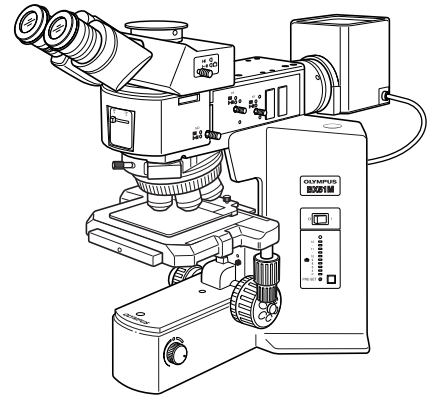


OLYMPUS[®]



INSTRUCTIONS

BX51M

SYSTEM METALLURGICAL MICROSCOPE

This instruction manual is for the Olympus System Metallurgical Microscope Model BX51M. To ensure the safety, obtain optimum performance and to familiarize yourself fully with the use of this microscope, we recommend that you study this manual thoroughly before operating the microscope. Retain this instruction manual in an easily accessible place near the work desk for future reference.



AX7609

CE Compliance

This device complies with the requirements of both directive **2004/108/EC** concerning electromagnetic compatibility and directive **2006/95/EC** concerning low voltage. The CE marking indicates compliance with the above directives.

NOTE: 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.

FCC WARNING: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

CONTENTS

Correct assembly and adjustments are critical for the microscope to exhibit its full performance. If you are going to assemble the microscope yourself, please read chapter 8, "ASSEMBLY" (pages 27 to 29) carefully.

IMPORTANT – Be sure to read this section for safe use of the equipment. – 1-3

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IMPORTANT

This microscope employs a UIS2 (UIS) (Universal Infinity System) optical design, and should be used only with UIS2 (UIS) eyepieces, objectives and condensers for the BX2 series. (Some of the modules designed for the BX series are also usable. For details, please consult Olympus or the latest catalogue.)

⚠ SAFETY PRECAUTIONS

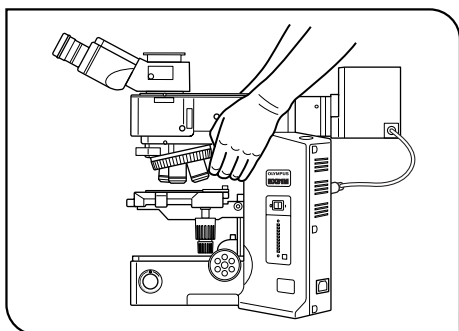


Fig. 1

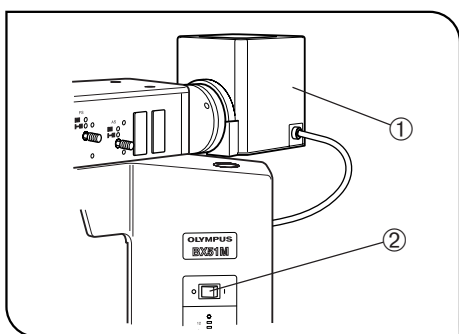


Fig. 2





1. Install the microscope on a sturdy, level table or bench so as not to block the air vents on the underside of the base.
2. When moving the microscope, carefully carry it with the grasping part on the arm as shown in Fig. 1 (Weight: approx. 15 kg).
 - ★ **Damage to the microscope will occur if you grasp it by other parts including the stage, lamp socket or tube.**
 - ★ **Before transporting the microscope, be sure to remove the specimen and eyepieces so that they will not drop. Also remove other modules attached to the microscope because they increase the system weight.**
3. The surface of the lamp housing ① becomes very hot during operation. Before installing the lamp housing, be sure to reserve enough space around, particularly above, the lamp housing.
4. To avoid potential shock hazards and burns when replacing the light bulb, set the main switch ② to "●" (OFF) then disconnect the power cord from the wall outlet in advance. Whenever you replace the bulb during use or right after use, allow the lamp housing ① and bulb to cool before touching (Fig. 2).

Designated halogen bulbs	12V100WHAL-L (PHILIPS 7724) 12V50WHAL-L (LIFE JC)
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- ★ **The microscope also incorporates a fuse (this should be replaced by the manufacturer or authorized agent).**
5. Always use the power cord provided by Olympus. If no power cord is provided, please select the proper power cord by referring to the chapter "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, product safety and performance cannot be guaranteed.
 6. Always ensure that the **grounding terminal** of the microscope and that of the wall outlet are properly connected. If the equipment is not grounded, Olympus can no longer warrant the electrical safety and performance of the equipment.
 7. Never insert metal objects, etc. into the air vents of the microscope frame as this could result in electrical shock and personal injury.
 8. The microscope system will be unstable when its height is increased by attached accessories. Take proper measures so that the system will not topple down.


Safety Symbols

The following symbols are found on the microscope. Study the meaning of the symbols and always use the equipment in the safest possible manner.

Symbol	Explanation
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual. Improper use could result in personal injury to the user and/or damage to the equipment.
	Indicates that the main switch is ON.
	Indicates that the main switch is OFF.

Warnings

Warning engraving/stickers are placed at parts where special precaution is required when handling and using the microscope. Always heed the warnings.

Warning engraving position	Lamp housing (U-LH100-3) (Warning against high temperature) 
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1 Getting Ready

1. A microscope is a precision instrument. Handle it with care and avoid subjecting it to sudden or severe impact.
2. Do not use the microscope where it is subjected to direct sunlight, high temperature and humidity, dust or vibrations. (For the operating conditions, refer to chapter 6, "SPECIFICATIONS".)
3. The BX51M can be used with an intermediate attachment such as a U-CA magnification changer or U-EPA2 eyepoint adjuster.

2 Maintenance and Storage

1. To clean the lenses and other glass components, simply blow dirty away using a commercially available blower and wipe gently using a piece of cleaning paper (or clean gauze).
If a lens is stained with fingerprints or oil smudges, wipe it gauze slightly moistened with commercially available absolute alcohol.
▲Since the absolute alcohol is highly flammable, it must be handled carefully.
Be sure to keep it away from open flames or potential sources of electrical sparks — for example, electrical equipment that is being switched on or off.
Also remember to always use it only in a well-ventilated room.
2. Do not attempt to use organic solvents to clean the microscope components other than the glass components. To clean them, use a lint-free, soft cloth slightly moistened with a diluted neutral detergent.
3. Never attempt to disassemble any part of the microscope.
4. When not using the microscope, make sure that the lamp socket has cooled down sufficiently and then cover the microscope with a dust cover.
5. When disposing of the microscope, check the ordinances and rules of your local authority and follow them.

3 Caution

If the microscope is used in a manner not specified by this manual, the safety of the user may be imperiled. In addition, the equipment may also be damaged. Always use the equipment as outlined in this instruction manual.

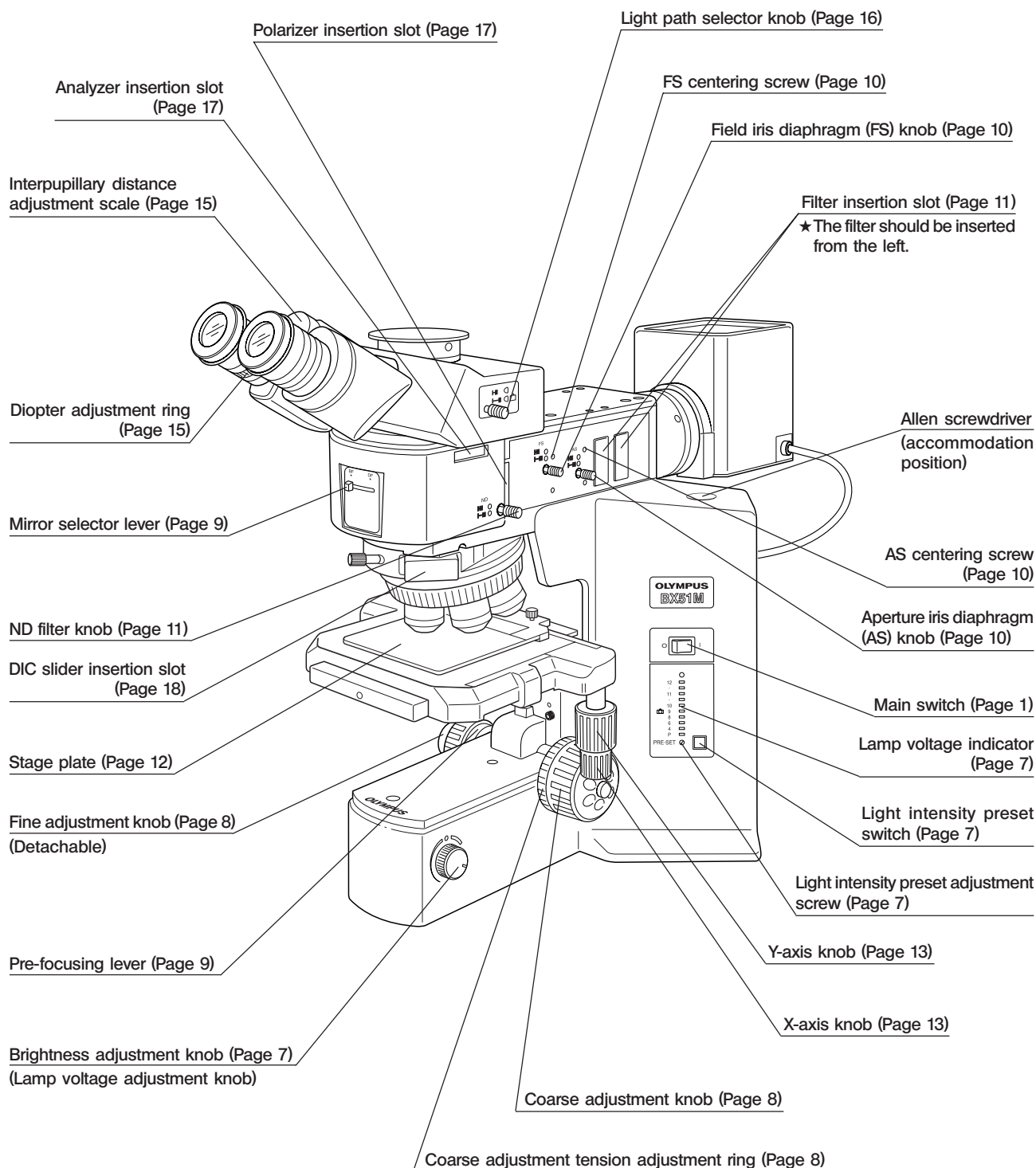
The following symbols are used to set off text in this instruction manual.

- ▲: Indicates that failure to follow the instructions in the warning could result in bodily harm to the user and/or damage to equipment (including objects in the vicinity of the equipment).
- ★: Indicates that failure to follow the instructions could result in damage to equipment.
- ◎: Indicates commentary (for ease of operation and maintenance).

1 NOMENCLATURE

© If you have not yet assembled the microscope, read chapter 8, "ASSEMBLY" (pages 27 to 29).

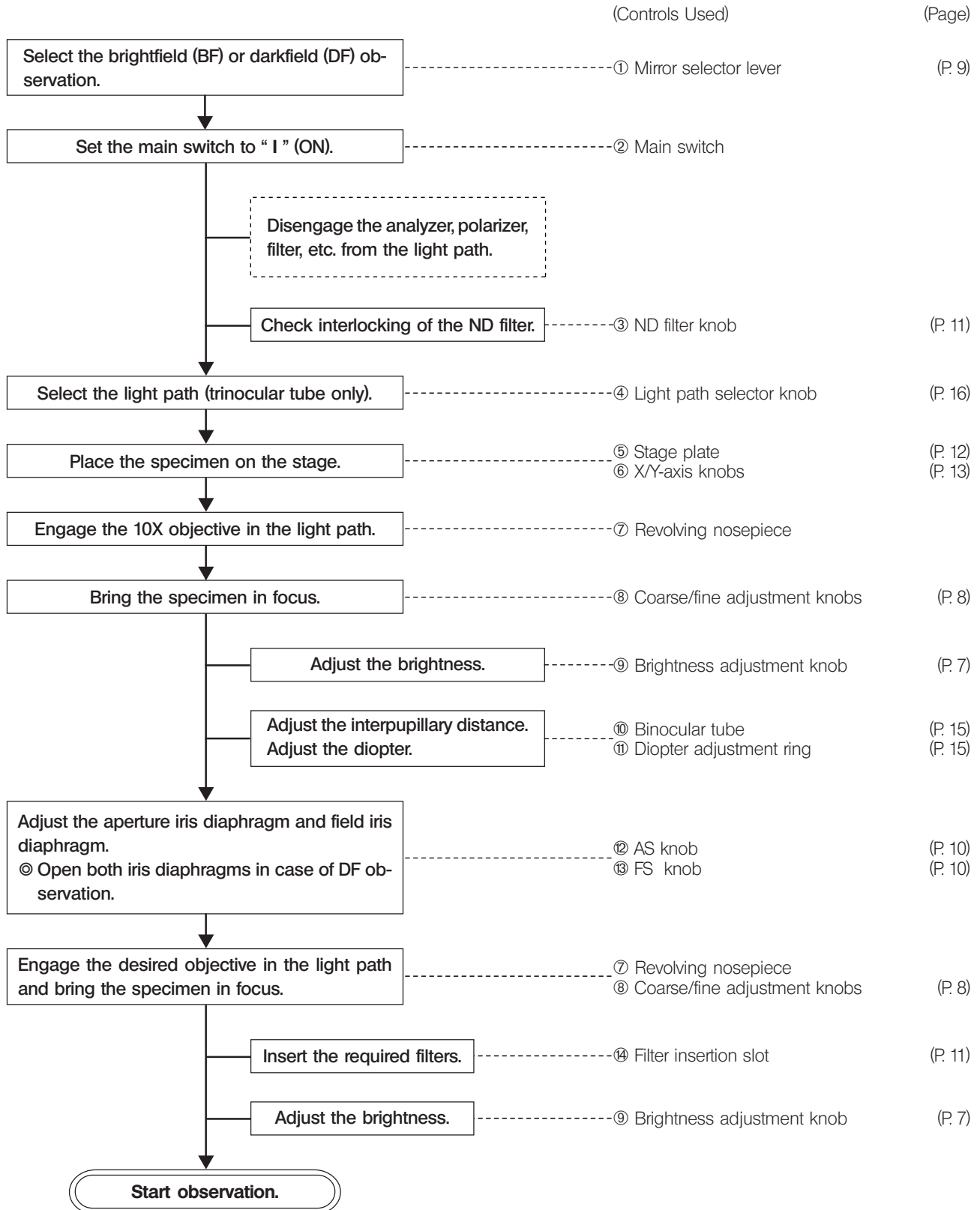
© This illustration shows the BX-51RF microscope frame with the BX-RLA2 reflected light brightfield/darkfield illuminator installed on it. For the nomenclature of the BX-URS2 universal illuminator, please refer to its instruction manual.

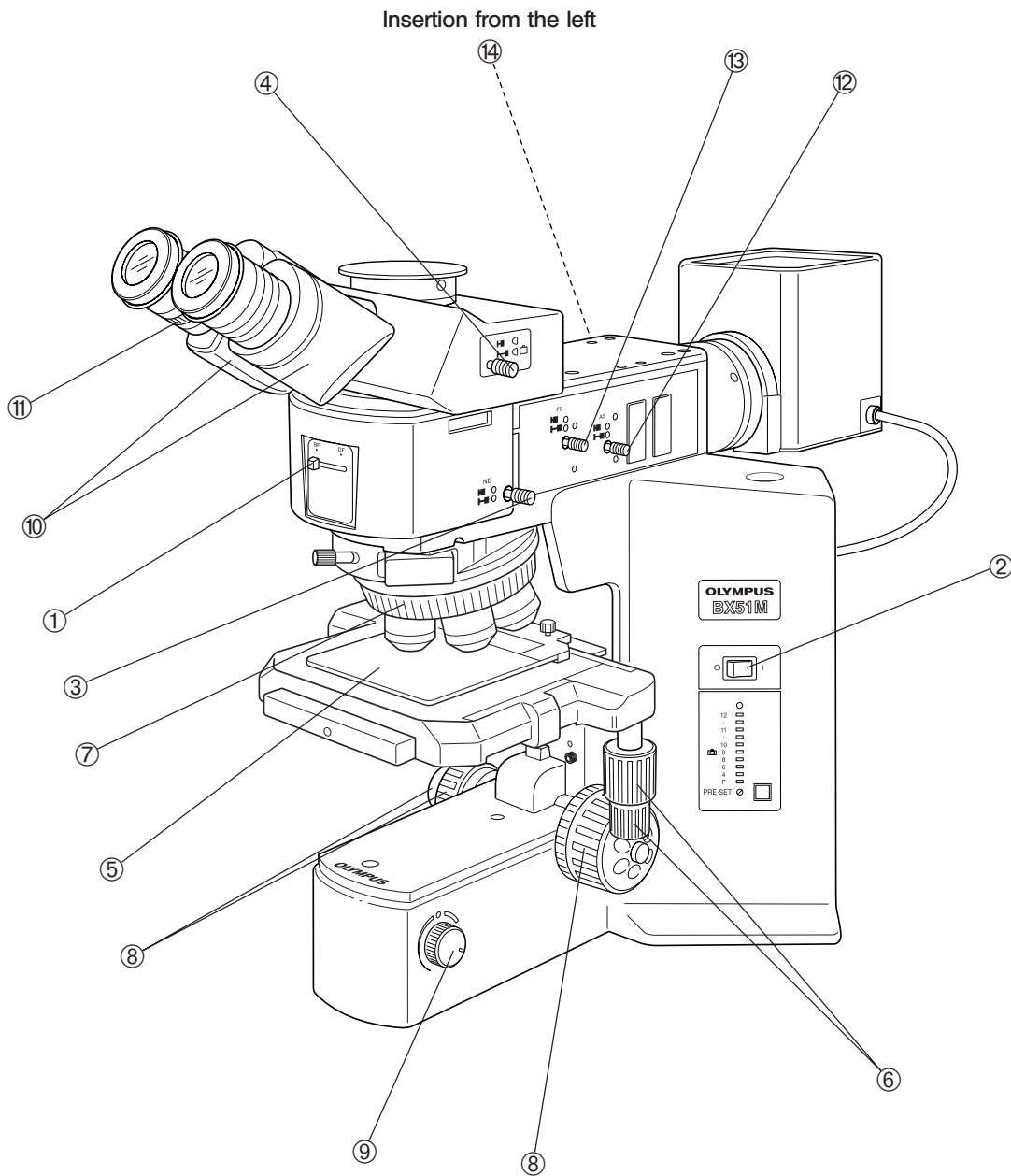


2

REFLECTED LIGHT BRIGHTFIELD/DARKFIELD OBSERVATION PROCEDURE

©The following flow shows the basic operating procedure for reflected light brightfield or darkfield observation. The operating procedures for polarized light and Nomarski DIC observations will be described separately in their descriptions.





© Make a photocopy of the observation procedure pages and post it near your microscope.

3 USING THE CONTROLS

3-1 Base

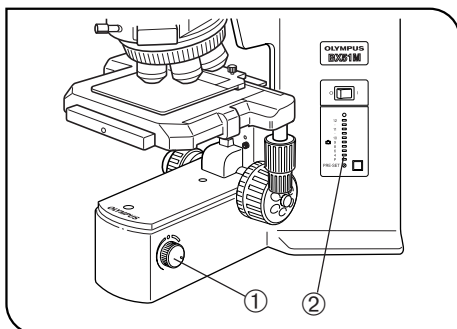


Fig. 3

1 Voltage Indication (Fig. 3)

1. Turn the brightness adjustment knob ① clockwise to increase the voltage and make illumination brighter.
2. The numerals on the left of the lamp voltage LEDs ② indicate the approximate voltage.

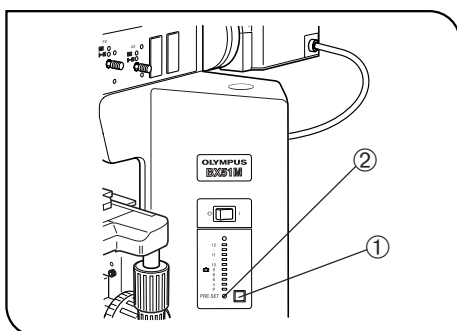



Fig. 4

2 Using the Light Intensity Preset Switch (Fig. 4)

- ⊙The light intensity preset switch ① makes it possible to limit the light intensity to a preselected level regardless of the position of the brightness adjustment knob. The light intensity preset switch has been preset before factory shipment to a position which can provide optimum color reproduction when the U-25LBD filter is engaged in the light path (approx. 9 V  mark).
1. Press the light intensity preset switch ① to the ON position. (The switch lights when it is ON.)
 2. Using a small flat-blade screwdriver, turn the preset adjustment screw ② to obtain the required light intensity. Turning the screw clockwise increases brightness.
 3. When the light intensity preset switch is set to OFF, the brightness returns to the level set by the brightness adjustment knob.
- ⊙While the light intensity preset switch is ON, turning the brightness adjustment knob does not affect brightness.

3-2 Focusing Block

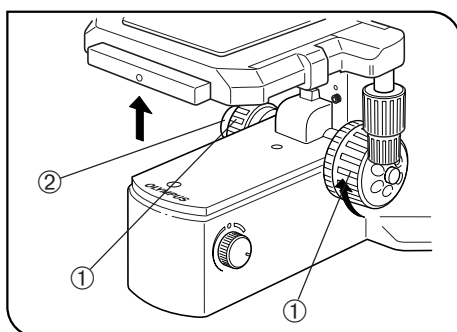


Fig. 5

1 Adjusting the Focus (Fig. 5)

(Fig. 5)

The coarse adjustment knob ① and fine adjustment knob ② are designed to raise the stage (i.e. to let the specimen approach the objective) when they are rotated in the direction of the arrows.

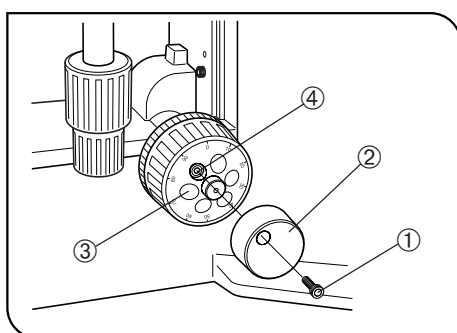


Fig. 6

2 Replacing the Fine Adjustment Knob (Fig. 6)

(Fig. 6)

★ The fine adjustment knob has been attached on the right side at the factory.

◎ The fine adjustment knob is designed detachable to prevent interference with hand during manipulation of the stage feed knobs. Usually attach the knob on the opposite side to the stage feed knobs.

1. Loosen the clamping screw ① using the Allen screwdriver, and remove the fine adjustment knob ②.

2. Remove the seal from the fine adjustment knob screw hole on the other side and attach the knob by reversing the removal procedure.

3. Attach one of the provided seals on the screw hole ④ of the removed fine adjustment knob.

◎ The fine adjustment dial ③ can be operated with your fingertip or finger surface.

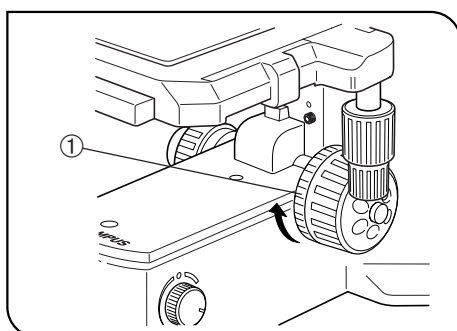


Fig. 7

3 Adjusting the Coarse Adjustment Knob Tension (Fig. 7)

(Fig. 7)

★ The rotation tension of the coarse adjustment knob should be adjusted using the tension adjustment ring.

The coarse adjustment knob tension is preadjusted for easy use. However, if desired, you can change the tension using the tension adjustment ring ①. Turning the ring in the direction of the arrow increases tension, and vice versa.

The tension is too low if the objective drops by itself or focus is quickly lost after adjustment with the fine adjustment knob. In this case, turn the ring in the direction of the arrow to increase tension.

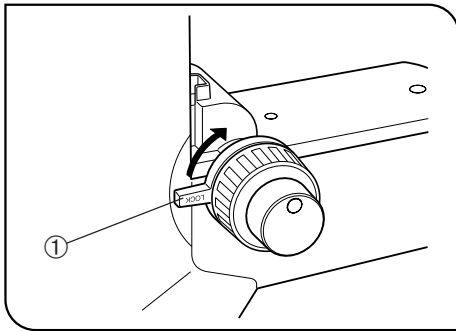


Fig. 8

4 Pre-focusing Lever (Fig. 8)

◎ The pre-focusing lever ensures that the objective does not come in contact with the specimen and simplifies focusing.

After focusing on the specimen with the coarse adjustment knob, turn this lever ① in the direction of the arrow and lock; the upper limit of coarse adjustment movement is set at the locked position.

After changing a specimen, refocusing is easily accomplished by rotating the coarse adjustment knob to reach the pre-focused position, then making fine adjustments with the fine adjustment knob.

◎ Stage movement with the fine adjustment knob is not locked.

★ If the pre-focusing lever is locked, the stage cannot be lowered to the lower limit.

3-3 Reflected Light Brightfield/Darkfield Illuminator (BX-RLA2)

◎ For the BX-URA2 universal illuminator, please refer to its instruction manual.

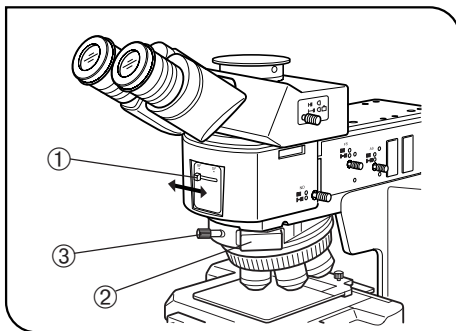


Fig. 9

1 Selecting the Light Path (Fig. 9)

Slide the mirror selector lever ① toward the indication of the mirror for the desired observation method.

BF: Reflected light brightfield observation

DF: Reflected light darkfield observation

★ Be sure to slide the mirror selector lever until it contacts the stopper position.

Effects of Dummy Slider

The dummy slider ② has been installed on the revolving nosepiece at the factory. It can be replaced by loosening the clamping knob ③ when a DIC prism is to be used. However, in observations other than DIC, be sure to push in the dummy slider in order for prevention of flare.

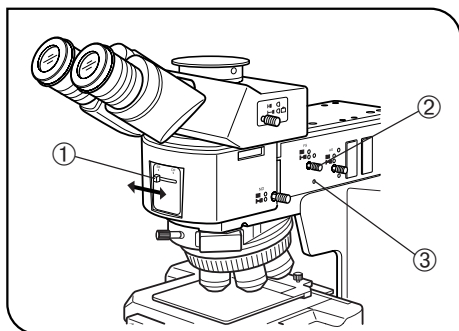
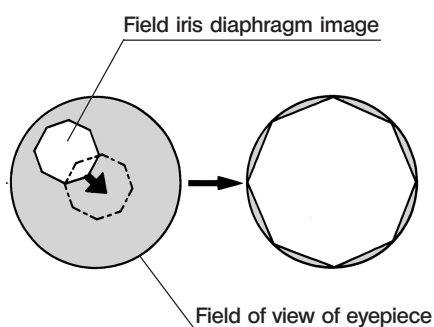


Fig. 10



2 Centering the Field Iris Diaphragm (FS) (Fig. 10)

1. Slide the mirror selector lever ① to "BF".
2. Engage the 10X objective by rotating the revolving nosepiece, place the specimen on the stage and adjust approximate focusing.
3. Pull out the FS knob ② on the reflected light illuminator to reduce the aperture iris diaphragm a little.
4. Rotate the two FS centering screws ③ using the Allen screwdriver to adjust so that the field iris image becomes concentric with the field of view.
5. While pushing in the FS knob ②, open the field iris diaphragm until the field iris image inscribes the field of view. If the image is found to be eccentric, adjust the centering again.
6. Open the field iris so that its image is almost the same size as (i.e. subtends) the field of view.

Using the Field Iris Diaphragm

- **In reflected light brightfield observation**

The field iris diaphragm adjusts the illuminated area to obtain an image with high contrast.

According to the objective in use, adjust the FS knob ② of the reflected light illuminator until the iris image circumscribes the field of view to block unnecessary light.

- **In reflected light darkfield observation**

The field iris diaphragm must be opened by pushing in the FS knob ②.

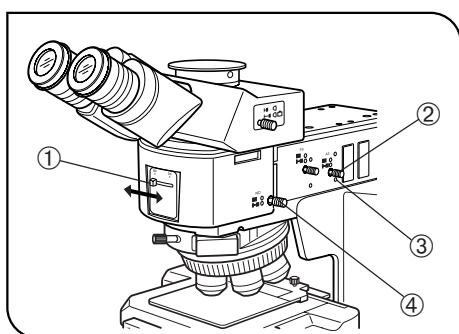
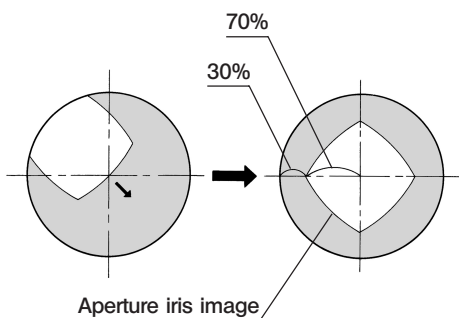


Fig. 11



3 Centering the Aperture Iris Diaphragm (AS) (Fig. 11)

1. Slide the mirror selector lever ① to "BF".
2. Engage the 10X objective by rotating the revolving nosepiece, place the specimen on the stage and adjust approximate focusing.
3. Remove the eyepiece, look into the eyepiece sleeve and pull the AS knob ② so that the aperture is about 70%.
4. If the center of the iris diaphragm is deviated, center it by rotating the two AS centering screws ③ using the Allen screwdriver.

Using the Aperture Iris Diaphragm

- In **reflected light brightfield observation**, optimum observation is generally possible by setting the aperture to between 70% and 80% of the aperture number of the objective.

- In **reflected light darkfield observation**, the aperture must be fully opened by pushing in the AS knob ②.

Ⓞ With some specimens, an image with high contrast and little flare may sometimes be obtained when the aperture is slightly closed. It is therefore recommended to also try a slightly closed aperture.

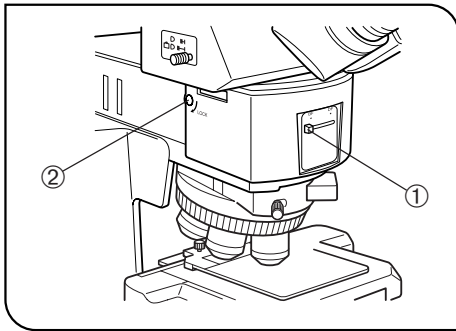


Fig. 12

4 Using the ND Filter Knob

(Fig. 12)

⊙ The ND filter is interlocked with the brightfield (BF) light path switching so it can be engaged or disengaged according to the mirror selector lever ①. The ND filter makes it possible to reduce the glare when darkfield (DF) is switched to brightfield (BF).

Releasing Interlocking

- ⊙ The ND filter knob has been interlocked at the factory.
- ⊙ If brightness is not enough during brightfield, DIC or other observation, the interlocking can be released.
 1. Loosen the screw interlocking the ND filter by inserting the Allen screwdriver into the hole ② on the left side of the reflected light illuminator.
 2. Now the interlocking is released and the ND filter knob (④ in Fig. 11) is active. Pull the lever out to disengage the ND filter from the light path.

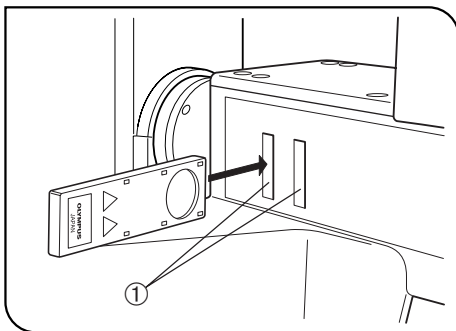


Fig. 13

5 Using the Filters

(Fig. 13)

⊙ Engage the optimum filter sliders for the purpose of observation in the two filter insertion slots ①. Be sure to engage from the left side. The first click position is the idle position and the second click engages the filter in the light path.

Usable Filters	Applications
U-25LBD (Color temperature conversion filter)	Turns the illumination light into daylight. Used in general observations and color photography.
U-25IF550 (Green filter)	Enhanced contrast in monochrome observation. Used in monochrome photography.
U-25Y48 (Yellow filter)	Contrast filter for observation of semiconductor wafers.
U-25ND50-2 (Light intensity adjustment filter)	Adjusts the brightness of the light source. (Transmittance: 50%)
U-25ND25-2 (Light intensity adjustment filter)	Adjusts the brightness of the light source. (Transmittance: 25%)
U-25ND6-2 (Light intensity adjustment filter)	Adjusts the brightness of the light source. (Transmittance: 6%)
U-25FR (Frost filter)	Reduces irregularity in the illumination field, but also reduces the brightness.
U-25L42 (UV cut filter)	Cuts ultraviolet rays. Used to prevent the polarizer from being burned by a high-intensity light source.

3-4 Stage

1 Placing the Specimen

Ⓞ The maximum load capacities are as follows.

- Stage plate: 500 g (U-SVRM/SVLM)
1 kg (U-SIC4R2/SIC4L2)

★ Do not place a specimen which is heavier than above. Otherwise, difficulty in stage movement or wear will result.

Ⓞ When the stage plate is removed, a specimen with a maximum weight of 1.5 kg can be directly placed on the stage.

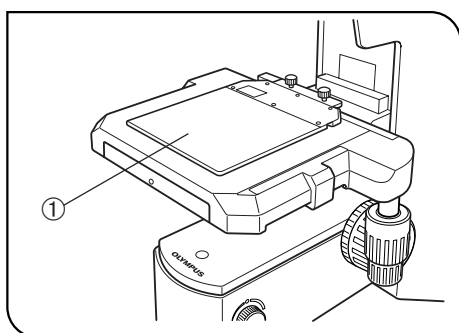


Fig. 14

With the U-MSSP or U-MSSP4 Stage Plate

Place the specimen on the stage plate ①.

Ⓞ The specimen should be parallel and planar. Otherwise, the reflected light cannot reach the objective, rendering observation impossible.

Ⓞ When observing very large specimens, remove the slide holder and place the specimen directly on the stage.

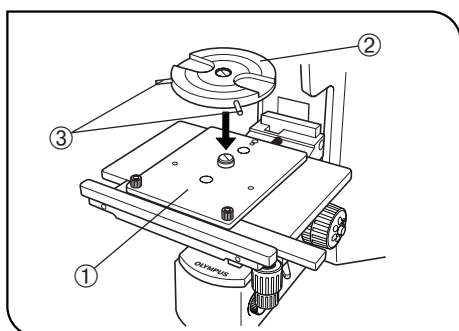


Fig. 15

[U-SIC4R2/SIC4L2 Stage Only]

Observation with the U-WHP2 Wafer Holder Plate (Fig. 15)

1. Place the BH2-WHR43 rotary wafer holder (for 3- or 4-inch) ② on the U-WHP2 wafer holder plate ①.
2. Place a 3-inch or 4-inch wafer on the BH2-WHR43 and observe the wafer.

The wafer holder plate can be rotated with the knob ③.

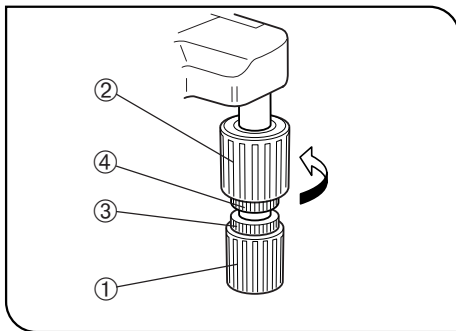


Fig. 17

2 Adjusting the X/Y-Axis Knob Tension (Fig. 17)

◎ This mechanism is provided only with the U-SVRM/SVLM stage.

1. Hold the X-axis knob ① and slide up the Y-axis knob ② up to expose the adjustment knobs.
2. Turning the X-axis adjustment knob ③ or Y-axis adjustment knob ④ clockwise (in the direction of the arrow) increases the tension and counter-clockwise decreases it.

★ If the tension is adjusted too tight, a creaking sound may be heard during stage travel, and the stage stopping accuracy may be imperiled.

CAUTION

After long hours of use, the stage guide may be deviated and the stage travel range may be decreased. However, this is not malfunction and can be corrected easily as described below.

[Treatment] X-axis direction: Hold the specimen holder and move the stage guide to the left and right so that it hits the stoppers.

Y-axis direction: Hold the upper stage and move it to the front and rear so that it hits the stoppers.

Rubber Stage Knob Caps (Optional)

◎ When the stage feed knobs of the U-SVRM/SVLM are fitted with the rubber knob caps, the knobs can be adjusted without slipping and fine adjustment is possible by holding the knobs with a very light force. The rubber knob caps also reduces fatigue after long hours of operation.

The U-SHGT thick type (thickness 5 mm) and U-SHG thin type (thickness 2 mm) rubber knob caps are available.

To attach the knob rubber caps:

First fit the larger rubber knob cap to the Y-axis (upper) knob from below it, then fit the smaller rubber knob cap to the X-axis (lower) knob from below it.

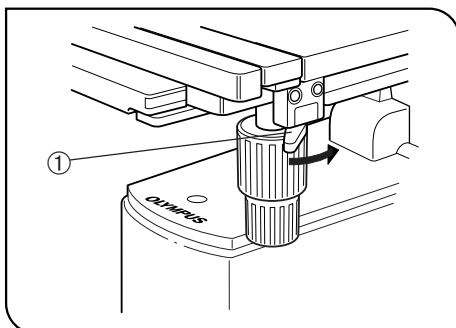


Fig. 18

3 Using the Y-Axis Lock Lever (Fig. 18)

◎ This mechanism is provided only with the U-SIC4R2/SIC4L2 stage.

1. When the Y-axis lock lever ① is locked by setting the lever in the direction of the arrow, the Y-axis movement is locked, making it possible to scan only in the X-axis direction.

2. To release the lock, return the lever to the original position.

★ If the lock lever is released incompletely, the lever will be worn out, making locking impossible or causing dust.

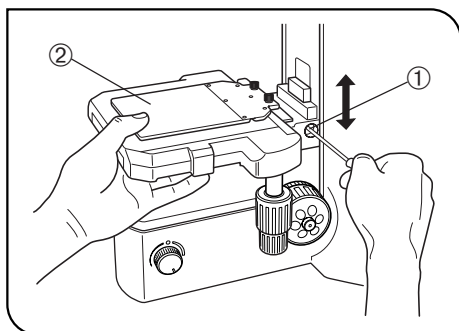


Fig. 20

4 Adjusting the Stage Height

(Fig. 20)

◎By lowering the position of the stage, the microscope will accommodate thick or metallurgical specimens with maximum height of 65 mm (62 mm when a stage plate is used).

▲When the stage holder clamping screw ① is loosened, the stage ② will fall. To prevent this, be sure to support the stage during the height adjustment.

1. Hold and support the stage ② and loosen the stage holder clamping screw ① using the Allen screwdriver.
2. Move the stage up or down to the desired height, and tighten the screw tightly.

3-5 Observation Tube

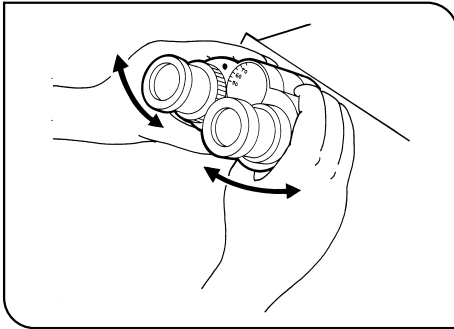


Fig. 21

1 Adjusting the Interpupillary Distance (Fig. 21)

While looking through the eyepieces, adjust for binocular vision until the left and right fields of view coincide completely. The index dot • indicates the interpupillary distance.

ⓈNote your interpupillary distance so that it can be quickly duplicated.

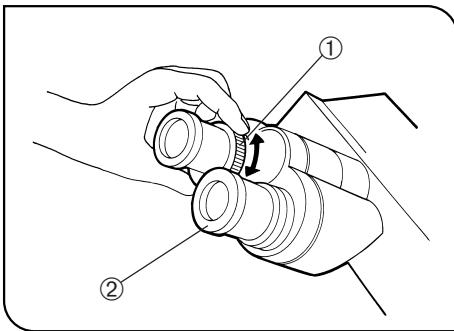


Fig. 22

2 Adjusting the Diopter (Fig. 22 & 23)

1. Looking through the eyepiece without the diopter adjustment ring, rotate the coarse and fine adjustment knobs to bring the specimen into focus.
2. Looking through the eyepiece with the diopter adjustment ring ①, turn it to focus on the specimen. (Fig. 22)

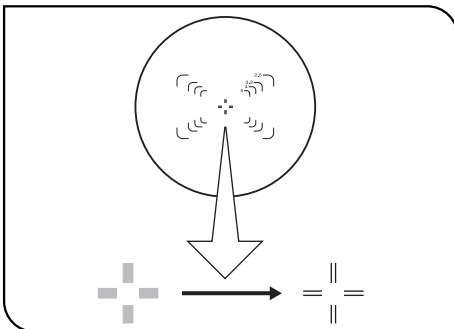


Fig. 23

Using a Finder Eyepiece

1. Looking through the right eyepiece with your right eye, turn the top of the eyepiece ② until a clearly defined double crosslines can be seen in the field of view. (Figs. 22 & 23)
2. Looking through the right eyepiece, rotate the coarse and fine adjustment knobs to bring the specimen and double crosslines into simultaneous focus.
3. Looking through the left eyepiece with your left eye, turn the diopter adjustment ring ① to focus on the specimen.

Using a Super Widefield Observation Tube

The operation is basically identical to the above. However, as the left eyepiece does not have the diopter adjustment ring, the focus should be adjusted by rotating the top of the right eyepiece.

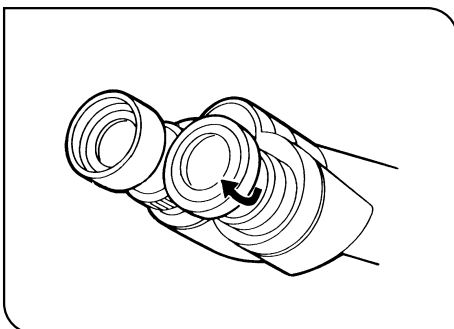


Fig. 24

3 Using the Eye Shades (Fig. 24)

When Wearing Eyeglasses

Use with the eye shades in the normal, folded-down position. This will prevent the eyeglasses from being scratched.

When Not Wearing Eyeglasses

Extend the folded eye shades in the direction of the arrow to prevent extraneous light from entering between the eyepieces and eyes.

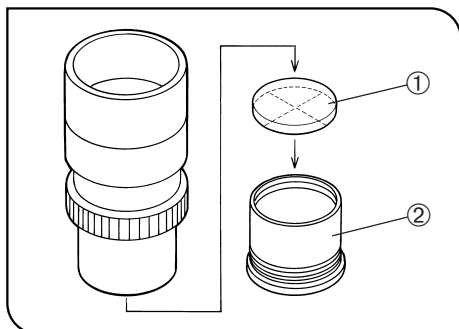


Fig. 25

4 Using Eyepiece Micrometer Disks (Fig. 25)

Eyepiece micrometer disks can be inserted into the WHN10X-H (or WHN10X) eyepieces.

However, if the eyepiece does not have the helicoid adjustment facility and your eyesight is poor, you may have difficulties in focusing on the eyepiece micrometer disk. In this case, it is recommended to look into the eyepiece through your eyeglasses.

Use 24 mm dia. x 1.5 mm micrometer disks.

Following Fig. 25, remove the micrometer mounting frame ② from the eyepiece and place a micrometer disk ① into the mounting frame.

Re-attach the micrometer mounting frame in the original position.

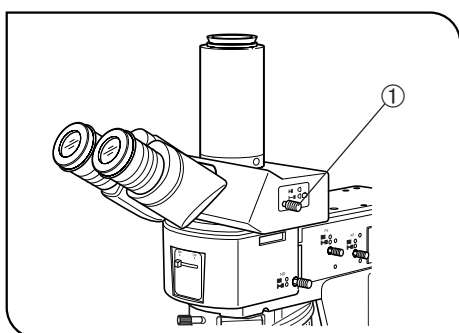


Fig. 26

5 Selecting the Light Path of the Trinocular Tube (Fig. 26)

Slide the light path selector knob ① to select the desired light path.

Trinocular Tube	Light Path Selector Position		
	Pushed In	Intermediate	Pulled Out
U-TR30-2	Binocular 100%	Binocular 20%	TV, photo 100%
U-SWTR-3		TV, photo 80%	
U-ETR-4	Binocular 100%		TV, photo 100%
U-SWETR			
U-SWETTR-5	Binocular 100%		Binocular 20% TV, photo 80%

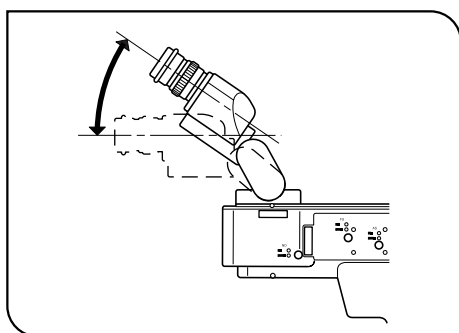


Fig. 27

6 Adjusting the Tilt (with the U-TBI3/SWETTR-5) (Fig. 27)

Ⓞ Adjust the height and tilt angle of the observation tube to obtain the most comfortable viewing position.

Holding the binocular section with both hands, raise or lower it to the desired position.

★ Never attempt to force the binocular section past the upper or lower stop position. Applying excessive force could destroy the limiting mechanism.

★ The U-TBI3 cannot be used in combination with any intermediate attachment.

★ When darkfield observation of scratches and/or dust on a mirror surfaces is performed with the U-TBI3, ghost images may appear.

With the U-ETBI (Fig. 28)

The U-ETBI is an ergonomical observation tube with normal field capable of tilting adjustment with an erect image. The eyepiece position can be adjusted by 45 mm toward the front and rear.

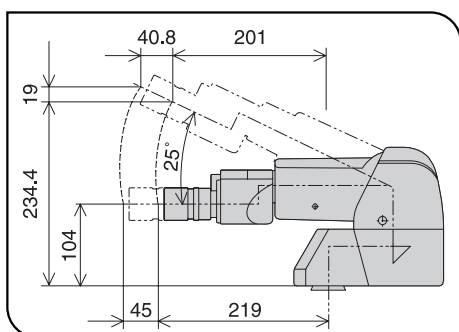


Fig. 28

4 OBSERVATION METHODS (Using BX-RLA2)

© For the observation methods with the BX-URA2 universal illuminator, refer to its instruction manual.

4-1 Reflected Light Brightfield/Darkfield Observation

See "REFLECTED LIGHT BRIGHTFIELD/DARKFIELD OBSERVATION PROCEDURE" on page 5.

4-2 Reflected Light Nomarski DIC (Differential Interference Contrast) Observation

- ★ The performance of polarizer may deteriorate when it has been exposed to light for a long period (about continuous 2000 hours). If this happens, replace the polarizer.
- ★ When performing sensitive color observation using the U-DICRH DIC slider, combine the U-POTP3 polarizer.
- ★ When using the high-intensity light source, be sure to use the U-25L42 filter to prevent the polarizer from being burnt.

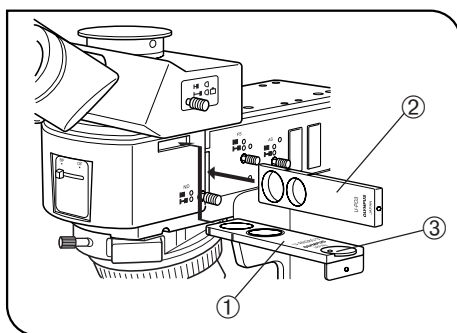


Fig. 29

1 Setting the Analyzer and Polarizer (Fig. 29)

★ In the current step, do not engage the DIC slider in the light path.

1. Bring the specimen in approximate focus using the 10X or 20X objective.
2. Remove the cover to enable installation of the U-AN360-3 analyzer. Then put the analyzer ① in the insertion slot.
3. Insert the U-PO3 or U-POTP3 polarizer ② so that the surface with indication comes on the front, and engage the polarizer in the light path.
4. Rotate the analyzer rotating dial ③ to find the position where the field of view is darkest.

© An approximate cross-Nicol position can be obtained by setting the index on the dial ③ on the outer side. Fine-adjust the dial by rotating it near this position to find the position where the field of view is darkest.

Using the Coupling Plate (Fig. 30)

When the U-AN360-3 analyzer ⑤ and U-PO3 or U-POTP3 polarizer ⑥ are coupled by using the coupling plate ④ provided with the polarizer and tightening the clamping knobs on it, the analyzer and polarizer can be engaged or disengaged in the light path together.

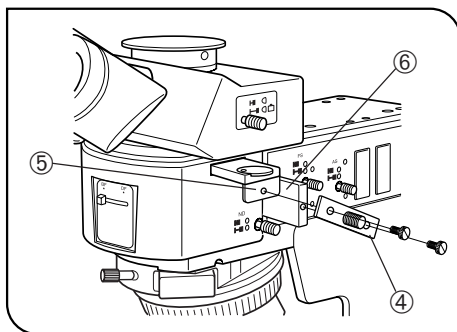


Fig. 30

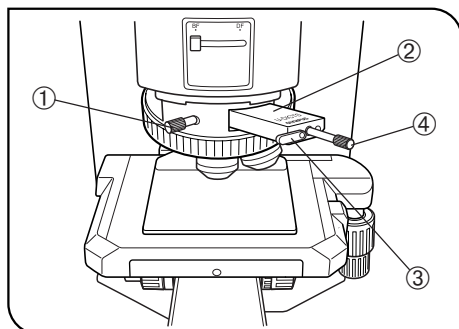


Fig. 31

2 Setting the DIC Slider (Fig. 31)

1. Loosen the mounting knob ① on the front of the DIC revolving nose-piece, insert the DIC slider ② so that the surface with indication faces up, and clamp by tightening the mounting knob.
2. With the U-DICR interference slider, set the slide lever ③ according to the objective in use.

Lever ③ position	Applicable Objectives	
Pushed in	UIS2	MPLFLN/MPLFLN-BD series
	UIS	UMPlanFI/UMPlanFI-BD series MPlanApo20X, 100X MPlanApo100XBD
Pulled out	UIS2	LMPLFLN/LMPLFLN-BD series
	UIS	LMPlanFI/LMPlanFI-BD series LMPlanApo/LMPlanApo-BD series

3. With the U-DICRH or U-DICRHC slider that does not have the slide lever, the applicable objectives are as follows.

DIC Slider	Applicable Objectives	
U-DICRH	UIS2	MPLFLN/MPLFLN-BD series
	UIS	UMPlanFI/UMPlanFI-BD series MPlanFI-BD series MPlanApo20X, 100X
U-DICRHC	UIS2	LMPLFLN/LMPLFLN-BD series
	UIS	LMPlanFI/LMPlanFI-BD series LMPlanApo/LMPlanApo-BD series

3 Observation Method (Fig. 31)

1. Place the specimen on the stage and adjust the focus by moving the stage up or down.
2. Adjust the field iris diaphragm so that its image circumscribes the field of view.
3. The contrast may sometimes be enhanced by closing the aperture iris diaphragm slightly.

U-DICR U-DICRHC

1. Adjust the background contrast by turning the prism movement knob ④ on the DIC slider as described below. (Fig. 31)
2. When the prism movement knob on the DIC slider is turned, the interference color in the background varies continuously from the gray sensitive color to magenta sensitive color (from -100 to 600 nm). Set the interference color which can provide best contrast with respect to the specimen.
 - Selecting a gray background color enables 3D-looking observation with high contrast thanks to the highest sensibility of the gray sensitive color.
 - Selecting a magenta sensitive color allows even small phase variation to be observed as a change in color.

U-DICRH

1. Adjust the background contrast by turning the prism movement knob ④ on the DIC slider as described below. (Fig. 31)
2. When the prism movement knob on the U-DICRH DIC slider is turned, the interference color in the background varies from -100 to 100 nm. Set the retardation which can provide best contrast.

- Selecting a gray background color enables 3D-looking observation with high contrast thanks to the highest sensibility of the gray sensitive color.
- Selecting a magenta sensitive color allows even small phase variation to be observed as a change in color.

To select the magenta sensitive color as the background color, use the U-POTP3 polarizer and insert it so that the λ indication can be seen from the front.

★ Since the DIC observation has a high detection sensitivity, take care against contamination on the specimen surface.

◎ The detection sensitivity is variable depending on direction so it is recommended to use a rotary stage.

4 Switching to Brightfield/Darkfield Observation

1. Loosen the mounting knob ① on the front of the DIC revolving nose-piece, gently pull out the DIC slider ② until it clicks, then clamp by tightening the mounting knob (Fig. 31).
2. Slide the analyzer (U-AN360-3) and polarizer to disengage them from the light path.

4-3 Reflected Light Simplified Polarized Light Observation

◎ For the preparation of reflected light simplified polarized light observation, perform the operation in "1 Setting the Analyzer and Polarizer" in section 4-2, "Reflected Light Nomarski DIC Observation".

1 Observation Method

1. Place the specimen on the stage and adjust the focus by moving the stage up or down. Now simplified polarized light observation can be started.
2. Adjust the field iris diaphragm so that its image circumscribes the field of view.
3. The contrast may sometimes be enhanced by closing the aperture iris diaphragm slightly.

5 TROUBLESHOOTING GUIDE

Under certain conditions, performance of the unit may be adversely affected by factors other than defects. If problems occur, please review the following list and take remedial action as needed. If you cannot solve the problem after checking the entire list, please contact your local Olympus representative for assistance.

Problem	Cause	Remedy	Page
1. Optical System			
a) Bulb does not light.	Bulb is burned out.	Replace bulb.	28
b) Bulb lights but the field of view is dark.	The aperture or field iris diaphragm is closed.	Open the aperture and field iris diaphragms.	10
	Analyzer and polarizer are engaged in light path.	Disengage them from light path.	19
	Light path selector knob of trinocular tube is positioned halfway.	Set the light path selector knob to position or .	16
	Mirror selector lever is in an intermediate position.	Set the knob correctly.	9
c) Field of view is obscured or not evenly illuminated	Light path selector knob of trinocular tube is in positioned halfway.	Set the light path selector knob to a click position according to the purpose.	16
	Mirror selector lever is in an intermediate position.	Set the knob correctly.	9
	Revolving nosepiece is not in a click position.	Set it in a click position.	-
	Revolving nosepiece is not installed correctly.	Secure it by pushing in the sliding dovetail all the way until the stopper.	-
	Field iris diaphragm is not centered.	Center the field iris diaphragm correctly.	10
	Field iris diaphragm is closed too much.	Open it sufficiently.	10
	Filter is not in a click position.	Set it in a click position.	11
	ND filter is not in a click position.	Set it in a click position.	11
	ND filter is half interlocked.	Set correctly to interlock or release ND filter.	11
	Lamp bulb is not installed correctly.	Push halogen bulb terminals all the way into stop position.	28
	Analyzer and/or polarizer not installed correctly	Engage analyzer and polarizer in light path.	17
d) Dirt or dust is visible in the field of view.	Dirt/dust on specimen	Clean thoroughly.	2
	Dirt/dust on eyepiece		
	Dirt/dust on extremity of objective		
e) Image glares.	Aperture iris diaphragm is closed too much.	Open it sufficiently.	10
f) Visibility of observed image is poor. • Image is not sharp. • Contrast is poor. • Details are poorly visible. • Darkfield observation is poorly visible (with flare tendency)	Objective in use is not designed for UIS2 (UIS) series.	Replace with a specified objective for UIS2 (UIS) series.	24/26
	Dummy slider is not inserted in revolving nosepiece.	Insert dummy slider.	9
	Revolving nosepiece is not installed correctly.	Secure it by pushing in the sliding dovetail all the way until the stopper.	-

Problem	Cause	Remedy	Page
f) cont'd	Objective is not correctly engaged in light path	Make sure that revolving nosepiece clicks into place correctly.	-
	Dirt/dust on extremity of objective	Clean it thoroughly.	2
	Dirt/dust on specimen	Clean specimen.	-
g) One side of image is blurred.	Revolving nosepiece is not installed correctly.	Secure it by pushing in the sliding dovetail all the way until the stopper.	-
	Objective is not correctly engaged in light path.	Make sure that revolving nosepiece clicks into place correctly.	-
	Parallelism of specimen cannot be achieved.	Correct specimen to make it parallel or replace specimen.	12
	Specimen is heavier than specified.	Replace the specimen.	12
h) One side of image is blurred.	Revolving nosepiece is not installed correctly.	Secure it by pushing in the sliding dovetail all the way until the stopper.	-
	Objective is not correctly engaged in light path.	Make sure that revolving nosepiece clicks into place correctly.	-
2. Electrical System			
a) Bulb intermittently lights and goes out.	Bulb is nearly burned out.	Replace bulb.	28
	A cord or connector is not properly connected.	Connect cords and plugs securely.	29
b) Lamp bulb burns out soon after lighting.	The bulb in use is not the specified lamp.	Replace with a standard bulb.	28
c) Brightness cannot be varied with brightness control.	Light preset switch is set to ON.	Set it to OFF.	7
d) All voltage indicator LEDs light and the voltage indication cannot be varied with brightness control.	Lamp bulb is not installed.	Attach lamp bulb.	28
	Lamp bulb is burnt out.	Replace lamp bulb.	28
	Lamp housing output connector is unplugged.	Plug lamp housing output connector.	29
e) Lamp intensity voltage cannot be increased with brightness control.	Lamp bulb is burned out.	Replace lamp bulb.	28
3. Coarse/Fine Adjustment Knobs			
a) Coarse adjustment knob is too heavy to rotate.	Rotation tension adjustment ring is too tight.	Loosen ring to an optimum tightness.	8
	Pre-focusing lever is locked.	Release pre-focusing lever.	9
b) Stage drifts down by itself or focus is lost during observation.	Tension adjustment ring is too loose.	Tighten ring to an optimum tightness.	8
c) Specimen cannot be brought into focus.	Stage height adjustment is too low.	Raise stage holder height.	14
d) Coarse movement cannot reach upper limit.	Pre-focusing lever is locked at the low position.	Release pre-focusing lever.	9

Problem	Cause	Remedy	Page
4. Observation Tube			
a) Field of view of one eye does not match that of the other.	Interpupillary distance is incorrect.	Adjust interpupillary distance.	15
	Incorrect diopter adjustment.	Adjust diopter.	15
	Different eyepieces are used on left and right.	Change on eyepiece to match the other so that both sides are the same type.	-
	You are not accustomed to parallel optical axis.	When looking into eyepieces, do not stare at image from the beginning but see the overall field of view. It is sometimes recommended to turn your eyes away from eyepieces, look far off and look into eyepieces again.	-
5. Stage			
a) Image shifts when you touch stage.	Stage is not properly mounted.	Clamp stage.	14
b) Stage cannot travel in Y-axis direction (U-SIC4R2/SIC4L2).	Y-axis travel is locked.	Release lock.	13
c) Stage knob is too light or too heavy to rotate (U-SVRM/U-SVLM)	X-axis and/or Y-axis rotation tension is not adjusted properly.	Adjust it again.	13

6 SPECIFICATIONS

Item	Specification							
Optical system	UIS2 (UIS) (Universal Infinity System) optical system							
Reflected light illumination	Reflected light illuminator (BX-RLA2), tube magnification 1X, super widefield (FN 26.5) compatible.							
	Available observations: ①Reflected light brightfield ②Reflected light darkfield ③Reflected light Nomarski DIC ④Reflected light simplified polarized light							
Electrical system	Rated input voltage: 100-120 V/220-240 V \sim , 1.8 A/0.8 A, 50/60 Hz. Light intensity voltage range: 1.0 to 12.0 V DC (continuously variable) 12 V, 100 W long-life halogen bulb (pre-centered) 12V100WHAL-L (PHILIPS 7724) 12 V, 50 W long-life halogen bulb (pre-centered) 12V50WHAL-L (LIFE JC) Average life time: Approximately 2000 hr. when used as directed. Light preset switch: Preset voltage can be set arbitrarily between 1.0 and 12 V. Power consumption: 140 W							
Focusing system	Stage height movement by roller guide (rack & pinion) Stroke per rotation: 0.1 mm (fine), 17.8 mm (coarse) Full stroke range: 25 mm Upper limit stopper Tension adjustment on coarse focus adjustment knob.							
Revolving nosepiece	U-5RE-2 DIC slider insertion type: U-D6RE, U-D7RE, U-D5BDRE, U-D6BDRE, etc.							
Observation tube	U-BI30-2 Widefield binocular	U-TR30-2 Widefield trinocular	U-ETR-4 Widefield erected trinocular	U-ETBI Widefield erected tilting binocular	U-SWTR-3 Super widefield trinocular	U-SWETR Super widefield erected trinocular	U-SWETTR-5 Super widefield erected tilting trinocular	
	FN 22							FN 26.5
	Tube tilting angle: Fixed				Tilting angle 25°	Tube tilting angle: Fixed		Tilting angle 35°
	Interpupillary distance adjustment: 50 to 76 mm							
Stage	U-SIC4R2/SIC4L2 Coaxial knobs on bottom right (left). 4 x 4 inch stage				U-SVRM/USVLM Stage with coaxial knobs on the bottom right (left)			
	Drive system: Rack & pinion drive Stroke: 100 Y-axis x 105 X-axis mm Y-axis lock: Fixing in Y-axis direction using a lock lever				Drive system: Wire drive Stroke 52 Y-axis x 76 X-axis mm X/Y-axis knob rotation tension adjustment available			
Operating environment	<ul style="list-style-type: none"> • Indoor use. • Altitude: Max. 2000 meters • Ambient temperature: 5° to 40°C (41° to 104° F) • Maximum relative humidity: 80% for temperatures up to 31°C (88°F), decreasing linearly through 70% at 34°C (93°F), 60% at 37°C (99°F), to 50% relative humidity at 40°C (104°F). • Supply voltage fluctuations: \pm10% • Pollution degree: 2 (in accordance with IEC60664) • Installation (overvoltage) category: II (in accordance with IEC60664) 							

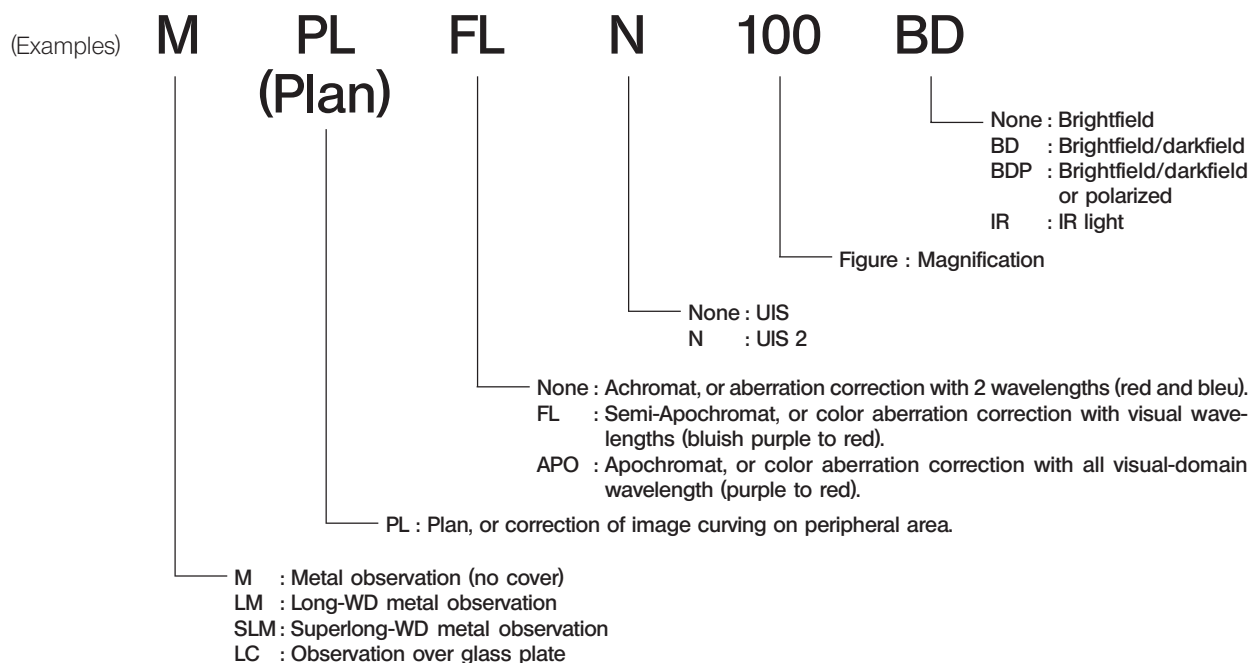
Optical characteristics		Magnification	N.A.	W.D. (mm)	Cover glass thickness (mm)	Resolution (μm)	Eyepieces						
							WHN10X (FN22)			SWH10X (FN26.5)			
							Total mag.	Depth of focus (μm)	Field of view (mm)	Total mag.	Depth of focus (μm)	Field of view (mm)	
Series	Marking												
UIS2 series	MPLAPON Plan Apochromat	MPlanApoN	50X	0.95	0.35	0	0.35	500X	0.7	0.44	500X	0.7	0.53
			100X	0.95	0.35	0	0.35	1000X	0.4	0.22	1000X	0.4	0.27

Objectives for LCD Panel

Optical characteristics		Magnification	N.A.	W.D. (mm)	Cover glass thickness (mm)	Resolution (μm)	Eyepieces						
							WHN10X (FN22)			SWH10X (FN26.5)			
							Total mag.	Depth of focus (μm)	Field of view (mm)	Total mag.	Depth of focus (μm)	Field of view (mm)	
Series	Marking												
UIS2 series	LCPLFLN Long-WD Plan Semi-Apochromat (FN26.5)	LCPlanFLN*	20XLCD	0.45	7.4-8.3	0-1.2	0.75	200X	5.2	1.1	200X	5.2	1.33
			50XLCD	0.70	2.2-3	0-1.2	0.48	500X	1.6	0.44	500X	1.6	0.53
			100XLCD	0.85	0.9-1.2	0-0.7	0.39	1000X	0.79	0.22	1000X	0.79	0.27

*Equipped with the glass thickness compensation ring.

Significance of Objective Name



Glossary of Terms Used in the Optical Characteristics Table



- Working distance (WD) : The distance from the top of specimen and the front lens of objective.
- Number of aperture (NA) : Important figure determining the objective characteristics (resolution, focal depth and brightness).
 - Resolution Increases in proportion with the NA.
 - Focal depth Decreases in proportion with the NA.
 - Brightness Proportional with the square of NA (comparison under the same magnification).
- Resolution : The limit that an objective can identify the images of two points that are close to each other, expressed as the distance between the two points on the specimen.
- Depth of focus : The maximum depth of the specimen at which the entire specimen can be brought into focus simultaneously. This value increases when the aperture iris diaphragm is narrowed and decreases when the objective NA is increased.
- Field number : The diameter of the image area that can be observed through the eyepieces, expressed in mm.
- Field of view : The diameter of the area observable on the specimen, expressed in mm.

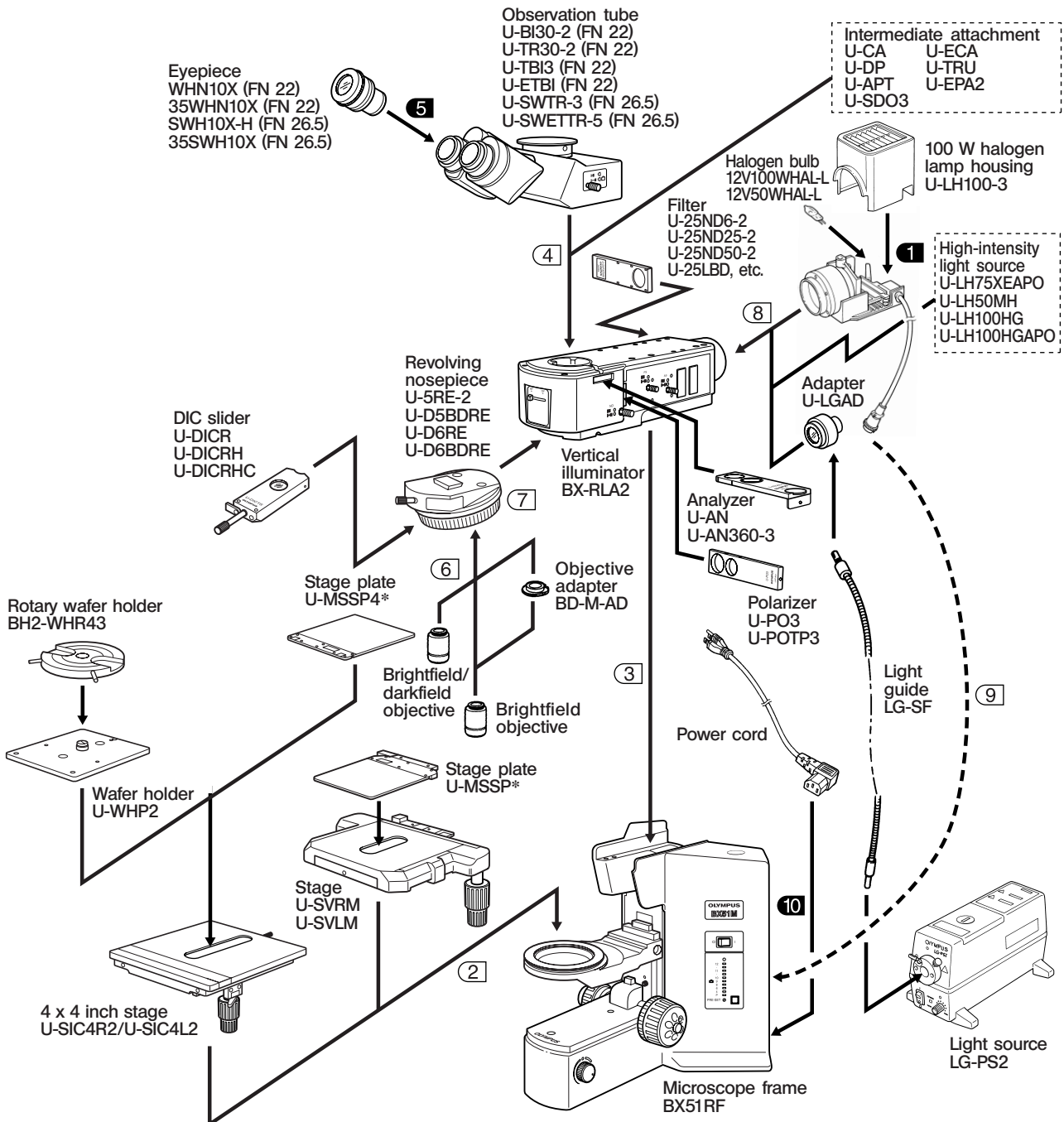
8-1 Assembly Diagram

- The diagram below shows the sequence of assembly of the various modules. The numbers indicate the order of assembly.
- The module numbers shown in the following diagram are merely the typical examples. For the modules with which the module numbers are not given, please consult your Olympus representative or the latest catalogues.

★ When assembling the microscope, make sure that all parts are free of dust and dirt, and avoid scratching any parts or touching glass surfaces.

◎ Assembly steps enclosed in will be detailed on the subsequent pages.

◎ All assembly operations are possible by using the Allen screwdriver () provided with the microscope. However, the BX-RLA2 vertical illuminator should be attached using the Allen wrench () provided with the illuminator to clamp the internal screws. (To assure the performance, please have your dealer assemble the illuminator.)



* Warp prevention pins (2 for each) are attached on the bottom sides of the U-MSSP/MSSP4 stage when the system is shipped from the factory. Remove the pins before use.

8-2 Detailed Assembly Procedures

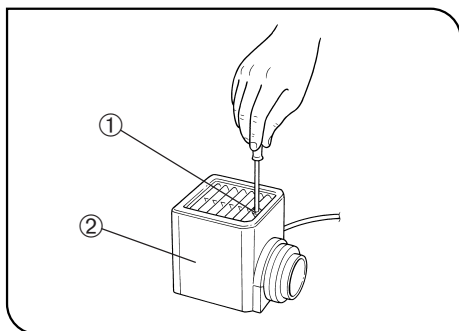


Fig. 32

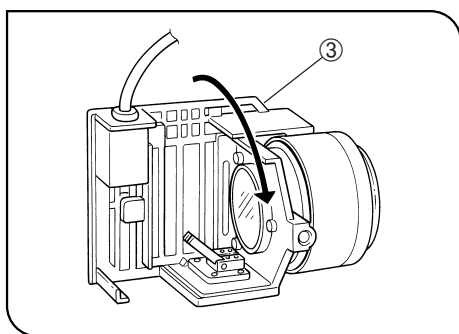


Fig. 33

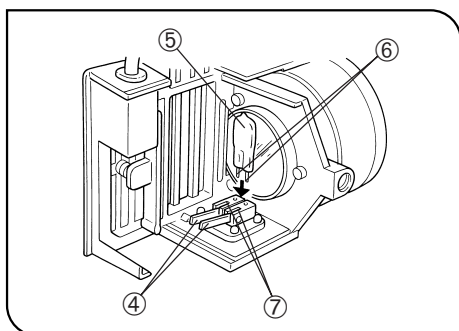


Fig. 34

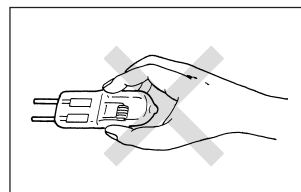
1 Attaching the Halogen Bulb

(Fig. 32 - 34)

ⓄThe applicable lamp bulb is the 12V100WHAL-L (PHILIPS 7724) or the 12V50WHAL-L (LIFE JC).

1. Fully loosen the clamping screw ① at the top of the lamp housing using the provided Allen screwdriver.
2. Remove the lamp housing ② by lifting it up.
3. Tilt the bulb socket ③ by 90° in the direction of the arrow.
4. While pushing down the bulb clamping levers ④ down, hold the halogen bulb ⑤ with gloves or a piece of gauze, insert the bulb pins ⑥ into the sections ⑦ as far as they will go.

Then return the lamp clamping lever gently back to the original position to clamp the bulb.



▲To prevent reduced bulb life or cracking, do not touch the bulb with bare hands. If fingerprints are accidentally left on the bulb, wipe the bulb with a soft cloth.

5. Fit the lamp housing from up and tighten the clamping screw ① by applying downward pressure.

▲Caution for Bulb Replacement During or Right After Use

The bulb, lamp housing and areas near these will be extremely hot during and right after use.

Set the main switch to "O" (OFF), disconnect the power cord from the wall outlet, then allow the old bulb and lamp housing to cool before replacing the bulb with a new one of the designated type.

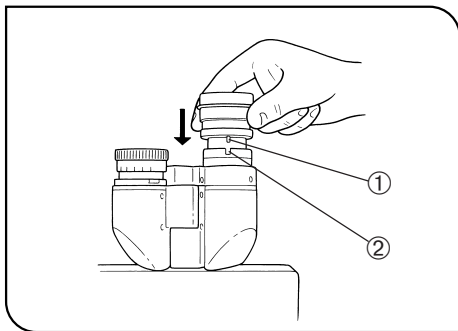


Fig. 35

5 Attaching the Eyepiece

(Fig. 35)

Gently insert the eyepiece all the way into each eyepiece sleeve.

★ When using the U-BI30-2 binocular tube, eyepieces with built-in micrometer disk cannot be attached.

★ When using a finder eyepiece or an eyepiece with micrometer disk, attach it to the right-hand eyepiece sleeve.

When doing so, make sure that the eyepiece positioning pin ① fits into the notch ② on the eyepiece sleeve.

★ The super widefield trinocular observation tube is equipped with a positioning notch on both eyepiece sleeves. Make sure that the positioning pins on both eyepieces fit into the respective notches.

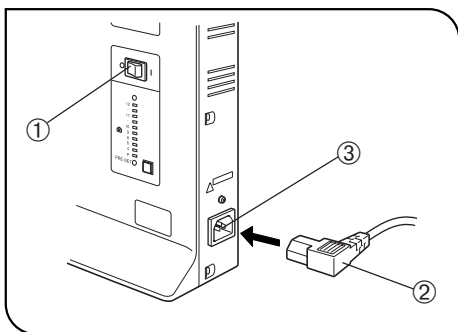


Fig. 36

10 Attaching the Power Cord

(Fig. 36 & 37)

▲ The power cord is vulnerable when bent or twisted. Never subject it to excessive force.

▲ Make sure that the main switch ① is set to “○” (OFF) before connecting the power cord.

▲ Always use the power cord provided by Olympus. If no power cord is provided with the microscope, please select the proper power cord by referring to chapter “PROPER SELECTION OF THE POWER SUPPLY CORD” at the end of this instruction manual.

1. Connect the power cord plug ② to the AC receptacle ③.

▲ The power cord should be connected to a grounded, 3-conductor power outlet. If the power outlet is not grounded properly, Olympus can no longer warrant the electrical safety performance of the equipment.

2. Plug the power cord plug ④ into the wall outlet ⑤.

▲ If the power cord comes in contact with the lamp housing or the surroundings, the cord may melt down, causing electric shock hazards. Be sure to distribute the power cord at enough distance from the lamp housing.

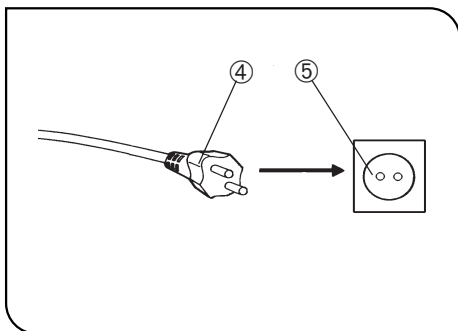


Fig. 37

■ PROPER SELECTION OF THE POWER SUPPLY CORD

If no power supply cord is provided, please select the proper power supply cord for the equipment by referring to “ Specifications ” and “ Certified Cord ” below:

CAUTION: In case you use a non-approved power supply cord for Olympus products, Olympus can no longer warrant the electrical safety of the equipment.

Specifications

Voltage Rating	125V AC (for 100-120V AC area) or, 250V AC (for 220-240V AC area)
Current Rating	6A minimum
Temperature Rating	60°C minimum
Length	3.05 m maximum
Fittings Configuration	Grounding type attachment plug cap. Opposite terminates in molded-on IEC configuration appliance coupling.

Table 1 Certified Cord

A power supply cord should be certified by one of the agencies listed in Table 1 , or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1. In case you are unable to buy locally in your country the power supply cord which is approved by one of the agencies mentioned in Table 1, please use replacements approved by any other equivalent and authorized agencies in your country.
















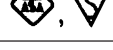



Country	Agency	Certification Mark	Country	Agency	Certification Mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JET, JQA, TÜV, UL-APEX / MITI	
Austria	ÖVE		Netherlands	KEMA	
Belgium	CEBEC		Norway	NEMKO	
Canada	CSA		Spain	AEE	
Denmark	DEMKO		Sweden	SEMKO	
Finland	FEI		Switzerland	SEV	
France	UTE		United Kingdom	ASTA BSI	
Germany	VDE		U.S.A.	UL	
Ireland	NSAI				

Table 2 HAR Flexible Cord

APPROVAL ORGANIZATIONS AND CORDAGE HARMONIZATION MARKING METHODS

Approval Organization	Printed or Embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)		Alternative Marking Utilizing Black-Red-Yellow Thread (Length of color section in mm)		
			Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEBEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V. Prüfstelle	<VDE>	<HAR>	30	10	10
Union Technique de l'Electricite' (UTE)	USE	<HAR>	30	10	30
Instituto Italiano del Marchio di Qualita' (IMQ)	IEMMEQU	<HAR>	10	30	50
British Approvals Service for Electric Cables (BASEC)	BASEC	<HAR>	10	10	30
N.V. KEMA	KEMA-KEUR	<HAR>	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalter	SEMKO	<HAR>	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	<ÖVE>	<HAR>	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	<DEMKO>	<HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI>	<HAR>	30	30	50
Norges Elektriske Materielkontroll (NEMKO)	NEMKO	<HAR>	10	10	70
Asociacion Electrotecnica Y Electronica Espanola (AEE)	<UNED>	<HAR>	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT	<HAR>	30	30	70
Instituto Portages da Qualidade (IPQ)	np	<HAR>	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	<HAR>	10	30	90
Elektriska Inspektoratet	SETI	<HAR>	10	30	90

Underwriters Laboratories Inc. (UL)
Canadian Standards Association (CSA)

SV, SVT, SJ or SJT, 3 X 18AWG
SV, SVT, SJ or SJT, 3 X 18AWG

9 LAMP HOUSING INSPECTION SHEET

- Study the instruction manual for the lamp housing before inspection.
- For safe use of the lamp housing, we recommend performing the following inspection periodically (every time you replace the lamp bulb and at least every 6 months).
- The table below identifies the check items to be observed. Put (X) if not applicable or (√) if applicable.
- If there is any (√) mark noted, immediately stop use of the product, and contact Olympus for detailed inspections or replace the lamp housing.
- If you detect an abnormality other than that listed below or with other Olympus product, also stop the use of the product and contact Olympus for detailed inspections.
- Note that the service, replacement and detailed inspections are charged after expiration of the warranty period.

If you have any questions, please contact Olympus.

Check items	Check results (Date)			
	/	/	/	/
1. More than 8 years have passed since original purchase or the total power ON time has exceeded 20,000 hours.				
2. Lamp does not light sometimes even though the main switch is set to on. (Except discharge burners*1.)				
3. Illumination flickers when you move the lamp cable or lamp housing.				
4. Lamp cable is unusually hot to the touch.				
5. Scorching or burning odor is produced during use.				
6. Illumination still flickers after replacement with a new lamp bulb. (Except discharge burners*1.)				
7. Deformation, backlash, or looseness, etc. when you assemble the lamp housing. (Impossibility of removing the top section of lamp housing when you attempt to replace the lamp bulb, etc.)				
8. Extreme discoloration of the lamp housing connection terminal or lamp socket. Uneven discoloration of the left and right sections of these parts. (Except discharge burners*1.)				
9. Discoloration, deformation or cracking of the lamp housing.				
10. Melting, crack, deformation or solidification of the lamp cable or a wiring part.				
11. Increased frequency of servicing compared to similar devices put into use at the same time as the lamp housing.				

* When the Check Result columns become insufficient, copy this sheet.

*1 Discharge burners: Mercury burner / Xenon burner / Metall halide burner

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