2

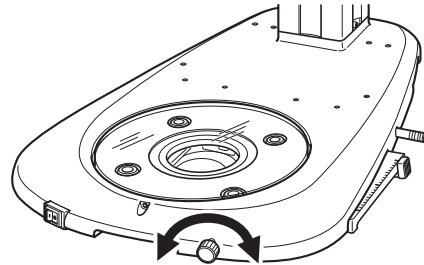
## Adjusting the Brightness

The illumination brightness can be adjusted for the following devices. Turn the brightness control dial to adjust the brightness to a comfortable level.

Depending on the system configuration, some devices support remote control of the brightness.

For details, see the sections in Chapter 4 describing how to use the individual devices.

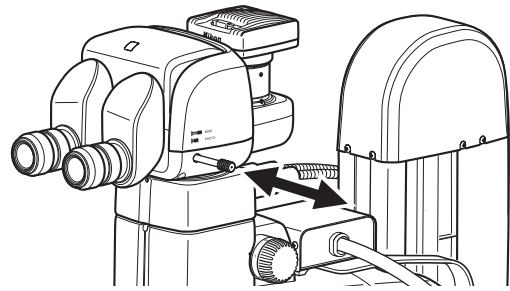
- Adjust the brightness using the adjustment volume of the device
  - P2-DBL LED Diascopic Illumination Base
- Adjust the brightness using the C-FLED2 LED Light source for fiber illuminator  
(See the instruction manual supplied with the C-FLED2 for details.)
  - P2-CI Coaxial Epi Illuminator
  - C-FDF Flexible Double Arm Fiber Illumination Unit
  - P2-FIR Ring Fiber Illumination Unit
  - P2-DBF Fiber Diascopic Illumination Base
- Adjust the brightness using the C-HGFI/C-HGFIE HG Precentered Fiber Illuminator  
(See the instruction manual supplied with the C-HGFI/C-HGFIE for details.)
  - P2-EFLI Epi Fluorescence Attachment
  - P2-EFLM Motorized Epi Fluorescence Attachment
- Adjust the brightness using the power supply section of each unit  
(See the instruction manual supplied with the P2-FIRL/P-DF for details.)
  - P2-FIRL LED Ring Illumination Unit
  - P-DF LED Dark Field Unit



**Adjusting the diascopic illumination brightness**

**3 Switching the Optical Path of the Tube**

For observing a specimen using the eyepiece, switch the optical path to the binocular part. For imaging using the DS camera head, switch the optical path to the vertical tube. Use the optical path switching lever of the tube to switch the optical path. Push or pull the lever to make the desired selection. Be sure the lever is fully pushed in or pulled out. Do not leave the lever stopped partway.



**Switching the optical path**

**Distribution of Light with Optical Path Switching (%)**

Tube	Lever position	Binocular part		Vertical tube*
		Left	Right	
P2-TERG 100 Trinocular Tilting Tube	Pulled out	100	100	0
	Pushed in	100	0	100
P2-TERG 50 Trinocular Tilting Tube	Pulled out	100	100	0
	Pushed in	100	50	50
P2-TL100 Trinocular Tube L	Pulled out	100	100	0
	Pushed in	100	0	100

\* The light amount of the left eye is always 100%. The light from the optical path of the right eye is diverged to the vertical tube. (Images of the right eye's optical path are captured.)

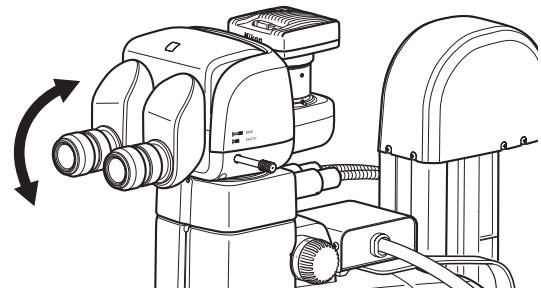
## 4 Adjusting the Angle of Depression

When the P2-TERG 100 Trinocular Tilting Tube or P2-TERG 50 is used, the angle of the binocular part to facilitate microscopy can be changed and adjusted.

The angle can be continuously changed by moving the binocular part as indicated by the arrow in the figure.

The eye level can also be changed by turning the binocular part 180°.

(The low eye level P2-TL100 Trinocular Tube L does not have a mechanism for adjusting the angle of depression.)



Adjusting the angle of depression

### Notes on adjusting the angle of depression

- Do not apply excessive force to the binocular part during depression angle adjustment. It may cause unexpected failure or malfunction.
- When moving the binocular part, be careful not to catch your fingers in the rotary section at the bottom of the binocular part.

## 5 Adjusting the Diopter

Adjust to match your diopter. This adjustment is required for each user.

- 1 Position the diopter adjustment rings of the right and left eyepieces to 0.
- 2 Maximize the magnification, and then focus on the sample using the focus knob. (See “7 Focusing on the Sample.”)
- 3 Minimize the magnification, and then turn the diopter adjustment rings of the right and left eyepieces to bring them into focus separately.

### [Image zooming]

SMZ18 Zooming Body: Zooming knob on the zooming body

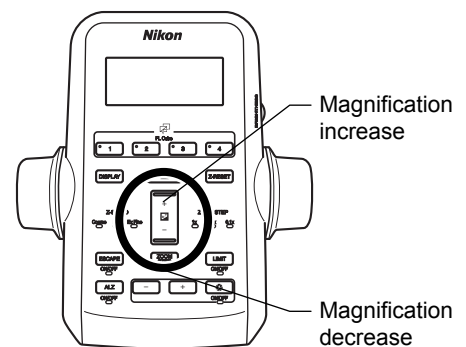
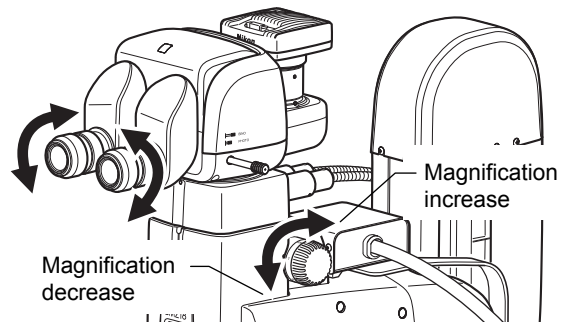
SMZ25 Zooming Body: Zoom buttons on the remote controller or the right pedal of the foot switch

### [Zoom magnification]

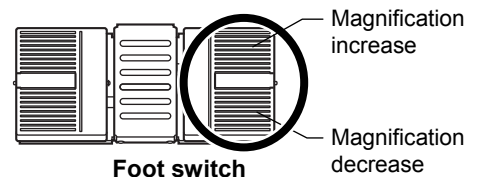
SMZ18 Zooming Body: 0.75x to 13.5x

SMZ25 Zooming Body: 0.63x to 15.75x

- 4 Repeat steps 2 and 3 to check the focus, so that changing the magnification does not affect the focus and clear images can be captured.



Remote controller



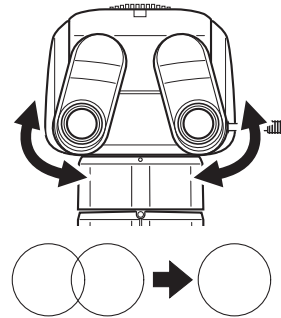
Foot switch

Adjusting the diopter

**6 Adjusting the Interpupillary Distance**

Adjust to match the distance between your right and left eyes.  
This adjustment is required for each user.

Look into both eyepieces and move the binocular part of the tube so that the right and left fields of view merge into a single circle.



**Adjusting the interpupillary distance**

**7 Focusing on the Sample**

Focus adjustment of the sample is performed by the rotation of the focus knobs on the focus unit or focus mount. When the remote controller or foot switch is connected, focusing can be adjusted using the focus knobs of the remote controller or the foot pedals on the left side of the foot switch. To use the foot switch, the P2-RC Remote Controller or the P2-CTLA Control Box must be connected.

**[Focus operation]**

Focus unit, focus mount, remote controller: Focus knob

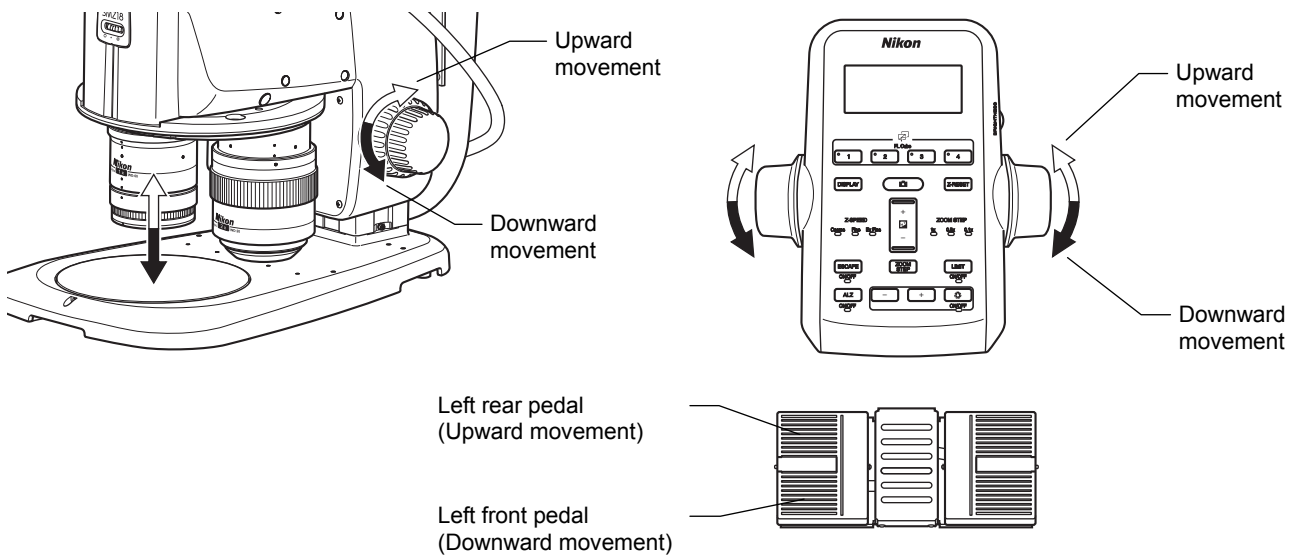
The figure shows the turning directions of the focus knobs and the corresponding vertical movements of the focus mount.

- **Turning the knob backward: Upward movement**
- **Turning the knob forward: Downward movement**

Foot switch: Left foot pedal

- **Rear pedal: Upward movement**
- **Front pedal: Downward movement**

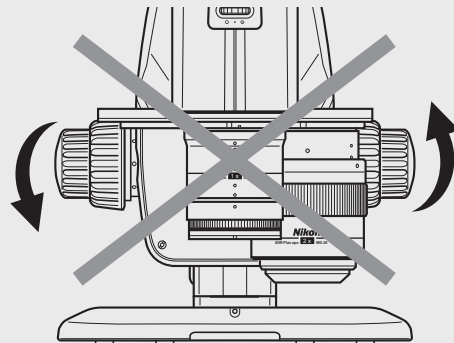
(See Chapter 4, "10.2 AZ-FSW Foot Switch.")



**Focus operation**

**! Notes on turning the focus knobs**

- When using the focus knobs of the focus unit, focus mount or the remote controller, do not turn (or twist) the right and left focus knobs in opposite directions at the same time. Doing so may cause malfunction.
- When the focus knobs of the focus unit or focus mount reach their rotational limits for the unit's vertical movement, do not forcibly turn it further. Doing so may cause malfunction.



**Do not turn the knobs in the opposite direction!**

- 1 Check that the optical path of the tube is 100% to the binocular part.
- 2 Using coarse control, lower the zooming body to a position near the working distance.

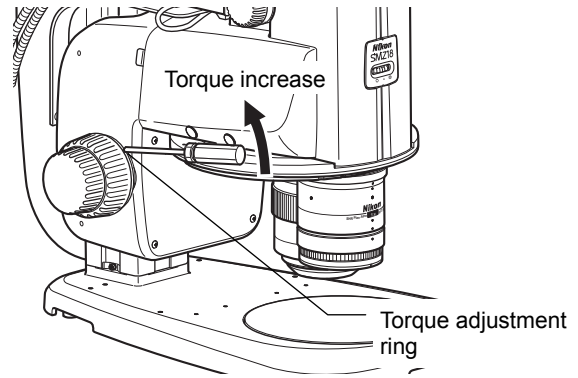
**[Working distances of objectives]**

- 0.5x : 71 mm
- 1x : 60 mm
- 1.6x : 30 mm
- 2x : 20 mm

- 3 Using fine control, precisely focus on the sample.

**■ Torque of the focus knobs**

For the P2-FU Focus Unit and P2-FMDN Focus Mount, the torque of the coarse control knobs can be changed. To do this, turn the torque adjustment ring on the base of the left coarse focus knob using a hex driver (nominal designation, 2: supplied with the focus unit). When the torque is too low, the vertical position of the zooming body may slide due to various loads (such as its own weight or the load of the counterbalance spring inside the focus unit). Be sure to adjust the torque to an appropriate level. Note that turning the fine control knob will cause the coarse control knob to also turn, changing the torque of the fine control knob.



**Adjusting the torque of the focus knobs**

**■ Focusing stroke**

- P2-FU Focus Unit

Focusing stroke:	100 mm
Stroke per rotation of the focus knobs	Coarse control, 18.50 mm per rotation Fine control, 3.27 mm per rotation

- P2-MFU Motorized Focus Unit

Focusing stroke:	100 mm
------------------	--------

- P2-FMDN Focus Mount

Focusing stroke:	65 mm
Stroke per rotation of the focus knobs	Coarse control, 18.50 mm per rotation Fine control, 3.27 mm per rotation

**✔ Useful functions for focusing**

When using the P2-MFU Motorized Focus Unit, the remote control enables the following remote operations: changing the focus speed, setting the limit position, setting retracting, and resetting Z. For details, see Chapter 4, “2.2 P2-MFU Motorized Focus Unit.”

\* Also see Chapter 4, “2 Focus Units.”



## 8

## Changing the Magnification

Besides changing the magnification with the zooming body, this microscope system enables the magnification to be changed by switching the objectives when used with the P2-RNI2 Intelligent Nosepiece and equipped with two objectives having different magnification ratios.

## 8.1

## Image Zooming

The magnification of the zooming body can be changed by zooming in and out.

**[Image zooming]**

SMZ18: Zooming knobs of the Zooming Body

The figure shows the turning directions of a knob and the corresponding changes in the magnification.

- **Turning the knob backward: Magnification increase**
- **Turning the knob forward: Magnification decrease**

SMZ25: Zoom buttons of the remote controller

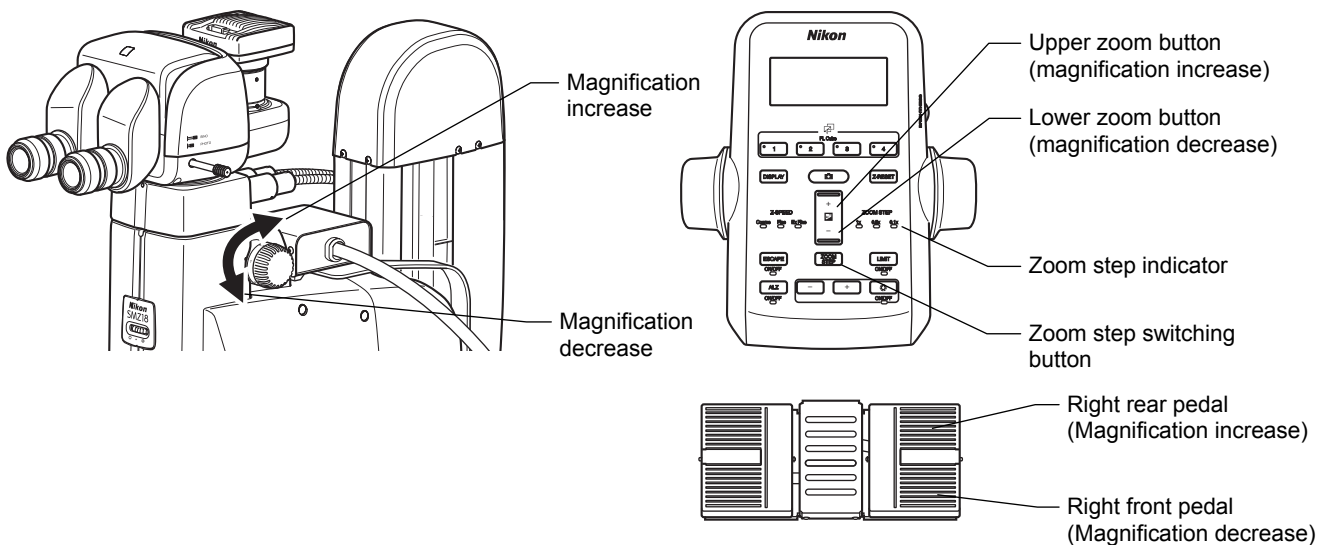
- **Upper button: Magnification increase**
- **Lower button: Magnification decrease**

Pressing and holding the buttons causes the magnification to change continuously.

Right foot pedal of the foot switch

- **Rear-side pedal: Magnification increase**
- **Front-side pedal: Magnification decrease**

(See Chapter 4, "10.2 AZ-FSW Foot Switch.")

**Image Zooming**

■ **Magnification and zoom ratio**

SMZ18: 0.75 to 13.5x, 18:1

SMZ25: 0.63 to 15.75x, 25:1

✔ **Useful functions for image zooming**

When using the SMZ25 Zooming Body, the magnification step size can be switched by pressing the zoom step switching button of the remote controller. The magnification can also be switched automatically so that the field of view before switching is maintained when the objective is switched (ALZ function). For details, see Chapter 4, "1.2 SMZ25 Zooming Body."

✔ **Total magnification**

The total magnification of the microscope is determined from the formula below:

Total magnification = zoom magnification x object's magnification x eyepiece's magnification

- When using a vertical tube, replace the eyepiece's magnification with the C mount adapter lens' magnification to calculate the total magnification.

\* Also see Chapter 4, "1 Zooming Body."

8.2

**Switching Objectives (Using the P2-RNI2 Intelligent Nosepiece)**

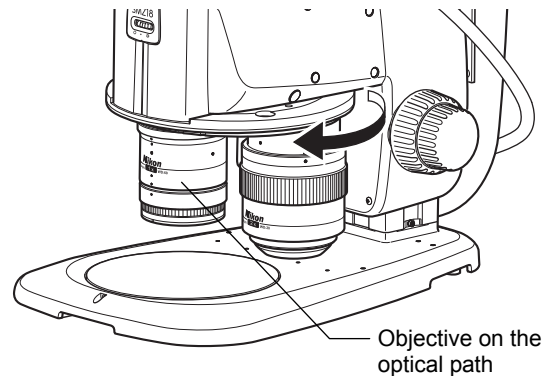
The P2-RNI2 Intelligent Nosepiece can be attached with two of the following objectives: P2-SHR Plan Apo 0.5X, 1X, 1.6X and 2X. The attached objectives can be switched by turning the nosepiece. Check that the objective falls into the click position when turning the nosepiece.

■ **Stereoscopic view and vertical view**

An intelligent nosepiece has two click positions for each objective.

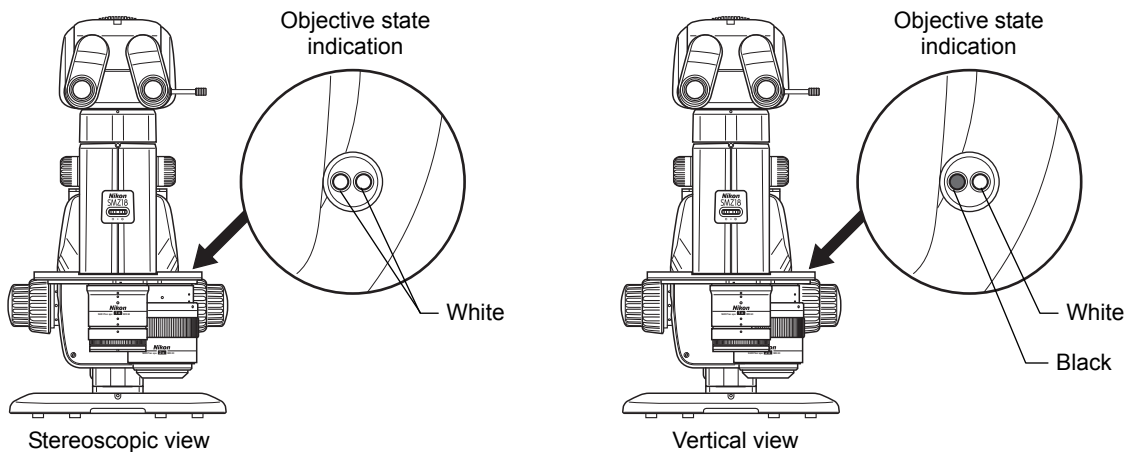
The click position switches between stereoscopic view and vertical view. Microscopy with vertical view is possible when needed, for example when taking a picture.

The click position of the objective can be checked by the position of the objective viewed from the front or the color of the hole on the objective status display area on the intelligent nosepiece.



**Switching Objectives**

\* Also see Chapter 4, "3.1 P2-RNI2 Intelligent Nosepiece."



**Objective position state (stereoscopic view and vertical view)**

## 9

## Shifting a Sample

To view another part of a sample during microscopy, use the following procedure to shift the sample.

## 9.1

## Shifting the Stage in the X and Y Directions (P-SXY64 XY Stage)

Turn the XY shift knob of the P-SXY64 XY Stage mounted instead of the stage plate to shift the sample on the glass plate and change the part to be observed.

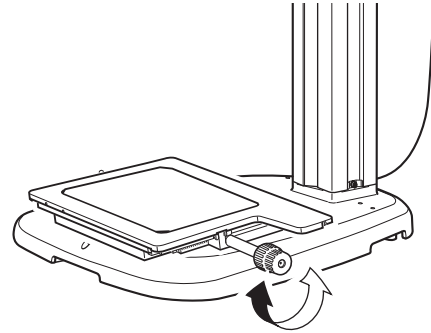
■ **XY stroke of the stage with the X/Y shift knob and stroke per rotation of the knob**

X: 150 mm; 37.5 mm per rotation

Y: 100 mm; 24.1 mm per rotation

⚠ **Usage restriction**

If the P-SXY64 XY Stage is mounted on the P-PS32 Plain Stand, the movement of the stroke in the Y direction is restricted.



**Shift using the P-SXY64 XY Stage**

\* Also see Chapter 4, “5.5 P-SXY64 XY Stage.”

## 9.2

## Using the Sliding Stage

Remove the stage plate from the base and attach the C-SSL DIA Sliding Stage or C-TRS Tilting Stage in place so that the sample can be tilted or moved slightly.

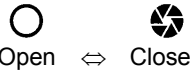
## 10 Using the Aperture Diaphragm

The SMZ18 and SMZ25 Zooming Bodies contain an aperture diaphragm.

Turn the aperture diaphragm dial to adjust the aperture.

The aperture can be adjusted in the range from fully open to 3 mm dia.

Opening and closing the aperture diaphragm causes the brightness and focus depth to change resulting in a change in resolution.

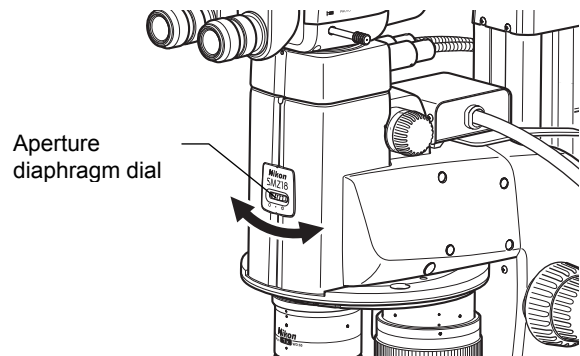


Open ⇔ Close

Brightness    Bright    Dark

Focus depth    Shallow    Deep

Resolution    High    Low



Adjusting the aperture diaphragm

## 11 Using Episcopic Illumination

The microscope system enables episcopic illumination when used with the devices listed below. All of the devices use LEDs as the light source and provide uniform illumination.

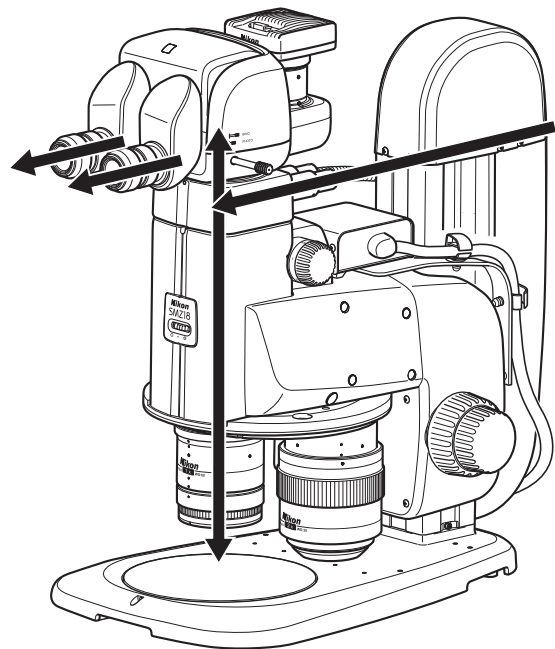
Illumination led from the light source by the fiber is emitted to a sample through an objective or directly so that an image resulting from the light reflected from the sample is observed. Episcopic illumination is used for observing samples which do not transmit light such as metal and mineral sections.

In addition, if the P2-CI Coaxial Epi Illuminator is attached, illumination along the optical axis for observation can also be emitted, which is effective for observing samples such as metallic mirrors, resins having smooth surfaces, and semiconductor wafers.

See Chapter 4, “7 Episcopic Illuminator” and select the appropriate device based on the objective of microscopy.

- P2-CI Coaxial Epi Illuminator
- C-FDF Flexible Double Arm Fiber Illumination Unit
- P2-FIR Ring Fiber Illumination Unit
- P2-FIRL LED Ring Illumination Unit

For the operations of the light sources such as brightness adjustment, refer to the instruction manuals of the light sources.



Episcopic illumination with the P2-CI Coaxial Epi Illuminator

## 12 Using Diascopic Illumination

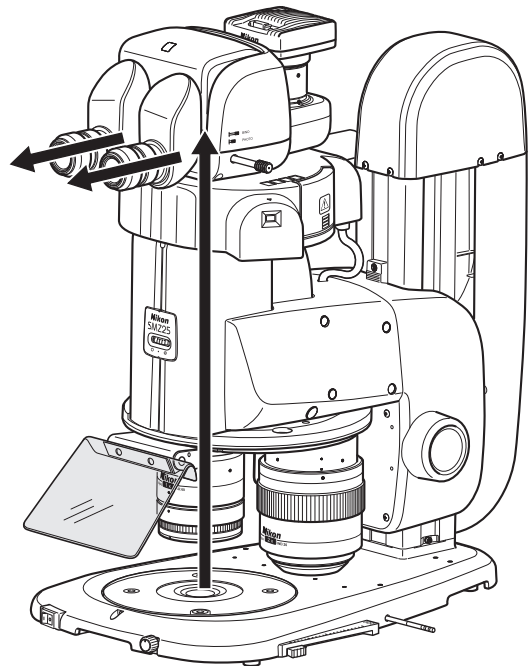
The microscope system enables diascopic illumination when used with the devices listed below. All of the devices use LEDs as the light source and provide uniform illumination.

The image to be observed results from diascopic illumination which passes through the sample and enters the objective. Diascopic illumination is used for observing transparent substances such as macromolecular compounds, fibers, and glass and tissue sections and biological specimens in petri dishes.

In addition, optional devices can be attached to enable dark-field diascopic illumination and diascopic simplified/polarized illumination. This allows for the observation of samples that are difficult to be observed under ordinary bright-field diascopic illumination such as transparent materials and crystals and tissues and minute organisms in culture solutions.

See Chapter 4 “8 Diascopic Illuminator” and select the appropriate device based on the objective of microscopy.

- P2-DBL LED Diascopic Illumination Base
- P2-DBF Fiber Diascopic Illumination Base
- P-DF LED Dark Field Unit
- P2-POL Simple Polarizing Attachment



**Diascopic illumination with the P2-DBL LED Diascopic Illumination Base**

### ! Empty cube

When an epi-fluorescence attachment is mounted, check that the empty cube of the attachment is in the optical path.

### ✓ OCC illumination

The P2-DBL LED Diascopic Illumination Base and P2-DBF Fiber Diascopic Illumination Base support OCC illumination (oblique illumination). OCC illumination, which offers high contrast, is appropriate for microscopy of phase objects.

## 13 Using Epi-Fluorescence Illumination

Epi-fluorescence microscopy used for observing fluorescence images requires an optical element such as a fluorescence filter, and a brighter light source including mercury lamp.

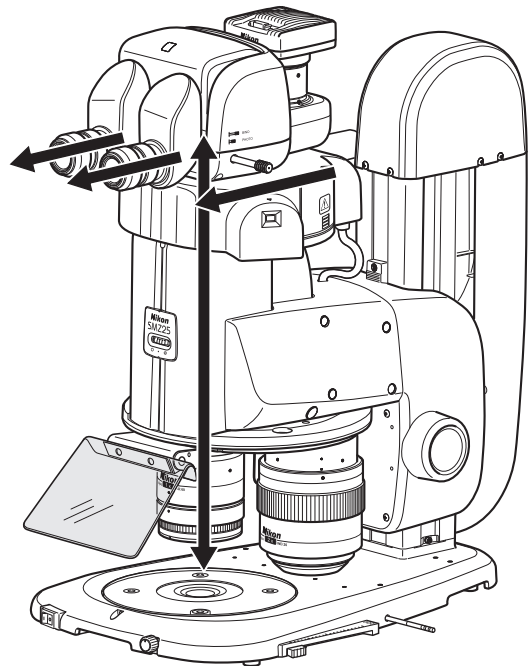
In this microscope system, state detection or motorized-type epi-fluorescence illumination is available. With a filter cube attached to the device, the filter cube is brought into the optical path by the rotation of the turret, resulting in the generation of epi-fluorescence illumination. The light source is a precentered high-intensity mercury lamp.

Illumination led from the light source to the device by the HG fiber passes through a fluorescence filter and emits excitation light to the sample so that fluorescent images can be observed.

See Chapter 4, “9 Epi-Fluorescence Attachment” and select the appropriate device based on the objective of microscopy.

- P2-EFLI Epi Fluorescence Attachment
- P2-EFLM Motorized Epi Fluorescence Attachment

For details on adjusting the light sources such as brightness adjustment, refer to the instruction manuals of the light sources.



Epi-fluorescence illumination with the epi fluorescence attachment

### ! WARNING

The light source used with the epi fluorescence attachment (mercury lamp) requires special care during handling because of its characteristics. Make sure you are familiar with and observe all warnings and cautions described at the beginning of this instruction manual.

### 13.1 Switching Filter Cubes

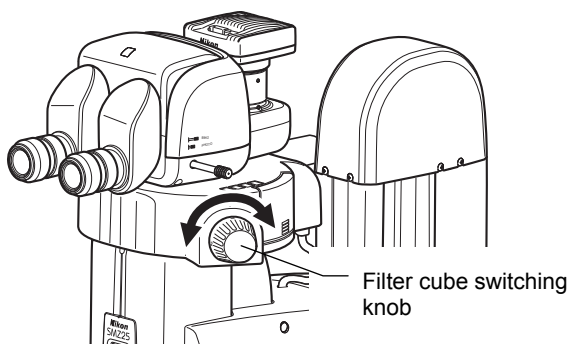
The turret of the epi fluorescence attachment is rotated to switch the four filter cubes attached to the turret.

#### [Turret rotation operation]

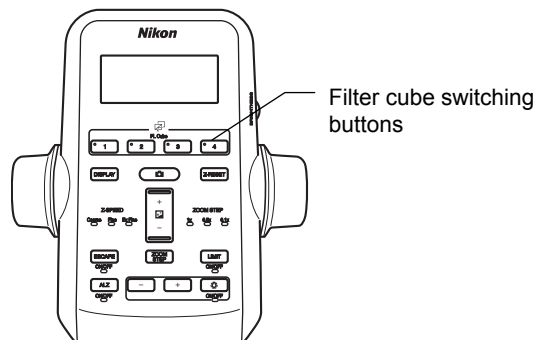
P2-EFLI Epi Fluorescence Attachment:

Filter cube switching knob of the device

P2-EFLM Motorized Epi Fluorescence Attachment: Filter cube switching buttons of the remote controller



Filter cube switching knob



Filter cube switching buttons

#### Switching filter cubes

On the P2-EFLI Epi Fluorescence Attachment, turn the filter cube switching knob to assign to the indicator the turret address (FL1 to FL4) of the filter cube to be placed into the optical path.

On the remote control, press the filter cube switching buttons (FL1 to FL4) to specify the turret address of the filter cube to be placed into the optical path. The LED of the pressed button lights so that the turret address on the optical path can be identified. The motorized epi fluorescence attachment has a turret address view window on the right front so that the turret address on the optical path can be identified.

### 13.2 Selecting a Filter Cube

The epi fluorescence attachment can be equipped with the following filter cubes:

- P2-EFL GFP-B, P2-EFL GFP-L, and P2-EFL RFP Filter Cube: Used for fluorescence observation with a given wavelength.
- P2-EFLC Filter Cube: Used for fluorescence observation with an arbitrary wavelength when combined with arbitrary filters, for example.
- P2-EFLBF Filter Cube (Bright Field): Used for bright-field episcopic observation.
- Empty cubes (three cubes supplied with an epi-fluorescence attachment): Used when performing diascope illumination observation using the epi-fluorescence attachment.

### 13.3 Important Notes for Epi-Fluorescence Microscopy

#### ■ Using non-fluorescent slide glass and cover glass

When performing fluorescence observation of samples with a slide glass or cover glass, be sure to use non-fluorescent slide glass or cover glass to obtain a high-contrast image.

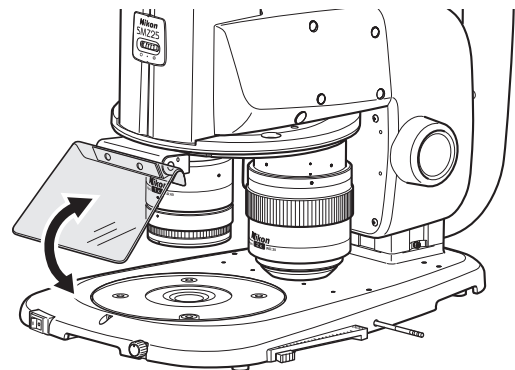
#### ■ Locating a target in the sample

For epi-fluorescence microscopy, Nikon recommend locating a target with bright-field diascope illumination (OCC illumination) and then switching to epi-fluorescence rather than emitting strong excitation light to the sample from the beginning. When doing so, follow the operational tips below:

- Start with low magnification under bright-field diascope illumination.
- If the sample is not transparent, use the P2-EFLBF Filter Cube (Bright Field) to obtain the entire image by reflected light.
- Gradually increase the magnification. When the target becomes difficult to locate, switch to epi-fluorescence and use low excitation light.

#### ■ Protection from ultraviolet light (light shielding plate)

The light shielding plate is used to prevent the reflected ultraviolet light, which is originally emitted through the objective, from entering the observer's eyes from the sample.



Using the light shielding plate

## 14 Remote Operation

The microscope system enables remote control of several functions including focusing and changing magnification. The following remote control devices can be used when connected with the P2-CTLA Control Box:

- P2-RC Remote Controller
- AZ-FSW Foot Switch
- AZ-PCR Photo Release

For details, see Chapter 4 “10 Remote Control Device.”

Remote control from NIS-Elements is also possible by connecting the USB connector on the control box to a personal computer. For details, refer to the NIS-Elements instruction manual.

## 15 Capturing Images

The microscope system can capture images of the sample being observed by attaching a camera such as a DS camera head to the vertical tube via a TV tube adapter or C-mount adapter.

### 15.1 Procedure for Capturing Images

Follow the procedure below to capture images. For the camera settings, see the instruction manual for the DS-L3 or DS-U3.

#### ✔ Using the DS-L3

Specify the following items beforehand.

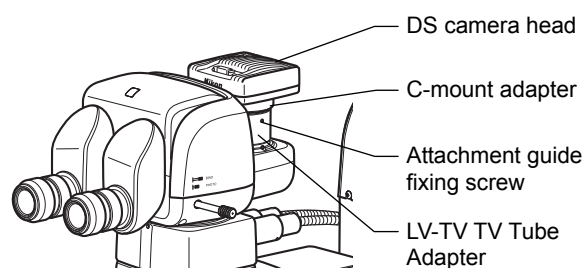
- Folder to save
- Name of the save file (or select Auto.)
- File format and file size of the save file
- Date and destination of the data

(1) **Adjust the illumination of the microscope correctly and the focus of the sample image.**

(2) **Adjust the mounting orientation of the DS camera head.**

For details about attaching the camera head, see [5] Attach a Camera in Chapter 5, “3.3 Assembly of Other Devices (Optional).”

Since shifting a sample horizontally causes the image on the monitor to move horizontally, loosen the attachment guide fixing screw and adjust the orientation of the camera. After making the appropriate adjustments, tighten the screw.



**Adjusting the camera orientation**

(3) **Select the camera scene mode suitable for the microscopy type.**

(4) **Adjust the camera's white balance.**

When using diascopic illumination, first capture an image of the top surface of the stage glass. When using episcopic illumination, first capture an image of any white subject. Then, press the WB button to execute white balance adjustment. (For fluorescent photomicrography, Nikon recommends adjusting the white balance under normal bright-field microscopy conditions before capturing images.)

(5) **Adjust the position of the sample.**

(6) **Readjust the focus on the target.**

(7) **Adjust the image brightness using the camera exposure compensation function.**

(8) **Press the Pause button on the DS-L3 to check the image.**

(9) **Save the image if acceptable.**

To save the image, press the capture button on the remote controller or DS-L3, or step on the pedal of the AZ-PCR Photo Release.



■ **Confirming the photomicrographic range**

The image on the monitor represents the photomicrographic range.

■ **Adjusting to eliminate extraneous light**

Cover the eyepiece with a piece of cloth or similar item.

■ **Protecting fluorescent images from decoloration**

The fluorescence of specimens may fade during exposure. To prevent this, do the following:

• **Adjusting the excitation light**

Excessively bright excitation light will accelerate the decoloration of the sample making it more difficult to obtain suitable fluorescent images. Use the ND filter of the light source to perform adjustment.

• **Sample**

Photomicrography of the color-fading portion requires a prolonged exposure time resulting in poor color reproduction and low-quality images. Move the sample so that the image of the portion that has not been exposed to excitation light can be captured. To obtain the best results, use the diasopic illumination method to select a specimen section for photomicrography, and then switch to the fluorescent method to capture the image.

• **Using the shutter**

When not performing observation, close the shutter.

■ **Adjusting the brightness of the image on the monitor**

When observing images on the monitor via a camera, the brightness can be changed also by making an adjustment on the camera side, for example, by changing the display mode, exposure mode and photometry mode, by compensating the exposure or by adjusting the image level.

For details, refer to the instruction manual for the DS-L3 or DS-U3.

## 16

## Internally Saved Information

In stereo microscopes, the following information saved in the control box is read and used. The lower limit and the escape distance are previously set when the product is shipped. Other items are set to OFF or nothing is set. When using a motorized system or intelligent (status detection) system for the first time, set the items as required by following the specified procedures. For details, see the instruction manual supplied with the corresponding product.

**P2-CTLA Control Box**

Items	Default	Tools
Objective	-	NIS-Elements and setup tools, DS-L3
Eyepiece	-	Setup tools, DS-L3
Epi-fl filter cube	-	NIS-Elements and setup tools, DS-L3
Motorized focus unit lower limit	0 mm	NIS-Elements, remote controller *
Motorized focus unit escape distance	20 mm	NIS-Elements and setup tools
ALZ function	OFF	NIS-Elements and setup tools, remote controller *

**P2-CTLB Control Box**

Items	Default	Tools
Objective	-	NIS-Elements and setup tools, DS-L3
Eyepiece	-	Setup tools, DS-L3
Epi-fl filter cube	-	NIS-Elements and setup tools, DS-L3

\*: The setting can be changed but cannot be saved.

Chapter

4

# Functions and Operations of the Devices

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This chapter describes the main functions and how to use the devices.

## 1 Zooming Body

Two types of zooming bodies are available: SMZ18 Zooming Body for manual zoom operations and SMZ25 Zooming Body for motorized zoom drive.

### 1.1 SMZ18 Zooming Body

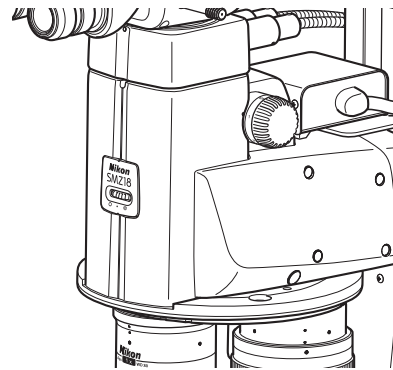
This model, which offers high NA, is designed for manual zoom operations.

For systems where a control box has been connected, the zoom information is sent to the control box via a motorized focus unit or relay box, and then transmitted to the DS-L3 DS Camera Control Unit and personal computer.

For the objective, the SHR-Plan Apo 0.5x, 1x, 1.6x, or 2x can be attached. When combined with the P2-RNI2 Intelligent Nosepiece, two objectives can be attached.

A focus unit can be connected through the P2-RNI2 Intelligent Nosepiece or the P2-FM Focus Mount Adapter.

The P2-FMDN Focus Mount can also be attached.



SMZ18 Zooming Body

#### ⚠ Usage restriction

Tubes, intermediate tubes and objectives of the previous SMZ series cannot be used.

Images can be zoomed in and out using the zooming knobs on the right and left sides of the zooming body.

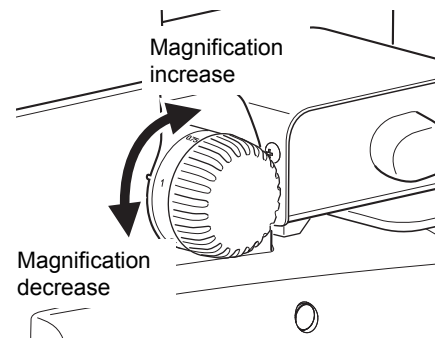
Turning the knob backward: Magnification increase

Turning the knob forward: Magnification decrease

Turning the knob causes the magnification to continuously change in the range from 0.75x to 13.5x (18:1 zoom ratio).

Magnification values are marked on the zooming knobs.

Click stop of the zooming knobs operates at the positions of 0.75x, 1x, 2x, 3x, 4x, 5x, 6x, 8x, 10x, 12x, and 13.5x. It is also possible to deactivate the click stop function.



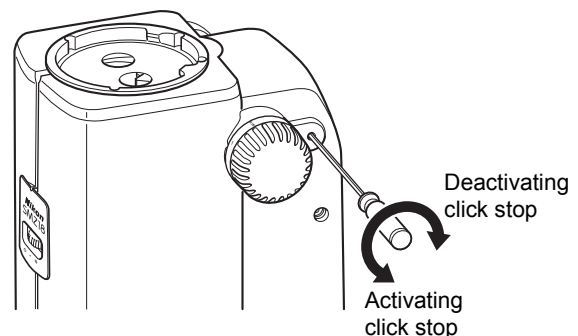
Zoom operation

#### ■ Activating and deactivating click stop of zoom operations

Insert the hex driver (nominal designation: 2) supplied with the focus unit into the hole on the rear side of the right zooming knob.

Turn the internal screw counterclockwise to activate click stop.

Turn it clockwise to deactivate click stop.



Activating and deactivating click stop of zoom operations

#### ✓ Aperture diaphragm

The zooming body is equipped with an aperture diaphragm dial which enables the diaphragm of the right and left optical paths to be simultaneously adjusted in the range from fully open to 3 mm dia.

For details about using the aperture diaphragm, see Chapter 3, "10 Using the Aperture Diaphragm."

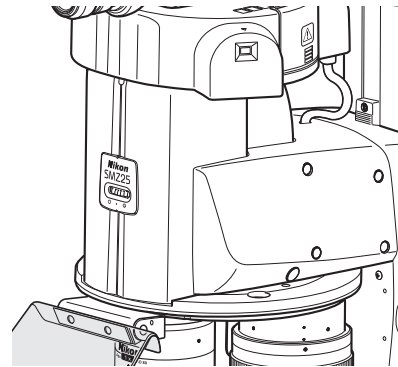
1.2 SMZ25 Zooming Body

This model, which offers high NA, is designed for motorized zoom operations.

Zoom control is performed by the P2-CTLA Control Box. Control signals are sent to the SMZ25 via a motorized focus unit or relay box. The zoom information is sent to the control box via a motorized focus unit or relay box, and then transmitted to the DS-L3 DS Camera Control Unit and personal computer.

For the objective, the P2-SHR Plan Apo 0.5X, 1X, 1.6X or 2X can be attached. When combined with the P2-RNI2 Intelligent Nosepiece, two objectives can be attached.

A focus unit can be connected through the P2-RNI2 Intelligent Nosepiece or the P2-FM Focus Mount Adapter.



SMZ25 Zooming Body

**Usage restriction**

Tubes, intermediate tubes and objectives of the previous SMZ series cannot be used

Images can be zoomed in and out using the zoom buttons on the remote controller.

Upper zoom button: Magnification increase

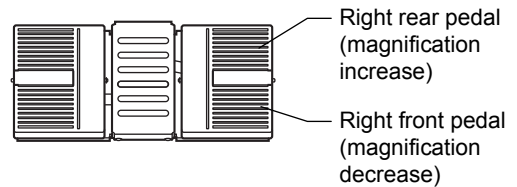
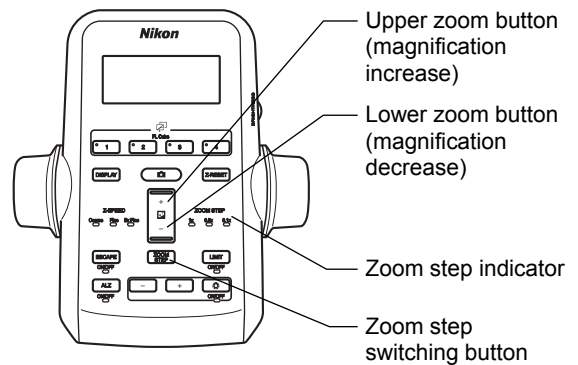
Lower zoom button: Magnification decrease

Each time the button is pressed, the magnification changes in the range from 0.63x to 15.75x (25:1 zoom ratio) in steps. The step size depends on the setting of the zoom step switching button. Pressing and holding the button causes the magnification to change continuously.

**Magnification step size**

Each time the zoom step switching button on the remote controller is pressed, the step size changes in the following order: 1x, 0.5x then 0.1x.

When a step size is selected, the corresponding step LED indicator lights.



Zoom operation

The right pedals of the foot switch can also be used to zoom in and out images as well as the zoom buttons on the remote controller.

Right rear pedal: Magnification increase

Right front pedal: Magnification decrease

Each time the pedal is pressed, the magnification changes by one step. The step size depends on the setting of the zoom step switching button on the remote controller. Pushing and holding the pedal causes the magnification to change continuously.

**Aperture diaphragm**

The zooming body is equipped with an aperture diaphragm dial which enables the diaphragm of the right and left optical paths to be simultaneously adjusted in the range from fully open to 3 mm dia.

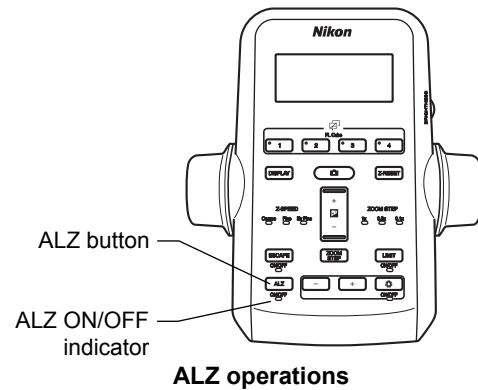
For details about using the aperture diaphragm, see Chapter 3, "10 Using the Aperture Diaphragm."

**Useful zoom operation functions (ALZ function)**

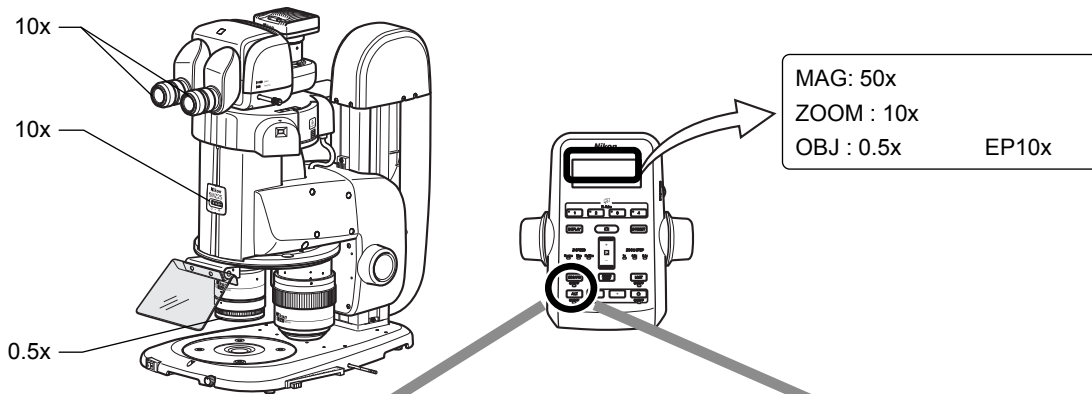
When the objective is switched, the zoom magnification is automatically changed so that the field of view is maintained as it was.

This prevents the target image from moving or disappearing and makes it possible to observe the image while increasing or decreasing the zoom magnification.

To activate the ALZ function, press the ALZ button on the remote controller. The ALZ ON/OFF indicator lights. To deactivate the ALZ function, press the button again.



Example: Starting from an objective magnification of 0.5x, zoom magnification of 10x and eyepiece magnification of 10x equaling a total magnification of 50x, switch the objective as follows;



**Deactivate the ALZ function.**

**Activate the ALZ function.**

**Switching the objective from 0.5x to 2x**

**MAG : 200x**  
ZOOM : 10x  
OBJ : 2x      EP10x

Total magnification changes from 50x to 200x.  
The field of view of the observed image changes.

**MAG : 50x**  
**ZOOM : 2.5x**  
OBJ : 2x      EP10x

Zoom magnification automatically changes from 10x to 2.5x.  
Total magnification stays 50x and the field of view is maintained.

**Deactivate the ALZ function.**

**ALZ function stays active.**

**Switching the objective from 2x to 0.5x**

**MAG : 12.5x**  
ZOOM : 2.5x  
OBJ : 0.5x      EP10x

Total magnification changes from 50x to 12.5x.  
The field of view of the observed image changes again.

**MAG : 50x**  
**ZOOM : 10x**  
OBJ : 0.5x      EP10x

Zoom magnification automatically changes from 2.5x to 10x.  
Total magnification stays 50x and the field of view is maintained.

**Use example of the ALZ function**

2

Focus Units

The P2-FU Focus Unit having a manual focus knob and the P2-MFU Motorized Focus Unit are available as focusing devices. In addition, the P2-FMDN Focus Mount is available for focus operations, and is attached to the support of the P-PS32 Plain Stand.

2.1

P2-FU Focus Unit

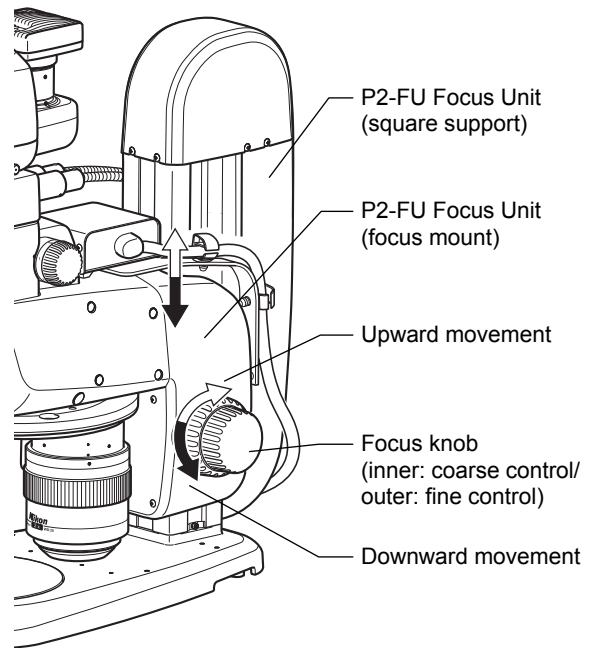
The P2-FU Focus Unit consists of a square-type support and a focus mount with the coaxial coarse/fine focusing system. The focus mount is attached with the SMZ18 or SMZ25 Zooming Body through the P2-RNI2 Intelligent Nosepiece or the P2-FM Focus Mount Adapter. The square support is attached with the P2-PB Plain Base, P2-DBL LED Diascopic Illumination Base or the P2-DBF Fiber Diascopic Illumination Base. Three types of stands can be configured.

Focus can be adjusted using the coarse/fine focus knobs on the right and left of the focus mount. The figure shows the turning directions of the focus knob and the corresponding vertical movements of the focus mount.

Turning the knob backward: Upward movement

Turning the knob forward: Downward movement

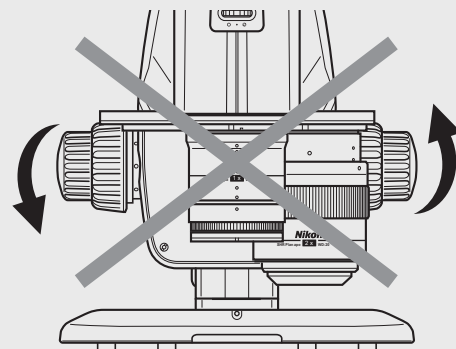
- Focusing stroke: 100 mm
- Stroke per rotation of the focus knob:
  - Coarse control, 18.50 mm/rotation
  - Fine control, 3.27 mm/rotation



P2-FU Focus Unit

**⚠ Notes on turning the focus knobs**

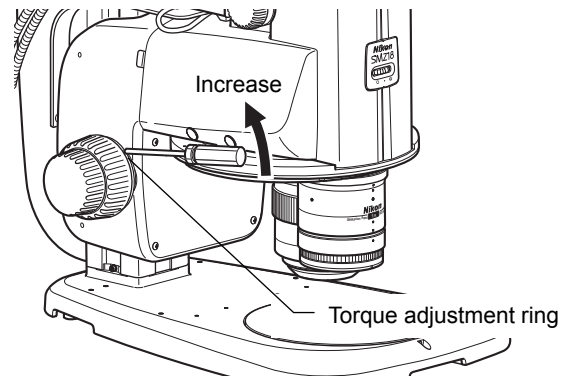
- Do not turn (or twist) the right and left focus knobs in opposite directions at the same time. Doing so may cause malfunction.
- When the focus knobs reach their rotational limits for the unit's vertical movement, do not forcibly turn it further. Doing so may cause malfunction.



**Do not turn the knobs in the opposite direction!**

■ **Torque of the focus knobs**

The torque of the coarse control knobs can be changed by turning the torque adjustment ring on the base of the left coarse focus knob using a hex driver (nominal designation, 2: supplied with the focus unit). When the torque is too low, the vertical position of the zooming body may slide due to various loads (such as its own weight or the load of the counterbalance spring inside the focus unit). Be sure to adjust the torque to an appropriate level. Note that turning the fine control knob will cause the coarse control knob to also turn, changing the torque of the fine control knob.



**Adjusting the torque of the focus knobs**

✔ **Tool storage space**

The focus unit has a storage space for storing three tools on its rear side. A hex driver and wrench supplied with the focus unit and the Intelligent nosepiece can be stored here.

2.2

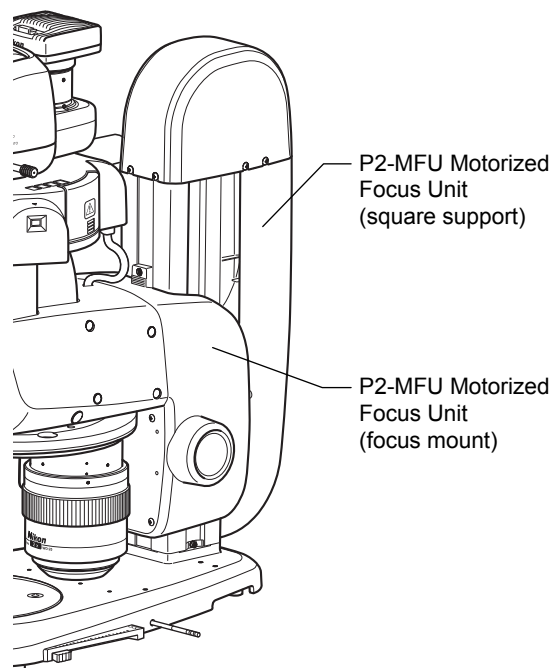
**P2-MFU Motorized Focus Unit**

The P2-MFU Motorized Focus Unit consists of a square-type support and a focus mount with the motorized focusing system. The focus mount is attached with the SMZ18 or SMZ25 Zooming Body through the P2-RNI2 Intelligent Nosepiece or the P2-FM Focus Mount Adapter. The square support is attached with the P2-PB Plain Base, P2-DBL LED Diascopic Illumination Base or the P2-DBF Fiber Diascopic Illumination Base. Three types of motorized stands can be configured.

Focusing movement of the motorized focus unit is conducted using the focus knobs on the remote controller or the foot switch connected to the remote controller. The vertical position (Z coordinate value) is shown on the LCD on the remote controller.

✔ **Z coordinate value**

The accuracy of the Z coordinate value (vertical position) shown on the remote controller is not guaranteed. This value is used as a reference and includes a margin error.



**P2-MFU Motorized Focus Unit**

■ **Initialization at power on**

When the microscope system has been assembled and the power of the control box is turned on, the motorized focus unit is initialized as follows:

- 1 The power is turned on.
- 2 The focus mount moves upward to the upper limit.
- 3 The focus mount moves downward to the position before the power was turned on.



**Focus knobs on the remote controller**

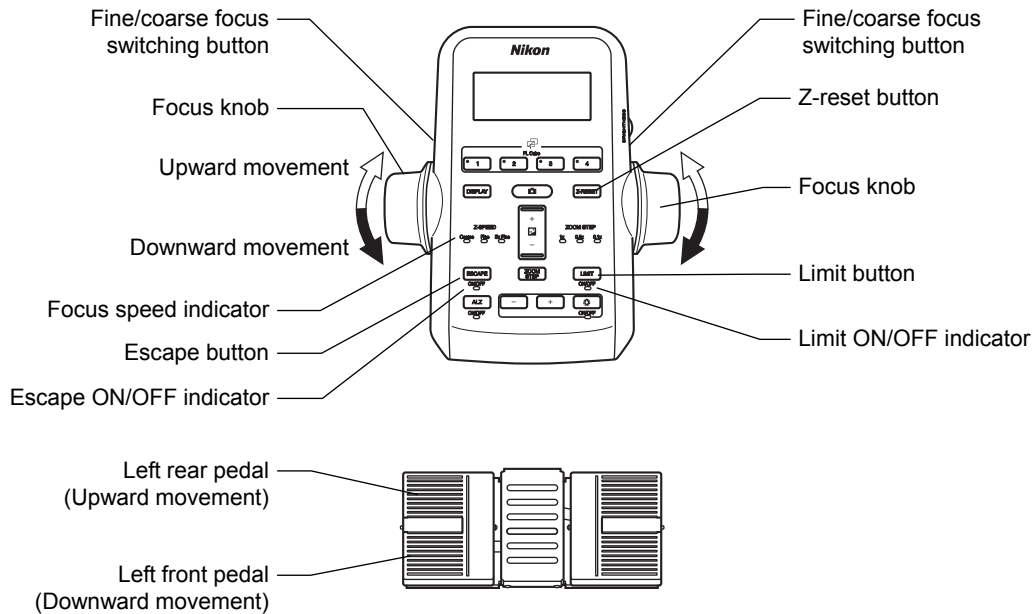
Turning the knob backward: Upward movement of the focus mount  
 Turning the knob forward: Downward movement of the focus mount

- Focusing stroke: 100 mm

**Pedals of the foot switch**

Left rear pedal: Upward movement of the focus mount  
 Left front pedal: Downward movement of the focus mount

For details about the pedal operations, see “10.2 AZ-FSW Foot Switch” in this chapter.



**Focus operation**

■ **Focus speed**

The focus speed can be switched between coarse, fine, and extra fine control.

Use the fine/coarse focus switching button on the remote controller to switch the speed.

Each time the button is pressed, the focus speed is cyclically switched in the order of coarse, fine, and extra fine.

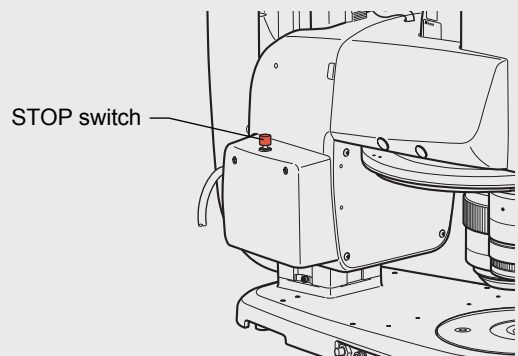
When the focus speed is changed, the corresponding indicator (Coarse/Fine/ExFine) lights.

- Coarse: 2 to 10 mm/second
- Fine: 0.2 to 5 mm/second
- Extra fine: 0.01 to 0.1 mm/second

**! Forced stop of motorized movement**

The motorized focus unit is equipped with the STOP switch on the left side. Pressing the switch causes motorized movement to be forcibly stopped. To resume the motorized movement, perform the following steps:

1. Press the STOP switch again.
2. Turn off the power by pressing the power switch of the P2-CTLB Control Box to the “O” position.
3. Turn on the power by pressing the power switch to the “I” position. (After the power on, initialization at power on is automatically performed.)



### ❗ Focus knob of the P2-MFU Motorized Focus Unit

The focus knob of the P2-MFU Motorized Focus Unit attached with a cover cannot be used. This knob is to be used by Nikon during maintenance.

### Useful focus operation functions

---

The P2-MFU Motorized Focus Unit enables operations such as setting the limit position, setting retracting, and resetting Z using the remote controller.

#### ■ Limit position setting

When the limit button is pressed, the current position is set as the limit position so that the vertical movement part does not move down passing the limit point.

Pressing the limit button again cancels the limit position setting. When a limit position is set, the limit ON/OFF indicator below the button lights. Note that a limit position cannot be set in the range from the upper limit to 10 mm below that position. The default value of the limit position setting is 0 mm. The setting value can be changed using the NIS-Elements of remote controller.

#### ■ Escape setting

Pressing the Escape button causes the vertical movement part to move upward by the preset distance so that it stays in position. The vertical movement is not possible in this escape status. Pressing the Escape button again causes the vertical movement part to return to the previous position. Pressing and holding the Escape button causes the vertical movement part to exit escape status. When in escape status, the Escape ON/OFF indicator below the button lights.

The default value of the escape setting is 20 mm. The setting value can be changed using the setup tool or NIS-Elements.

#### ■ Z resetting

Pressing the Z-reset button displays 0 as the Z position (focus position) on the LCD of the remote controller. Pressing the button at another position sets that position as 0.

Also see “10.1 P2-RC Remote Controller” in this chapter.

### ✔ Tool storage space

The focus unit has a storage space for storing three tools on its rear side. A hex driver and wrench supplied with the focus unit and the Intelligent nosepiece can be stored here.

2.3

**P2-FMDN Focus Mount**

The P2-FMDN Focus Mount is used exclusively for the SMZ18. Adjust the focus using the focus knob.

The focus mount can be attached to various stands having a support of 32 mm diameter.

**Usage restriction**

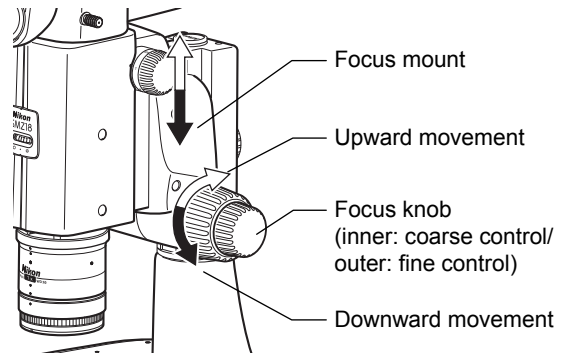
This focus mount cannot be combined and used with the P2-EFLM Motorized Epi Fluorescence Attachment.

The figure shows the turning directions of the focus knob and the corresponding vertical movements of the focus mount.

Turning the knob backward: Upward movement

Turning the knob forward: Downward movement

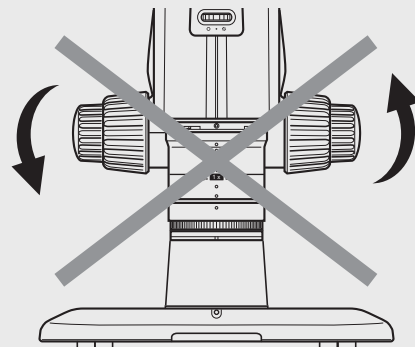
- Focusing stroke: 65 mm
- Stroke per rotation of the focus knob:
  - Coarse control, 18.50 mm/rotation
  - Fine control, 3.27 mm/rotation



**P2-FMDN Focus Mount**

**Notes on turning the focus knobs**

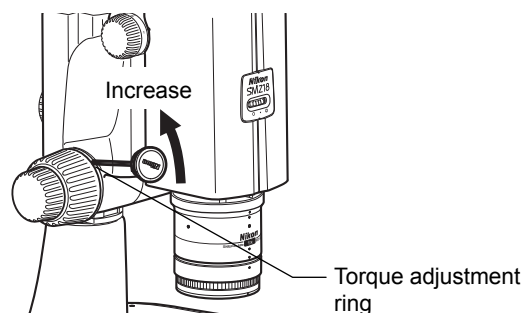
- Do not turn (or twist) the right and left focus knobs in opposite directions at the same time. Doing so may cause malfunction.
- When the focus knobs reach their rotational limits for the unit's vertical movement, do not forcibly turn it further. Doing so may cause malfunction.



**Do not turn the knobs in the opposite direction!**

**Torque of the focus knobs**

The torque of the coarse control knobs can be changed by turning the torque adjustment ring on the base of the left coarse focus knob using the tool supplied with the stand. When the torque is too low, the vertical position of the zooming body may slide due to various loads (such as its own weight or the load of the counterbalance spring inside the focus unit). Be sure to adjust the torque to an appropriate level. Note that turning the fine control knob will cause the coarse control knob to also turn, changing the torque of the fine control knob.



**Adjusting the torque of the focus knobs**

3

Nosepiece

3.1

P2-RNI2 Intelligent Nosepiece

The P2-RNI2 Intelligent Nosepiece can be attached with two objectives. The attached objectives can be switched by turning the nosepiece.

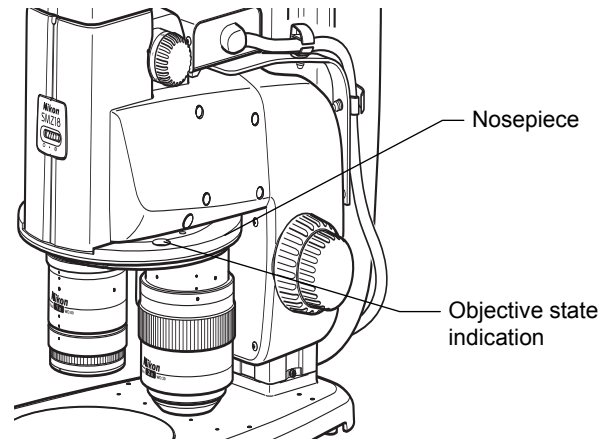
■ Stereoscopic view and vertical view

An intelligent nosepiece has two click positions for each objective.

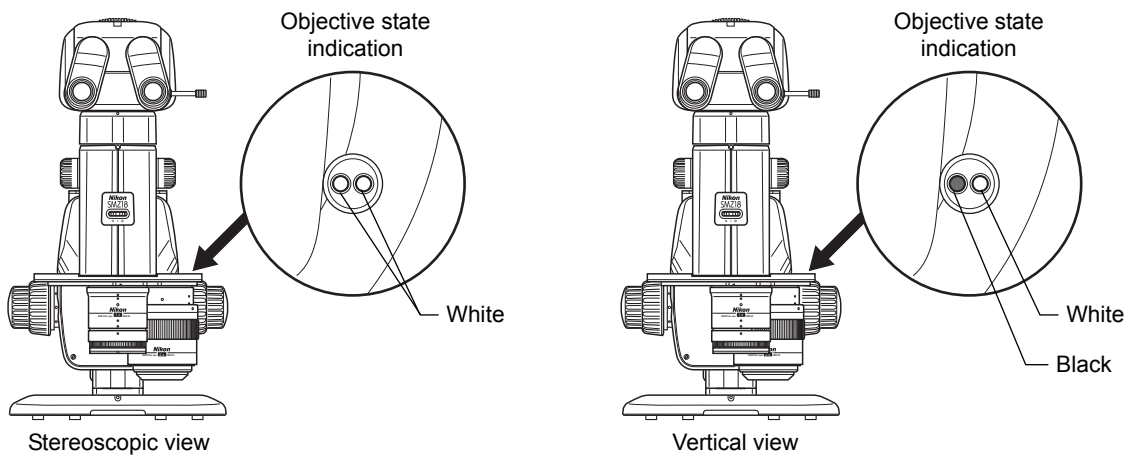
The click position switches between stereoscopic view and vertical view. Microscopy with vertical view is possible when needed, for example when taking a picture.

The click position of the objective can be checked by the position of the objective viewed from the front or the color of the hole on the objective status display area on the intelligent nosepiece.

For systems where a control box has been connected, the objective attachment position addresses and vertical-view state are sent to the control box via a motorized focus unit or relay box, and then transmitted to the DS-L3 DS Camera Control Unit and personal computer.



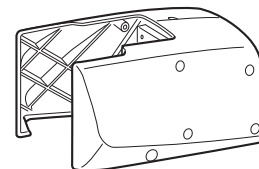
P2-RNI2 Intelligent Nosepiece



Objective position state (stereoscopic view and vertical view)

✔ P2-FM Focus Mount Adapter

The P2-RNI2 Intelligent Nosepiece also serves as the interface between the zooming body and focus unit. To connect the zooming body with the focus unit, the P2-FM Focus Mount Adapter must be connected.



P2-FM Focus Mount Adapter

## 4

## Objectives

The microscope system supports the following objectives.

Attach the objectives to the zooming body or intelligent nosepiece.

Model name	P2-SHR Plan Apo 0.5X	P2-SHR Plan Apo 1X	P2-SHR Plan Apo 1.6X	P2-SHR Plan Apo 2X
Magnification	0.5x	1x	1.6x	2x
Numerical aperture (maximum)	0.078	0.156	0.25	0.312
Working distance	71 mm	60 mm	30 mm	20 mm
Parfocal distance:	150 mm	150 mm	150 mm	150 mm
Objective mount	Exclusively-shaped bayonet	Exclusively-shaped bayonet	Exclusively-shaped bayonet	Exclusively-shaped bayonet
Others	Protection ring provided	Correction glass provided		With a correction ring

- The 2x objective is equipped with the correction ring for water 0 to 3 mm in depth. The correction ring compensates an aberration caused by water in the dish. With this objective, select 2x magnification or higher. If magnification less than 2x is selected, shading will occur or part of the field of view will be missing.
- Attach the 1/4 lambda plate supplied with the coaxial epi illuminator to the position from which the protection ring supplied with the 0.5x objective or the correction glass supplied with the 1x objective has been removed.

#### ! Usage restriction

- When the episcopic illuminator is used, use of the objectives and magnification are subject to some restrictions. (See "7 Episcopic Illuminator" in this chapter.)
- When the diasopic illuminator is used, use of the objectives and magnification are subject to some restrictions. (See "8 Diasopic Illuminator" in this chapter.)

#### ✓ Total magnification

The total magnification of the microscope is determined from the formula below:

Total magnification = zoom magnification x objective's magnification x eyepiece's magnification

- When using a vertical tube, replace the eyepiece's magnification with the C mount adapter lens' magnification to calculate the total magnification.

## 5 Bases, Stand, and Stages

Bases consist of various focus stands in combination with the focus units. The base models include a base without a built-in diascope illumination system and a base with a built-in optical system for diascope illumination.

A stand type is also available where a focus mount is connected to the support of the stand.

In all cases, a large stage plate (180 mm dia.) is used to enable more efficient work and easier observation of samples in containers such as petri dishes.

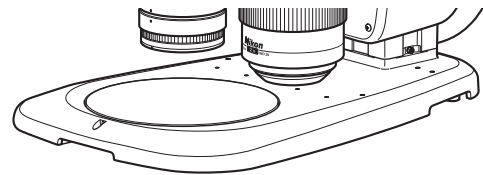
The stage plate can be replaced with a stage having an X/Y shift knob or a sliding stage. It is also possible to attach other devices such as a fiber illuminator or diascope polarizing device to expand the base's functions.

### 5.1 P2-PB Plain Base

The plain base consists of a plain stand or a motorized plain stand in combination with the P2-FU Focus Unit or P2-MFU Motorized Focus Unit.

It is equipped with a stage plate having black and milky white planes. Select the plain based on the sample being observed.

The plain base has three indents for holding the base: front of the base's top board and on the right and left rear.

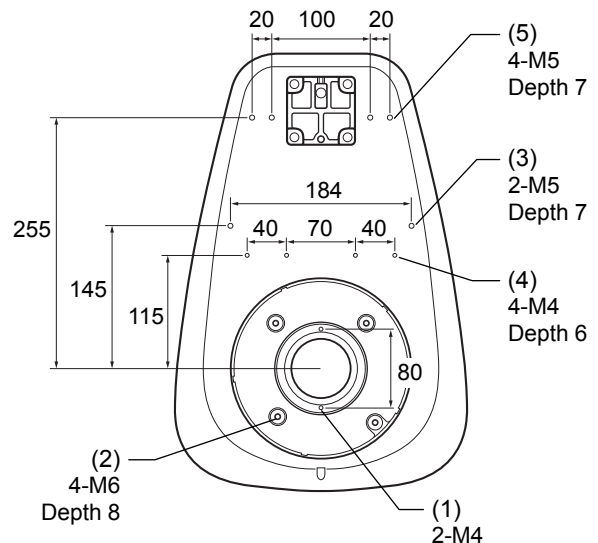


**P2-PB Plain Base**

#### ✔ Tap holes for attaching accessories

The base's top board has tap holes for attaching various accessories. Tap holes (2) to (5) are not penetrating to prevent ingress of solution into the base.

- (1) 2-M4: Positioned under the stage plate attachment section of the base. Used for multiple purposes.
- (2) 4-M6: Positioned under the stage plate attachment section of the base, Used for attaching the P-SXY64 XY Stage.
- (3) 2-M5: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (4) 4-M4: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (5) 4-M5: Positioned at the rear on the top surface of the base. Used for attaching an accessory such as the C-FDF Flexible Double Arm Fiber Illumination Unit.



**Tap holes for attaching accessories**

### 5.2 P2-DBL LED Diascopic Illumination Base

See "8.1 P2-DBL LED Diascopic Illumination Base" in this chapter.

### 5.3 P2-DBF Fiber Diascopic Illumination Base

See "8.2 P2-DBF Fiber Diascopic Illumination Base" in this chapter.

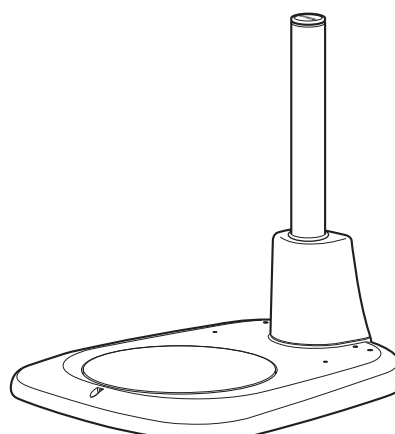
## 5.4

**P-PS32 Plain Stand**

This stand consists of a microscope system with the SMZ18 Zooming Body attached with the P2-FMDN Focus Mount.

It is equipped with a stage plate having black and milky white planes. Select the plane based on the sample being observed.

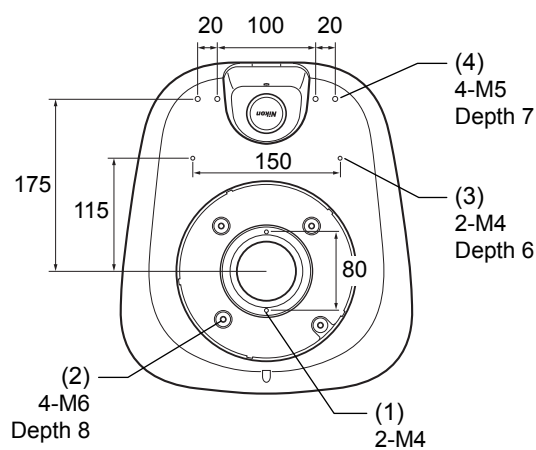
The stand support can be replaced with a long support. A special screwdriver is stored in the upper part of the support.

**P-PS32 Plain Stand**

✔ **Tap holes for attaching accessories**

The base's top board has tap holes for attaching various accessories. The tap holes are not penetrating to prevent ingress of solution into the base.

- (1) 2-M4: Positioned under the stage plate attachment part of the base. Used for multiple purposes.
- (2) 4-M6: Positioned under the stage plate attachment part of the base. Used for attaching the P-SXY64 XY Stage.
- (3) 2-M4: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (4) 4-M5: Positioned at the rear on the top surface of the base. Used for attaching an accessory such as the C-FDF Flexible Double Arm Fiber Illumination Unit.

**Tap holes for attaching accessories**

**5.5 P-SXY64 XY Stage**

This stage shifts the glass plate in the X and Y directions when the X/Y shift knobs are turned. Attach this stage instead of the base or the stage plate on the stand. The glass plate measures 215 mm x 154 mm x 5 mm and is detachable.

A 45-mm dia. filter can be slotted into the optical-path hole on the lower board of the stage.

[Compatible bases and stand]

- P2-PB Plain Base
- P2-DBL LED Diascopic Illumination Base
- P2-DBF Fiber Diascopic Illumination Base
- P-PS32 Plain Stand  
(The movement of the stroke in the Y direction is restricted.)

■ **XY stroke of the stage with the X/Y shift knob and stroke per rotation of the knob**

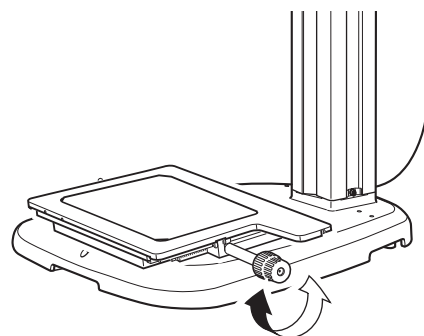
X: 150 mm; 37.5 mm per rotation  
Y: 100 mm; 24.1 mm per rotation

■ **Load weight**

5 kg or less

■ **Applicable range of diascopic illumination (bright field/ OCC)**

150 x 100 mm travel range (Shading may occur in diascopic illumination or OCC illumination in the low zoom magnification range.)

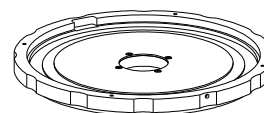


**Shift using the P-SXY64 XY Stage**

**5.6 C-SSL DIA Sliding Stage**

This stage enables fine movement of a sample when its side is pushed.

Remove the stage plate of the base and attach it to the upper surface of the sliding stage. Then, mount the sliding stage to the base.



**C-SSL DIA Sliding Stage**

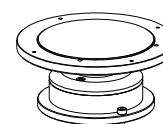
[Compatible bases]

- P2-PB Plain Base
- P2-DBL LED Diascopic Illumination Base
- P2-DBF Fiber Diascopic Illumination Base
- P-PS32 Plain Stand

**5.7 C-TRS Tilting Stage**

This stage enables tilt observation of samples. Attach the stage to the base or stand.

For details about usage, refer to the instruction manual for the C-TRS Tilting Stage.



**C-TRS Tilting Stage**

[Compatible bases and stand]

- P2-PB Plain Base
- P2-DBL LED Diascopic Illumination Base
- P2-DBF Fiber Diascopic Illumination Base
- P-PS32 Plain Stand

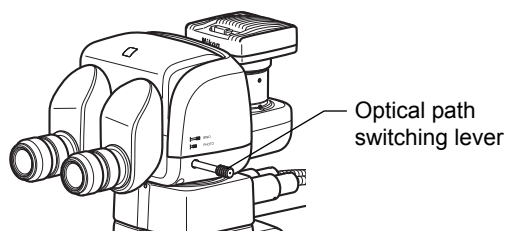


**6 Tubes**

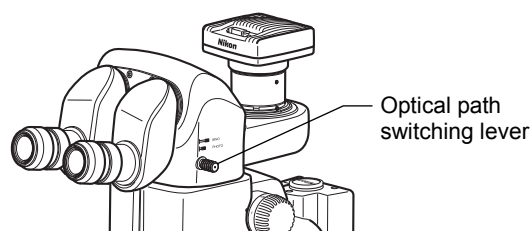
This microscope system can be used with the tubes listed in the table below.

Attach the 10x, 15x, 20x, or 30x eyepiece to the binocular sleeve. Then, attach a camera such as a DS camera head to the vertical tube using an adapter.

The tube is equipped with the optical path switching lever. This allows the optical path to be switched during observation using the eyepiece and capture images using the DS camera. The distribution ratio of the light amount depends on the tube type.



**P2-TERG 100/ P2-TERG 50 Trinocular Tilting Tube**



**P2-TL100 Trinocular Tube L**

**Distribution of light with optical path switching (%)**

Tube	Lever position	Binocular part		Vertical tube*
		Left	Right	
P2-TERG 100 Trinocular Tilting Tube	Pulled out	100	100	0
	Pushed in	100	0	100
P2-TERG 50 Trinocular Tilting Tube	Pulled out	100	100	0
	Pushed in	100	50	50
P2-TL100 Trinocular Tube L	Pulled out	100	100	0
	Pushed in	100	0	100

\* The light amount of the left eye is always 100%. The light from the optical path of the right eye is diverged to the vertical tube. (An image in the right eye's optical path is captured.)

**6.1 P2-TERG 100/ P2-TERG 50 Trinocular Tilting Tube**

This is an ergonomic tube that enables the angle of depression to be adjusted.

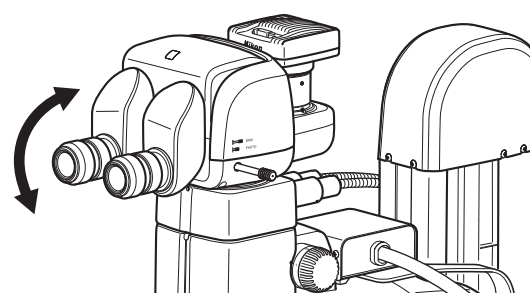
The angle can be continuously changed by moving the binocular part as indicated by the arrow in the figure.

Adjust the angle to facilitate microscopy.

The eye level can be changed also by turning the binocular part 180°.

Angle of depression: 0 to 30° (continuously variable)

For the division of the light amount with the optical path switching lever, see the table above.



**Adjusting the angle of depression**

**Notes on adjusting the angle of depression**

- Do not apply excessive force to the binocular part during depression angle adjustment. It may cause unexpected failure or malfunction.
- When moving the binocular part, be careful not to catch your fingers in the rotary section at the bottom of the binocular part.

**6.2 P2-TL100 Trinocular Tube L**

Angle of depression: 10°

For the distribution ratio of the light amount with the optical path switching lever, see the table above.

## 7 Episcopic Illuminator

The illuminators which can be used for this microscope system include a coaxial episcopic illuminator, which is attached between the zooming body and tube, a ring fiber illuminator, which is attached to the tip of the objective, and an illuminator that has a flexible fiber for adjusting the illumination direction.

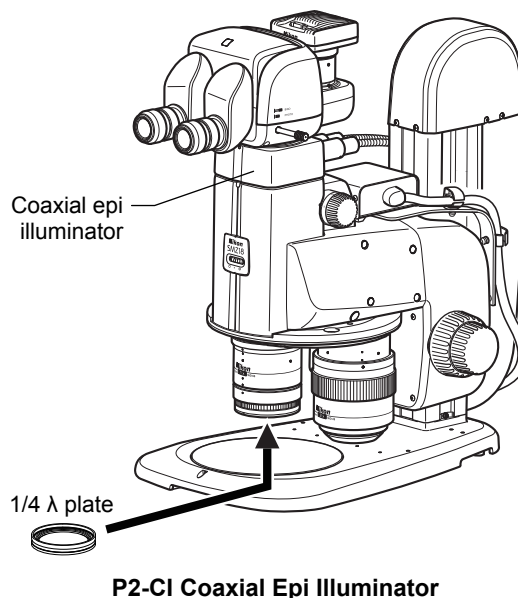
### 7.1 P2-CI Coaxial Epi Illuminator

Attach this illuminator to the position between the zooming body and the tube. The C-FLED2 LED Light Source for Fiber Illuminator is used as its light source. The light from the light source is led into the device by the two-branch fiber and episcopic illumination is generated along the optical axis. This illuminator is suitable for observing mirror-like samples.

A  $1/4 \lambda$  plate is supplied with the illuminator to prevent flare at the imaging system due to light reflected in the optical system. Attach the plate to the tip of the 0.5x or 1x objective.

Before attaching the plate, remove the protection ring from the tip of the 0.5x objective, and remove the correction ring from the tip of the 1x objective.

The brightest illumination is generated when the while-circle indicator is at the front. Select a position that has the optimum brightness and contrast for observation.



**P2-CI Coaxial Epi Illuminator**

#### ! Usage restriction

The type of objectives used for the coaxial epi illuminator and the recommended zoom magnification are shown below.

#### Compatible objectives and recommended zoom magnification

Objective	Zoom magnification	
	SMZ18 Zooming Body	SMZ25 Zooming Body
P2-SHR Plan Apo 0.5X	3.8x -	2.5x -
P2-SHR Plan Apo 1X	4x -	4x -
P2-SHR Plan Apo 1.6X	Unusable	Unusable
P2-SHR Plan Apo 2X	Unusable	Unusable

\* Shading or vignetting may occur in the low zoom magnification range.

For details about using the light source, refer to the instruction manual for the light source.

7.2

**C-FDF Flexible Double Arm Fiber Illumination Unit**

This illuminator is a fiber connected to the C-FLED2 LED Light Source for Fiber Illuminator for illuminating samples.

Two fibers are held by the C-FIDH Fiber Holder. The orientation of the holder's arm can be adjusted so that the tips of the fibers face the samples for illumination. For details about using the fiber holder, see the "■ C-FIDH Fiber Holder" on the next page.

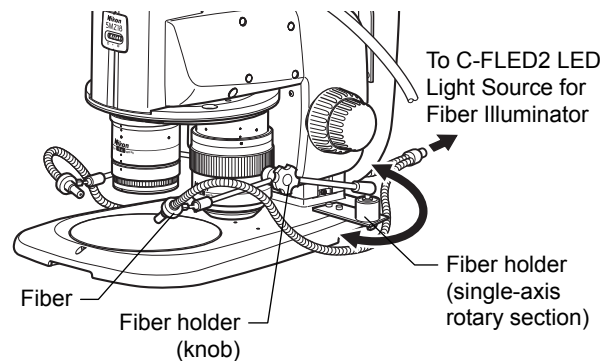
**! Important notes on handling the fibers**

Do not excessively bend the fibers or apply excess force to the fibers. Doing so may damage the fibers.

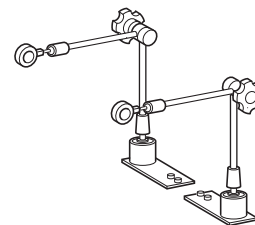
For details about using the light source, refer to the instruction manual for the light source.

**■ C-FIDH Fiber Holder**

It holds the tip of the flexible double-arm fiber. Mount the base of the holder to the base (stand) of the microscope system. It holds the tips of the fibers with the two arms coming from the holder's base. The arms can be freely positioned in any direction. The positions of the arms can be firmly locked by tightening the knobs at the joints of the arms. The arms are connected with a mechanism that enables the arms to be freely swung centered around a single axis (Z axis). This allows the arms to be pushed aside without having to unlock the arm joints. After that, if the arm position is returned by the rotation of the single axis, the arm will stop at the position that was locked first.



**C-FDF Flexible Double Arm Fiber illumination Unit**



**C-FIDH Fiber Holder**

7.3

**P2-FIR Ring Fiber Illumination Unit**

This illuminator is connected to the C-FLED2 LED Light Source for Fiber Illuminator. Attach the ring-shaped fiber illumination to the outer periphery of the objective in order to illuminate samples. The edge face of the sample can be illuminated evenly using this ring-shaped fiber.

**! Usage restriction**

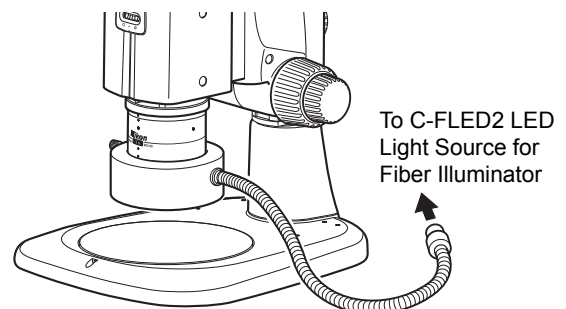
The following two objectives can be used with the P2-FIR Ring Fiber Illumination Unit:

- P2-SHR Plan Apo 0.5X
- P2-SHR Plan Apo 1X

**! Important notes on handling the fibers**

Do not excessively bend the fibers or apply excess force to the fibers. Doing so may damage the fibers.

For details about using of the light source, refer to the instruction manual for the light source.



**P2-FIR Ring Fiber Illumination Unit**

7.4

**P2-FIRL LED Ring Illumination Unit**

The ring illumination part is attached to the outer periphery in order to illuminate samples.

For details, refer to the instruction manual for the P2-FIRL LED Ring Illumination Unit.

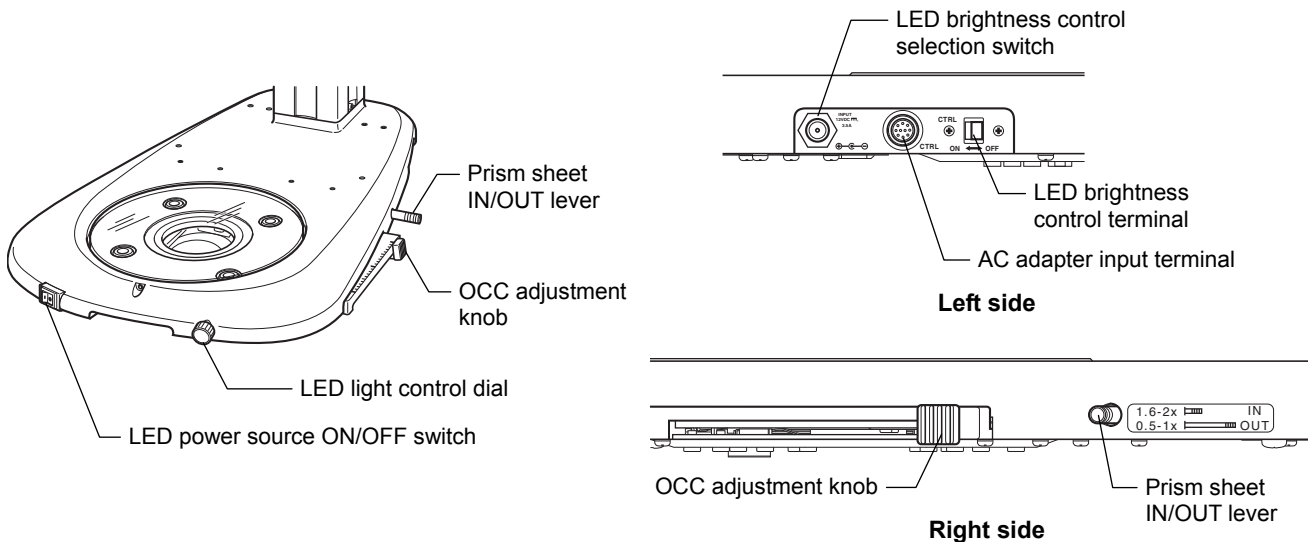
## 8

## Diascopic Illuminator

The primary diascopic illuminator for this microscope system consists of an illumination base equipped with an illuminating optical system. A dark-field illuminator and polarizing illuminator are also available.

## 8.1

## P2-DBL LED Diascopic Illumination Base



## P2-DBL LED Diascopic Illumination Base

This illumination base contains an optical system for diascopic illumination. Since the base supports OCC illumination, high-contrast observation of transparent samples is enabled.

The control box supplies the power for illumination control if the control box is connected. Otherwise, a 12 V AC adapter must be connected.

To turn on illumination, move the LED power ON/OFF switch on the front of the base to the “I” (ON) position. Use the LED brightness control dial to adjust the brightness. Turn the LED brightness control dial clockwise to increase the brightness as needed.

If the control box is connected, LED On/Off, brightness control, and light intensity monitoring are possible using the control box by assigning the illumination control right to the control box. Use the brightness control selection switch on the base to assign the control right to the base or to the control box.

- Brightness control selection switch Off: Assigns the control right to the base.
- Brightness control selection switch On: Assigns the control right to the control box.

The stage plate of the base is large (180 mm dia.) and made of transparent glass to enable more efficient work and easier observation of samples in containers such as petri dishes. The base has three indents for holding the base: front of the base's top board and on the right and left rear.

The stage plate can be replaced with a stage having an X/Y shift knob or a sliding stage. It is also possible to attach other devices such as a fiber illuminator or diascopic polarizing device to expand the base's functions.

#### ■ OCC (oblique coherent contrast) illumination

The LED diascopic illumination base supports OCC illumination. OCC illumination is an oblique illumination method for observing the phase objects, where a sample is illuminated with a coherent illuminating light obliquely by shielding a part of the optical path using a shading plate. By this illumination method, a colorless transparent sample can be observed with relief and contrast.

To adjust the OCC contrast, slide the OCC adjustment knob at the right front of the base back and forth. Adjust until the optimum observation state is obtained in combination with the selected magnification and phase amount of the sample. For ordinary bright-field microscopy under diascopic illumination, set the OCC adjustment control to either the farthest or closest position. Sliding the control gradually forward or backward from that position will cause the OCC effect to increase. Sliding the control by 46 mm will result in completely shielded status. Since adjustment in two directions is thus possible, the direction of the OCC contrast can be reversed.

In addition, since the adjustment control has a scale, the control position can be reproduced.

■ Prism sheet

The LED diascope illumination base contains a prism sheet to reduce shading. When using the 1.6x or 2x objective, push in the prism sheet IN/OUT lever. When using the 0.5x or 1x objective, pull out the lever.

**Compatible objectives and recommended zoom magnification**

Objective	Zoom magnification	
	Bright-field diascope illumination	OCC illumination
P2-SHR Plan Apo 0.5X	1.3x -	Contrast in the field of view is not uniform.
P2-SHR Plan Apo 1X	Entire area	5.0x-
P2-SHR Plan Apo 1.6X	Entire area	4.0x -
P2-SHR Plan Apo 2X	2.0x -	3.0x -

\* Shading may occur in the low zoom magnification range.

✔ **Increasing contrast of the OCC observation image**

For observations of the OCC observation image with higher contrast, remove the filter dropping ring (attached to the base optical path immediately under the grass plate). The contrast can be increased by removing the filter dropping ring that contains a diffuser plate to control excess contrast for OCC.

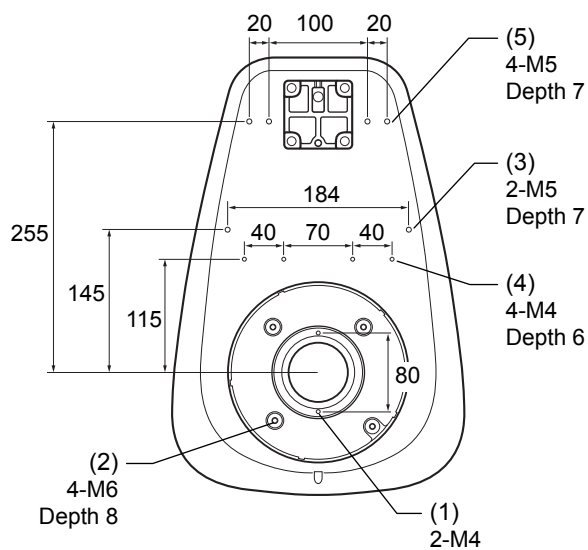
✔ **45-mm dia. filter**

A 45-mm dia. filter (no thicker than 5 mm) can be dropped onto the filter dropping ring (attached to the base optical path immediately under the grass plate).

✔ **Tap holes for attaching accessories**

The base's top board has tap holes for attaching various accessories. Tap holes (2) to (5) are not penetrating to prevent ingress of solution into the base.

- (1) 2-M4: Positioned under the stage plate attachment section of the base. Used for multiple purposes.
- (2) 4-M6: Positioned under the stage plate attachment section of the base. Used for attaching the P-DF LED Dark Field Unit.
- (3) 2-M5: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (4) 4-M4: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (5) 4-M5: Positioned at the rear on the top surface of the base. Used for attaching an accessory such as the C-FDF Flexible Double Arm Fiber Illumination Unit.



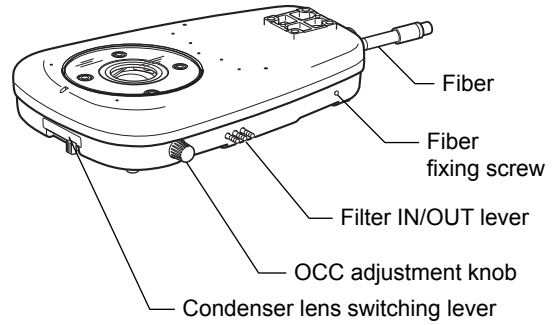
**Tap holes for attaching accessories**

**8.2 P2-DBF Fiber Diascopic Illumination Base**

This illumination base contains an optical system for episcopic illumination. Since the base supports OCC illumination, high-contrast observation of transparent samples is enabled. The C-FLED2 LED Light Source for Fiber Illuminator is used as the light source. The fiber should be connected to the rear side of the base. For details about using the light source, refer to the instruction manual for the light source.

The stage plate of the base is large (180 mm dia.) and made of transparent glass to enable more efficient work and easier observation of samples in containers such as petri dishes. The base has three indents for holding the base: front of the base's top board and on the right and left rear.

The stage plate can be replaced with a stage having an X/Y shift knob or a sliding stage. It is also possible to attach other devices such as a fiber illuminator or diascope polarizing device to expand the base's functions.



**P2-DBF Fiber Diascopic Illumination Base**

■ **OCC (oblique coherent contrast) illumination**

The fiber diascope illumination base supports OCC illumination. OCC illumination is an oblique illumination method for observing the phase objects, where a sample is illuminated with a coherent illuminating light obliquely by shielding a part of the optical path using a shading plate. By this illumination method, a colorless, transparent sample can be observed with relief and contrast.

To adjust the OCC contrast, turn the OCC adjustment knob. Adjust until the optimum observation state is obtained in combination with the selected magnification and phase amount of the sample. In addition, since the OCC adjustment knob has a scale, the position of the knob can be reproduced.

■ **Condenser lens**

The base contains condenser lenses for low/high-magnification microscopy. Switch the condenser lens based on the objective being used to ensure uniform diascope illumination. A wide range of observation magnifications are supported. To switch the condenser lens, slide the condenser lens switching lever to the right or left.

Slide the lens switching lever to the right: For low magnification; objective lens 0.5x to 1x

Slide the lens switching lever to the left: For high magnification; objective lens 1.6x to 2x

When the condenser lens is switched, the built-in prism sheet is automatically switched and the shading adjusted.

**Compatible objectives and recommended zoom magnification**

Objective	Zoom magnification	
	Bright-field diascope illumination	OCC illumination
P2-SHR Plan Apo 0.5X plus condenser lens for low magnification	1.5x -	4.5x -
P2-SHR Plan Apo 01X plus condenser lens for low magnification	Entire area	4.0x -
P2-SHR Plan Apo 1.6X plus condenser lens for high magnification	Entire area	4.0x -
P2-SHR Plan Apo 2X plus condenser lens for high magnification	2.0x -	6.0x-

\* Shading may occur in the low zoom magnification range.

■ **Filter**

The base has three different filters: NCB11, ND4, and ND16. The individual filters can be inserted into and removed from the optical path separately. To insert a filter into the optical path, push in the filter IN/OUT lever.

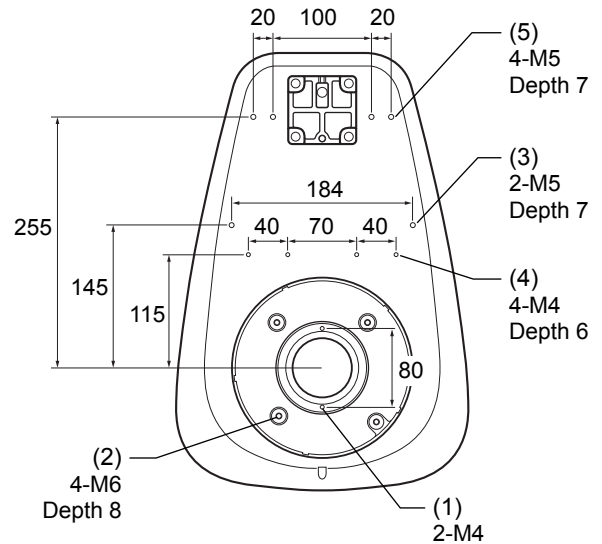
✔ **45-mm dia. filter**

A 45-mm dia. filter (no thicker than 2 mm) can be dropped onto the filter dropping ring (attached to the base optical path immediately under the glass plate).

✔ **Tap holes for attaching accessories**

The base's top board has tap holes for attaching various accessories. Tap holes (2) to (5) are not penetrating to prevent ingress of solution into the base.

- (1) 2-M4: Positioned under the stage plate attachment section of the base. Used for multiple purposes.
- (2) 4-M6: Positioned under the stage plate attachment section of the base. Used for attaching the P-SXY64 XY Stage.
- (3) 2-M5: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (4) 4-M4: Positioned at the center on the top surface of the base. Used for multiple purposes.
- (5) 4-M5: Positioned at the rear on the top surface of the base. Used for attaching an accessory such as the C-FDF Flexible Double Arm Fiber Illumination Unit.



**Tap holes for attaching accessories**

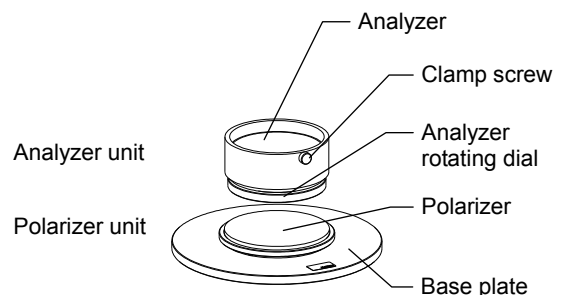
**8.3 P-DF LED Dark Field Unit**

This dark-field illumination unit has LEDs that are tilted and positioned like a ring. The unit is attached to the base of the microscope. For details, refer to the instruction manual for the P-DF LED Dark Field Unit.

**8.4 P2-POL Simple Polarizing Attachment**

This is a simple polarizing device that consists of a polarizer unit and analyzer unit.

First remove the stage glass from the diascope illumination base. Attach the base plate of the polarizer unit, orient the polarizer as required, and then set the 90 mm dia-stage glass supplied with the device. The stage glass can be rotated. Attach the analyzer to the tip of the objective and tighten the clamp screw to stabilize it. To turn the analyzer, turn the knurled ring at the tip of the objective. The polarizer and analyzer have indicators which show the orientation of the polarizing plate.



**P2-POL Simple Polarizing Attachment**

✔ **Directly placing the polarizer**

When the LED diascope illumination base is in use, the polarizer can be removed from the polarizer attachment and can be individually attached to the diascope illumination base. Fit it under the stage plate of the diascope illumination base. The stage plate can be used as is.

⚠ **Usage restriction**

Objectives P2-SHR Plan Apo 1.6x and 2x are not compatible.  
 The objective P2-SHR Plan Apo 1x covers the entire zoom area.  
 The objective P2-SHR Plan Apo 0.5x covers a 1x or larger zoom area.

## 9

## Epi-Fluorescence Attachment

The microscope system can be used with the status detection model P2-EFLI Epi Fluorescence Attachment and Motorized P2-EFLM Epi Fluorescence Attachment.

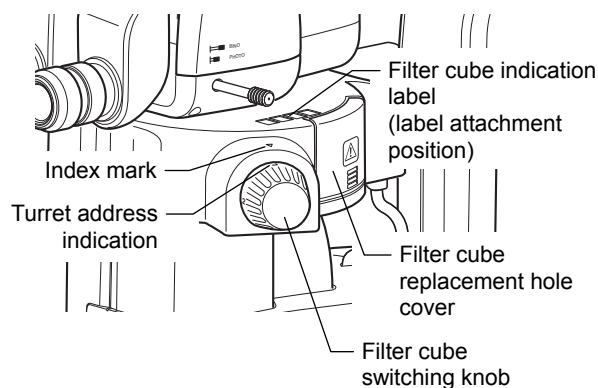
## 9.1

## P2-EFLI Epi Fluorescence Attachment

This illuminator is attached between the zooming body and tube. A HG precentered fiber illuminator is used as the light source. The light coming from the light source is led into the device by the HG fiber and then passed through the filter cube attached to the internal turret for epi-fl illumination.

The turret can be attached with up to four filter cubes; the addresses of the attachment positions are FL1 to FL4. For the attachable filter cube types, those for fluorescence, bright-field, and empty are available. Turn the filter cube switching knob to assign to the indicator the turret address (FL1 to FL4) of the filter cube to be placed into the optical path.

For systems where a control box has been connected, the information about the turret address on the optical path is sent to the control box via a motorized focus unit or relay box, and then transmitted to the DS-L3 DS Camera Control Unit and personal computer.



**P2-EFLI Epi Fluorescence Attachment**

**⚠ CAUTION**

- Do not use the epi-fluorescence attachment while the filter cube replacement cover is open. Harmful light including ultraviolet light may leak and affect fluorescence observation.
- Immediately after diascope observation using an epi-fluorescence attachment, the front face of the empty cube may become hot, resulting in burns. Do not touch the front face of the empty cube. Replace the empty cube several minutes after finishing the diascope observation.

**ⓘ Be sure to attach four cubes to the turret.**

Attach an empty cube to the position to which no filter cube is attached.

■ **Filter cube**

- P2-EFL GFP-B, P2-EFL GFP-L, and P2-EFL RFP Filter Cubes: Used for fluorescence observation with a given wavelength.
- P2-EFLC Filter Cube: Used for fluorescence observation with an arbitrary wavelength when combined with arbitrary filters, for example.
- P2-EFLBF Filter Cube (Bright Field): Used for bright-field episcopic observation.
- Empty cube (Three cubes are supplied with an epi-fluorescence attachment): Used when performing diascope illumination observation using the epi-fluorescence attachment.

✔ **Light shielding plate**

The device is equipped with a light shielding plate for preventing the reflection of ultraviolet light. Use the light shielding plate when performing fluorescence microscopy. When in use, the light shielding plate can be pushed aside to positions up to 45° horizontally to the rear. When not in use, the plate can be pushed aside to positions up to 170°.



✔ **Bright-field episcopic observation**

This is useful for observing the entire image of the opaque specimen during fluorescence observation. Although the P2-EFLBF Filter Cube contains the UV blocking filter, adjust the brightness of the illuminator so that illumination is not too bright. When observing light reflected from the specimen with a mirror-like surface, the brightness on the right path differs from that on the left optical path. Also, duplicated images may be produced by internal half mirror.

✔ **OCC light shielding plate**

When using an epi-fluorescence attachment with a diascope illumination base, Nikon recommends closing the OCC light shielding plate on the dia-illumination completely. This can decrease background noise caused by intrinsic fluorescence in the diascope illuminator.

For details about using the light source, refer to the instruction manual for the light source.

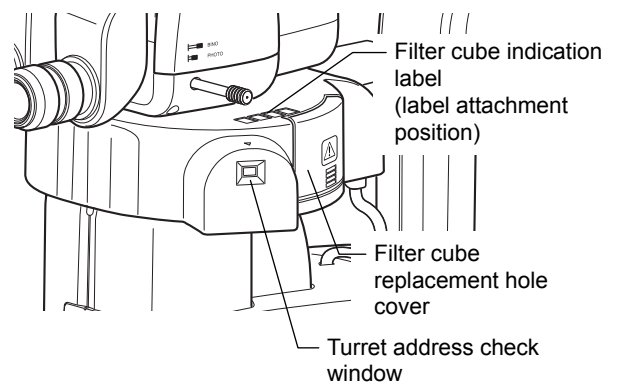
9.2

**P2-EFLM Motorized Epi Fluorescence Attachment**

The motorized epi-fluorescence illuminator is attached between the zooming body and tube. A HG precentered fiber illuminator is used as the light source. The light coming from the light source is led into the device by the HG fiber and then passed through the filter cube attached to the internal turret for epi-fl illumination.

The turret can be attached with up to four filter cubes; the addresses of the attachment positions are FL1 to FL4. For the attachable filter cube types, those for fluorescence, bright-field, and empty are available. On the remote control, press the filter cube switching buttons (FL1 to FL4) to specify the turret address of the filter cube to be placed into the optical path. The LED of the pressed button lights so that the turret address on the optical path can be identified. The attachment has a turret address check window on the right front so that the turret address on the optical path can be identified.

For systems where a control box has been connected, the information about the turret address on the optical path is sent to the control box via a motorized focus unit or relay box, and then transmitted to the DS-L3 DS Camera Control Unit and personal computer.



**P2-EFLM Motorized Epi Fluorescence Attachment**

**⚠ CAUTION**

- Do not use the epi-fluorescence attachment while the filter cube replacement cover is open. Harmful light including ultraviolet light may leak and affect fluorescence observation.
- Immediately after diascope observation using an epi-fluorescence attachment, the front face of the empty cube may become hot, resulting in burns. Do not touch the front face of the empty cube. Replace the empty cube several minutes after finishing the diascope observation.

**⚠ Be sure to attach four cubes to the turret.**

Attach an empty cube to the position to which no filter cube is attached.

### ■ Filter cube

- P2-EFL GFP-B, P2-EFL GFP-L, and P2-EFL RFP Filter Cubes: Used for fluorescence observation with a given wavelength.
- P2-EFLC Filter Cube: Used for fluorescence observation with an arbitrary wavelength when combined with arbitrary filters, for example.
- P2-EFLBF Filter Cube (Bright Field): Used for bright-field episcopic observation.
- Empty cube (Three cubes are supplied with an epi-fluorescence attachment): Used when performing diascope illumination observation using the epi-fluorescence attachment.

#### ✔ Light shielding plate

The device is equipped with a light shielding plate for preventing the reflection of ultraviolet light. Use the light shielding plate when performing fluorescence microscopy. When in use, the light shielding plate can be pushed aside to positions up to 45° horizontally to the rear. When not in use, the plate can be pushed aside to positions up to 170°.

#### ✔ Bright-field episcopic observation

This is useful for observing the entire image of the opaque specimen during fluorescence observation. Although the P2-EFLBF Filter Cube contains the UV blocking filter, adjust the brightness of the illuminator so that illumination is not too bright. When observing light reflected from the specimen with a mirror-like surface, the brightness on the right path differs from that on the left optical path. Also, duplicated images may be produced by internal half mirror.

#### ✔ OCC light shielding plate

When using an epi-fluorescence attachment with a diascope illumination base, Nikon recommends closing the OCC light shielding plate on the dia-illumination completely. This can decrease background noise caused by intrinsic fluorescence in the diascope illuminator.

For details about using the light source, refer to the instruction manual for the light source.

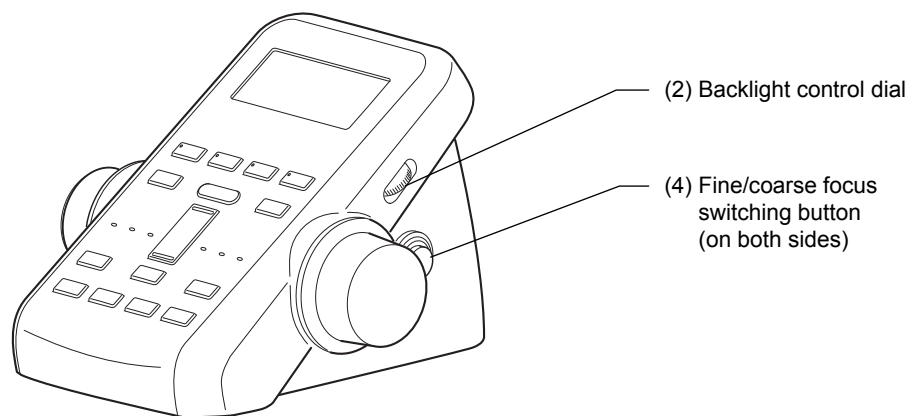
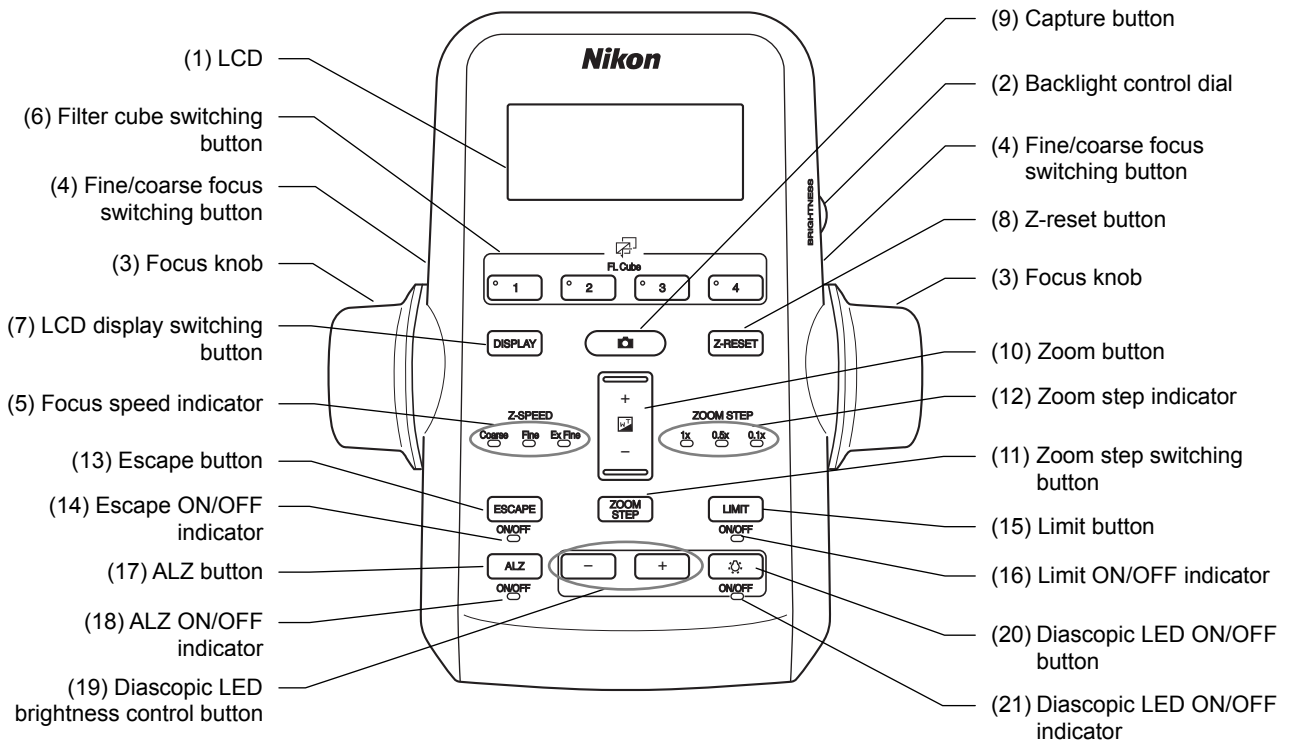
**10 Remote Control Device**

A remote controller, foot switch, and photo release are available as remote control devices of the microscope system.

**10.1 P2-RC Remote Controller**

The P2-RC Remote Controller is used mainly for focus and zoom operations.

The remote controller is attached to the REMOTE connector of the P2-CTLA Control Box.



Front Right Side

P2-RC Remote Controller

**■ Functions and indications of the operation buttons**

No.	Button/Indication	Function/Description
(1)	LCD	This 4 x 16 LCD displays magnification, filter cube names, and other information. (See “■ LCD indications.”)
(2)	Backlight control dial	Adjusts the backlight of the LCD. When turned fully clockwise, the LCD’s backlight and the LED’s are turned off.
(3)	Focus knob	Vertically moves the focus mount of the P2-MFU Motorized Focus Unit. Turn backward to move upward. Turn forward to move downward.
(4)	Fine/coarse focus switching button	Switches the focus speed. Each time the button is pressed, the speed is cyclically switched in order of coarse, fine, and extra fine.
(5)	Focus speed indicator	When the focus speed is changed, the corresponding indicator (Coarse/Fine/ExFine) lights.
(6)	Filter cube switching button	Turns the turret of the motorized epi fluorescence attachment. The filter cube of the address of the pressed button is brought into the optical path and the LED of the corresponding button (address on the optical path) lights.
(7)	LCD display switching button	Switches the display on the LCD. Two pages can be switched for display. (See “■ LCD indications.”)
(8)	Z-reset button	Resets the indication of the Z position (focus position) on the LCD to 0. Pressing at another position sets that position as 0.
(9)	Capture button	Captures images using a DS camera.
(10)	Zoom button	Changes the magnification of the zooming body. Pressing the upper button causes the magnification to increase. Pressing the lower button causes the magnification to decrease. Pressing and holding the button causes the magnification to change continuously.
(11)	Zoom step switching button	Switches the zoom step size in order of 1x, 0.5x, and 0.1x.
(12)	Zoom step indicator	When the zoom step size is changed, the corresponding LED (1x, 0.5x, and 0.1x) lights.
(13)	Escape button	Moves the vertical movement part upward by the preset distance so that it stays in position. The vertical movement is not possible in this escape status. Pressing the Escape button again causes the vertical movement part to return to the previous position. Pressing and holding the Escape button causes the vertical movement part to exit escape.  The travel distance can be newly set or changed using the setup tool or NIS-Elements.
(14)	Escape ON/OFF indicator	The LED lights when in escape status.
(15)	Limit button	When the limit button is pressed, the current position is set as the limit position so that the vertical movement part does not move down passing the limit point. Pressing the limit button again cancels the limit position setting.
(16)	Limit ON/OFF indicator	The LED lights when the limit position has been set.
(17)	ALZ button	Activates the ALZ function. To deactivate the ALZ function, press the button again. For the ALZ function, see “■ Useful zoom operation functions (ALZ function)” in “1.2 SMZ25 Zooming Body” in this chapter.
(18)	ALZ ON/OFF indicator	The LED lights when the ALZ function is activated.
(19)	Diascopic LED brightness control button	Changes the brightness of the diascopic LED illumination. Press [+] to increase the brightness and [-] to decrease the brightness.
(20)	Diascopic LED ON/OFF button	Turns diascopic LED illumination on and off.
(21)	Diascopic LED ON/OFF indicator	The LED lights when diascopic LED illumination is turned on.



No.	Operation Section	Function																																																			
(1)	Left foot pedal	<p><b>Left rear foot pedal (motorized focus unit Z-coordinate DOWN switch)</b></p> <ul style="list-style-type: none"> <li>• Drives the motorized focus unit downward.</li> <li>• When pressed, lowers the unit by 1.6 <math>\mu\text{m}</math>. Press and hold to move the unit continuously.</li> <li>• The speed changes based on the magnification and nosepiece address. (See the table below.)</li> <li>• If a nosepiece address has not been set, the unit moves at the maximum speed.</li> </ul> <p><b>Left front of the foot pedal (motorized focus unit Z-coordinate UP switch)</b></p> <ul style="list-style-type: none"> <li>• Drives the motorized focus unit upward.</li> <li>• When pressed, raises the unit by 1.6 <math>\mu\text{m}</math>. Press and hold to move the unit continuously.</li> <li>• The speed changes based on the magnification and nosepiece address. (See the table below.)</li> <li>• If a nosepiece address has not been set, the unit moves at the maximum speed.</li> </ul> <p style="text-align: center;"><b>Coarse</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2">Magnification</td> <td>SMZ25</td> <td>0.63 to 5.0</td> <td>5.1 to 10.0</td> <td>10.1 to 15.75</td> </tr> <tr> <td>SMZ18</td> <td>0.75 to 4.0</td> <td>4.1 to 8.0</td> <td>8.1 to 13.5</td> </tr> <tr> <td rowspan="2">Nosepiece address</td> <td>1</td> <td colspan="3" rowspan="2" style="text-align: center;">10 (mm/second)</td> </tr> <tr> <td>2</td> </tr> </table> <p style="text-align: center;"><b>Fine</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2">Magnification</td> <td>SMZ25</td> <td>0.63 to 5.0</td> <td>5.1 to 10.0</td> <td>10.1 to 15.75</td> </tr> <tr> <td>SMZ18</td> <td>0.75 to 4.0</td> <td>4.1 to 8.0</td> <td>8.1 to 13.5</td> </tr> <tr> <td rowspan="2">Nosepiece address</td> <td>1</td> <td>5 (mm/second)</td> <td>4 (mm/second)</td> <td>2 (mm/second)</td> </tr> <tr> <td>2</td> <td>2 (mm/second)</td> <td>1 (mm/second)</td> <td>0.5 (mm/second)</td> </tr> </table> <p style="text-align: center;"><b>Extra fine</b></p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td rowspan="2">Magnification</td> <td>SMZ25</td> <td>0.63 to 5.0</td> <td>5.1 to 10.0</td> <td>10.1 to 15.75</td> </tr> <tr> <td>SMZ18</td> <td>0.75 to 4.0</td> <td>4.1 to 8.0</td> <td>8.1 to 13.5</td> </tr> <tr> <td rowspan="2">Nosepiece address</td> <td>1</td> <td>0.5 (mm/second)</td> <td>0.4 (mm/second)</td> <td>0.2 (mm/second)</td> </tr> <tr> <td>2</td> <td>0.2 (mm/second)</td> <td>0.1 (mm/second)</td> <td>0.05 (mm/second)</td> </tr> </table>	Magnification	SMZ25	0.63 to 5.0	5.1 to 10.0	10.1 to 15.75	SMZ18	0.75 to 4.0	4.1 to 8.0	8.1 to 13.5	Nosepiece address	1	10 (mm/second)			2	Magnification	SMZ25	0.63 to 5.0	5.1 to 10.0	10.1 to 15.75	SMZ18	0.75 to 4.0	4.1 to 8.0	8.1 to 13.5	Nosepiece address	1	5 (mm/second)	4 (mm/second)	2 (mm/second)	2	2 (mm/second)	1 (mm/second)	0.5 (mm/second)	Magnification	SMZ25	0.63 to 5.0	5.1 to 10.0	10.1 to 15.75	SMZ18	0.75 to 4.0	4.1 to 8.0	8.1 to 13.5	Nosepiece address	1	0.5 (mm/second)	0.4 (mm/second)	0.2 (mm/second)	2	0.2 (mm/second)	0.1 (mm/second)	0.05 (mm/second)
Magnification	SMZ25	0.63 to 5.0		5.1 to 10.0	10.1 to 15.75																																																
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	2																																																				
Magnification	SMZ25	0.63 to 5.0	5.1 to 10.0	10.1 to 15.75																																																	
	SMZ18	0.75 to 4.0	4.1 to 8.0	8.1 to 13.5																																																	
Nosepiece address	1	5 (mm/second)	4 (mm/second)	2 (mm/second)																																																	
	2	2 (mm/second)	1 (mm/second)	0.5 (mm/second)																																																	
Magnification	SMZ25	0.63 to 5.0	5.1 to 10.0	10.1 to 15.75																																																	
	SMZ18	0.75 to 4.0	4.1 to 8.0	8.1 to 13.5																																																	
Nosepiece address	1	0.5 (mm/second)	0.4 (mm/second)	0.2 (mm/second)																																																	
	2	0.2 (mm/second)	0.1 (mm/second)	0.05 (mm/second)																																																	
(2)	Right foot pedal	<p><b>Right rear of the foot pedal (motorized magnification UP switch)</b></p> <ul style="list-style-type: none"> <li>• Increases the magnification by one step. The step size depends on the zoom step size setting.</li> <li>• Press and hold to increase the magnification continuously.</li> <li>• The zoom step size depends on the setting of the zoom step switching button on the remote controller.</li> </ul> <p><b>Right front of the foot pedal (motorized magnification DOWN switch)</b></p> <ul style="list-style-type: none"> <li>• Decreases the magnification by one step. The step size depends on the zoom step size setting.</li> <li>• Press and hold to decrease the magnification continuously.</li> <li>• The zoom step size depends on the setting of the zoom step switching button on the remote controller.</li> </ul>																																																			
(3)	Foot rest	Used as a foot rest.																																																			
(4)	CTRL connector	Attach to the FOOT connector of the P2-CTLA Control Box using the supplied cable.																																																			
(5)	PHOTO connector	Connect the AZ-PCR Photo Release. (See "10.3 AZ-PCR Photo Release" in this chapter.)																																																			

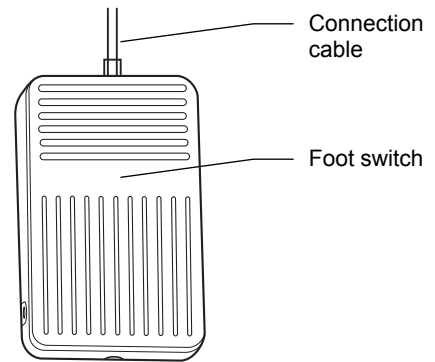
10.3

**AZ-PCR Photo Release**

The AZ-PCR Photo Release is a foot switch for capturing images using the camera connected to the microscope.

The photo release is connected to the PHOTO connector of the AZ-FSW Foot Switch.

For operations using a DS camera control unit such as the DS-L3 after a DS camera head has been attached to the microscope, connect the DS camera control unit to the P2-CTLA Control Box (USB connection). Next, connect the photo release to the AZ-FSW Foot Switch connected to the control box. The camera can then capture images simply by stepping on the pedal of the photo release.



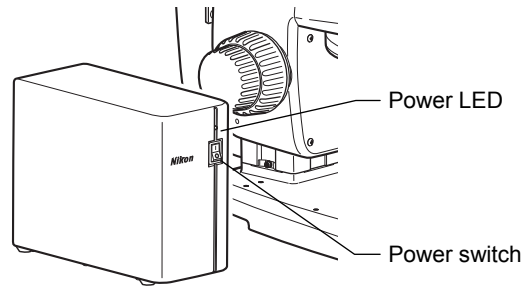
**AZ-PCR Photo Release**

11

Control/Communications Device and Relay Device

11.1

P2-CTLB Control Box



P2-CTLB Control Box

When electrically connected to the following devices, the P2-CTLB Control Box can detect the device states and handle communications:

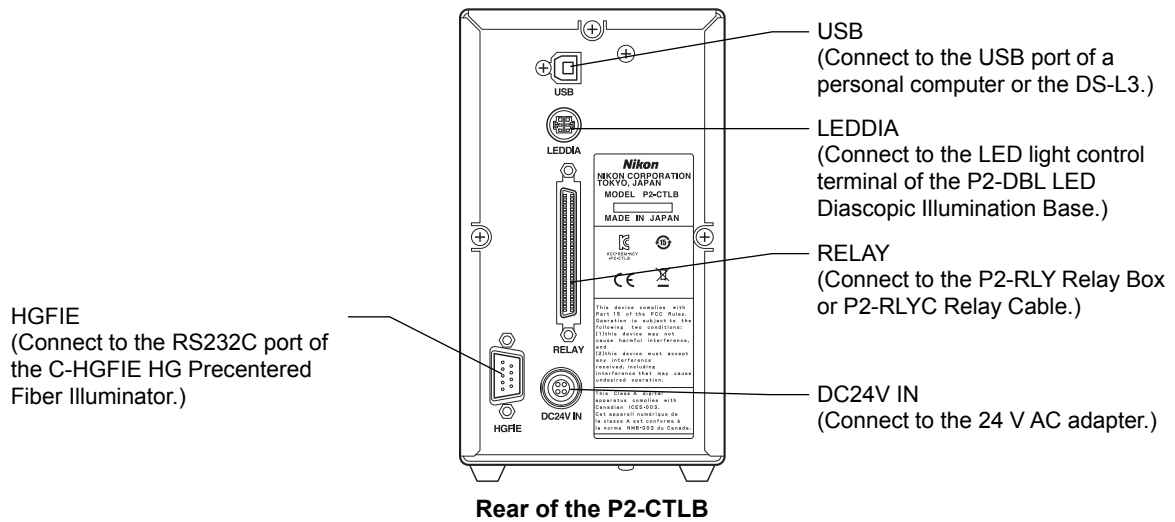
No.	Device	Operation
(1)	SMZ18 Zooming Body	Detects the magnification.
(2)	P2-DBL LED Diascopic Illumination Base	Turns On/Off the LED illumination, controls the illumination, and monitors the light intensity.
(3)	P2-RLY Relay Box	Relays communications.
(4)	P2-EFLI Epi Fluorescence Attachment	Detects the turret address on the optical path.
(5)	P2-RNI2 Intelligent Nosepiece	Detects the nosepiece address on the optical path.
(6)	C-HGFIE HG Precentered Fiber Illuminator	Switches the ND filter and opens/closes the shutter.
(7)	C-HGFIE HG Precentered Fiber Illuminator	Communications
(8-1)	DS-L3 DS Camera Control Unit plus DS camera	Communications
(8-2)	Personal computer plus DS-U3 DS Camera Control Unit plus DS camera	Communications
(9)	AC adapter	24 V power input

- The power supply for control provides power for the board in the control box and devices (1) to (5).
- Devices (1), (4), and (5) are connected through device (3).
- One type-B USB connector is equipped so that device (8-1) or (8-2) can be connected. Note that both devices cannot be connected at the same time.
- To operate using a personal computer after connecting device (8-1), connect the USB cable from the personal computer to device (8-1).
- Communications with device (7) are handled through a RS232C connection. Communications with device (8-1) or (8-2) are handled through a USB connection.

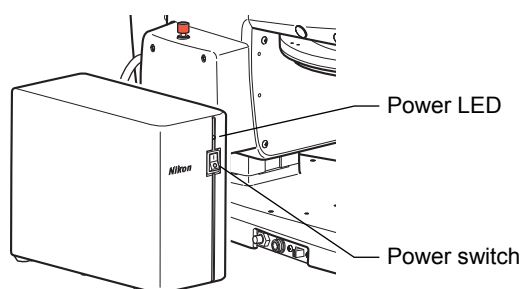


■ Connector names and connection destinations

The figure below shows the connectors on the rear of the control box and the connection destinations:



For the power cable connected to the AC adapter, use the one specified in Chapter 8, "2 Performance Properties."



P2-CTLA Control Box

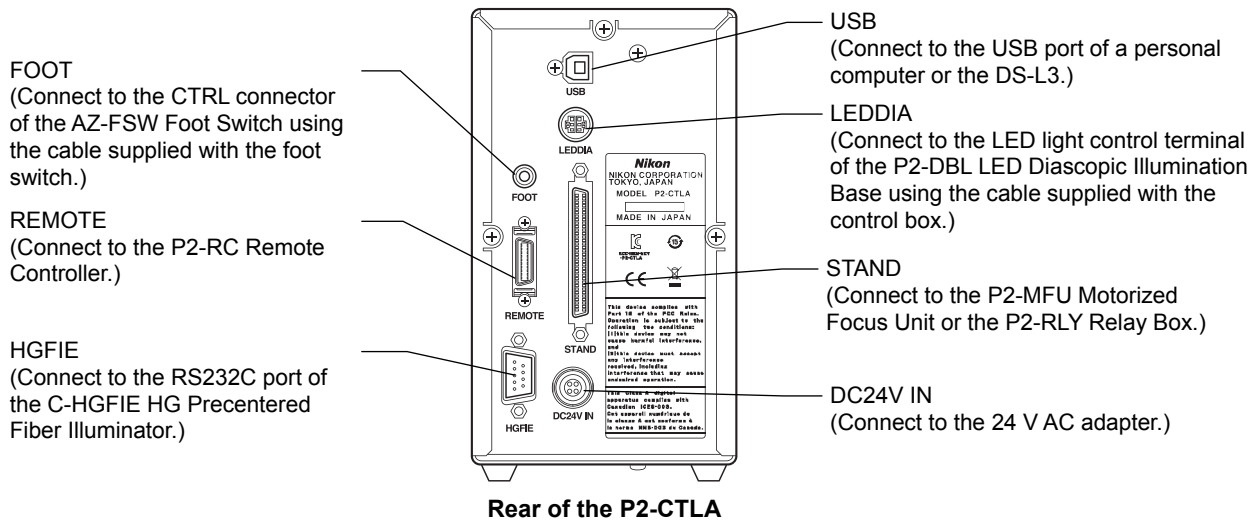
When electrically connected to the following devices, the P2-CTLA Control Box can perform motorized control of the devices, detect the device states, and handle communications:

No.	Device	Operation
(1)	SMZ25 Zooming body	Motorized control of magnification
(2)	SMZ18 Zooming body	Detects the magnification.
(3)	P2-MFU Motorized Focus Unit	Motorized control of focus
(4)	P2-DBL LED Diascopic Illumination Base	Turns On/Off the LED illumination, controls the illumination, and monitors the light intensity.
(5)	P2-RLY Relay Box	Relays communications.
(6)	P2-EFLM Motorized Epi Fluorescence Attachment	Motorized control of turret rotation
(7)	P2-EFLI Epi Fluorescence Attachment	Detects the turret address on the optical path.
(8)	P2-RNI2 Intelligent Nosepiece	Detects the nosepiece address on the optical path.
(9)	P2-RC Remote Controller	Communications
(10)	AZ-FSW Foot Switch	Detects the switch states, moves the P2-MFU Motorized Focus Unit vertically, and adjust the magnification of the SMZ25 Zooming Body.
(11)	AZ-PCR Photo Release	Detects the switch states and captures images.
(12)	C-HGFIE HG Precentered Fiber Illuminator	Switches the ND filter and opens/closes the shutter.
(13)	C-HGFIE HG Precentered Fiber Illuminator	Communications
(14-1)	DS-L3 DS Camera Control Unit plus DS camera	Communications
(14-2)	Personal computer plus DS-U3 DS Camera Control Unit plus DS camera	Communications
(15)	AC adapter	24 V power input

- The power supply for control provides power for the board in the control box and devices (1) to (11).
- Devices (1), (2), (6), (7), and (8) are connected through device (3) or (5).
- One type-B USB connector is equipped so that device (14-1) or (14-2) can be connected. Note that both devices cannot be connected at the same time.
- To operate using a personal computer after connecting device (14-1), connect the USB cable from the personal computer to device (14-1).
- Communications with device (9) are handled through serial communications, communications with device (13) are handled through a RS232C connection, and communications with device (14-1) or (14-2) are handled through a USB connection.

■ Connector names and connection destinations

The figure below shows the connectors on the rear of the control box and the connection destinations:

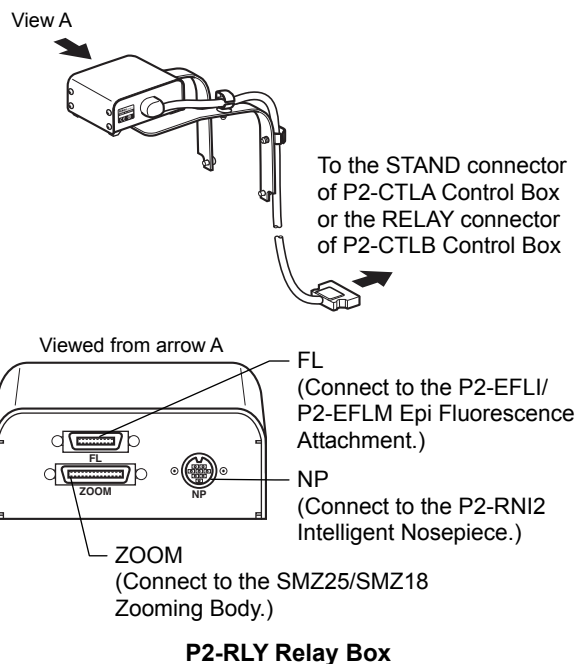


Use the power cable specified in Chapter 8, "2 Performance Properties."

**11.3 P2-RLY Relay Box**

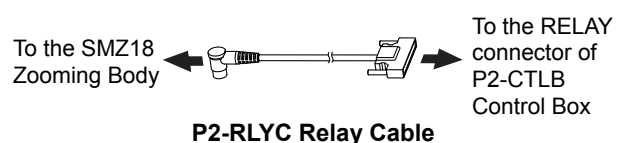
When electrically connected to the following devices, the P2-RLY Relay Box can relay signals for motorized control of the devices and detect the device states:

- (1) P2-CTLA Control Box
  - (2) P2-CTLB Control Box
  - (3) SMZ25 Zooming Body
  - (4) SMZ18 Zooming Body
  - (5) P2-EFLM Motorized Epi Fluorescence Attachment
  - (6) P2-EFLI Epi Fluorescence Attachment
  - (7) P2-RNI2 Intelligent Nosepiece
- The drive signals of devices (3) and (5) are relayed through device (1) or (2). For devices (4), (6), and (7), address information signals are relayed.



**11.4 P2-RLYC Relay Cable**

For systems where the P2-RLY Relay Box has not been connected, the P2-RLYC Relay Cable is used to connect the SMZ18 Zooming Body to the RELAY connector of the P2-CTLB Control Box. This enables the status detection signals to be relayed.



☆☆☆


## Chapter

# 5

# Assembling

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This chapter contains the SMZ18/SMZ25 system configuration diagrams and lists of the system components, and explains how to assemble the systems.

Before starting assembling, read the appropriate notes such as  CAUTION “11 Cautions on assembling and installing the product” at the beginning of this instruction manual and “3 Installation location” in “Notes on Handling the Product” in this instruction manual.

 **CAUTION** When moving or carrying the system

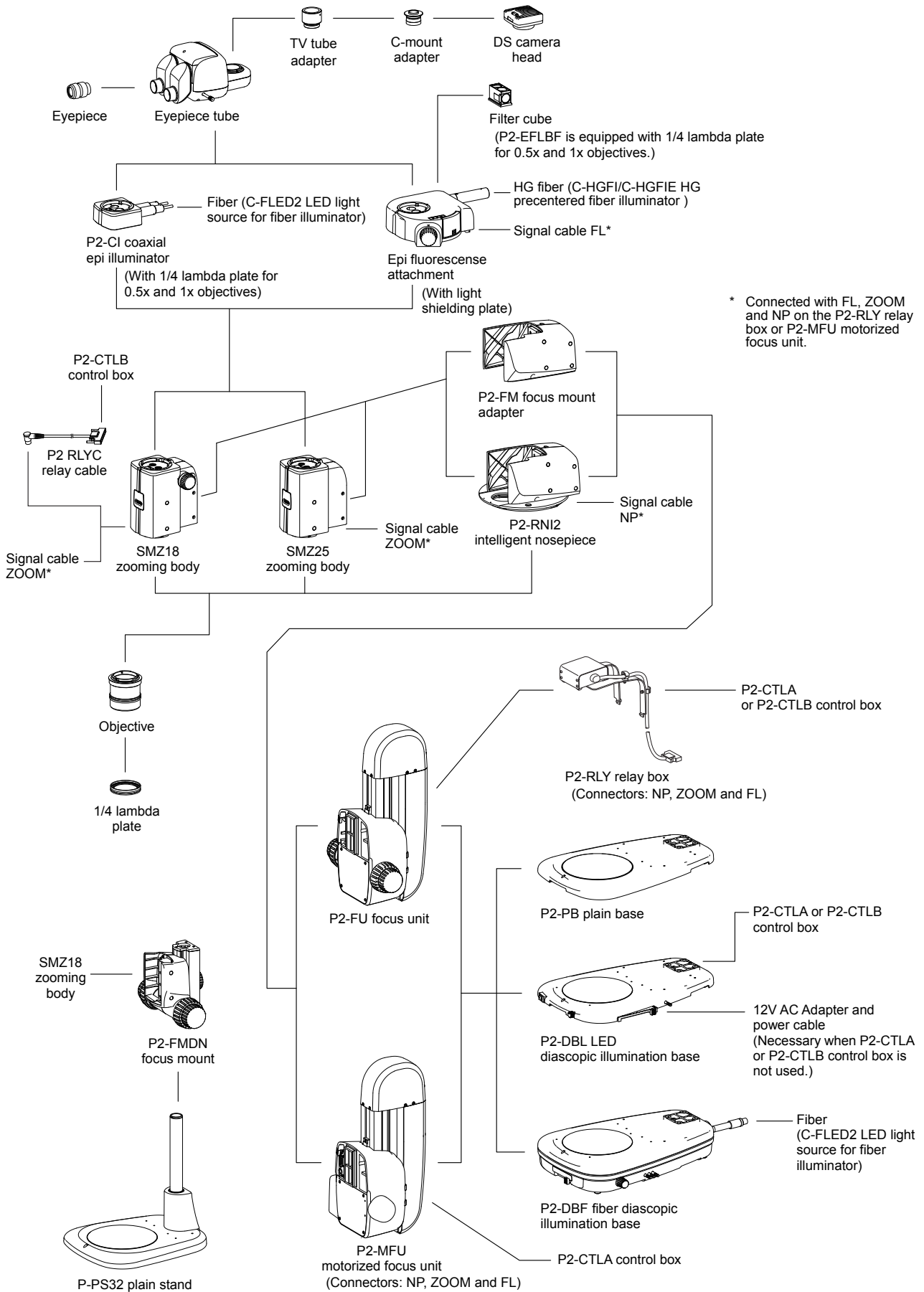
The SMZ18/SMZ25 system weighs over 20 kg in total.

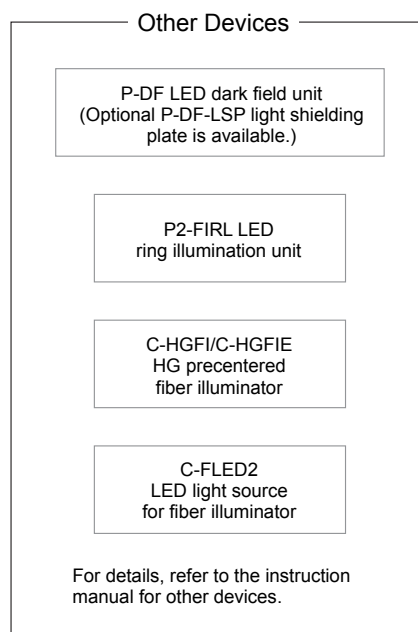
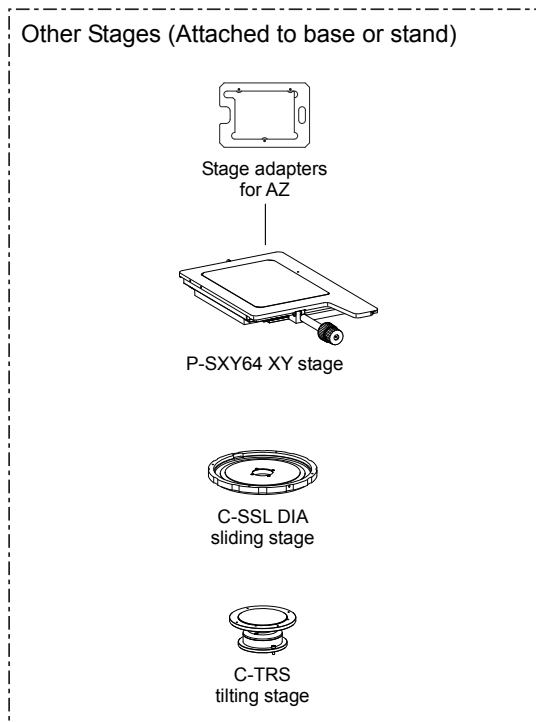
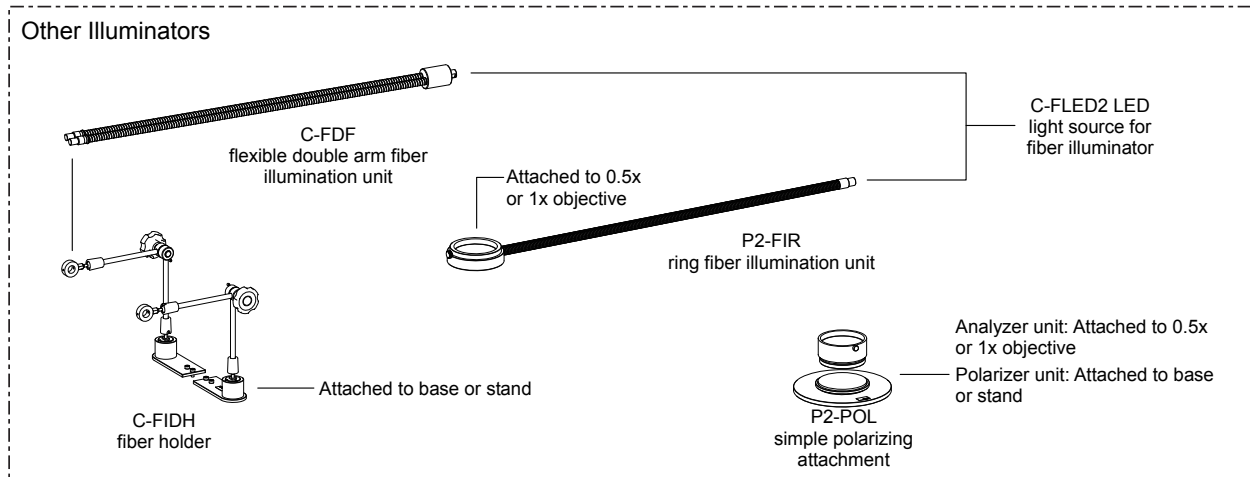
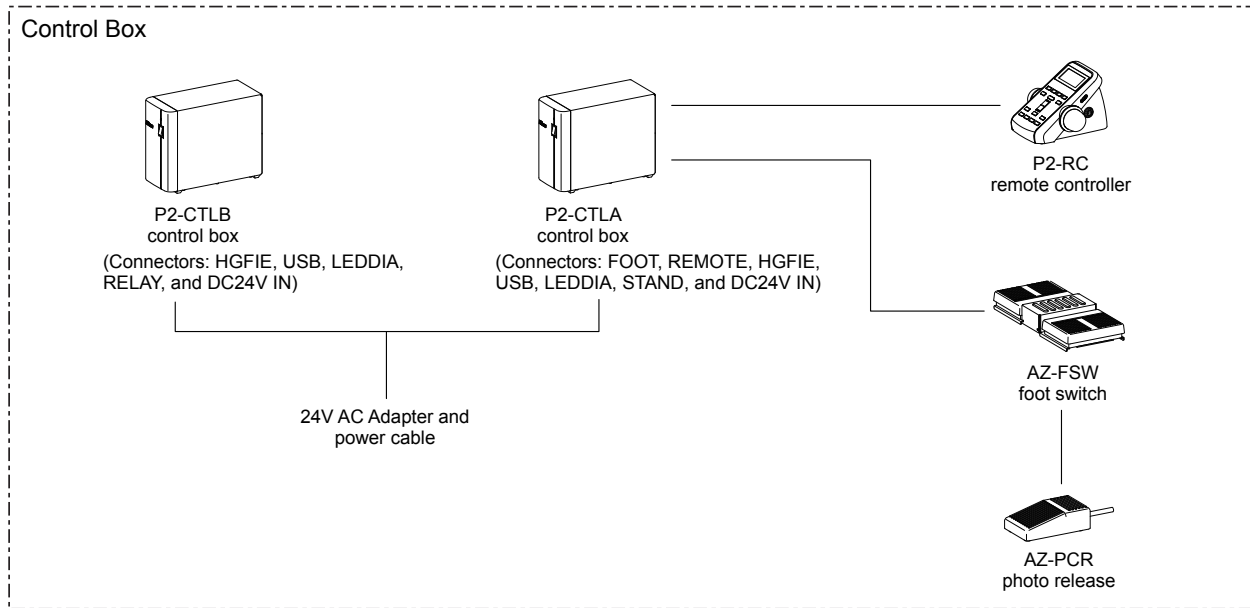
When moving the assembled microscopy system, work with at least two people. Put hands in the depression at the front of the base and the rear of both sides to lift up the system. Be very careful not to let fingers be caught when putting it down.

■ Tools necessary for assembly

Tools	Devices that supply tools
Hex wrench (nominal designation: 2.5)	Intelligent nosepiece, P-SXY64 XY Stage
Hex wrench (nominal designation: 3)	P-SXY64 XY Stage
Hex wrench (nominal designation: 4)	Fiber holder
Hex wrench (nominal designation: 5)	P-SXY64 XY Stage
Hex wrench (nominal designation: 6)	Focus unit
Hex driver (nominal designation: 2)	Focus unit, P-PS32 Plain Stand (fit-in type to the top of the support)
Hex driver (nominal designation: 4)	Intelligent nosepiece, Focus mount adapter, Focus mount
Spanner wrench (nominal designation: 10)	Fiber holder

1 System Configuration





## 2

## Device List

Microscopy system is configured by devices that are marked with “√.” For details about the restrictions regarding the configurations, see Chapter 4, “Functions and Operations of the Devices.”

Device	Model Name	Device Name	Microscopy System under Episcopic Illumination	Microscopy System under Diascopic Illumination and Epi-fluorescence Illumination	Compact System	Remarks
Main Body	SMZ18	Zooming Body	√	√	√	
	SMZ25	Zooming Body			-	
Focus Unit or Focus Mount	P2-MFU	Motorized Focus Unit	√	√	-	
	P2-FU	Focus Unit				
	P2-FMDN	Focus Mount	-	-	√	
Focus Mount Adapter or Nosepiece	P2-FM	Focus Mount Adapter	√	√	-	
	P2-RNI2	Intelligent Nosepiece				
Objective	P2-SHR Plan Apo 0.5X	Objective	√	√	√	
	P2-SHR Plan Apo 1X	Objective				
	P2-SHR Plan Apo 1.6X	Objective				
	P2-SHR Plan Apo 2X	Objective				
Base, Stand, Stage	P2-PB	Plain Base	√	-	-	With an acrylic stage plate
	P2-DBL	LED Diascopic Illumination Base		√		With a transparent glass stage plate
	P2-DBF	Fiber Diascopic Illumination Base		√		With a transparent glass stage plate
	P-PS32	Plain Stand	-	-	√	With an acrylic stage plate
	P-SXY64	XY Stage	Optional	Optional	Optional	
	C-SSL	DIA Sliding Stage				
Tube	P2-TERG 100	Trinocular Tilting Tube	√	√	√	
	P2-TERG 50	Trinocular Tilting Tube				
	P2-TL100	Trinocular Tube L				
Eyepiece	C-W 10XB	Eyepiece	√	√	√	
	C-W 15X	Eyepiece				
	C-W 20X	Eyepiece				
	C-W 30X	Eyepiece				
Episcopic Illuminator	P2-CI	Coaxial Epi Illuminator	√	-	Optional	With a 1/4 lambda plate
	C-FDF	Flexible Double Arm Fiber Illumination Unit	Optional			Retained by a C-FIDH Fiber Holder
	P2-FIR	Ring Fiber Illumination Unit				
Diascopic Illuminator	P2-POL	Simple Polarizing Attachment	-	Optional	-	
Epi Fluorescence Attachment	P2-EFLM	Motorized Epi Fluorescence Attachment	-	√	-	With a light shielding plate Maximum of four filter cubes can be attached.
	P2-EFLI	Epi Fluorescence Attachment			Optional	
Control/Relay Device	P2-CTLA	Control Box	√	√	-	
	P2-CTLB	Control Box			Optional	
	P2-RLY	Relay Box	√	√	-	
	P2-RLYC	Relay Cable	Optional	Optional	Optional	
Remote Control Device	P2-RC	Remote Controller	√	√	-	
	AZ-FSW	Foot Switch	Optional	Optional		
	AZ-PCR	Photo Release				

Other devices: The P2-FIRL LED Ring Illumination Unit, P-DF LED Dark Field Unit, C-TRS Tilting Stage and DS cameras are available.



### 3 Assembly Procedures

The SMZ18 and SMZ25 stereo microscopes are system microscopes that can be configured in a variety of ways. This chapter describes how to assemble the following three systems.

- Episcopic illumination system (called the “EPI System” in this chapter)
- Diascopic illumination + epi-fluorescence microscopy system (called the “DIA + EPI-FL System” in this chapter)
- Compact system

This chapter also describes how to assemble the devices that can be added to the basic configuration of each system. Refer to the preceding section “5.2 Device List” and check the devices to be used before assembling.

#### 3.1 Assembling the EPI System and DIA + EPI-FL System

##### 1 Attach the base.

Attach the base to be used to the P2-FU Focus Unit or P2-MFU Motorized Focus Unit.

The base is attached to the focus unit in the same manner in either case.

When configuring the DIA + EPI-FL System, select the dia-illumination base.

The following figure shows an example of attaching the P2-DBL LED Diascopic Illumination Base to the P2-FU Focus Unit.

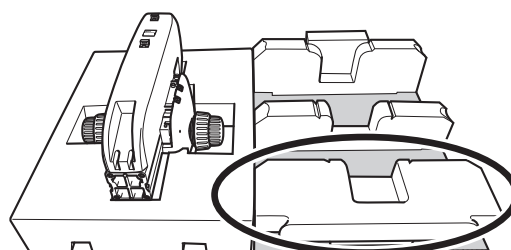
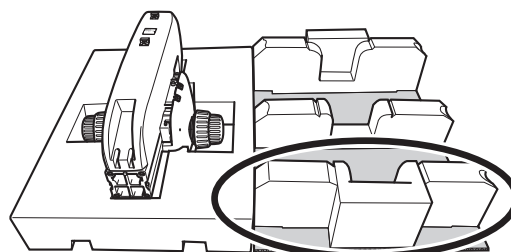
##### CAUTION Heavy Object

The base and focus unit are heavy. The focus unit is especially heavy so be very careful not to drop it when unpacking or installing. Working with two or more people is recommended.

- P2-FU Focus Unit: Approx. 11 kg
- P2-MFU Motorized Focus Unit: Approx. 12 kg

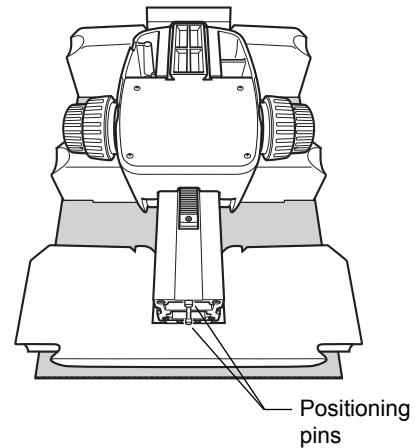
- (1) Remove the inner cover (cardboard) holding the focus unit from the packing box. This inner cover is used when connecting the focus unit and base.

Turn the inner cover over and place it on the desk where the microscope is to be installed. Select a desk and location free from vibration. Remove one of the white polystyrene pieces holding the product at either side, change its orientation as shown in the figure and place it again.



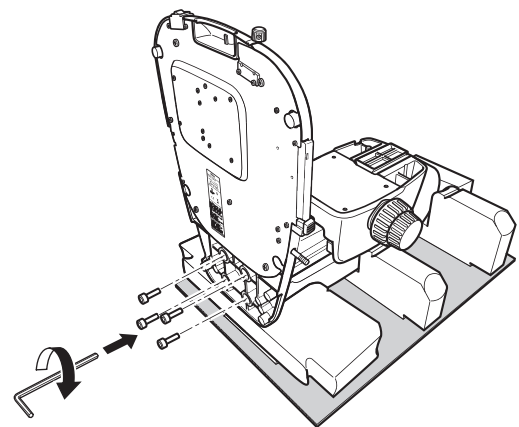
Changing the orientation of the polystyrene piece

- (2) Place the focus unit in the recession of the polystyrene piece as show in the figure.



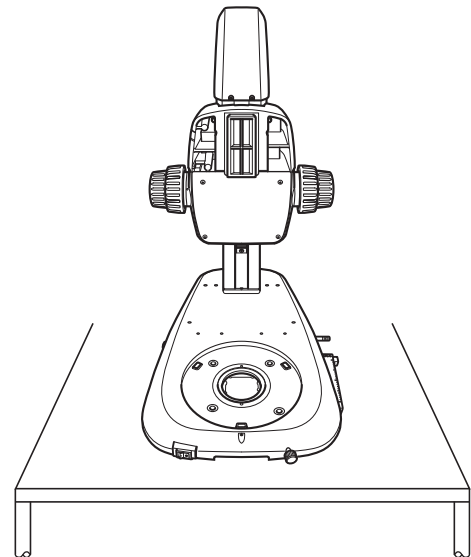
**Fitting the focus unit**

- (3) Hold the base with the two base side positioning holes aligned with the two positioning pins on the focus unit, screw the four M8 hexagon socket head bolts (supplied with the focus mount) from the bottom of the base and tighten firmly using a hex wrench (nominal designation: 6).



**Attaching the base by tightening the bolts**

- (4) Install the attached device on the desk.



**Installing the base**

■ **Attaching the stage plate**

Attach the stage plate.

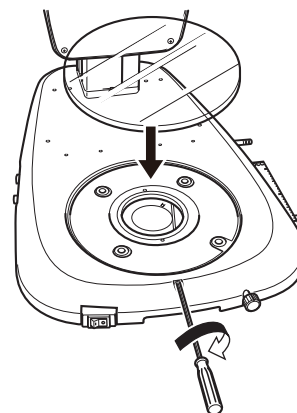
Depending on the type of the base, either a transparent glass stage plate or an acrylic stage plate is supplied.

The acrylic plate is black on one side and milky white on the other side. Attach the stage plate with the appropriate side facing up based on the sample to be viewed.

**! Glass stage plate handling precautions**

Be very careful when handling the glass stage plate. Before attaching the glass stage plate, attach all other components in order to avoid the risk of breaking the glass during assembly.

- (1) Loosen the M4 set screw for the stage plate in the front center of the base using a hex driver (nominal designation: 2).
- (2) Tilt the stage plate, fit it into the base, and then tighten the fixing screw.

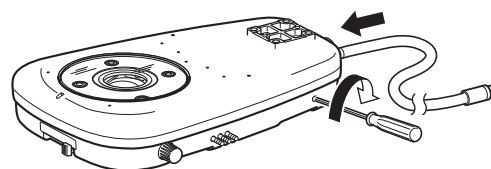


**Attaching the stage plate by tightening the screw**

**■ Attaching a fiber to the P2-DBF Fiber Diascopic Illumination Base**

When using the P2-DBF Fiber Diascopic Illumination Base, connect the fiber to the base.

Insert a hex driver (nominal designation: 2) in the fiber fixing screw hole at the right rear side of the base and loosen the internal fixing screw (M4 set screw). Insert the fiber to the rear side of the base until it reaches the limit and tighten the fixing screw.



**Attaching the fiber by tightening the screw**

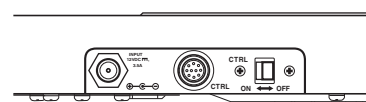
Firmly insert the other end of the fiber into the fiber attachment hole of the C-FLED2 LED Light Source for Fiber Illuminator. See the instruction manual for the light source for details.

**■ Connecting a cable to the P2-DBL LED Diascopic Illumination Base**

Connect the cable to the connector on the left.

Connect the LED brightness control terminal “CTRL” with the connector “LEDDIA” on the control box using the CTRL cable supplied with the control box.

Connect the 12 V AC adapter to the AC adapter input terminal that is used for the dia-illumination power supply for the system without a control box connected.



**Connecting the LED dia-illumination base using a cable**

**! Beware of overhang of cables**

When these cables are connected, the connectors (cables) overhang to the left of the base. Be careful so that they do not interfere with other devices such as a control box or they are not accidentally touched and disconnected while attaching devices or performing observation.

Use the power cord specified in Chapter 8, “2 Performance Properties.”

**! WARNING Before connecting the power cord**

To prevent electric shock, be sure to turn off the power switch (press it to the “○” position) at the front of the base before connecting the power cord to the adapter.

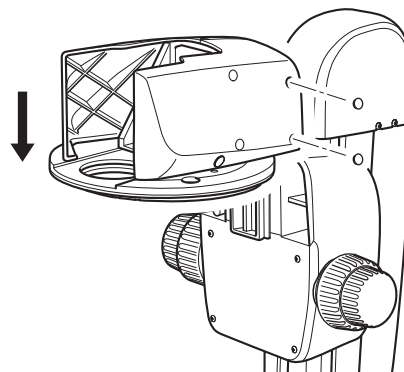
## 2 Attach the intelligent nosepiece or focus mount adapter.

Attach the intelligent nosepiece or focus mount adapter to the focus unit.

Both the intelligent nosepiece and focus mount adapter are attached to the focus unit in the same manner.

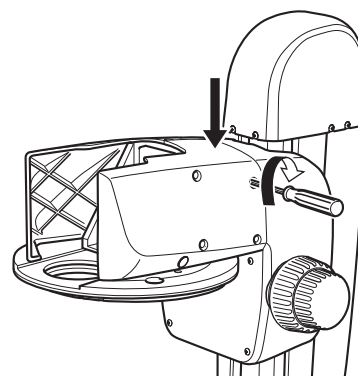
The following figure shows an example of attaching the intelligent nosepiece to the P2-FU Focus Unit.

- (1) Remove the two rubber caps from the fixing bolt holes at the right rear of the intelligent nosepiece (as viewed from the front). Insert the hex driver (nominal designation: 4) and completely loosen the two internal M5 hexagon socket head bolts.
- (2) Drop and fit the dovetail groove on the rear side of the intelligent nosepiece onto the dovetail of the focus unit mount from the top.



**Attaching the intelligent nosepiece**

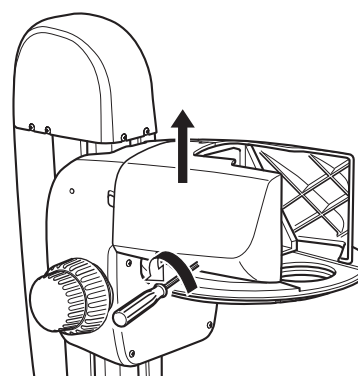
- (3) Firmly tighten the two fixing bolts using a hex driver (nominal designation: 4). After tightening the bolts, put the rubber caps back onto the bolt holes.



**Firmly tightening the bolts**

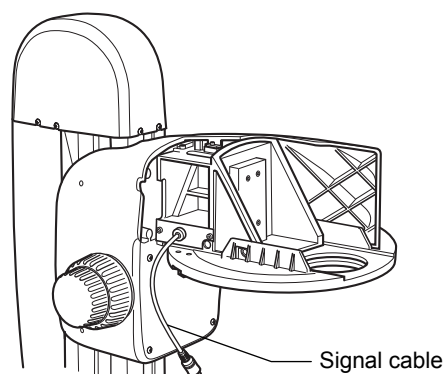
- (4) The cover on the left side (as viewed from the front) of the intelligent nosepiece is a sliding cover. Removing this cover at this point will facilitate the cable connection and routing in “[4] Connect the signal cables.”

Remove the rubber caps from the two fixing bolt holes at the bottom of the cover, loosen and remove the two internal M5 hexagon socket head bolts using a hex driver (nominal designation: 4), and pull the cover up to remove it.



■ **Connecting signal cables**

Connect the signal cable of the intelligent nosepiece to the connector “NP” on the motorized focus unit or the relay box. (See “[4] Connect the signal cables.”)



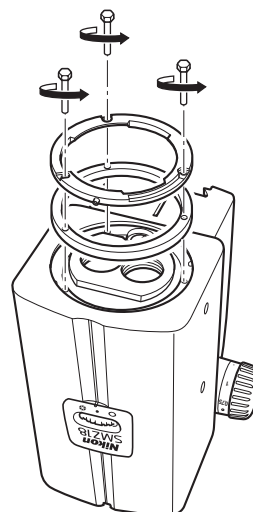
**3 Attach the zooming body.**

Attach the SMZ18 or SMZ25 Zooming Body to the intelligent nosepiece or focus mount adapter. Both zooming bodies are attached to the intelligent nosepiece or focus mount adapter in the same manner. The following figure shows an example of attaching the SMZ18 Zooming Body to the intelligent nosepiece.

**ⓘ When attaching to the focus mount adapter**

Step (1) is not necessary when attaching the zooming body to the focus mount adapter. Proceed to Step (2).

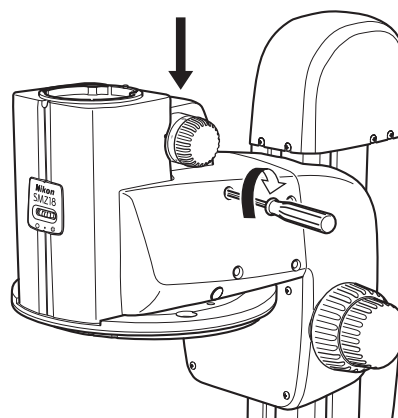
- (1) Detach the objective attachment adapter (dovetail and ring) attached under the zooming body. Loosen the three M3 hexagon socket head bolts using a hex wrench (nominal designation: 2.5).



**Detaching the objective attachment adapter**

- (2) Completely loosen the two M5 hexagon socket head bolts for fixing the zoom body on the right side of the zooming body (as viewed from the front) using a hex driver (nominal designation: 4).
- (3) Drop and fit the dovetail groove on the rear side of the zooming body onto the dovetail of the intelligent nosepiece mount.

- (4) Remove the two rubber caps from the fixing bolt holes on the right front side of the intelligent nosepiece (as viewed from the front). Insert a hex driver (nominal designation: 4) into the holes and firmly tighten the two zooming body fixing bolts. After tightening the bolts, put the rubber caps back onto the bolt holes.



**Attaching the zooming body by tightening the bolts**

■ **Connecting signal cables**

The signal cable for the SMZ25 comes from the left side of the zooming body. In case of the SMZ18, connect the signal cable supplied with the SMZ18 to the round connector on the left side of the zooming body.

Connect the other end of the cable to the connector “ZOOM” on the motorized focus unit or relay box. (See “[4] Connect the signal cables.”)

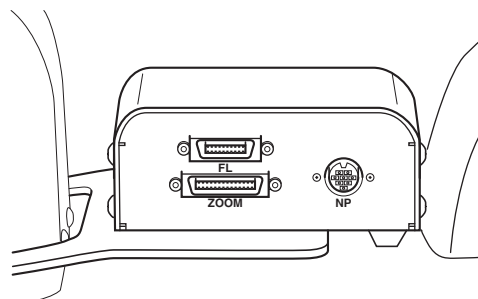
**4 Connect the signal cables.**

Connect the cables necessary to detect the device state or to drive the motorized devices.

- (1) Connect the signal cables.

The relay box has connectors “NP”, “ZOOM”, and “FL” on the left side (as viewed from the front).

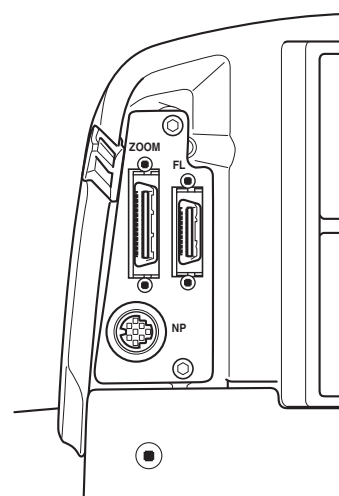
The P2-MFU Motorized Focus Unit has connectors “NP”, “ZOOM” and “FL” on the left side of the unit mount (as viewed from the front).



**Connectors on the relay box**

The following cables are connected to each connector.

- NP: Connect the signal cable coming from the intelligent nosepiece (there is no connection to the NP connector if the focus mount adapter is attached).
- ZOOM: In case of the SMZ18 Zooming Body, connect to the round connector on the left side of the zooming body using the signal cable supplied with the SMZ18. In case of the SMZ25, connect the signal cable coming from the left side of the zooming body.
- FL: Connect the signal cable coming from the P2-EFLM Motorized Epi Fluorescence Attachment.



**Connectors on the motorized focus unit**

✔ **Cable routing**

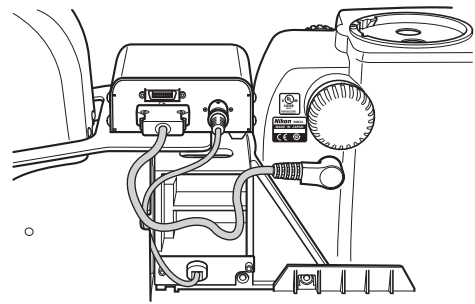
Route the cables before attaching the cover.

(In the figure, even though the relay box is already attached for explanatory reasons, the attachment of the relay box is explained in Step [5])

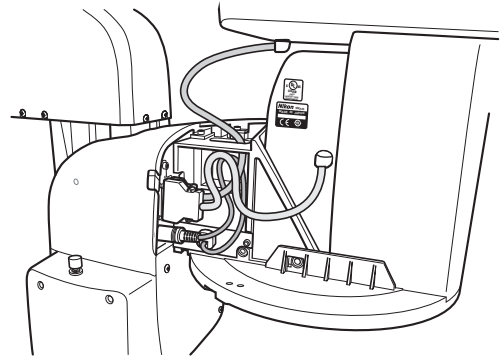
Bring out the cable from the SMZ zooming body along the notch on the focus unit cover and connect to the connector "ZOOM." Pass the cable from the intelligent nosepiece through the oval hole on top of the mount, bring it out along the notch on the top of the left side cover, and then connect to the connector "NP."

When the cable was connected to the motorized focus unit, route the cable as shown in the figure.

Pass the cable from the motorized epi fluorescence attachment through the oval hole at the top of the mount, drop it down, and then connect to the connector "FL."

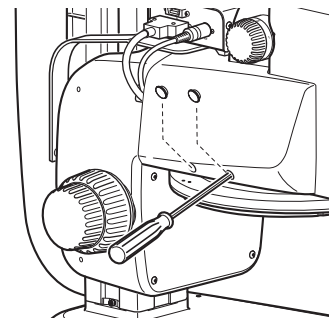


**Cable connection to the relay box**



**Cable connection to the motorized focus unit**

- (2) Attach the left cover of the intelligent nosepiece. Route the cable and replace the intelligent nosepiece left side cover removed in Step [2]-(4). Align and fit the two protrusions on the left side cover to the two notches in the top center of the intelligent nosepiece, insert the two M5 hexagon socket head fixing bolts in the fixing bolt holes at the bottom of the cover and firmly tighten them using a hex driver (nominal designation: 4). After the attachment, cover the bolt holes using the rubber caps.

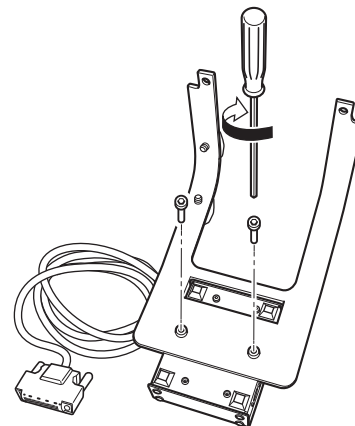


**5 Attach the relay box. (P2-FU Focus Unit system only)**

Attach the relay box to the P2-FU Focus Unit.

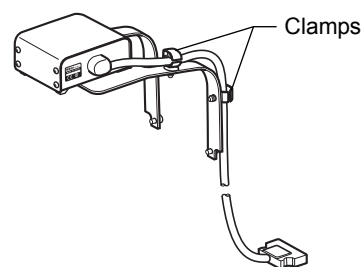
- (1) The relay box is provided with the box itself with the attaching arm removed. Assemble the box and arm before attaching.

The orientation of the joint is such that the signal cables come out from the right side (as viewed from the front) with the relay box attached to the focus unit. Align the box with the two attachment arm screw holes and attach it by tightening the M5 hexagon socket head bolts supplied with the relay box using a hex driver (nominal designation: 4).



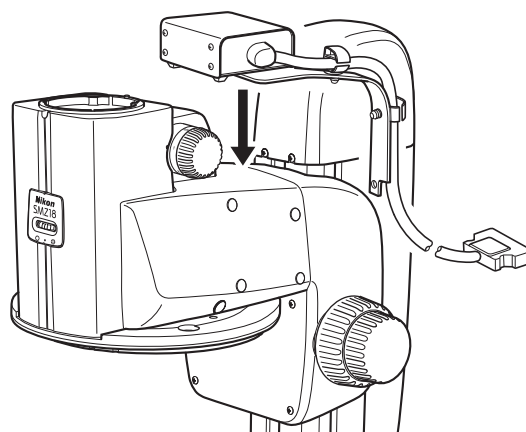
**Assembling the relay box**

- (2) Clamp the relay box cable using the arm clamps.

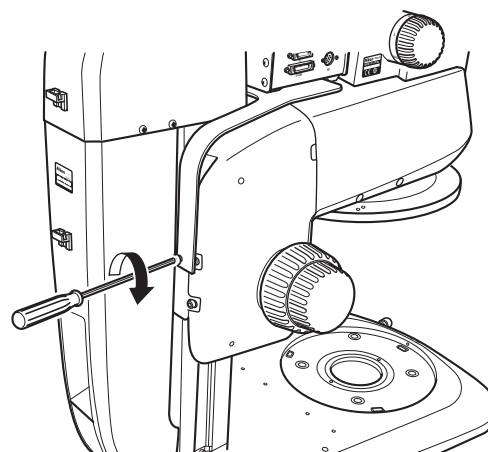


**Clamping a cable**

- (3) Place the relay box arms over the focus unit as shown in the figure, align the screw holes of the arm with the two screw holes at the back of the focus unit, and attach it by tightening the M5 hexagon socket head bolts supplied with the relay box using a hex driver (nominal designation: 4).



**Attaching the relay box**

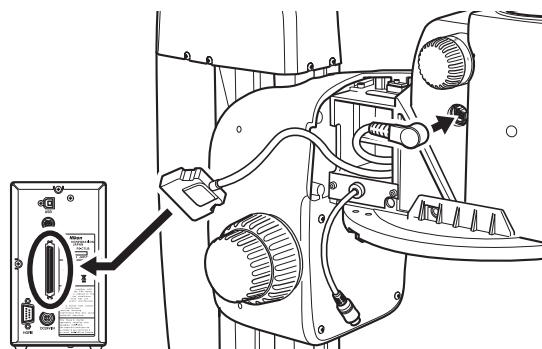


**Tightening the bolts for the relay box**

### ■ Connecting the relay cable (when not using a relay box)

Use the P2-RLYC Relay Cable to output the zoom magnification information of the SMZ18 to the P2-CTLB Control Box without using a relay box.

Connect the relay cable to the round connector on the left side of the SMZ18, route the wire along the notch of the focus unit cover and connect to the RELAY connector of the P2-CTLB Control Box.



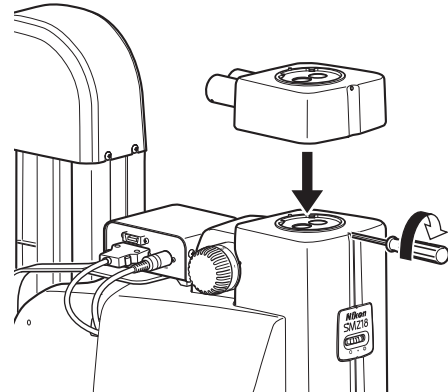
**Connecting the relay cable**



## 6 Attach the coaxial epi illuminator. (for the EPI System)

Attach the coaxial epi illuminator to the zooming body.

- (1) Completely loosen the M4 set screw for the illuminator at the top front of the zooming body using a hex driver (nominal designation: 2).
- (2) Align and fit the round dovetail at the bottom of the coaxial epi illuminator with the round dovetail of the zooming body and tighten the fixing screw.

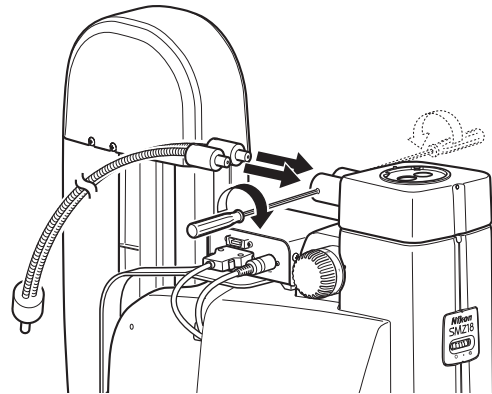


**Attaching the coaxial epi illuminator by tightening the screw**

### ■ Attaching the fiber

Loosen the M4 set screws for the fiber on the side of the two fiber attachment holes on the rear side of the coaxial epi illuminator using a hex driver (nominal designation: 2). Insert the fiber to the attachment hole until it reaches the limit and tighten the fixing screw.

Firmly insert the other end of the fiber into the fiber attachment hole of the C-FLED2 LED Light Source for Fiber Illuminator. See the instruction manual for the light source for details.



**Attaching the LED fiber by tightening the screw**

### ■ Attaching the 1/4 lambda-plate

Screw and attach the 1/4 lambda plate supplied with the coaxial epi illuminator to the end of the objective.

In case of using a 0.5x objective, remove the protection ring at the end of the objective, and in case of using a 1x objective, remove the correction glass at the end of the objective before attaching the 1/4 lambda plate.

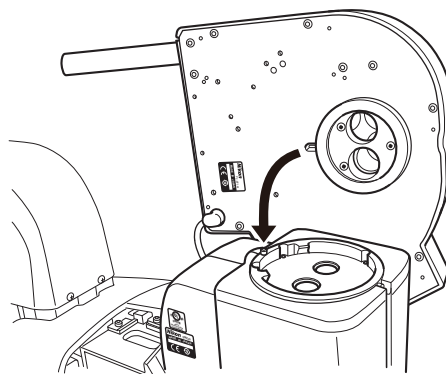
## 7

**Attach the epi fluorescence attachment. (for the DIA + EPI-FL System)**

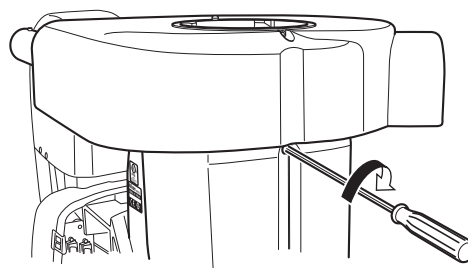
Attach the P2-EFLM Motorized Epi Fluorescence Attachment or the P2-EFLI Epi Fluorescence Attachment to the zooming body.

Both epi fluorescence attachments are attached to the zooming body in the same manner.

- (1) Completely loosen the M4 set screw for the illuminator at the top front of the zooming body using a hex driver (nominal designation: 2).
- (2) Align and fit the positioning groove at the far end of the round dovetail at the bottom of the epi fluorescence attachment with the positioning pin at the far end of the round dovetail groove on top of the zooming body, and then tighten the fixing screw.



**Attaching the epi fluorescence attachment**



**Tightening the screw for epi fluorescence attachment**

#### ■ Connecting signal cables

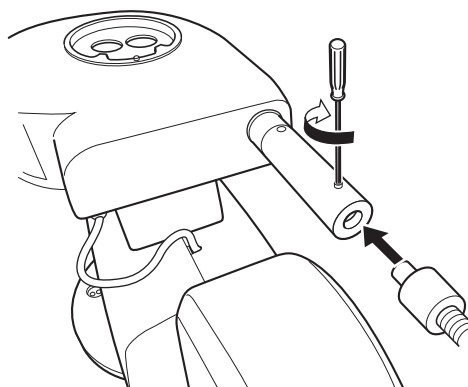
Connect the signal cable that comes from the bottom of the epi fluorescence attachment to the connector “FL” on the motorized focus unit or relay box. In case of the motorized unit, connect it inside the left cover of the intelligent nosepiece. (See “[4] Connect the signal cables.”)

#### ■ Attaching the HG fiber

Loosen the M4 set screw for the HG fiber on the top of the HG fiber attachment hole on the rear side of the epi fluorescence attachment using a hex driver (nominal designation: 2).

Insert the emission side tip of the HG fiber to the attachment hole until it reaches the limit and tighten the fixing screw.

Firmly insert the source side connector to the HG fiber attachment hole of the C-HGFI or C-HGFIE HG Precentered Fiber Illuminator. See the instruction manual for the light source for details.



**Attaching the HG fiber by tightening the screw**

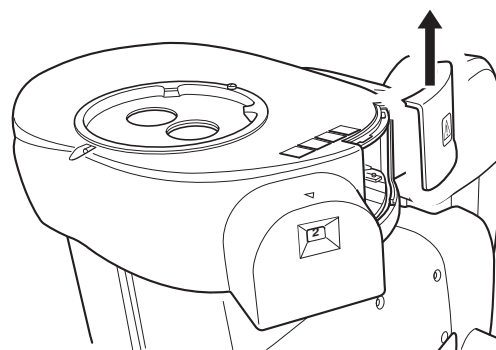
#### ■ Attaching the fluorescent filter cube

Attach the filter cube to the turret in the epi fluorescence attachment. Up to four filter cubes can be attached.

#### ⚠ Do not touch the surface of the filter with bare hands

Scratches or fingerprints on the filter surface will degrade microscope images. Handle the filter cube carefully.

- (1) Remove the filter cube replacement hole cover on the right side of the epi fluorescence attachment (as viewed from the front). Push it upward to remove.

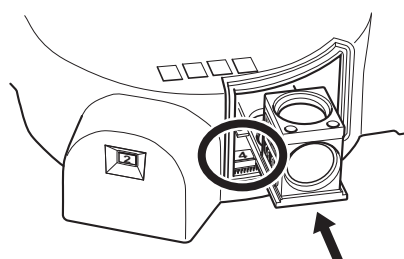


Removing the filter cube replacement hole cover

- (2) Align and insert the dovetail groove of the filter cube to the internal dovetail until it reaches the limit. The installation positions are numbered from [1] to [4] and are shown on the left inside of the filter cube attachment hole.

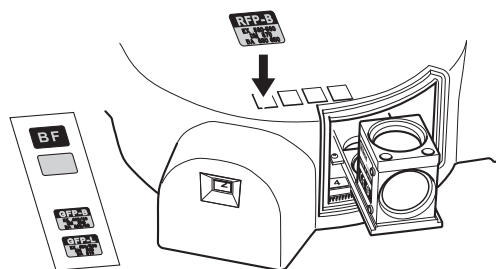
**!** Be sure to attach four cubes to the turret.

Attach an empty cube to the position to which no filter cube is attached.



Attaching the filter cube

- (3) Affix the filter cube indication label. Labels indicating the type of filter cube are supplied with the epi fluorescence attachment. It is useful to identify the type with the labels. Affix a label indicating the type of attached filter cube to the label attachment position at the top of the filter cube attachment hole. Numbers 1 through 4 are indicated next to the label indents. Affix a label for the attached filter cube to the indent corresponding to the filter cube address.



Affixing a label indicating the type of the filter cube

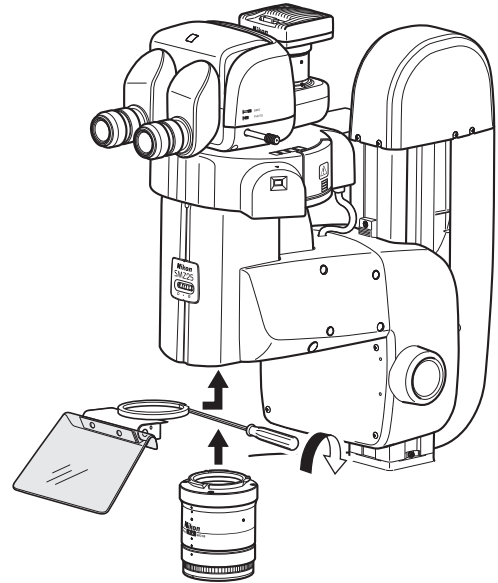
- (4) Replace the cover of the filter cube replacement hole.

■ **Attaching a light shielding plate**

When using a focus mount, attach the light shielding plate to the zooming body, and when using an intelligent nosepiece, attach it to the bottom of the intelligent nosepiece.

• **Attachment to the zooming body**

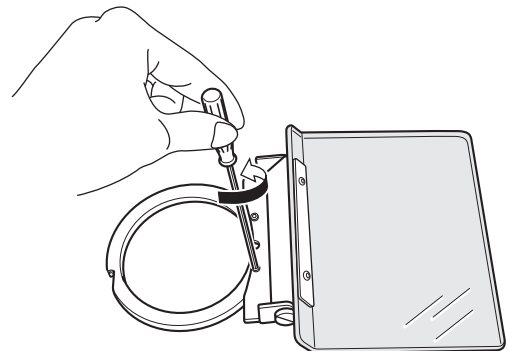
Fit the ring of the light shielding plate to the periphery of the dovetail attachment adapter attached to the lower part of the zooming body, and firmly tighten the M2.5 hexagon socket head bolt on the rear side of the ring using a hex driver (nominal designation: 2).



**Attaching the shielding plate by tightening the screw**

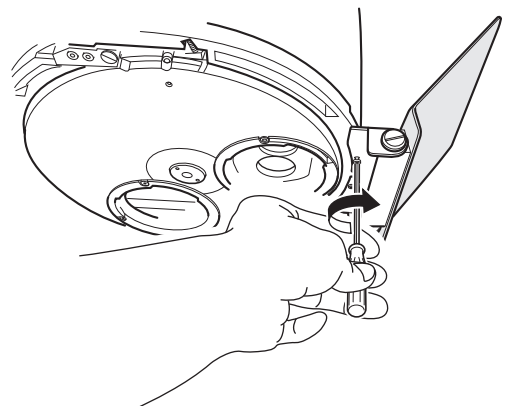
• **Attaching to the intelligent nosepiece**

- (1) Separate the ring attached to the light shielding plate. The ring is attached to the light shielding plate with the two M2.5 hexagon socket head bolts. Remove them using a hex driver (nominal designation: 2).



**Removing the ring from the light shielding plate**

- (2) Align the screw holes of the light shielding plate with the two screw holes at the bottom front of the intelligent nosepiece and firmly attach the light shielding plate using the two M2.5 hexagon socket head bolts that were used to affix the ring.

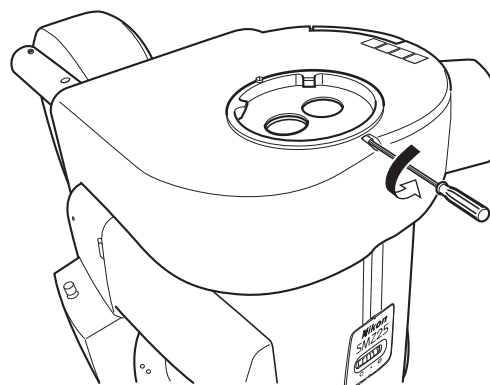


**Attaching the shielding plate by tightening the screws**

## 8 Attach the tube.

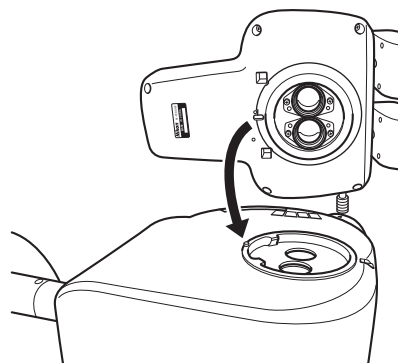
Attach a tube to be used to the epi illuminator or epi fluorescence attachment.  
All types of tubes can be attached to the illuminator in the same manner.

- (1) Completely loosen the M4 set screw for the tube at the top front of the illuminator using a hex driver (nominal designation: 2).



Loosening the tube fixing screw

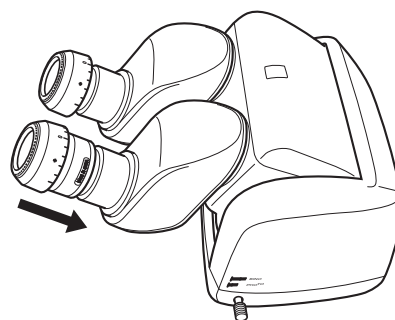
- (2) Align and fit the round dovetail at the bottom of the tube to the round dovetail of the illuminator and tighten the fixing screw.



Attaching the tube

## 9 Attach the eyepiece.

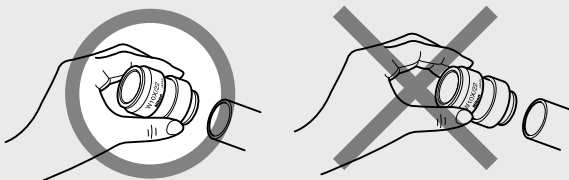
Attach the eyepiece to the tube.  
Two eyepieces with the same magnification are used.  
Firmly insert the eyepiece until it contacts the end of the tube sleeve.



Attaching the eyepiece

### ⚠ Caution when attaching the eyepiece

Pay attention when inserting a 10x eyepiece because a rubber cover is attached and the eyepiece end is not visible. To prevent malfunction, hold the rubber cap when inserting the 10x eyepiece. Do not hold the diopter adjustment ring when inserting it.



**10 Attach the objective.**

Attach the objective to be used to the zooming body or intelligent nosepiece. Up to two intelligent nosepieces can be attached.

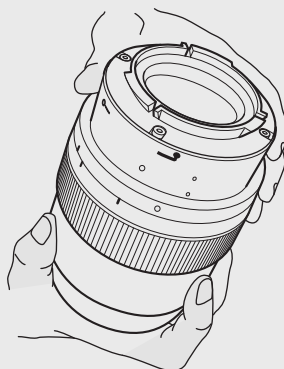
Both objectives are attached to the zooming body or intelligent nosepiece in the same manner.

The following figures show an example of attaching a 2x objective to the intelligent nosepiece.

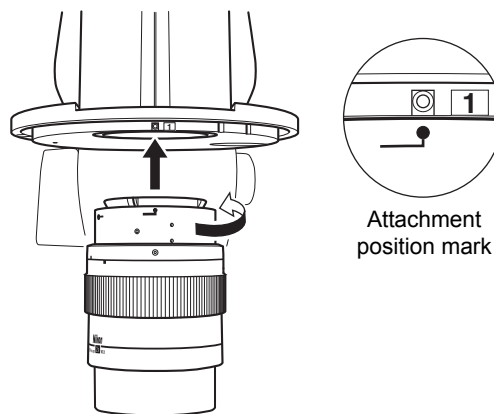
**ⓘ Handling the objective**

Be sure to hold the objective of the microscope system with both hands because it is very heavy.

Hold the objective by hand when tightening or loosening the fixing screw. In addition, scratches or fingerprints on the lens at the end will degrade the microscope images. Handle the objective carefully.

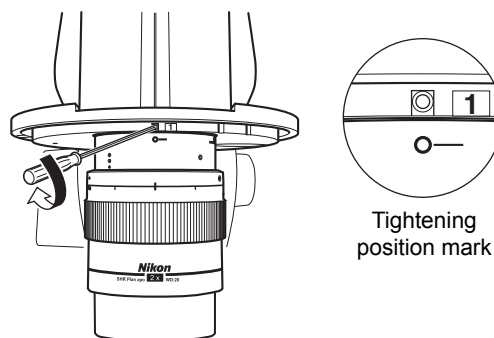


- (1) Completely loosen the M4 set screw for the objective at the top front of the zooming body using a hex driver (nominal designation: 2).
- (2) Align and fit the mark (white dot) on top of the objective to the objective fixing screw position and rotate the objective counterclockwise (as viewed from the top).



**Attaching the objective**

- (3) Rotate the objective until the mark (white ring) on top of the objective aligns exactly with the objective fixing screw position. After confirming that the dovetail is mated properly, tighten the objective fixing screw.



**Tightening the screw for objective**

■ Detaching the objective

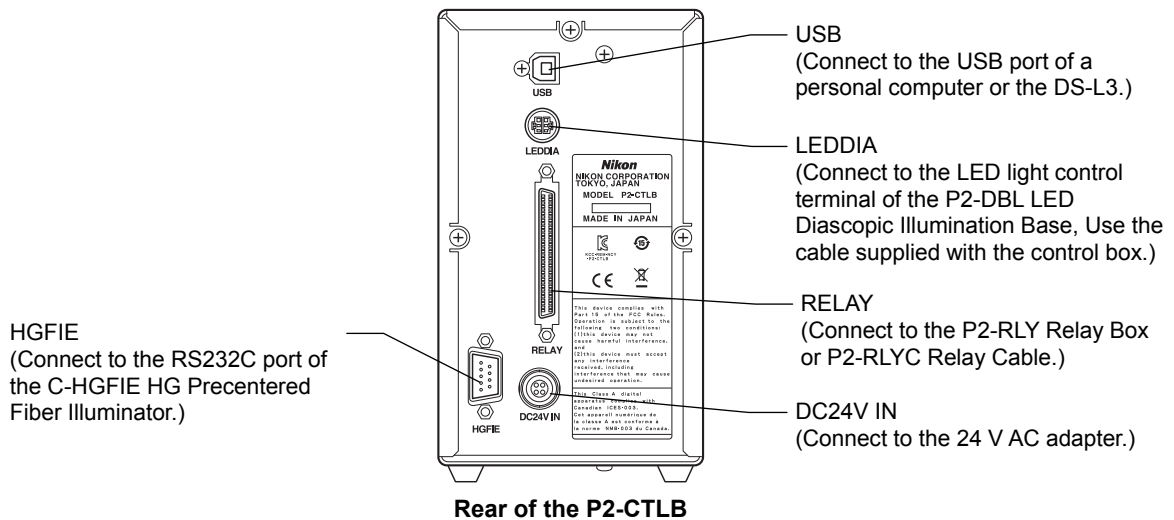
Loosen the objective fixing screw. Hold and rotate the objective clockwise (as viewed from the top) and align the mark (white dot) on top of the objective with the objective fixing screw position. Mating of the dovetail can be released at this position. Loosen the objective fixing screw and pull the objective down to detach it. The objective can be easily detached by pushing it up while rotating.

11

Connect a control box.

■ Connecting to the P2-CTLB Control Box

The figure below shows the connectors on the rear side of the control box and the connection destinations:

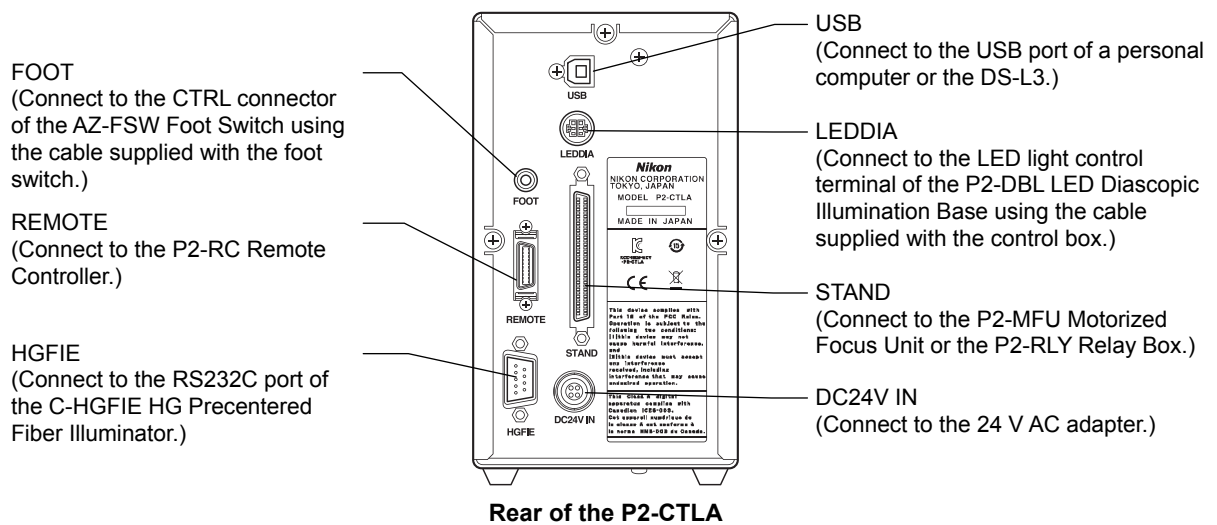


Use a power cord specified in Chapter 8, “2 Performance Properties” to connect to the 24 V AC adapter.

**⚠ WARNING Before connecting the power cord**  
 To prevent electric shock, be sure to turn off the power switch (press it to the “○” position) at the front of the control box before connecting the power cord to the adapter.

■ Connecting to the P2-CTLA Control Box

The figure below shows the connectors on the rear side of the control box and the connection destinations:



Use a power cord specified in Chapter 8, “2 Performance Properties” to connect to the 24 V AC adapter.



**WARNING Before connecting the power cord**

To prevent electric shock, be sure to turn off the power switch (press it to the “○” position) at the front of the control box before connecting the power cord to the adapter.

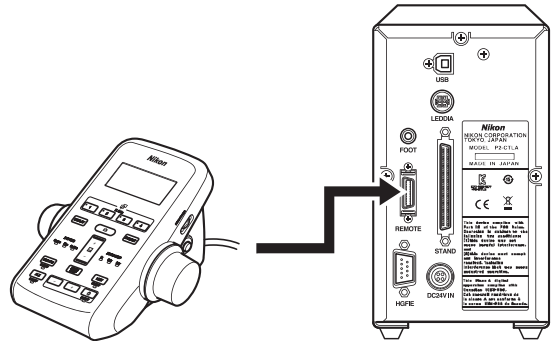
**12**

**Connect the Remote Control Devices. (P2-CTLA Control Box only)**

Attach the following remote control devices to the P2-CTLA Control Box.

- (1) Connect the P2-RC Remote Controller.

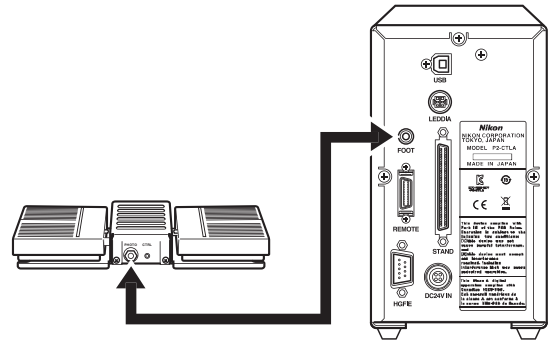
Connect the P2-RC Remote Controller to the connector “REMOTE” of the P2-CTLA Control Box.



**Connecting the control box**

- (2) Connect the AZ-FSW Foot Switch (optional).

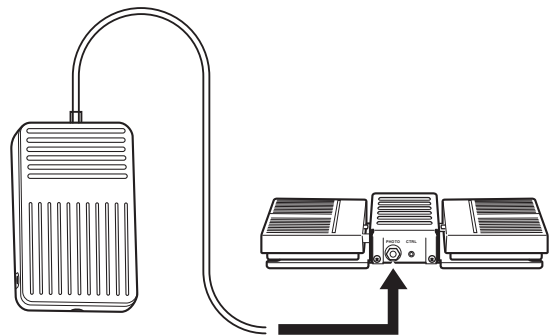
Connect the AZ-FSW Foot Switch to the connector “FOOT” of the P2-CTLA Control Box.



**Connecting the foot switch**

- (3) Connect the AZ-PCR Photo Release (optional).

Connect the AZ-PCR Photo Release to the connector “PHOTO” of the AZ-FSW Foot Switch.



**Connecting the photo release**

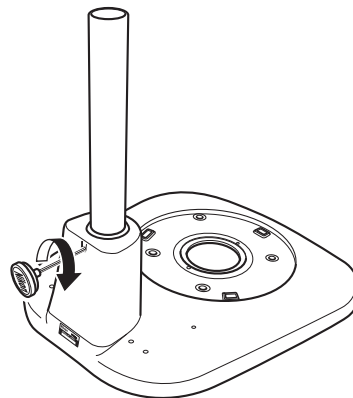


**1****Install the stand.**

Select a location free of vibration. Install a P-PS32 Plain Stand on a level surface.

■ **Attaching a support to the stand**

Fit the support to the stand and tighten the clamp screw on the rear side using a hex driver supplied with the support (The hex driver is inserted on the top of the support).



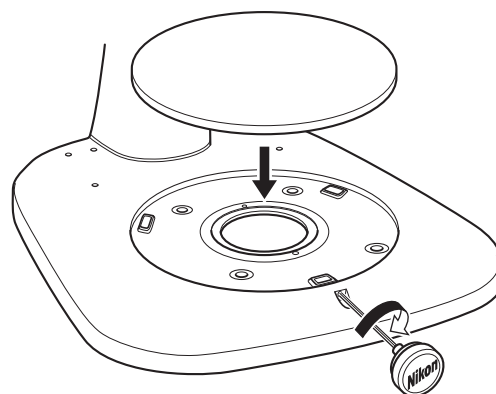
**Attaching the support by tightening the screw**

■ **Attaching the stage plate**

An acrylic stage plate having black and milky white planes is supplied with the P-PS32 Plain Stand. Attach the stage plate with the appropriate side facing up based on the sample to be viewed.

Loosen the M4 set screw for the stage plate in the front center of the base using a hex driver (nominal designation: 2).

Tilt the stage plate, fit it into the base, and then tighten the fixing screw.

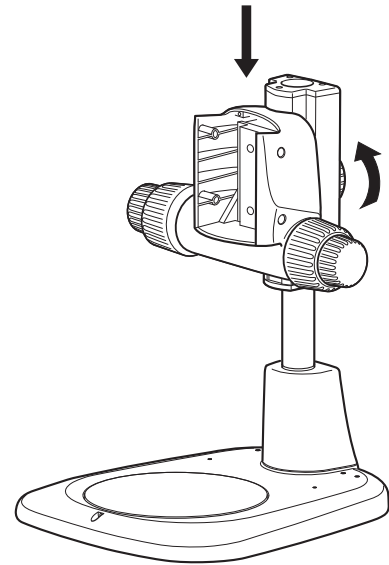


**Attaching the stage plate by tightening the screw**

## 2 Attach the focus mount.

Attach the P2-FMDN Focus Mount to the stand.

Fit the focus mount in the stand from the top of the support and tighten the fixing knob on the rear side.

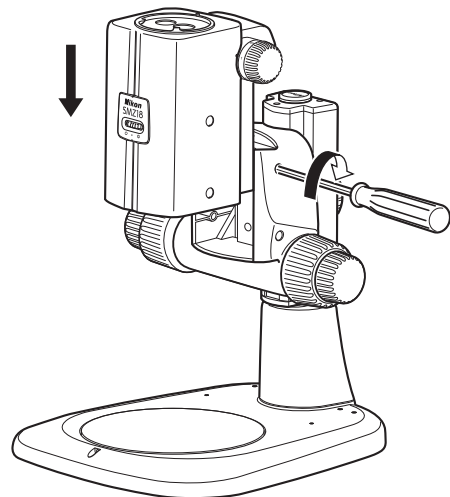


Attaching the focus mount by tightening the knob

## 3 Attach the zooming body

Attach the SMZ18 Zooming Body to the focus mount.

- (1) Completely loosen the two M5 hexagon socket head bolts for the zooming body on the right side of the zooming body (as viewed from the front) using a hex driver (nominal designation: 4).
- (2) Drop and fit the dovetail groove of the zooming body onto the dovetail of the focus mount from the top.
- (3) Remove the two rubber caps for the fixing bolt holes on the right side of the focus mount (as viewed from the front). Insert the hex driver (nominal designation: 4) into a hole and firmly tighten the two zooming body fixing bolts. After tightening the bolts, put the rubber caps back onto the bolt holes.

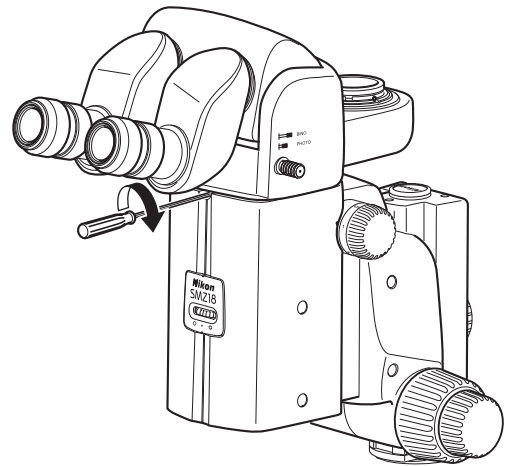


Attaching the zooming body by tightening the bolts

**4 Attach the tube.**

Attach a tube to be used to the zooming body.

The procedure for attaching a tube to the zooming body is the same as the procedure for attaching a tube to the fluorescence attachment or epi-fluorescence attachment. See “3.1, Step 8 Attach the tube.”



**Attaching the tube by tightening the screw**

**5 Attach the eyepiece.**

Attach the eyepiece to the tube.

For details, see “3.1, Step 9 Attach the eyepiece.”

**6 Attach the objective.**

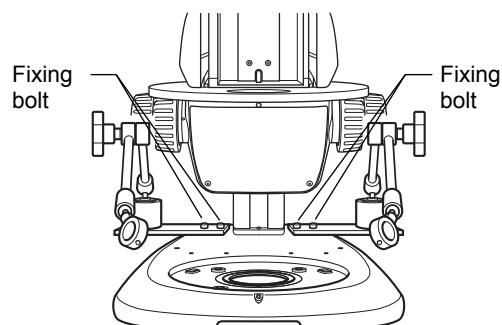
Attach the objective to the zooming body.

The procedure for attaching/removing the objective to/from the zooming body is the same as for attaching/removing it to/from the intelligent nosepiece. See “3.1, Step 10 Attach the objective.”

## 1 Attach the C-FDF Flexible Double Arm Fiber Illumination Unit.

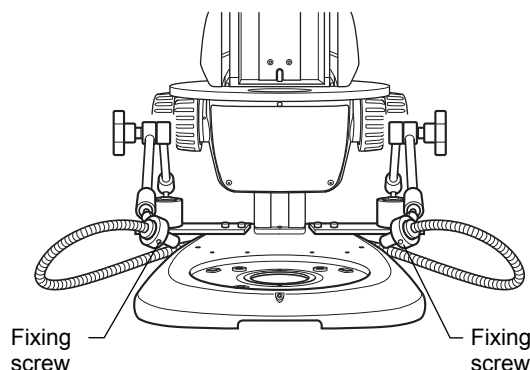
This unit can be attached to any kinds of the bases or the stand.

- (1) Attach a base of the C-FIDH Fiber Holder to the right and left rear sides of the base. Two bolt holes are located on each side.



Attaching the fiber holder by tightening the bolts

- (2) Fit the flexible double arm fiber tip to the ring at the arm end and tighten the M4 set screw for the fiber using a hex driver (nominal designation: 2).
- (3) Firmly insert the fiber source side connectors into the C-FLED2 LED Light Source attachment holes. See the instruction manual for the light source for details.



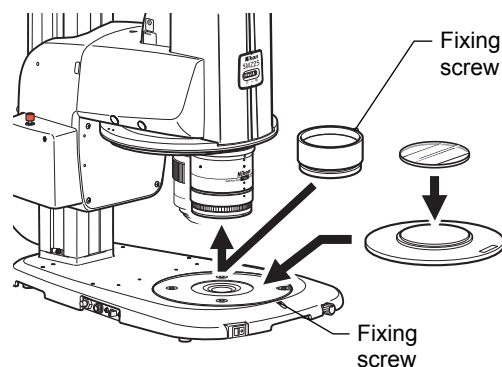
Attaching the flexible double arm fiber by tightening the screws

## 2 Attach the P2-POL Simple Polarizing Attachment.

Attach it to the P2-DBL LED Diascopic Illumination Base or P2-DBF Fiber Diascopic Illumination Base.

Attach a P2-SHR Plan Apo 0.5X or 1X objective.

- (1) Loosen the M4 set screw for the stage plate on the diascopic illumination base using a hex driver (nominal designation: 2) to detach the stage plate, and fit the base plate of the polarizer into the diascopic illumination base.
- (2) Determine the orientation of the polarizer and tighten the stage plate fixing screw.
- (3) Place the stage glass (90 mm dia.) supplied with the polarizer attachment on the polarizer.
- (4) Loosen the fixing screw of the analyzer. Fit the analyzer into the objective end until it reaches the limit, and tighten the fixing screw.



Attaching the simple polarizing attachment by tightening the screws

### ✔ Directly placing the polarizer

When the LED diascope illumination base is in use, the polarizer can be removed from the polarizer attachment and can be individually attached to the diascope illumination base. Fit it under the stage plate of the diascope illumination base. The stage plate can be used as is.

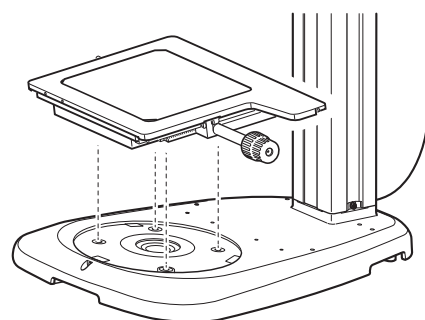
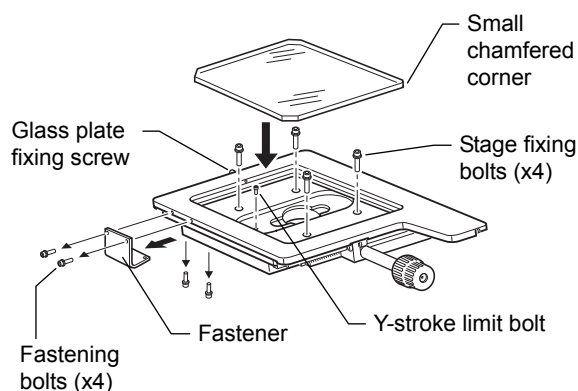
## 3 Attach the P-SXY64 XY Stage.

Attach the P-SXY64 XY Stage to the P2-PB Plain Base, P2-DBL LED Diascopic Illumination Base or P2-DBF Fiber Diascopic Illumination Base.

- (1) Remove the fastener for the stage. Loosen the four M4 hexagon socket head bolts for the stage using a hex wrench (nominal designation: 3).
- (2) Loosen the M4 set screw for the stage plate on the base using a hex driver (nominal designation: 2) to detach the stage plate.
- (3) Attach the P-SXY64 Stage using the four tap holes that are located under the stage plate attachment position.

Move the upper plate of the P-SXY64 to align the installation holes on the lower plate with the tap holes, insert the four M6 hexagon socket head bolts and firmly tighten them using a hex wrench (nominal designation: 5).

- (4) Fit the glass plate supplied with the P-SXY64 XY Stage on to the upper plate of the stage. The glass plate has chamfered corners including one small chamfered corner. Align the small chamfered corner with the right rear side of the stage (as viewed from the front) to fit the glass plate on the stage, and tighten the glass plate fixing screw.



**Attaching the P-SXY64 Stage by tightening the bolts**

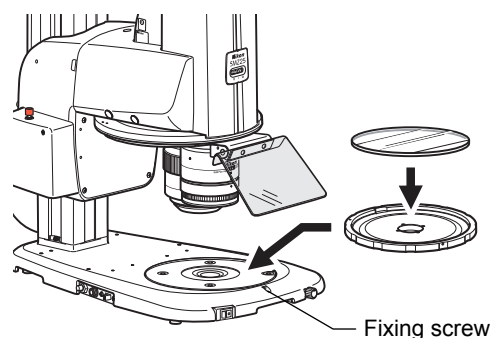
### ⓘ Y-stroke limit bolt

When attaching the P-SXY64 to the P-PS32 Plain Stand, screw the Y-stroke limit bolt supplied with the P-SXY64 into the stage. Use a hex wrench (nominal designation: 2.5) when tightening the M3 hexagon socket head bolt.

## 4 Attach the C-SSL DIA Sliding Stage.

Attach the C-SSL DIA Sliding Stage to the P2-PB Plain Base, P2-DBL LED Diascopic Illumination Base or P2-DBF Fiber Diascopic Illumination Base.

- (1) Loosen the M4 set screw for the stage plate on the base using a hex driver (nominal designation: 2) to detach the stage plate.
- (2) Fit the sliding stage into the base and tighten the stage plate fixing screw.
- (3) Place the stage plate detached in Step (1) on the sliding stage.

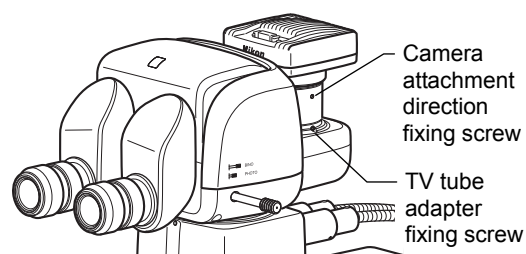


**Attaching the DIA sliding stage by tightening the screw**

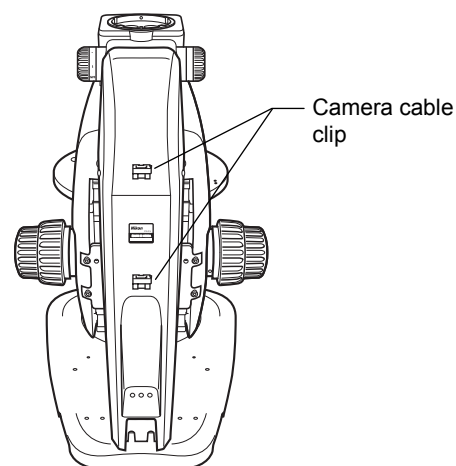
## 5 Attach a Camera.

- (1) Screw the C-mount lens in the DS camera head, attach it to the LV-TV TV Tube Adapter, and then tighten the camera attachment direction fixing screw on the TV tube adapter.
- (2) Loosen the TV tube adapter fixing screw located on the mount on the tube side, attach the TV tube adapter, determine the DS camera head orientation, and then tighten the TV tube adapter fixing screw.
- (3) Connect the camera cable connector of the DS camera head to the connector "CAMERA" of the DS-L3/DS-U3 DS camera control unit using a dedicated camera cable.

Use two camera cable clips that are located on the rear side of the focus unit.



**Attaching the camera by tightening the screws**



**Camera cable clip**

## 6 Attach other devices.

Devices such as those listed below can also be attached.

For details on assembly, see the instruction manual supplied individually with the devices.

- C-TRS Tilting Stage: Attached to the base or stand
- P-DF LED Dark Field Unit: Attached to the base, stand or C-SSL DIA Sliding Stage
- P2-FIRL LED Ring Illumination Unit: Attached to the outer cylinder of the objective

Chapter

6

# Troubleshooting

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Misuse of the microscope can adversely affect performance even if the microscope is functioning properly. If any of the problems described in this chapter occur, be sure to check the table for possible causes before requesting service.

If you detect problems that are not listed in the table or the problem still persists even after the indicated measures are taken, turn off the device and contact your nearest Nikon representative.

## 1 Image Viewing

Problem	Cause	Measure
Part of the field of view is missing. The field of view is invisible. The brightness of the field of view is not uniform. Images are dark.	Devices are not attached correctly.	Attach the devices correctly.
	The optical path switching lever of the tube is positioned partway.	Position the lever correctly.
	The nosepiece is not turned to the click position or is placed in vertical view status.	Firmly turn the nosepiece to the click position for stereoscopic view to bring the objective into the optical path.
	The objective and/or sample is contaminated with dirt or dust.	Clean as needed.
	An aperture diaphragm is stopped down too far.	Open it to the proper size.
	The light intensity of illumination is too low.	Adjust the light intensity to an appropriate level.
Dirty or dusty field of view	The objective is contaminated with dirt or dust.	Clean as needed.
	The sample is contaminated with dirt or dust.	Clean as needed.
One side of the images is blurred or images are distorted.	The stage is not attached horizontally.	Attach the stage correctly.
	A sample is tilted relative to the stage surface.	Correctly reposition the sample on the stage.

## 2 Operation

Problem	Cause	Measure
Even when looking with both eyes, an image does not appear as a single image.	The interpupillary distance has not been adjusted.	Adjust the interpupillary distance.
	The diopter has not been adjusted.	Adjust the diopter distance.
Eyes become fatigued.	The interpupillary distance has not been adjusted.	Adjust the interpupillary distance.
	The diopter has not been adjusted.	Adjust the diopter distance.
	Brightness is inadequate.	Adjust the brightness of the illumination.
Changing magnification results in large focal deviation.	The diopter has not been adjusted.	Adjust the diopter distance.
The focal deviation is large when switching objectives.	The diopter has not been adjusted.	Adjust the diopter distance.
The torque of the coarse focus knob is heavy.	The torque adjustment ring has been tightened too much.	Loosen the torque adjustment ring to some extent.
The focus becomes less sharp over time. The vertical position of the zooming body may slide due to various loads (such as its own weight or the load of the counterbalance spring inside the focus unit).	The torque adjustment ring is loosened too much.	Tighten the torque adjustment ring to adjust the torque to an appropriate level.



## 3

## Motorized Devices

Problem	Cause	Measure
The product cannot be turned on.	The power cable is not connected.	Connect the power cable properly.
Operating the remote controller does not cause a motorized device to operate.	The power of the P2-CTLA Control Box is not turned on or the AC adapter is not connected.	Check the connections between the AC adapter and the P2-CTLA Control Box, and then move the power switch to the "I" position to turn on the power.
	The devices are not connected or the connections are not made correctly.	Connect the devices correctly.
The motorized focus unit does not operate.	The unit is placed in escape status.	Exit the escape status.
	The STOP switch has been pressed.	Press the STOP switch again to cancel the function.
The motorized focus unit does not move down completely.	Limit setting has been made.	Cancel the limit setting.
The motorized zoom function works unexpectedly.	The ALZ function is enabled.	Disable the ALZ function.
The LCD of the remote controller is invisible.	The backlight is turned off.	Turn the backlight control dial.
The LED of the remote controller is off.	The backlight control dial is set to the minimum level.	Turn the backlight control dial.
The light of the LED diascopic illumination base cannot be adjusted.	The LED power ON/OFF switch is set to OFF.	Set the LED power ON/OFF switch to ON.
	The control right has not been matched.	Match the control right.

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Chapter

7

# Maintenance and Storage

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This chapter describes how to maintain and store the product.

## 1 Cleaning

Clean and disinfect the microscope and lenses as described in the procedures below.

### ■ Tools used for cleaning

- Blower
- Soft brush
- Soft cotton cloth, lens tissue, gauze, etc.
- Pure alcohol (ethyl or methyl alcohol), medical alcohol

### CAUTION

- Pure alcohol used for cleaning is highly flammable. Be careful when handling these materials particularly around open flames or when turning the power switch on or off.
- Follow the instructions provided by the manufacturer when using pure alcohol.
- When cleaning the product, do not use organic solvents (alcohol, ether, thinner, etc.) on the coated, plastic, or printed areas. Doing so will result in discoloration or peeling of the printed characters.

## 1.1 Cleaning Lenses

Keep the lens free of dust and fingerprints. Any contamination on the lenses or filters will lower the image quality. If the lenses have become dirty, clean them as follows:

### ■ Cleaning light dirt (dust)

- (1) Use an air blower to blow off any dust.
- (2) If any dust remains, brush the dust off using a soft brush or gently wipe the dust off using a piece of gauze.

### ■ Cleaning tough dirt (fingerprints or grease)

Use a soft, clean cotton cloth, lens tissue, or gauze lightly dampened with pure alcohol (ethyl or methyl alcohol) to wipe the dirt off.

#### Tips on wiping

Do not reuse cotton cloth, lens tissue, or gauze that has already been used.

## 1.2 Cleaning Parts Other than the Lens

### ■ Cleaning light dirt (dust)

Use a silicon cloth to clean the part.

### ■ Cleaning tough dirt (fingerprints or grease)

Lightly dampen a piece of gauze with a neutral detergent and gently wipe the dirt off.

### 1.3 Disinfecting the Product

For routine disinfection of this product, Nikon recommends using 70% medical alcohol.

Using organic solvents on plastic parts can cause discoloration.

#### ✔ Cautions on disposal

If a sample contacts this product, check whether the sample is hazardous. If the sample is hazardous, follow the standard procedures established for your facility.

## 2 Storage

- Store this product in a dry location free of mold or mildew.  
The storage conditions are as follows: temperature (-20°C to +60°C), humidity (90% RH max., no condensation).
- Place a cover over this product to protect it from dust.
- Switch off the device (press the switch to the “O” position). If the device is warm, wait for it to cool before covering it with a cover.

## 3 Periodic Inspection (Charged)

To maintain the performance of this product, Nikon recommends periodic inspection (chargeable service). Contact your nearest Nikon representative for details.

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Chapter

8

# Specifications

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## 1 Microscopy (Principles)

The microscope's objectives and optical zoom system enable the magnification of minute substances of such samples placed on the stage as metal, mineral, and cells, so that microscopy and image capturing are performed with the focus adjusted using the focus device.

### ■ Intended use of this product

This microscope is intended primarily for microscopic observations, experimentation and image capturing of samples (metal, mineral, cells, etc.) placed on the stage, using diascopic and reflected illumination. Therefore, accuracy of the numeric information (such as magnifications or Z-position information) is not guaranteed. These values are used as reference and include a margin of error.

## 2 Performance Properties

### ■ Stereo microscope

Name	Zooming body	Zooming body
Model	SMZ18	SMZ25
Zoom ratio	18:1	25:1
Magnification	0.75 to 13.5x	0.63 to 15.75x
NA	0.15 (For 1x objective and 13.5x zoom)	0.156 (For 1x objective and 15.75x zoom)
Objective mount	Circular dovetail with a drop prevention mechanism	Circular dovetail with a drop prevention mechanism
Zooming	Right/left single-axis knob Click stop: 0.75x, 1x, 2x, 3x, 4x, 5x, 6x, 8x, 10x, 12x, 13.5x; cancelable	Motorized (No zooming knob)
Aperture diaphragm	Variable in the range from fully open to 3 mm dia.	Variable in the range from fully open to 3 mm dia.

### ■ Focus device

Name	Focus Unit	Motorized Focus Unit
Model	P2-FU	P2-MFU
Vertical movement method	<ul style="list-style-type: none"> <li>Through rotation of the right/left single-axis coarse/fine focus knob</li> <li>Adjustable coarse focus knob torque</li> </ul>	<ul style="list-style-type: none"> <li>Motorized</li> <li>Focusing travel speed: coarse/fine/extra fine movement switching method (The focus speed changes based on the rotation angle of the remote controller's knob.) <ul style="list-style-type: none"> <li>Coarse: 2 to 100 mm/second</li> <li>Fine: 0.2 to 5 mm/second</li> <li>Extra fine: 0.01 to 0.1 mm/second</li> </ul> </li> </ul>
Focusing stroke	100 mm	100 mm
Stroke per rotation of the focus knob	Coarse: 18.50 mm/rev Fine: 3.27 mm/rev	—



■ Base/stand

Name	Plain Base	LED Diascopic Illumination Base	Fiber Diascopic Illumination Base	Plain Stand
Model	P2-PB	P2-DBL	P2-DBF	P-PS32
Tap hole	With tap holes for accessories	With tap holes for accessories	With tap holes for accessories	With tap holes for accessories
Diascopic illumination	None	<ul style="list-style-type: none"> <li>• Diascopic illumination through an LED light source (bright field, OCC)</li> <li>• Prism sheet for shading reduction: Removable</li> <li>• LED illumination ON/OFF switch; with a brightness control dial; switchable LED brightness control</li> <li>• AC adapter input terminal</li> <li>• LED brightness control terminal</li> <li>• Power supply: Supply from the control box or a 12 V AC adapter</li> </ul>	<ul style="list-style-type: none"> <li>• Diascopic illumination through an external LED light source and fiber (bright field, OCC)</li> <li>• High/low magnification condenser lens: Switching method</li> <li>• Filter (NCB11, ND4, ND16): Removable</li> <li>• Light source: C-FLED2 LED Light Source for Fiber Illuminator (Refer to the instruction manual for the light source.)</li> </ul>	None

■ Tube

Name	Trinocular Tilting Tube	Trinocular Tilting Tube	Trinocular Tube L
Model	P2-TERG 100	P2-TERG 50	P2-TL100
Angle of depression	0 to 30° (continuously variable)	0 to 30° (continuously variable)	10°
Eyepiece mount/tube mount optical-path switching	By the optical path switching lever	By the optical path switching lever	By the optical path switching lever

■ Objective

Name	Objective	Objective	Objective	Objective
Model	P2-SHR Plan Apo 0.5X	P2-SHR Plan Apo 1X	P2-SHR Plan Apo 1.6X	P2-SHR Plan Apo 2X
Magnification	0.5x	1x	1.6x	2x
Numerical aperture (maximum)	0.078	0.156	0.25	0.312
Working distance	71 mm	60 mm	30 mm	20 mm
Parfocal distance	150 mm	150 mm	150 mm	150 mm
Objective mount	Exclusively-shaped bayonet	Exclusively-shaped bayonet	Exclusively-shaped bayonet	Exclusively-shaped bayonet
Others	Protection ring provided	Correction glass provided		With a correction ring

■ **Eyepiece**

Name	Eyepiece	Eyepiece	Eyepiece	Eyepiece
Model	C-W10XB	C-W15X	C-W20X	C-W30X
Magnification	10x	15x	20x	30x
Field number	22	16	12.5	7

■ **Episcopic illuminator**

Name	Coaxial Epi Illuminator	Flexible Double Arm Fiber Illumination Unit	Ring Fiber Illumination Unit	LED Ring Illumination Unit
Model	P2-CI	C-FDF	P2-FIR	P2-FIRL
Magnification	1x	—	—	—
Episcopic illumination	<ul style="list-style-type: none"> <li>• Episcopic illumination through a two-branch fiber</li> <li>• Light source: C-FLED2 LED Light Source for Fiber Illuminator (Refer to the instruction manual for the light source.)</li> </ul>	<ul style="list-style-type: none"> <li>• Episcopic illumination through fiber branched into two</li> <li>• Light source: C-FLED2 LED Light Source for Fiber Illuminator (Refer to the instruction manual for the light source.)</li> <li>• Used together with C-FIDH Fiber Holder</li> </ul>	<ul style="list-style-type: none"> <li>• Episcopic illumination through fiber positioned like a ring</li> <li>• Light source: C-FLED2 LED Light Source for Fiber Illuminator (Refer to the instruction manual for the light source.)</li> </ul>	<ul style="list-style-type: none"> <li>• Episcopic illumination through an LED ring (Refer to the instruction manual for the LED ring illuminator.)</li> </ul>

■ **Epi fluorescence attachment**

Name	Epi Fluorescence Attachment	Motorized Epi Fluorescence Attachment
Model	P2-EFLI	P2-EFLM
Magnification	1x	1x
Epi-fl illumination	<ul style="list-style-type: none"> <li>• Attachment of filter cubes to the internal turret</li> <li>• Up to four filter cubes can be attached.</li> <li>• Turret switching: Knob rotation method</li> <li>• Light source: HG Precentered Fiber Illuminator C-HGFI/C-HGFIE (Refer to the instruction manual for the light source.)</li> </ul>	<ul style="list-style-type: none"> <li>• Attachment of filter cubes to the internal turret</li> <li>• Up to four filter cubes can be attached.</li> <li>• Turret switching: Motorized</li> <li>• Light source: HG Precentered Fiber Illuminator C-HGFI/C-HGFIE (Refer to the instruction manual for the light source.)</li> </ul>

■ **Remote control device**

Name	Remote Controller	Foot Switch	Photo Release
Model	P2-RC	AZ-FSW	AZ-PCR
Function, etc.	<ul style="list-style-type: none"> <li>• Focus operation, zoom operation, etc.</li> <li>• Connected to the P2-CTLA Control Box</li> <li>• For details, see Chapter 4, “10.1 P2-RC Remote Controller.”</li> </ul>	<ul style="list-style-type: none"> <li>• Focus operation, zoom operation</li> <li>• Connected to the P2-CTLA Control Box</li> </ul>	<ul style="list-style-type: none"> <li>• Image capture using a DS camera head</li> <li>• Connected to the AZ-FSW Foot Switch</li> </ul>

**■ Relay device**

Name	Relay Box	Relay Cable
Model	P2-RLY	P2-RLYC
Function, etc.	<ul style="list-style-type: none"> <li>Relay of signals for motorized control of a device or detection of the device status</li> <li>For details, see Chapter 4, "11.3 P2-RLY Relay Box."</li> </ul>	<ul style="list-style-type: none"> <li>Relay of status detection signals with the SMZ18 Zooming Body and RELAY of the P2-CTLB Control Box connected</li> </ul>

**■ Control box**

Name	Control Box	Control Box
Model	P2-CTLB	P2-CTLA
AC adapter	24 V AC adapter	24 V AC adapter
Function, etc.	<ul style="list-style-type: none"> <li>Combined with a status detection device for status detection or communications through electrical connections</li> <li>For details, see Chapter 4, "11.1 P2-CTLB Control Box."</li> </ul>	<ul style="list-style-type: none"> <li>Combined with a motorized device or status detection device for motorized control, status detection, or communications through electrical connections</li> <li>For details, see Chapter 4, "11.2 P2-CTLA Control Box."</li> </ul>

**■ AC Adapter**

Name	12 V AC Adapter	24 V AC Adapter
Model	EA1050E-120	PW-120A-1Y24GPB
Manufacturer	EDAC POWER Electronics Co., Ltd.	Power-Win Technology
Input rating	100-240 VAC±10%, 50-60 Hz, 1.8 A	100-240 VAC±10%, 50-60 Hz, 2.0 A
Output rating	12 VDC, 3.5 A Max.	24 VDC, 5.0 A Max.
External dimensions (W x H x L)	60 x 35 x 120 mm	64.8 x 38.5 x 170 mm
Weight	253 g (excluding power cable)	650 g (excluding power cable)
Safety standards	UL certified, GS certified, CE declaration of conformity, PSE certified	UL certified, GS certified, CE declaration of conformity, PSE certified

**■ Power cable**

Relevant device	P2-CTLA Control Box P2-CTLB Control Box P2-DBL LED Diascopic Illumination Base EA1050E-120 12 V AC adapter PW-120A-1Y24GPB 24 V AC adapter
When used in 100-120 V regions outside Japan	UL listed detachable power cable set, 3 conductor grounding (3 conductor grounding Type SVT, No.18 AWG, 3 m long maximum, rated at 125 VAC minimum)
When used in 220-240 V region	Detachable power cable set approved in accordance with EU/EN standards, 3 conductor grounding (3 conductor grounding Type H05VV-F, 3 m long maximum, rated at 250 VAC minimum)
When used inside Japan	PSE approved detachable power cable set, 3 conductor grounding (3 conductor grounding Type VCTF 3 x 0.75 mm <sup>2</sup> , 3 m long maximum, rated at 125 VAC minimum)

3

Physical Properties

Research stereo microscope SMZ25/SMZ18

<p>Operating conditions</p>	<p>Temperature: 0°C to +40°C                  Humidity: 60% RH max. (no condensation)                  Altitude: 2,000 m max.                  Pollution level: Degree 2                  Overvoltage Category: Category II                  Short-term temporary overvoltage: 1440 V (5 sec. max.)                  Long-term temporary overvoltage: 490 V (over 5 sec.)                  Electrical shock protection class (AC Adapter): Class I                  Indoor use only</p>
<p>Transport/storage conditions</p>	<p>Temperature: -20°C to +60°C                  Humidity: 90% RH max. (no condensation)</p>
<p>External dimensions (W x H x L) and weight</p>	<p>310 x 550 x 573 mm, 25 kg                  (The system shown in Chapter 1, “2 Microscopy System under Diascopic Illumination and Epi-fluorescence Illumination” excluding the remote controller, control box and HG precentered fiber illuminator is taken as an example.)</p>
<p>Safety Standards</p>	<ul style="list-style-type: none"> <li>• UL listed product</li> <li>• This product meets FCC Part 15B Class A requirements.                      This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 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.</li> <li>• This Class A digital apparatus complies with Canadian ICES-003(A) / NMB-003(A).                      Cet appareil numérique de la classe A est conforme à la norme NMB-003(A) du Canada.</li> <li>• This product complies with Australian AS/NZS CISPR11 Group 1 Class B.</li> </ul> <p>CE Marking</p> <ul style="list-style-type: none"> <li>• This product meets EU Low Voltage Directive requirements.</li> <li>• This product meets EU EMC Directive requirements.</li> </ul>

