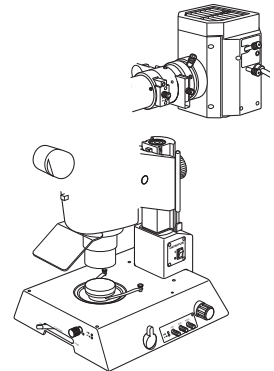


OLYMPUS[®]

Main modules described in this manual

MVX10
MVX-2RE
MVX-CA2X
SZX-STAD1
SZH-STAD1
SZX-STAD2
SZ2-FO
SZH-SG
SZH-SC



INSTRUCTIONS

MVX10

RESEARCH MACRO ZOOM SYSTEM MICROSCOPE

This instruction manual is for the Olympus MVX Research Macro Zoom System Microscope. To ensure the safety, obtain optimum performance and familiarize yourself fully with the use of this attachment, we recommend 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.



A X 7 4 4 1

This device complies with the requirements of directive 98/79/EC concerning in vitro diagnostic medical devices. CE marking means the conformity to the directive.

IMPORTANT – Be sure to read this section for safe use of the equipment. – 1-4

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IMPORTANT**⚠ SAFETY PRECAUTIONS**

- After observation of a specimen that involves the risk of infection, be sure to clean the positions that contacted the specimen to prevent infection.
 - To avoid the risk that the specimen drops and splatters, be sure to remove the specimen before moving the microscope.
 - If a specimen is destroyed due to an erroneous operation, immediately take the infection prevention measures.
 - The microscope becomes unstable when its height is increased by a mounted attachment. To prevent the specimen from dropping if the microscope topples down, be sure to take the toppling prevention measures when mounting an attachment.
- The applicable ultrahigh-pressure mercury burners are the USH-103OL (OLYMPUS) and HBO103W/2 (OSRAM), both of which are DC mercury burners available from Olympus.
- Ensure that the burners are mounted and that the cords are connected securely.
- The inside of the lamp housing is very hot while the burner is on and immediately after it is turned off. Do not open the lamp housing in these periods (see page 42).
- The power supply unit contains high-voltage parts inside. Do not attempt to disassemble it.
- Always use the power cord provided by Olympus. If no power cord is provided, please select the power cord by referring to the section "PROPER SELECTION OF THE POWER SUPPLY CORD" at the end of this instruction manual. If the proper power cord is not used, Olympus can no longer warrant the electrical safety performance of the equipment. Before plugging the power cord into the wall outlet, ensure that the main switch of the power supply unit is set to "○" (OFF).
- Always ensure that the grounding terminal of the power supply unit is properly grounded. If the equipment is not grounded, Olympus can no longer warrant the electrical safety performance of the equipment.
- Before opening the lamp housing for replacing the burner, be sure to set the main switch to "○" (OFF), unplug the lamp housing output connector of the power supply unit and wait at least 10 minutes or until the burner and lamp housing have cooled down.
- The top of the lamp housing becomes very hot. To avoid the risk of a fire, never block the ventilation of this part. Make sure you leave a space of 10 cm or more around the lamp housing and power supply unit to dissipate heat.
- The power cord is also used to shut off the power supply unit in case of emergency by unplugging. To facilitate this, locate the power supply unit or wall outlet so that the power cord connector (on the rear of the power supply unit) or the wall outlet is easily accessible in case of emergency.

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 the presence of a high voltage (1 kV or more), which should not be touched to prevent an electric shock.
	Indicates that the surface becomes hot, and should not be touched with bare hands.
	Before use, carefully read the instruction manual. Improper handling could result in injury to the user and/or damage to the equipment.
	Indicates that the main switch is ON.
	Indicates that the main switch is OFF.

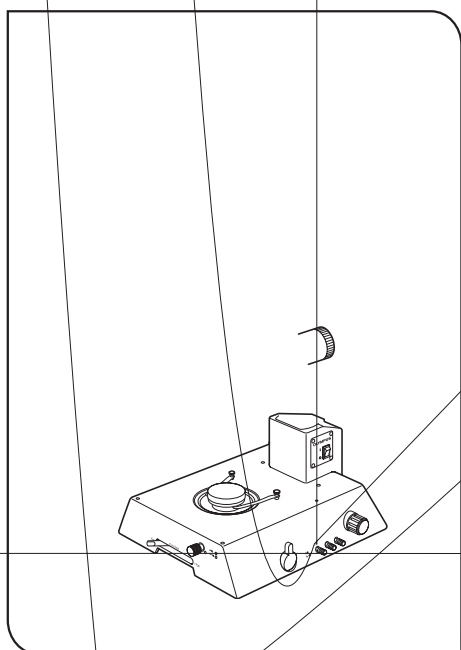


Fig. 2

6. Observe the following cautions when operating the coarse focus adjustment knobs of the zooming knobs.

Operation	Manipulated Controls	Caution
Focusing	Coarse focus adjustment knobs ① (Fig. 2)	<p>1. If the knob hits the upper or lower limiting mechanism violently or it is rotated after it hits a limiting mechanism, the internal mechanism may be damaged.</p> <p>2. If the knobs on the left and right are rotated in opposite directions, the internal mechanism will be damaged. (The rotation tension of the knob should be adjusted using the rotation tension adjustment ring ③ on the knob. See page 10.)</p>
Zooming	Zooming knobs ② (Fig. 2)	<p>1. If the knob hits the upper or lower limiting mechanism violently or it is rotated after it has hit a limiting mechanism, the internal mechanism may be damaged.</p> <p>2. If the knobs on the left and right are rotated in opposite directions, the internal mechanism will be damaged.</p>

7. Before moving the microscope, detach the modules including the tilting trinocular head and lamp housing to reduce the total weight. Then hold it by the base, not by the zoom microscope body.

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.

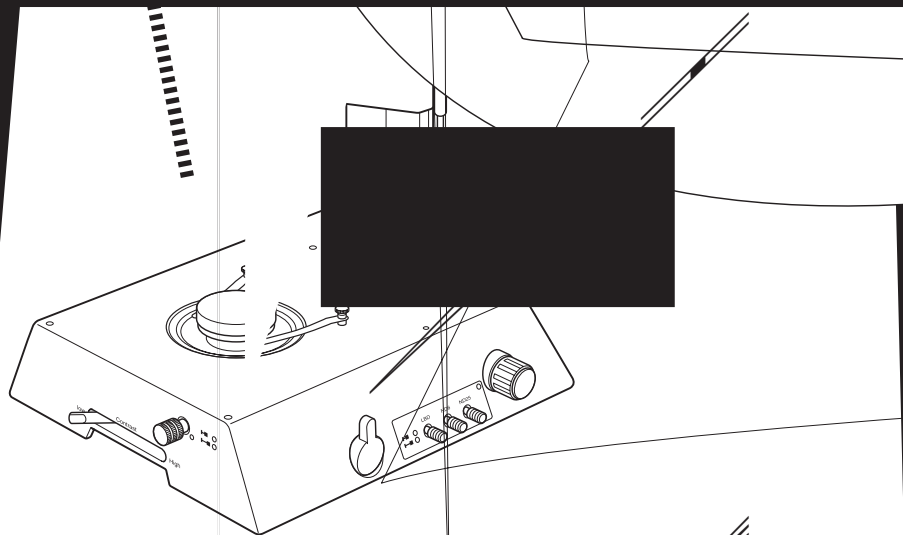
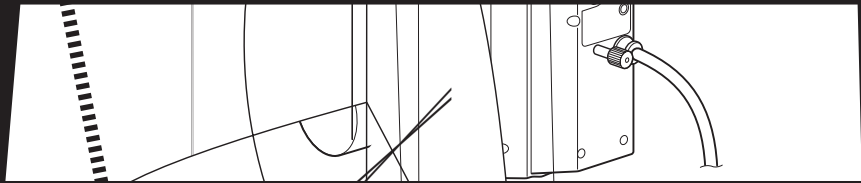
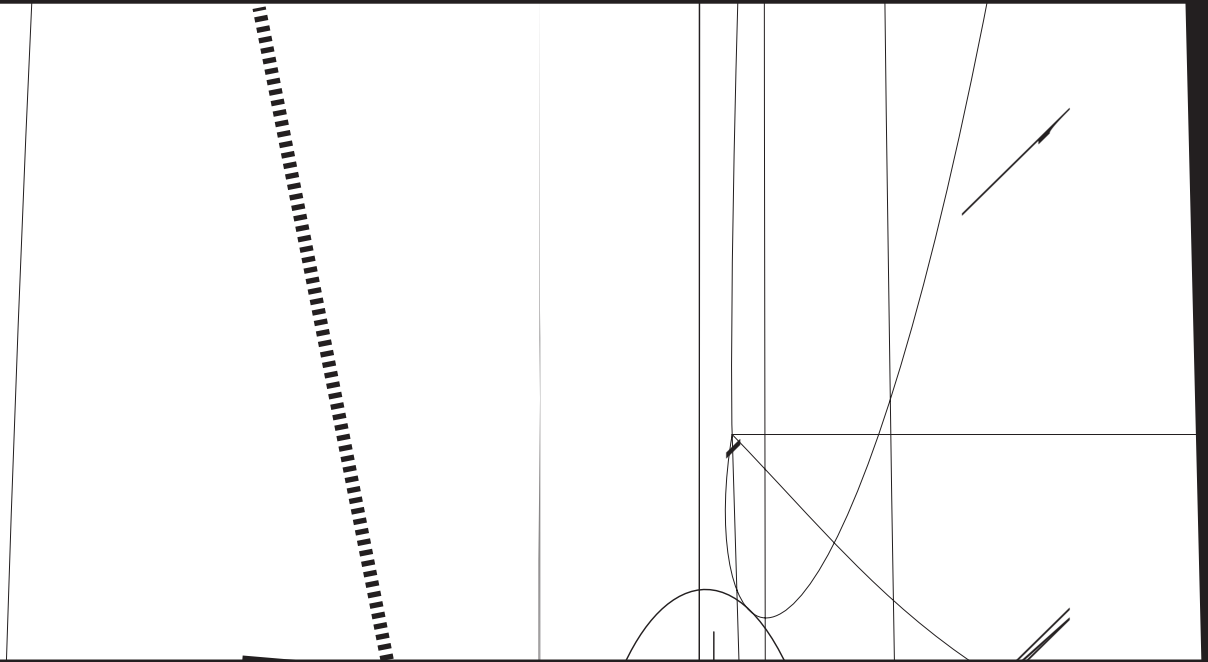
2. The equipment uses plastic resins extensively in its external finish. Do not attempt to use organic solvents to clean the non-optical components of the microscope. To clean these components, use a lint-free, soft cloth lightly moistened with a diluted neutral detergent.
3. Never disassemble any part of the microscope as this could result in malfunctions or reduced performance.
4. When not using the microscope, keep it covered with the dust cover provided. Ensure that the lamp housing is cool before covering the microscope.
5. When the hour counter on the power supply unit indicates 300 hours (USH-103OL, HBO103W/2), set the main switch to " " (OFF) for safety, wait for more than 10 minutes and then replace the burner (see page 42). Unlike the fluorescent lamps, the mercury burner seals high-pressure gas inside. If it used after the specified service life has been exceeded, the glass tube may be distorted accumulatively and may eventually burst, though this happens very rarely. The used mercury burner should be disposed of as an industrial waste. If you cannot dispose of it properly, contact Olympus.
6. When disposing of the microscope. Check the regulations and rules of your local government and be sure to observe them. To dispose of only the gas spring (④, Fig. 2) used in the counterbalance of the focusing assembly, follow the precautions provided with the gas spring.

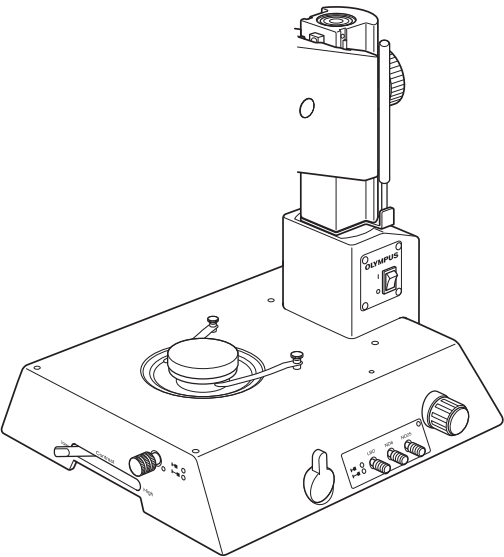
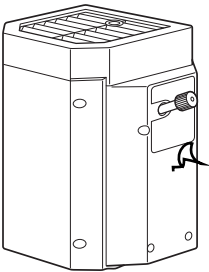
3 Caution

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

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

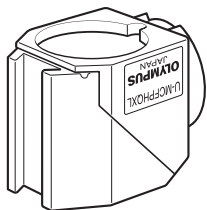
- ▲ : Indicates that failure to follow the instructions in the warning could result in bodily harm to the user and/or damage to equipment (including objects in the vicinity of the equipment).
- ★ : Indicates that failure to follow the instructions could result in damage to equipment.
- © : Indicates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





Fluorescence mirror units

U-MCFPHQ/XL
 U-MGFPHQ/XL
 U-MYFPHQ/XL
 U-MRFPHQ/XL
 U-MGFP/XL
 U-MGFPA/XL



◎ Up to three fluorescence mirror units can be mounted by placing them in every other dovetail of the six dovetails of the MVX-RFA.

★ Each fluorescence mirror unit is composed of the dichroic mirror, barrier filter and excitation filter that match a specific fluorescent protein.

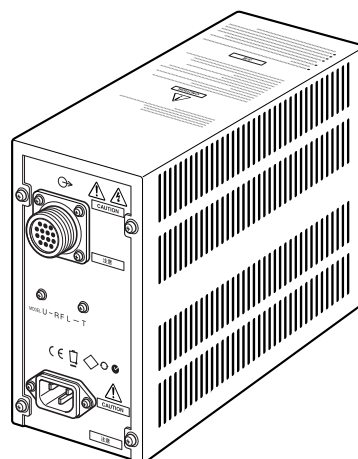
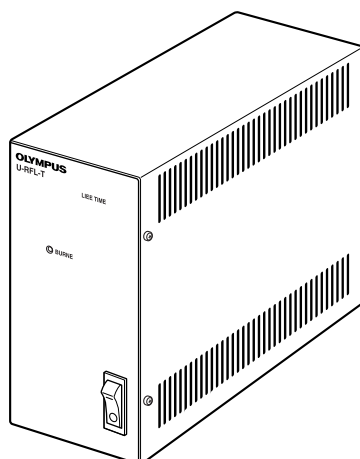
◎ When fabricating an original fluorescence unit by your own, it is recommended to use the U-MF/XL mirror unit frame (which does not incorporate a filter). (P. 39)

Use the blank indicator sheets provided with the illuminator to write the original mirror unit name.

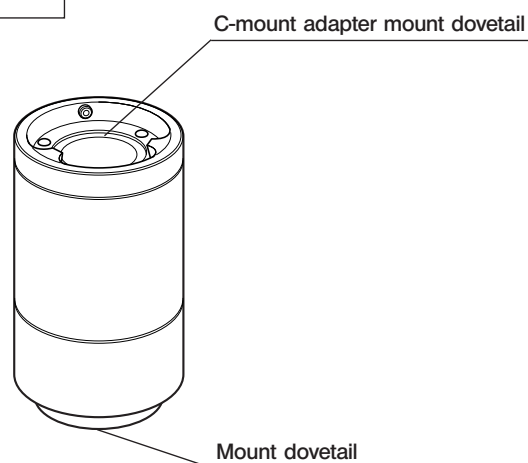
**Power Supply Unit
U-RFL-T**

Hour counter

Lamp ON LED

**Tube Lens Unit
MVX-TLU**

◎ For details, see the instruction manual provided with the U-LH75XEAP0 and U-RX-T.



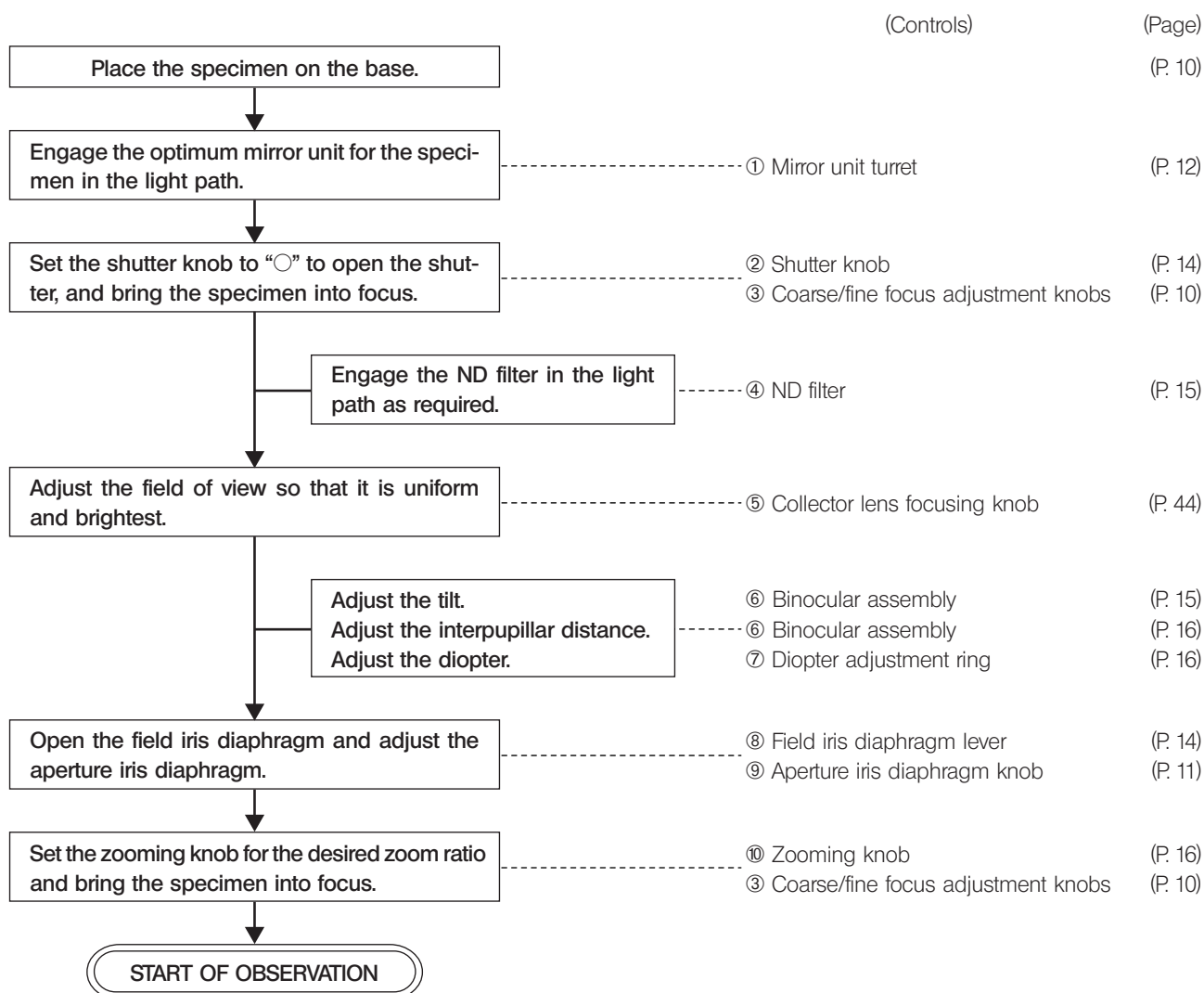
3 SUMMARY OF REFLECTED FLUORESCENT LIGHT OBSERVATION PROCEDURE

© For the observation procedures of other methods, see page 20.

3-1 Preparation

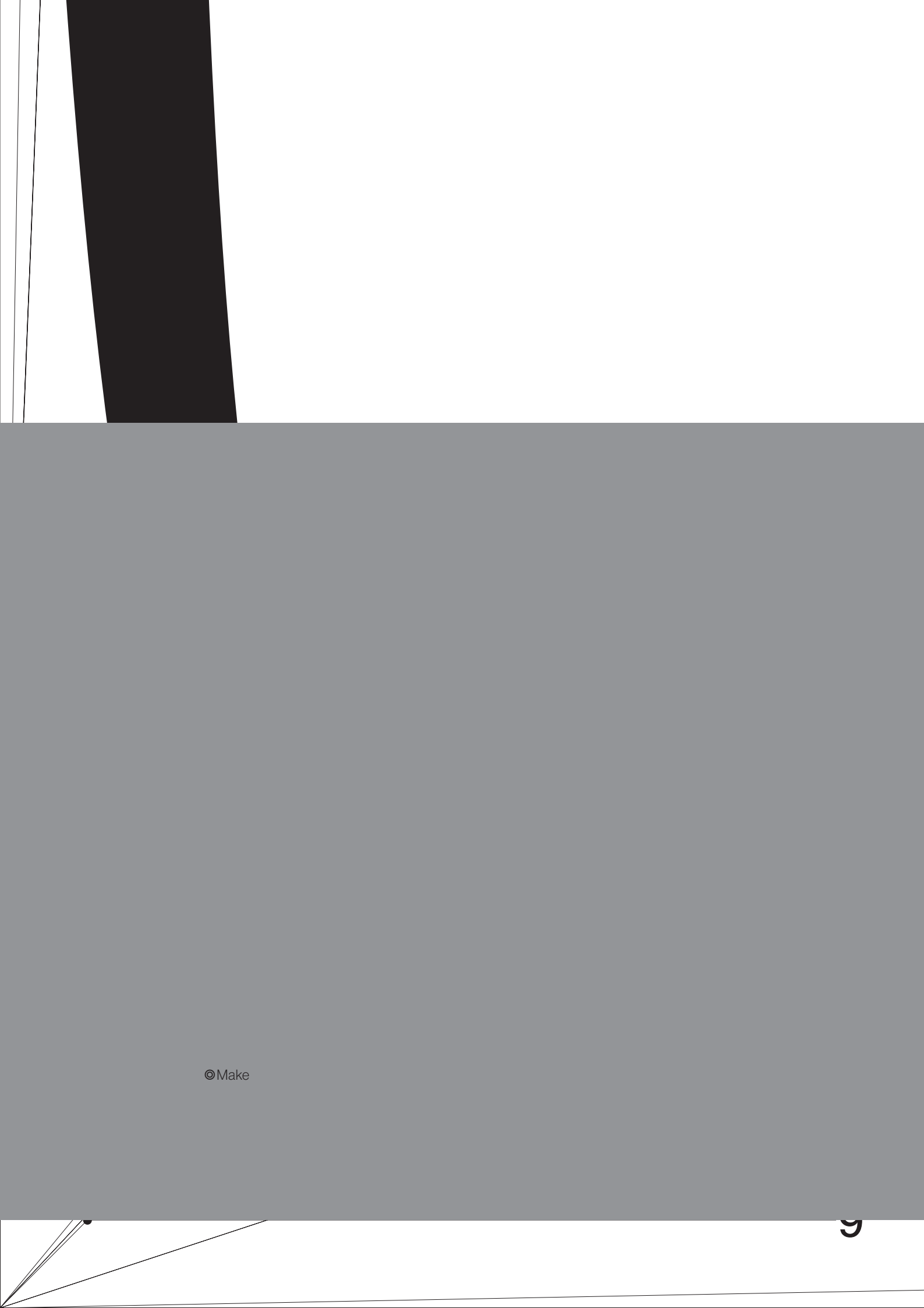
1. Set the shutter knob to "●" to close the shutter. (Page 14)
2. Mount the fluorescence mirror unit(s) that match the desired observation. (Page 38)
3. Turn the mirror unit turret to engage the desired fluorescence mirror units in the light path. (Page 12)
4. Turn on the mercury burner and wait until the arc stabilizes (for about 5 to 10 minutes). (Page 14)
- (If the burner is not centered, center it.)

3-2 Observation Procedure



© To interrupt observation for a short period, close the shutter.

② Shutter knob (P. 14)



©Make

4 OPERATION

4-1 Base

1 Using the Stage Plate

1. When performing reflected light observation, place the stage plate with the white or black side up according to the specimen.
2. When performing transmitted light observation, use the transparent stage glass.

2 Placing the Specimen

Place the specimen on the approximate center of the stage plate (or stage glass). Hold the specimen with the specimen holder as required.

4-2 Microscope Body and Focusing Assembly

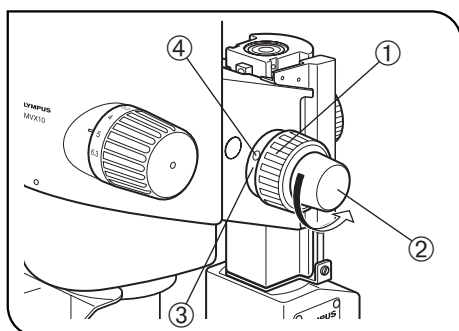


Fig. 3

1 Adjusting the Focus

(Fig. 3)

With both the coarse focus adjustment knob ① and fine focus adjustment knob ②, rotating the knob in the direction of the arrow lowers the microscope body.

- Stroke per turn of the coarse focus adjustment knob : 36.8mm.
- Stroke per turn of the fine focus adjustment knob : 1.5 mm.

2 Adjusting the Rotation Tension of the Coarse Focus Adjustment Knob

(Fig. 3)

★ The rotation tension of the coarse focus adjustment knob can be adjusted with the rotation tension adjustment ring ③. Do not rotate the knobs on the left and right in opposite directions, for this will damage the internal mechanism.

◎ This adjustment is intended to facilitate the rotation of the knob while preventing the microscope body from lowering spontaneously. For best ease of use, it is recommended to adjust the rotation tension slightly tighter than the level at which spontaneous lowering of the microscope body occurs.

1. Rotate the rotation tension adjustment ring ③ by inserting the Allen screwdriver into the hole ④ on the ring periphery.

Rotating the ring clockwise increases the rotation tension of the coarse focus adjustment knob, and rotating counterclockwise decreases it.

★ If the microscope body falls down by its own weight or the focus obtained by fine focusing is lost immediately, the rotation tension adjustment may be too light. In this case, rotate the ring clockwise to increase the rotation tension.

★ If the rotation tension adjustment is too tight, delicate focusing will be impossible and the knob may be damaged. Particularly, never rotate the fine focus adjustment knob quickly while its rotation tension is extremely tight.

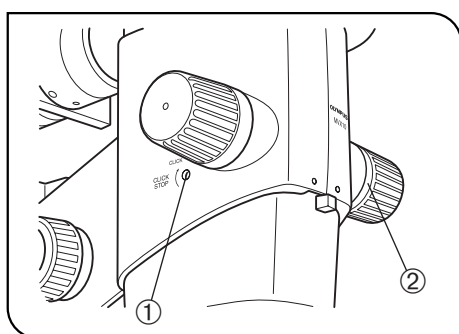


Fig. 4

3

Engaging and Disengaging the Zooming Knob Click Stop Position

(Fig. 4)

- ⊙ When the click stop knob is engaged to ON, the click stop function is engaged for each zoom ratio indicated with the zooming knob. When the knob is disengaged to OFF, the zoom magnification can be varied continuously and finely near the click groove.
- ⊙ Click stop can be provided for the nine zoom ratios from 0.8 to 5. The click stop is engaged when the microscope leaves the factory.
- 1. To disengage the click stop function, rotate the click stop ON-OFF screw ① counterclockwise (by about two turns from the ON position, in the direction opposite to the arrow) using the Allen screwdriver.
- ★ **Do not rotate too much, or the cover may be damaged.**
- 2. To engage the click stop function, rotate the click stop ON-OFF screw ① fully clockwise (in the direction of the arrow) using the Allen screwdriver. The zooming knob then stops at every position corresponding to the zoom ratio indicated on the zoom ratio indicator ②.

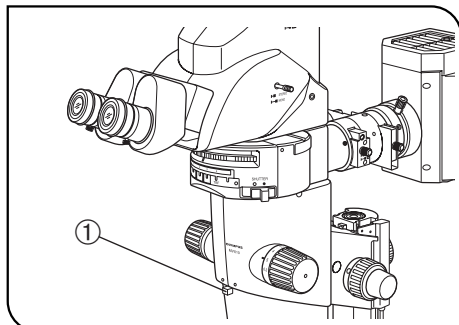


Fig. 5

4

Adjusting the Aperture Iris Diaphragm

(Fig. 5)

- ⊙ Adjusting the aperture iris diaphragm improves the insufficiency of brightness in the peripheral section light at intermediate zoom ratios as well as the depth of focus. However, setting the aperture iris diaphragm too narrowly degrades resolution.
- When performing fluorescent light observation, it is recommended to open the aperture iris diaphragm fully for bright observation.
- 1. Adjust the aperture iris diaphragm knob ① to the left or right. Rotating the ring toward the left "O" opens the aperture; rotating it toward the right "⊗" closes it. Adjust while monitoring the observed image to confirm the contrast and focal depth improvement effects.
- ★ **Do not close the aperture too much, for this may cause degradation in resolution and/or insufficiency of brightness in the peripheral section.**

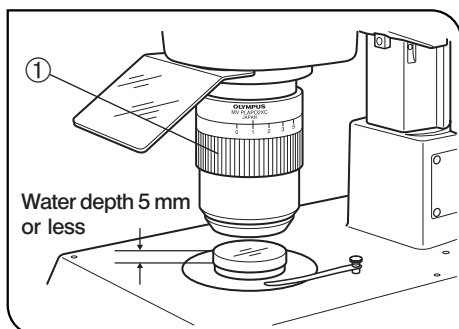


Fig. 6

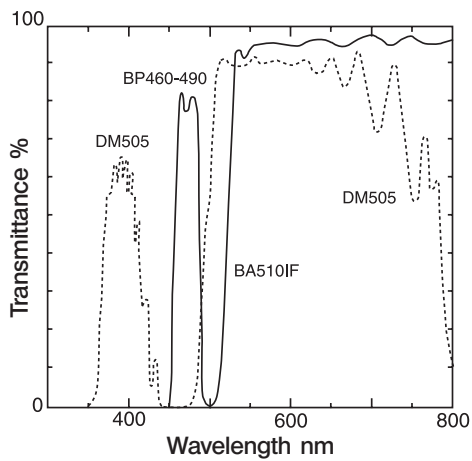
5

Using the Objective Correction Collar

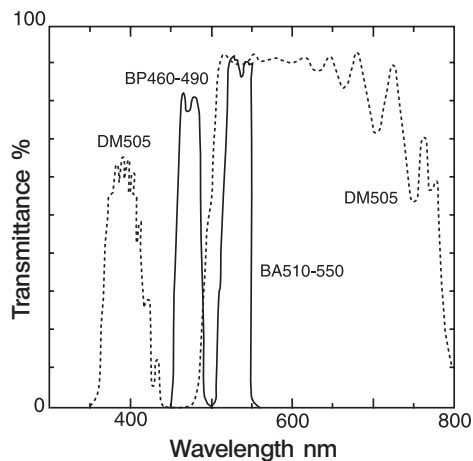
(Fig. 6)

- ⊙ The MVPLAPO 2XC objective is equipped with a correction collar ①, which corrects the aberration produced by a medium such as water or plastic container.
- When observing the specimen through a liquid or petri dish cover, rotate the correction collar to find the position that provides the best contrast.
- Correction is possible for aberrations equivalent to a water depth of about 5 mm.
- The effect of the correction collar may be less sensible when the zoom ratio is low or the aperture iris diaphragm is stopped down.
- ⊙ When the MVX-2RE revolving nosepiece is used, hold the objective so that the revolving nosepiece does not displace from the position when turning the correction collar ①.

5. IB excitation filter (wide band) U-MGFP/XL



6. IB excitation filter (wide band) U-MGFPA/XL



2 Turning the Burner ON

★ The burner should be centered before the first use after it has been mounted or replaced. (see page 45) When resetting the burner hour counter, press and hold the reset button until the reading becomes “0.0”.

Set the main switch of the power supply unit to “ I ” (ON). The arc image of the burner will stabilize in 5 to 10 minutes after the burner is ignited.

⊙ A discharge-type mercury burner may not turn on by the first try due to the characteristics of the burner. If a burner does not turn on, set the main switch to “ O ” (OFF), wait for 5 to 10 seconds and set the main switch to “ I ” (ON) again.

★ To avoid shortening the service life of the burner, do not turn a burner off for 2 hours after turning it on but use the shutter in this period.

★ When turning on a mercury burner that has been turned off, wait for about 10 minutes after it is turned off, because it cannot be turned on unless the mercury vapor in the burner has cooled down and liquefied.

⊙ If the lamp housing is opened while the burner is on, the power supply stops to ensure safety. In this case, set the main switch to “ O ” (OFF) and wait for more than 10 minutes before retrying to turn it on again. Do not open the lamp housing unless it has cooled down sufficiently.

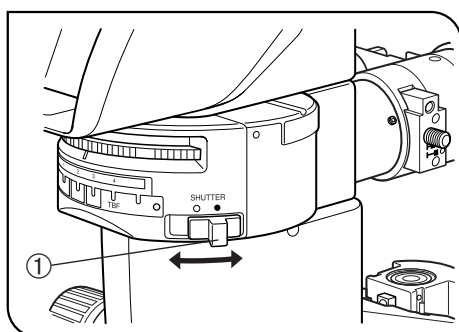


Fig. 7

3 Opening/Closing the Shutter

(Fig. 7)

⊙ The shutter can be used to close the shutter temporarily when changing the mirror unit turret or interrupting observation for a short period.

1. When the shutter knob ① is set to “●”, the shutter is engaged to shut off the excitation light.
2. When the shutter knob ① is set to “○”, the shutter is disengaged and opened.

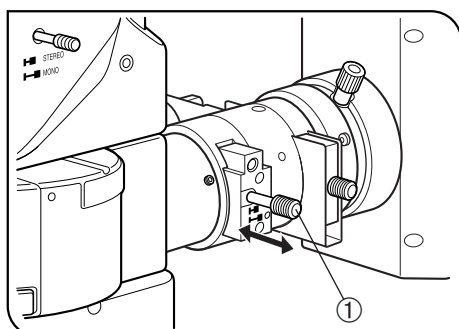


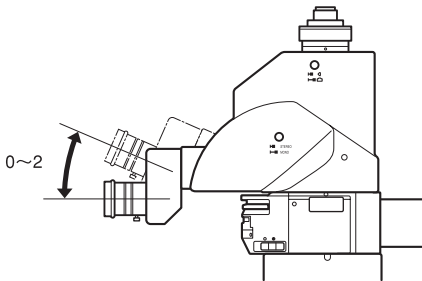
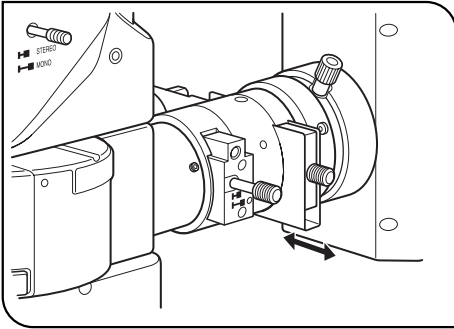
Fig. 8

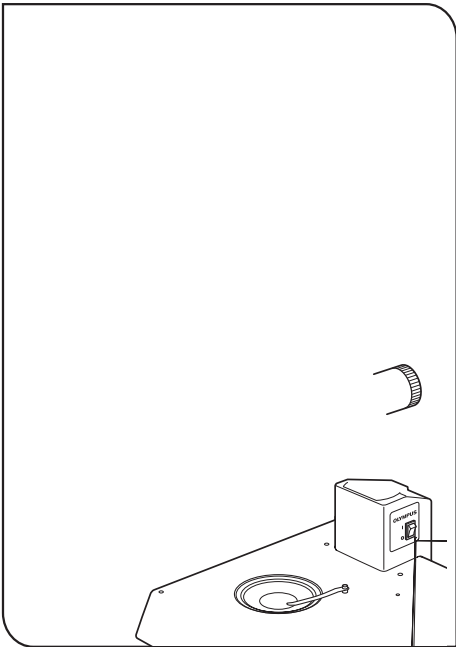
4 Using the Field Iris Diaphragm

(Fig. 8)

⊙ The centering of the field iris diaphragm can be adjusted (see page 45).

⊙ Push in or pull out the field iris diaphragm lever ① as required to prevent color fading due to fluorescence in parts other than the observed region.





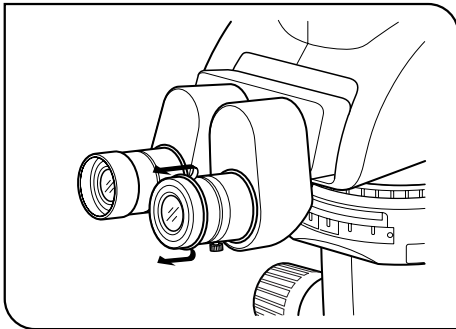


Fig. 13

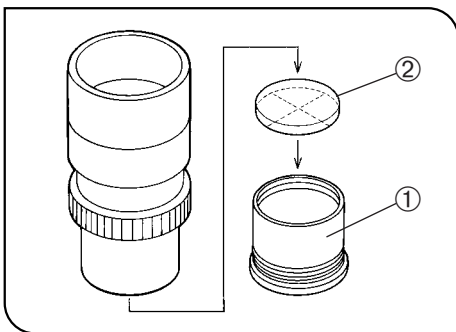


Fig. 14

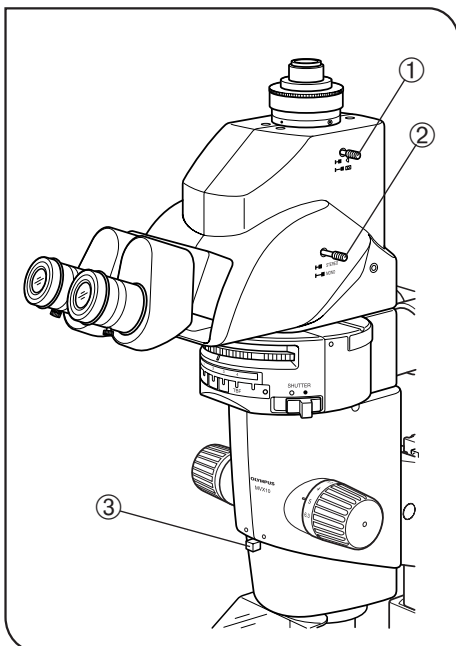


Fig. 15

4 Using the Eye Shades (Fig. 13)

(Fig. 13)

When Wearing Eyeglasses

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

When Not Wearing Eyeglasses

Extend the folded eyeshades in the direction of the arrow. This makes observation easier by preventing the inverse incidence of light from between the eyepieces and your eyes.

5 Using the Eyepiece Micrometer Disk (Fig. 14)

(Fig. 14)

WHN10X-H

1. Unscrew and remove the ring from the bottom of an eyepiece.
2. Clean an eyepiece micrometer disk (diameter 5 mm) and remove dust, then place the disk into the eyepiece with the side with the arrow pointing down.
3. Attach the ring to the eyepiece and turn it clockwise onto the disk.

6 Selecting the Light Path (Fig. 15)

(Fig. 15)

Slide the light path selector lever ① to select the light path.

Light path selector lever	Indication	Intensity Ratio
Pushed in		100% for binocular assembly.
Pulled out		100% for TV observation and photomicrography.

7 Switching the Monaural/Stereo View (Fig. 15)

(Fig. 15)

Slide the mono/stereo selector lever ② for stereo observation based on pupil division.

Mono/stereo selector lever	Indication	Observation
Pushed in	STEREO	Stereo
Pulled out	MONO	Standard

The brightness of the peripheral section of the field becomes insufficient when the aperture iris diaphragm knob ③ is stopped down.

5 TV OBSERVATION AND PHOTOMICROGRAPHY

◎ When TV observation or photomicrography is required, use the MVX-TTRS tilting trinocular head or MVX-TLU tilting lens unit.

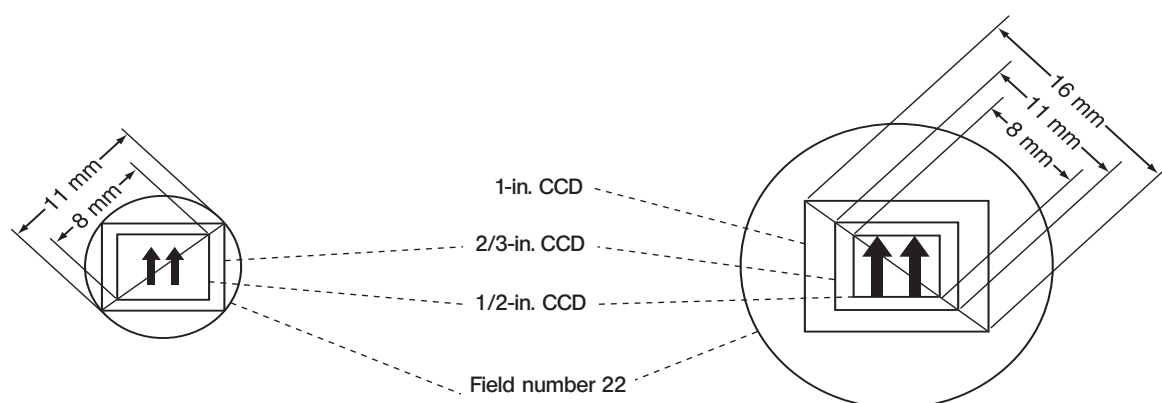
The MVX-TV1XC/TV0.63XC exclusive C-mount adapter can be installed on this microscope.

◎ When the MVX-TV0.63XC C-mount adapter is used, insufficiency of brightness in the peripheral section may sometimes be noticeable at low to intermediate zoom ratios. In this case, stop down the aperture iris diaphragm knob on the front of the microscope body.

1 Selecting the C-mount Adapter Magnification

Set the magnification of the C-mount adapter according to the size of the CCD in the TV camera or digital camera.

The following figures show the TV observation areas when the WHN10X-H eyepieces with a field diameter of 22 are used.



When the 0.63X C-mount adapter is used
(The field may be cut off when the 1-inch CCD is used)

When the 1X C-mount adapter is used

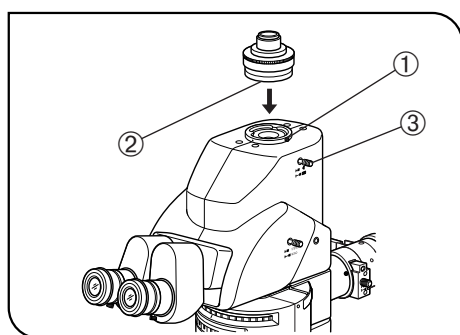


Fig. 16

2 Attaching the C-Mount

(Fig. 16)

1. Using the Allen screwdriver, fully loosen the straight tube clamping screw ① of the straight tube mount on the top of the tilting trinocular head.
2. Fit the round dovetail ② of the C-mount adapter into the straight tube mount of the trinocular head, and tighten the clamping screw ①.
3. Mount a TV camera with C-mount on the C-mount adapter.

3 Selecting the TV Camera Light Path

(Fig. 16)

Pull out the light path selector knob ③ to select the TV & Photo 100% light path setting.

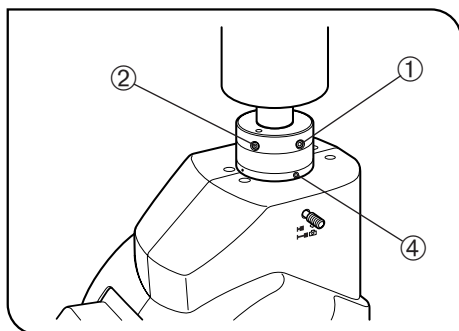


Fig. 17

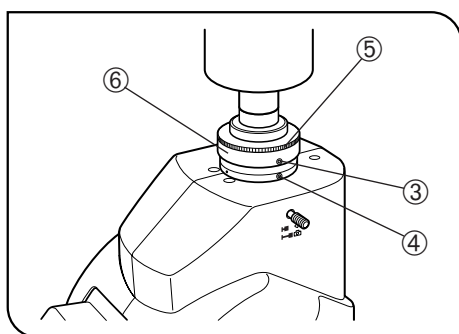


Fig. 18

4

Adjusting the Parfocality Between Observation Image and Monitor Image

(Figs. 17 & 18)

◎ The parfocality adjustment makes correction of focusing unnecessary when the observation image is switched to the image monitored with the TV camera.

1. Looking into the eyepieces, select a high zoom ratio and focus on the specimen.
2. Select the TV/Photo light path to view the TV monitored image and select a low zoom ratio.

When Using the MVX-TV0.63XC (Fig. 17)

3. Using the Allen screwdriver, loosen the parfocality adjustment clamping screw (LOCK) ① on the C-mount adapter.
4. While observing the monitored image, turn the parfocality adjustment screw (FOCUS) ② slowly to focus on the specimen.
5. When the specimen is focused, tighten the clamping screw ① using the Allen screwdriver.

When Using the MVX-TV1XC (Fig. 18)

3. Using the Allen screwdriver, loosen the parfocality adjustment clamping screw ③ and C-mount adapter clamping screw ④.
4. While observing the monitored image, hold the upper part ⑤ of the C-mount adapter and rotate the lower part ⑥ to focus on the specimen.
5. When the specimen is focused, tighten the clamping screws ③④ using the Allen screwdriver.

Adjusting the TV Camera Angle

1. Loosen only the C-mount adapter clamping screw ④ and rotate the TV camera to adjust its angle.
2. After adjusting the angle, tighten the clamping screw ④.

◎ When an SZX series transmitted illumination base is used, the microscope can be used in transmitted light brightfield/darkfield, focal light and simplified transmitted polarized light observations.

To perform these observations, rotate the mirror unit turret on the coaxial fluorescence illuminator to select the light path without fluorescence mirror unit (No. 4/TBF).

The following table shows the main specifications of the transmitted illumination base.

Item \ Base	Transmitted Illumination Base SZX-ILLK	High-Class Transmitted Illumination Base SZX-ILLB2	Transmitted Brightfield/ Darkfield Illumination Base SZX-ILLD2
Max. illumination field diameter	ϕ 40 mm		ϕ 63mm: Brightfield ϕ 33 mm: Darkfield
Brightfield observation	Available		
Darkfield observation	Not Available		Available
Focal light observation	Available		Not Available
Simplified transmit- ted polarized light observation	Available (Note) The SZX-AN analyzer/SZX-PO polarizer are required. ★The MVPLAPO 2XC objectives cannot be used.		

Note 1. When the MVPLAPO2XC objective is used and the zoom ratio is 2.5X or less, insufficiency of brightness in the peripheral section becomes noticeable. To prevent this, place the diffusion plate (ϕ 45 mm, made of plastic) provided with the microscope body below the stage glass of the SZX transmitted illumination base.

When the SZX-ILLB2 is used and the contrast selector lever is set to the "High" position, irregularities may be noticeable in the image.

Note 2. To reduce background noise during fluorescence observation, it is recommended to use the SP-BW-2 stage plate (B&W) or the SP-FL fluorescence center plate (with metallic plate).

However, if transmitted light observation is also necessary, use the SP-C stage glass or the SP-FL fluorescence center plate (with glass plate) instead, and place the ND6 filter (ϕ 45 mm), provided with the microscope, in the position for the diffusion plate described in Note 1) above. If both the diffusion plate and ND6 filter are used, they can be stacked in the position.

7 TROUBLESHOOTING GUIDE

Under certain conditions, performance of this unit may be adversely affected by factors other than defects. If a problem occurs, 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. Incomplete binocular vision.	Interpupillary distance is not correctly adjusted.	Adjust it correctly.	16
	Diopter adjustment is incomplete.	Complete diopter adjustment.	16
2. Field of view is cut off or illuminated unevenly.	Stereo observation is performed and the aperture iris diaphragm is stopped down excessively.	Open the aperture.	11
	The trinocular head and intermediate attachment are not correctly mounted.	Mount them correctly.	40,41
	Light path selector knob is stopped midway.	Set correctly to the desired position.	17
	Mirror unit turret or filter slider knob is in an intermediate position.	Set them in the correct positions.	15
3. Dust is visible in the field of view.	Dust on the specimen.	Remove dust.	3
	Dust on eyepiece.	Remove dust.	3
4. Excessive image contrast.	Aperture is stopped down excessively.	Open the aperture to proper diameter.	11
5. Resolution problems: • Image is not sharp. • Insufficient contrast.	Objective is not correctly mounted.	Mount it correctly until it is stopped.	37
	Dust on objective front lens.	Clean lens surfaces.	3
	Dust on top or lower lens of zoom microscope body.		
6. Specimen image blurs when zoom ratio is changed.	Diopter of the eyepieces is not correctly adjusted.	Adjust it correctly.	16
	Not in complete focus on specimen.	Focus specimen correctly at a high zoom ratio.	16
7. Coarse focus adjustment knobs rotate with too much resistance.	Rotation tension adjustment ring is too tight or a module is attached on the microscope body.	Loosen the ring properly.	10
8. Zoom microscope body drops or specimen goes out of focus during observation.	Rotation tension adjustment ring is too loose.	Tighten the ring properly.	10
9. Image looks doubled.	The MVX-CA2X is set to an intermediate position.	Push or pull the lever into a stop position.	26
10. Background noise is noticeable in the fluorescence.	The excitation light is too strong.	Insert the ND filter and set the excitation light to the minimum required intensity level.	40

Item	Specification
1. Zoom microscope body MVX-ZB10	Zoom magnification system. Zoom drive system: Horizontal knob. Click stop ON-OFF switchable per zoom ratio. Zoom ratios: 10 (0.63X to 6.3X). Zoom ratio indications: 0.63, 0.8, 1, 1.25, 1.6, 2, 2.5, 3.2, 4, 5, 6.3. Objective mount: Threaded mount Built-in aperture iris diaphragm.
2. Objective	MVPLAPO 0.63X: NA 0.15, WD 87 mm, FN 22. MVPLAPO 1X: NA 0.25, WD 65 mm, FN 22. MVPLAPO 2XC: NA 0.5, WD 20 mm, FN 22, with correction collar.
3. Eyepiece * ϕ 24 mm dia., 1.5 mm thick eyepiece micrometer disk can be inserted.	WHN10X-H*: FN 22, with diopter adjustment ring.
4. Focusing assembly MVX-FOF	Focusing system: Rack & pinion roller guide (with coarse focus adjustment knob rotation tension adjustment ring). With built-in high-load counterbalance. Coaxial coarse/fine focus adjustment knobs. Coarse focus adjustment knob stroke: 80 mm Coarse knob stroke per turn: 36.8 mm. Fine focus adjustment knob stroke: 80 mm. Fine knob stroke per turn: 1.5 mm.
5. Tilting trinocular head MVX-TTRS	Tilting angle: 0° to 23° Light path selection: 2 steps (Bi 100% or TV/Photo 100%). Interpupillary distance adjustment: 51 to 76 mm. Eyepiece clamping knob provided. Eyepiece: WHN10X-H
6. Coaxial fluorescence illuminator MVX-RFA	Illumination magnification: 1X (FN 22). Observation switching: Mirror unit turret. Number of mountable fluorescence mirror units: 3 (with idle positions). Field iris diaphragm provided (centering possible). Shutter provided. Filter slider knob provided (2 filter pockets + 1 idle position). Available observation methods: Reflected light fluorescence and transmitted light.
7. Lamp housing for mercury burner	U-LH100HG: Lamp housing for 100 W mercury burner. U-LH100HGAP0: Apo lamp housing for 100 W mercury burner. Mercury burner: USH-103OL (OLYMPUS) or HBO103W/2 (OSRAM) Power Supply Unit: U-RFL-T
8. Operating environment	<ul style="list-style-type: none"> Indoor use. Altitude: Max. 2000 meters (6440 ft). Ambient temperature: 5° to 40°C (41° to 104°F). 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: $\pm 10\%$. Pollution degree: 2 (in accordance with IEC60664). Installation (overvoltage) category: II (in accordance with IEC60664)

9 OPTICAL CHARACTERISTICS

Total Magnification/Actual Field

• Total magnification = Objective power x Zoom ratio x Eyepiece magnification

• Actual field area = $\frac{\text{Eyepiece FN}}{\text{Objective power} \times \text{Zoom ratio}}$

Objective	Eyepieces	
	WHN10X-H (Field number: 22)	
	Total magnification	Actual field (mm)
MVPLAPO 0.63X	4X to 40X	55.4 to 5.54
MVPLAPO 1X	6.3X to 63X	34.9 to 3.49
MVPLAPO 2XC	12.5X to 125X	17.4 to 1.74



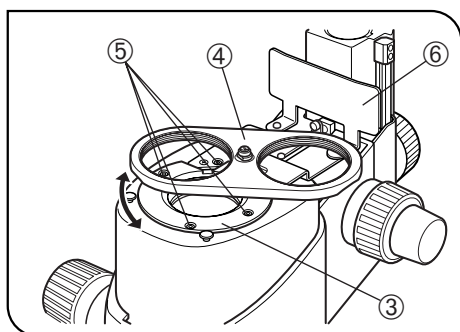


Fig. 20

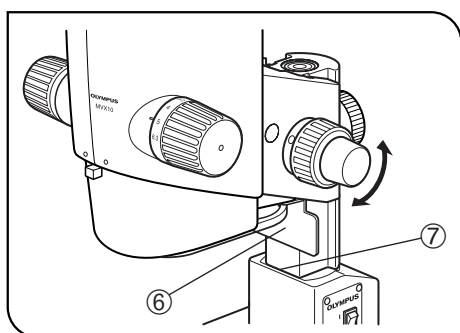


Fig. 21

4. Place the nosepiece mount ③ (with its objective mounts ④ facing upward) where the objective has been by aligning the screw holes. Using the Allen wrench (for M3 screws), clamp the nosepiece mount with the provided four clamping screws (M3, 6 mm long) ⑤. (Fig. 20)

★ As the screw holes may be hidden behind the objective mounts ④, clamp the nosepiece mount while rotating it. (Fig. 20)

★ Before installing the focusing assembly on the pillar, adjust the coarse and fine focus adjustment knobs so that the hand guard ⑥ does not protrude from the lower end of the focusing assembly ⑦. (Fig. 21)

5. Install the focusing assembly on the pillar, and install the observation tube and coaxial fluorescence illuminator which have been removed above in the original positions.

6. Attach two objectives onto their respective objective mounts ④ by screwing. (Fig. 20)

3 Operation

(Fig. 22)

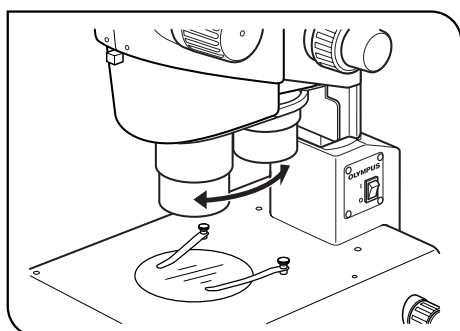


Fig. 22

Hold the objectives and gently rotate the nosepiece until a click position where the objective to be used is engaged in the light path.

4 Caution

- ★ When transporting the microscope, do not hold it by the revolving nosepiece.
- ★ The parfocal property when the objective is switched is not completely guaranteed.
- ★ The revolving nosepiece cannot be used in combination with the SZ2-FO stage (because the objectives interfere with the stage).

10-2 Magnification Changer MVX-CA2X

◎When the magnification changer has been installed on the MVX-TTRS tilting trinocular head by the dealer, the observation magnification can be switched between 1X and 2X with a selector lever.

Pushed-in position: 1X

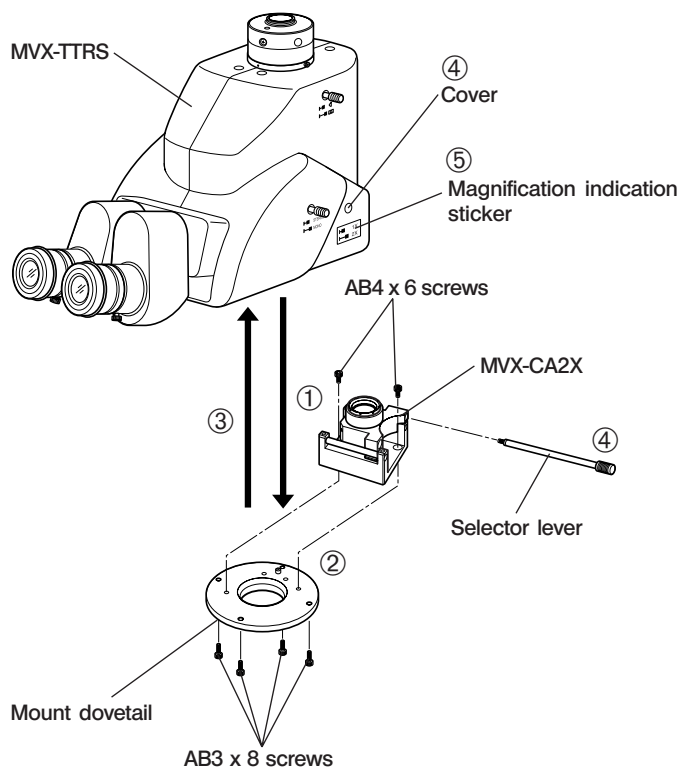
Pulled-out position: 2X

Be sure to push in or pull out the selector lever in a position where it is stopped securely.

★ **Not to spoil the optical performance, always have your dealer perform the assembly work.**

Assembly (Operation performed by the dealer)

★ The MVX-CA2X is shipped with grease applied on it. Be careful not to stain the lenses with the grease during assembly.



- ① Using the Allen wrench, remove the four AB3 x 8 screws from the mount dovetail on the MVX-TTRS.
- ② Using the two AB4 x 6 screws and the Allen screwdriver, attach the MVX-CA2X onto the mount dovetail by aligning the positioning pin.
- ③ Place the mount dovetail with the MVX-CA2X on the original position by aligning the positioning pin, and then clamp using the four AB3 x 8 screws.
- ④ Remove the cover of the lever insertion hole of the MVX-TTRS and screw the selector lever into it.
- ⑤ Attach the magnification indication sticker below the lever.

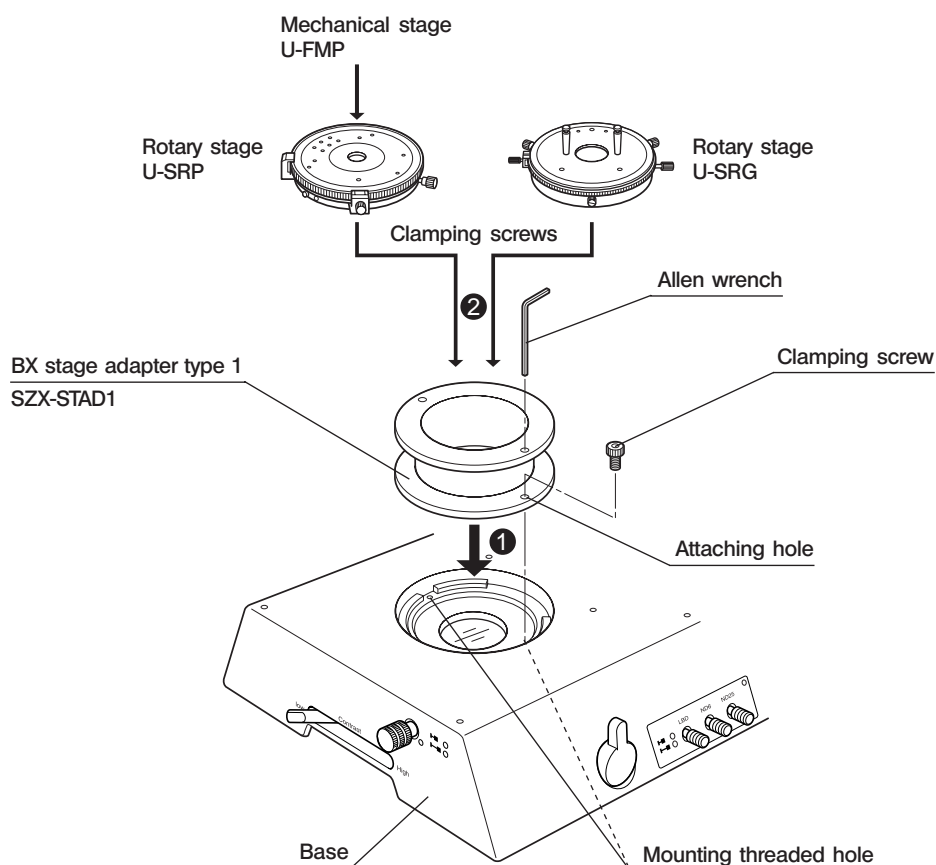
10-3 BX Stage Adapter Type 1 SZX-STAD1

©This adapter is for installation of a U-SRG or U-SRP rotary stage on the SZX-STL large base or a SZX series illumination base. When the U-SRP rotary stage is used together with the U-FMP mechanical stage, X-Y directional movement becomes possible, which is convenient for framing during photomicrography and TV observation.

1 Applicable Bases & Restrictions

Base	Applicable Objectives	Restrictions
Large base SZX-STL	MVPLAPO 0.63X MVPLAPO 1X MVPLAPO 2XC	None.
Transmitted illumination base SZX-ILLK SZX-ILLB2 SZX-ILLD2		<p>The same restrictions apply regardless of whether the stage adapter is used or not. (Refer to the SZX illumination base's instruction manual.) Note that the field illuminated by the transmitted light is limited depending on the diameter of the opening of the stage plate in use.</p> <p>★Darkfield observation is not possible using the SZX-ILLD2.</p> <p>★The illumination intensity may be reduced when a frosted filter is used.</p>

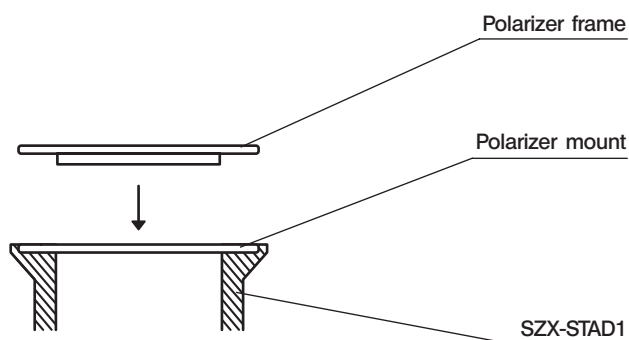
2 Assembly



Mounting the Polarizer (SZX-PO)

When simplified transmitted polarized light observation is required, install the polarizer on the SZX-STAD1 BX stage adapter type 1.

To install the polarizer, place the polarizer frame in the polarizer mount on the upper part of the SZX-STAD1. (The polarizer oscillation directions \leftrightarrow are basically horizontal.)



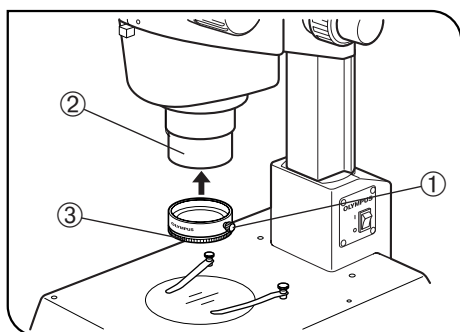


Fig. 23

Simplified Transmitted Polarized Light Observation

◎ The SZX-AN analyzer is required.

1. Loosen the analyzer clamping knob ①, fit the analyzer into the front of the objective ② and tighten the clamping knob (by placing it on the right side of the microscope body).
2. With no specimen placed on the rotary stage, rotate the analyzer rotation ring ③ so that the field of view is darkest (cross-Nikol adjustment).
3. Place a specimen on the rotary stage and rotate it to perform the polarized light observation.

10-4 Stage Adapter Type 1 SZH-STAD1

This adapter has the same function as the SZX-STAD1 BX stage adapter type 1, but the usable stages with this adapter is only the BH2-SH horizontal knob stage.

The assembly and polarizer (SZX-PO) installation procedures for this adapter are identical to those for the SZX-STAD1. Refer to the previous section (page 28).

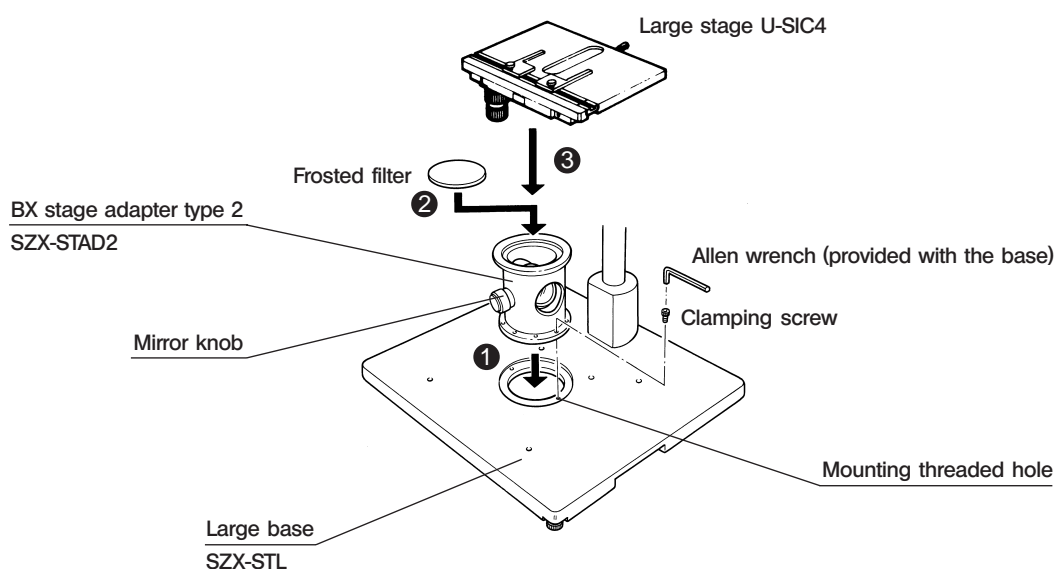
10-5 BX Stage Adapter Type 2 SZX-STAD2

This adapter is for installing the U-SIC4 large stage on the SZX-STL large base. When this stage adapter is used, the provided SZH-P400 auxiliary pillar should be used to cover the height of the stage adapter.

The U-SVL or U-SVR BX stage can also be used but the operability is degraded, and the U-SVLB and U-SVRB cannot be used due to the long stage knobs.

The SZX-STAD2 can also be used with an SZX series illumination base, but its built-in transmitted illumination cannot be used.

1 Assembly



★ For simplified transmitted light observation, place the mirror knob on the front and use a frosted filter.

2 Simplified Transmitted Light Observation

(Fig. 24)

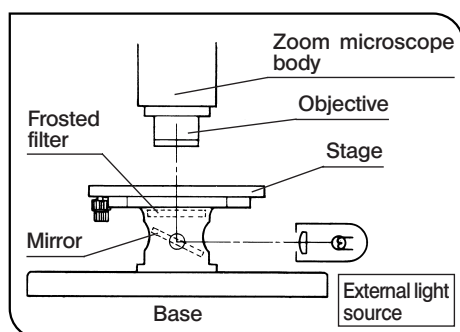


Fig. 24

1. Illuminate the specimen with an external light source (illuminator, light guide illuminator, etc.). Light the external light source as shown in Fig. 24 and irradiate the mirror assembly.
2. Eliminate irregularities in illumination.
 - 1) Align the microscope body center with the center of the SZX-STAD2.
 - 2) Set the zooming knob on the microscope body to the minimum zoom ratio and focus the stage top surface.
 - 3) While observing through the eyepieces, rotate the mirror knob to adjust the mirror angle so that the entire field of view is illuminated uniformly.

◎ When observing using a focal light illuminator, remove the frosted filter and, while observing through the eyepieces, tilt the mirror gradually until optimum contrast can be obtained.

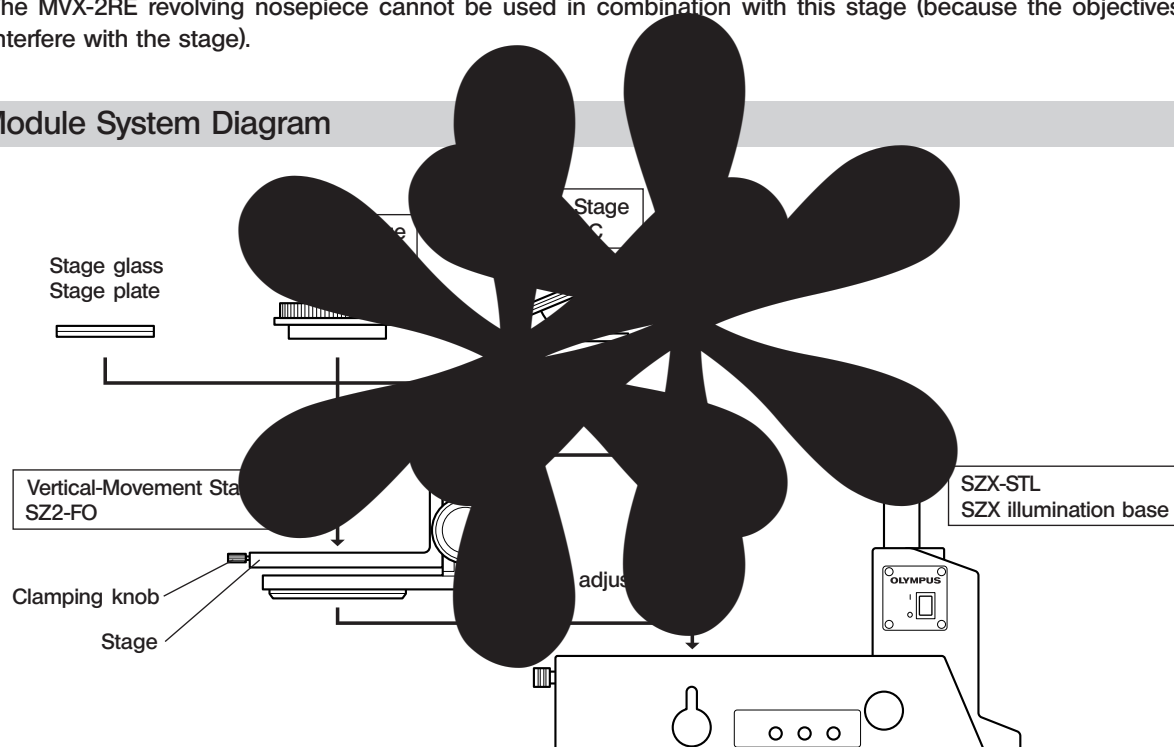
3 Caution

- ★ Do not project the image of the external light source filament on the frosted surface of the frosted filter. Otherwise the frosted filter may deteriorate.
- ★ Use neutral detergent to clean the frosted filter.
- ★ In transmitted light observation at a total magnification of no more than 10X, the field of view may be obscured in the peripheral sections depending on the stage in use.

10-6 Vertical-Movement Stage SZ2-FO

- ★ The MVX-2RE revolving nosepiece cannot be used in combination with this stage (because the objectives interfere with the stage).

1 Module System Diagram



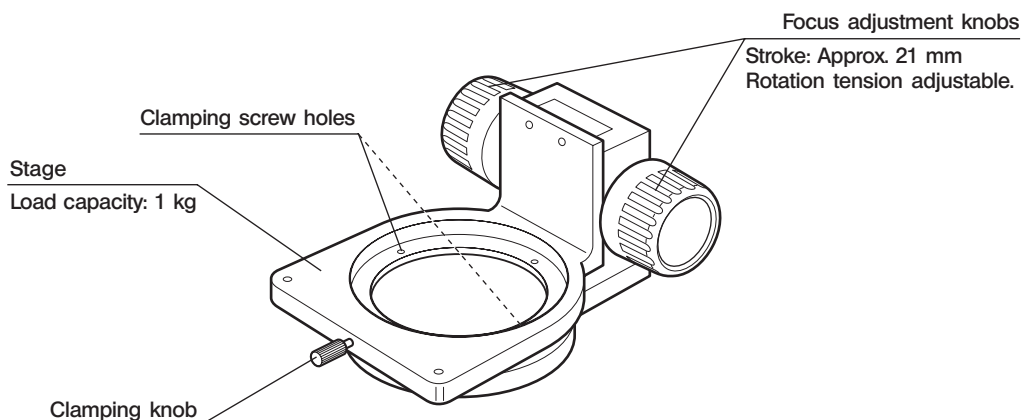
- When using a filter or polarized simplified light module in combination with a transmitted illumination base, install the filter holder or polarizer on the base before installing the vertical-movement stage.
- The vertical-movement stage can also be installed so that the focus adjustment knob comes on the side of the observer (i.e. in a 180° opposite orientation to the above figure).

Modules Combinable with the SZ2-FO

- Stage plate : SP-C, SP-FL, SP-BW-2
- Base : SZX-STL, SZX illumination base
- Stage : SZX-SC, SZH-SG

The movement in the front-rear direction is possible only in the section in front of the center due to interference with the focus adjustment knob of the SZ2-FO.

2 External View & Specifications



3 Assembly

1. Attach the SZ2-FO vertical-movement stage inside the stage plate mounting hole of an applicable base by using the provided clamping screws and the Allen wrench.
The stage can also be mounted so that the focus adjustment knob comes on the front side.
2. Loosen the clamping knob of the stage, attach the stage plate SZH-SG or SZH-SC and tighten the clamping knob again.

4 Operation

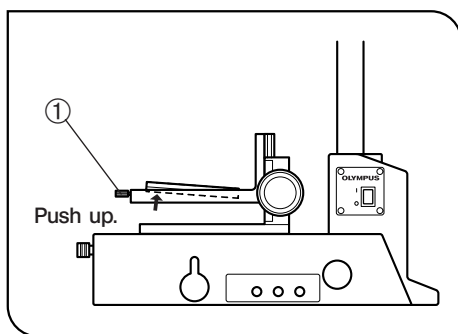


Fig. 25

Removing the Stage Plate (Fig. 25)

Loosen the clamping knob ① and push up the stage plate from its bottom side.

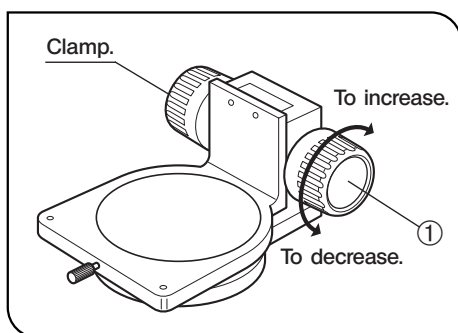


Fig. 26

Adjusting the Rotation Tension of the Focus Adjustment Knob (Fig. 26)

© This adjustment is intended to facilitate the rotation of the knob while preventing the vertical-movement stage from lowering spontaneously. For best ease of use, it is recommended to adjust the rotation tension slightly tighter than the level at which spontaneous lowering of the stage occurs.

- a. Holding the left and right focus adjustment knobs ① with both hands, fix the left knob and rotate only the right knob to increase or decrease the rotation tension.
- b. If the rotation tension is too large, fine focusing will be unavailable and the mechanism may eventually be damaged.

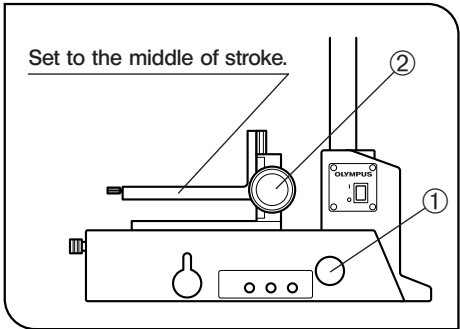


Fig. 27

Adjusting the Focus (Fig. 27)

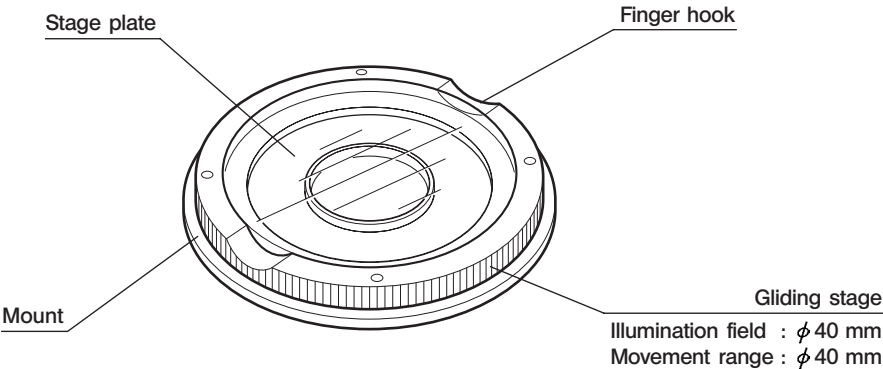
1. Rotate one of the focus adjustment knobs ① of the SZ2-FO vertical-movement stage to set the stage in the position corresponding to the middle of the focusing stroke.
2. Place a specimen on the stage and rotate the focus adjustment knob ② of the base to bring the specimen into approximate focus. Then proceed to fine focus adjustment using the focus adjustment knob ① of the vertical-movement stage.

5 Applicable Bases & Restrictions

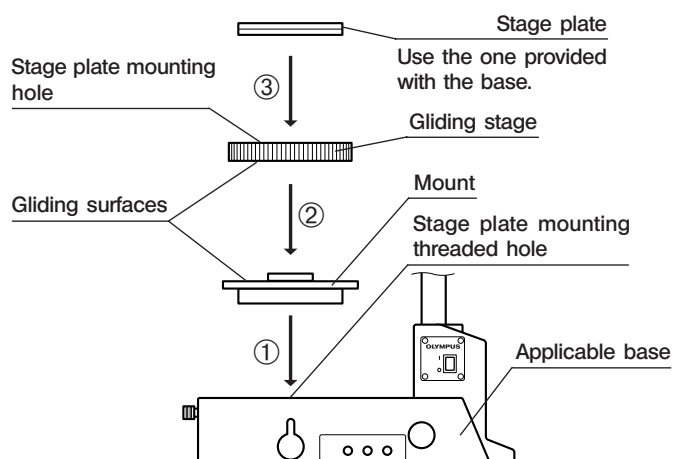
Base	Applicable Objectives	Restrictions
Large base SZX-STL	MVPLAPO 0.63X MVPLAPO 1X MVPLAPO 2XC	None.
Transmitted illumination base SZX-ILLK SZX-ILLB2 SZX-ILLD2		The same restrictions apply regardless of whether the stage adapter is used or not. (Refer to the SZX illumination base's instruction manual.) Note that the field illuminated by the transmitted light is limited depending on the diameter of the opening of the stage plate in use. ★Darkfield observation is not possible using the SZX-ILLD2. ★The illumination intensity may be reduced when a frosted filter is used.

10-7 Gliding Stage SZH-SG

1 External View & Nomenclature



2 Assembly



Note 1) If dirt or metallic powder is attached on the gliding surfaces, be sure to clean them.

Note 2) When placing the gliding stage parts, be sure to avoid bringing the gliding surfaces in contact with the desk surface.

Note 3) Clean the gliding surfaces periodically.

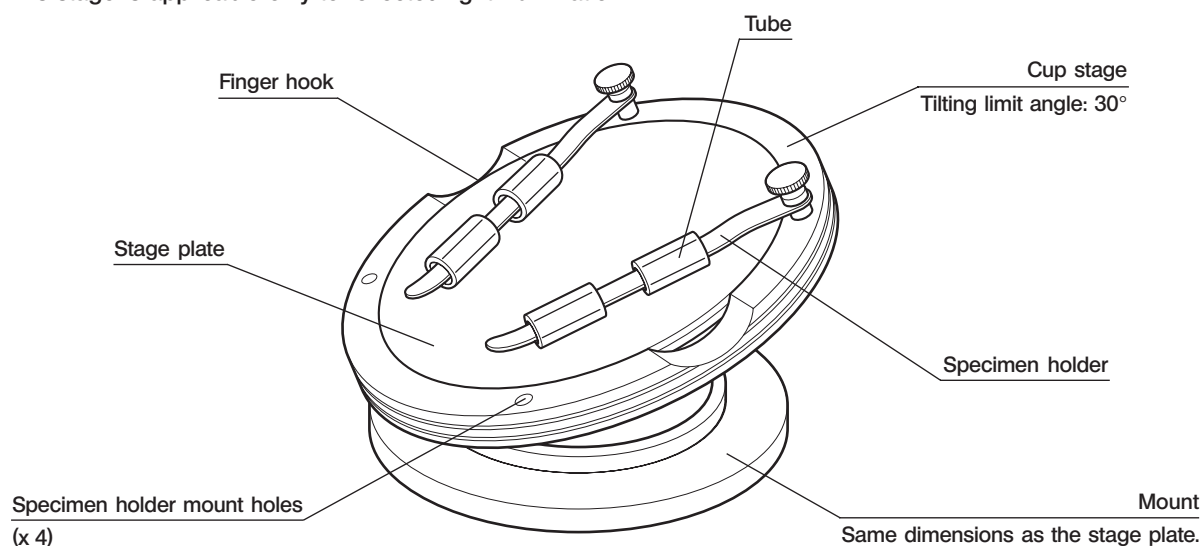
3 Operation

Hold the gliding stage by the surrounding edge and move it horizontally.

10-8 Cup Stage SZH-SC

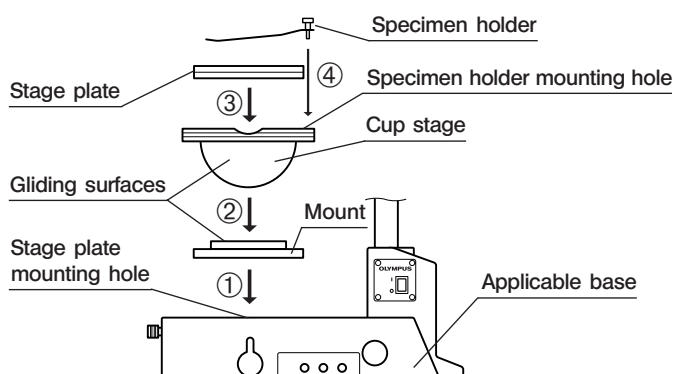
1 External View & Nomenclature

★ This stage is applicable only to reflected light illumination.



2 Assembly

★ Before assembly, remove dirt and dust from the parts and perform the operation cautiously.



- ① Fit the cut stage mount into the stage plate mounting hole of an applicable base.
- ② Place the cup stage on the mount.
Before placing, clean the gliding surfaces on the cup stage and mount by wiping with a clean cloth.
- ③ Attach the stage plate.
- ④ Attach the specimen holder.
- Ⓢ Clean the gliding surfaces periodically.

3 Operation

(Figs. 28 & 29)

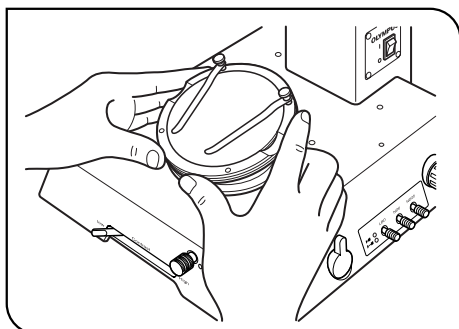


Fig. 28

Place a specimen on the stage plate, hold the edge of the cut stage and tilt it slowly. (Fig. 28)

Ⓢ If the specimen slips off, fix it using the provided specimen holder.

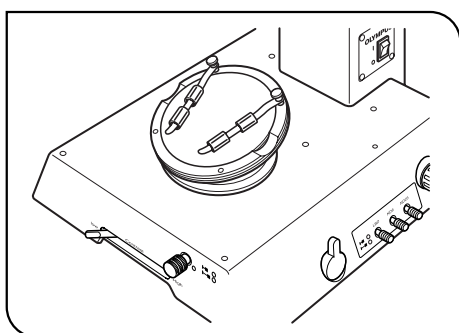


Fig. 29

Ⓢ To fix a container such as a petri dish, fit the provided tube around the specimen holder and hold the container with it. (Fig. 29)

Notes

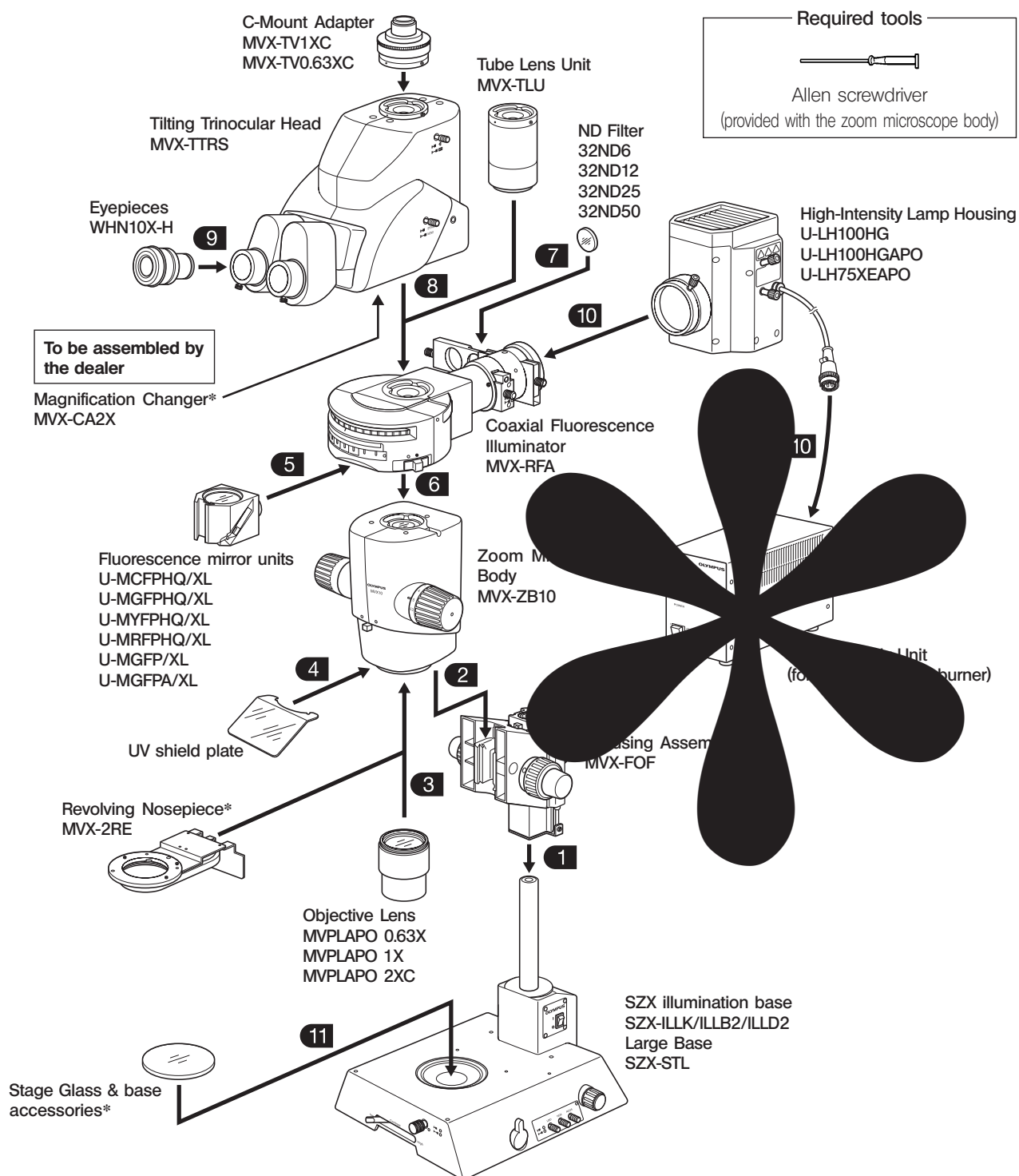
- ★ Take care not to touch the gliding surfaces of the cup stage and mount with a hand. If they are contaminated, clean with neutral detergent before use.
- ★ The cup stage may move spontaneously if a load of 20 g or more is applied to its outer periphery.
- ★ When the cup stage is tilted while a specimen with large height is placed on it, the image may be defocused. If this happens, adjust focusing again.

11 ASSEMBLY

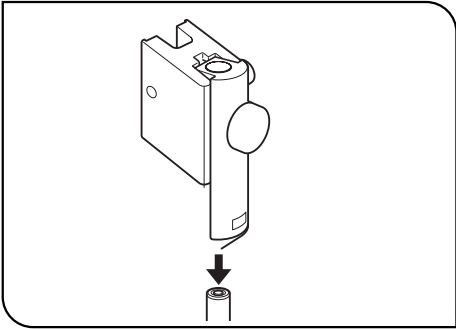
11-1 Assembly Diagram

The diagram below shows how to assemble the various modules. The numbers indicate the order of assembly.

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



The assembly methods of the modules marked * are described in Chapter 10, "OPERATION OF OTHER MODULES".





4

5

⑤

How to Fabricate an Optional Mirror Unit

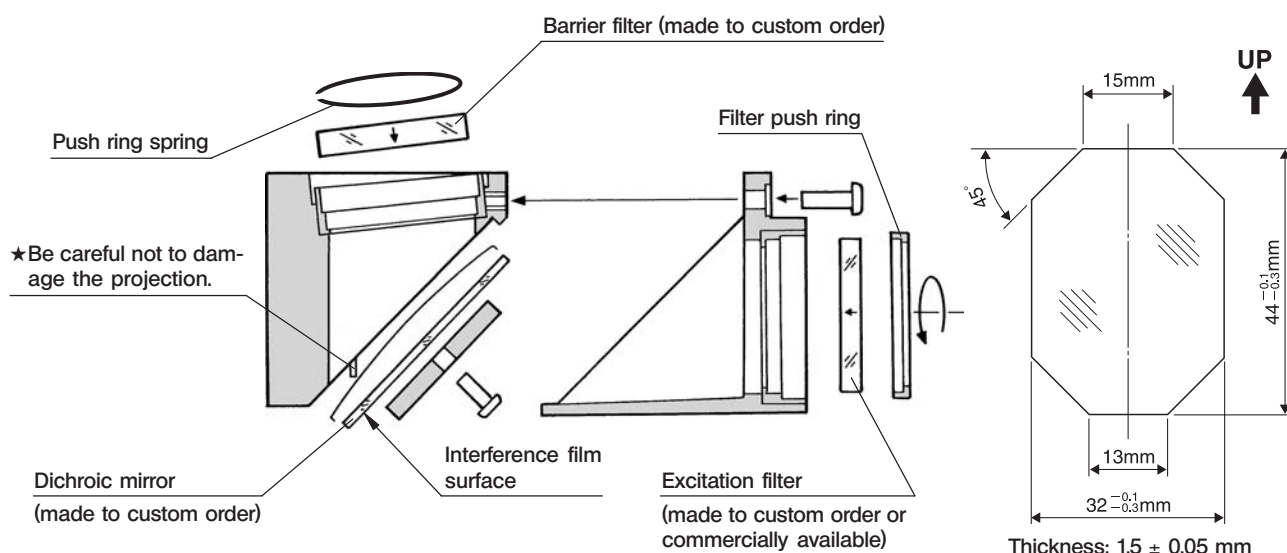
◎ A custom ordered or commercially available mirror unit can be fabricated by assembling a barrier filter, excitation filter and dichroic mirror, all of which are available commercially, in the U-MF/XL mirror unit frame.

However, the barrier filter and dichroic mirror should be the Olympus products. If a commercially available product is used, Olympus cannot guarantee the safety of operation.

◎ The arrow inscribed on the side of an Olympus barrier filter or excitation filter indicates the filter mounting orientation.

Dimensional Conditions of the Optical Parts

- Barrier filter : $\phi 32 \pm 0.1$ mm, max. thickness 4 mm.
- Excitation filter : $\phi 25 \pm 0.1$ mm, max. thickness 6 mm.
- Dichroic mirror : See figure on the right.



★ When replacing the dichroic mirror, be particularly careful not to contaminate it with fingerprints, etc.

◎ A mirror unit of the UIS series can also be used. However, in this case, the NA is limited in the low to medium zoom ratios due to the diameter of the filter.

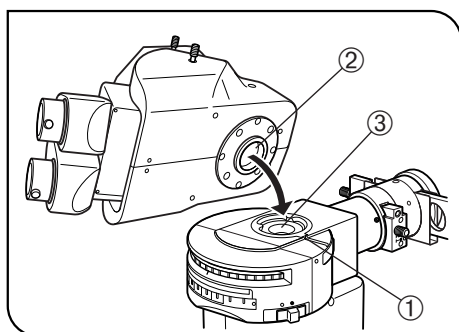


Fig. 39

8 Mounting the Tilting Trinocular Head (Fig. 39)

1. Using the Allen screwdriver, loosen the clamping screw ① of the coaxial fluorescence illuminator.
2. Fit the round dovetail ② on the bottom of the trinocular head into the mount dovetail ③ of the illuminator and tighten the clamping screw.

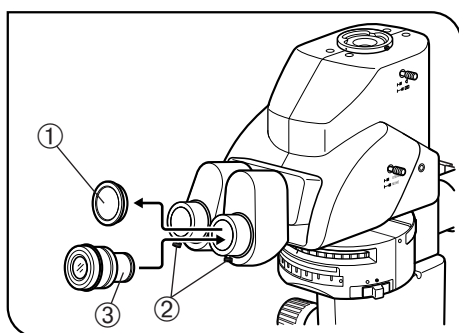


Fig. 40

9 Mounting the Eyepieces (Fig. 40)

1. Remove the eyepiece dust caps ① and loosen the eyepiece clamping knobs ② completely.
2. Gently insert the eyepiece (WHN10X-H) ③ into the left and right eyepiece sleeves all the way until they stop.
3. Tighten both eyepiece clamping knobs ②.

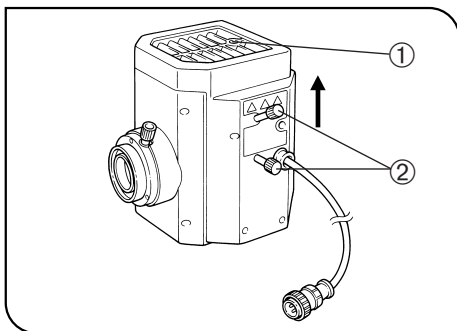


Fig. 41

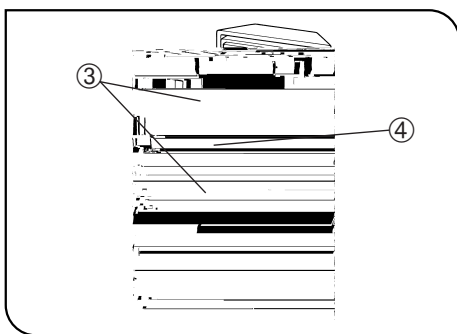


Fig. 42

10

Mounting the Lamp Housing for Mercury Burner

(Figs. 41 to 43)

☉ For the lamp housing for xenon burner, refer to the instruction manual provided with the lamp housing. The centering method is identical to that for the mercury burner.

Attaching the Mercury Burner

1. Using the Allen screwdriver, loosen the socket clamping screw ①.
2. Hold the upper section of the lamp housing and pull it upward to remove the socket section.

★ **To prevent malfunction, do not hold the lamp housing by the centering knobs ②.**

3. Place the socket section upside down as shown in Fig. 42.

☉ The lamp housing is equipped with the holder for transportation in the factory shipment condition or with an old burner after the burner is replaced. Remove the holder or old burner by loosening the two burner holding screws ③.

4. Attach the + (positive) pole of a specified mercury burner ④ to the fixed mount on the upper side, then the - (negative) pole to the mount on the lower side.

★ **Be sure to use the USH-103OL (OLYMPUS) or the HBO103W/2 (OSRAM) mercury burner.**

▲ **Be careful and avoid leaving fingerprints or contaminants on the mercury burner. Otherwise, there is a danger of explosion due to distortion of glass caused by the strains. If the burner is contaminated, clean it by wiping gently with gauze slightly moistened with absolute alcohol.**

5. Attach the socket section with burner to the original position and tighten the socket clamping screw ①.

★ **Align the external edges of the lamp housing with those on the socket section, and push the lamp housing straight downward.**

Burner Service Life

USH-103OL: 300 hours

☉ This value assumes light cycles composed of 2 hours of lighting and 30 minutes of extinction. Do not turn it on and off at a shorter cycle than the above, for this will shorten the service life of the burner.

▲ **After replacing the burner, reset the hour counter to "0.0" as outlined above.**

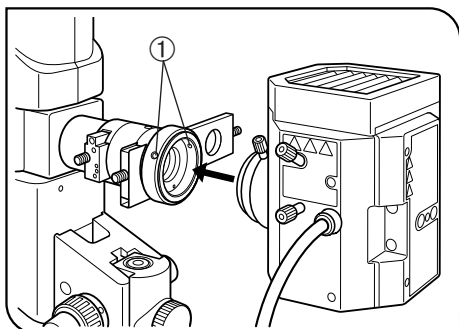


Fig. 43

Attaching the Lamp Housing

1. Using the Allen screwdriver, loosen the two clamping screws ① on the lamp housing mount hole.
2. Fit the lamp housing all the way as shown in Fig. 43.
3. Tighten the clamping screws ① using the Allen screwdriver.

★The surroundings of the lamp housing become very hot during and after operation. When installing the microscope system, ensure sufficient space around the lamp housing, particularly above it. Also do not mount the lamp housing obliquely.

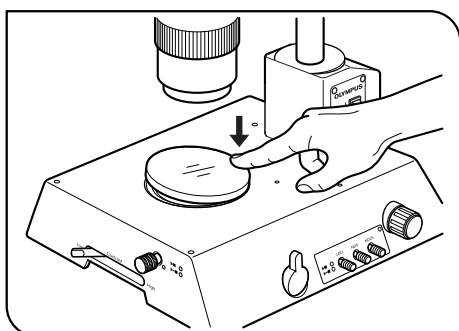


Fig. 44

11

Mounting (Removing) the Stage Plate

(Fig. 44)

Place the stage plate (white, black on back side) or a stage glass into the mounting hole on the base.

To remove, press the stage plate at the edge nearest to the pillar with your fingertip. The opposite end will rise from the base so the stage plate can be picked up easily.

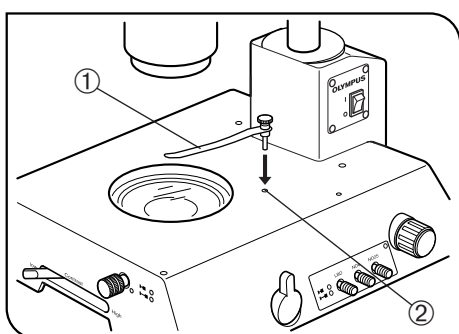


Fig. 45

Attaching the Specimen Holder

- ◎Use the specimen holder when a specimen is hard to be fixed.
Insert the specimen holder ① into the two holes ② on the top surface of the base.

11-3 Centration of the Mercury (Xenon) Burner and Field Iris Diaphragm

☉ For centering of the xenon burner, use the same procedure as the mercury burner.

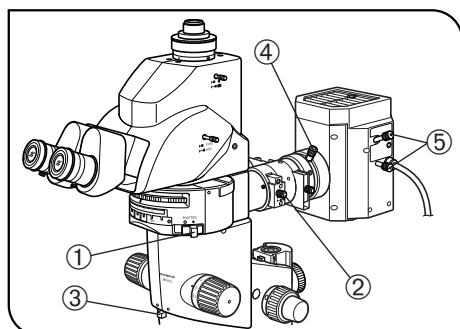
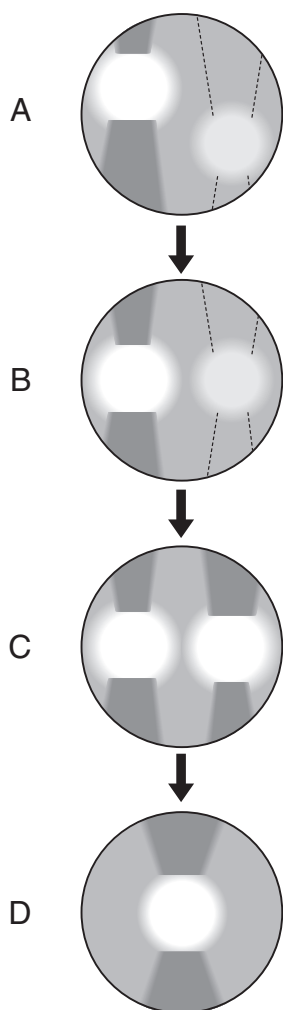


Fig. 46



1 Centering the Mercury Burner

(Figs. 46 & 47)

☉ Set the main switch to "I" (ON) and wait until the arc image stabilizes (for 5 to 10 minutes after ignition) before proceeding to the centering.

1. Set the shutter knob ① to "●" to close the shutter.
2. Set the mirror unit turret to "TBF", place a sheet of white paper on the specimen surface, focus on the white sheet and set a low zoom ratio.
3. Engage the fluorescence mirror unit in the light path.

▲ **The fluorescence illumination may contain wavelengths harmful to your eyes. The specimen must always be observed through the UV shield plate.**

4. Remove the objective.
5. Pull out the field iris diaphragm lever ② (to stop down the diaphragm).
6. Rotate the aperture iris diaphragm knob ③ toward the left (to open the diaphragm).
7. Set the shutter knob ① to "○" to open the shutter.
8. Rotate the collector lens focusing knob ④ to project the arc image on the white sheet. (A)
9. Rotate the burner centering knobs ⑤ to bring the arc image on the center of the left (or right) half of the field. (B)
10. Insert the Allen screwdriver into the mirror focusing screw hole (⑥ in Fig. 51) on the rear of the lamp housing, and turn the screw to focus on the mirror-reflected image. (C)
11. Rotate the burner centering knob ⑤ until the arc image and mirror-reflected image overlap.

☉ After starting observation, rotate the collector lens focusing knob ④ as required to render the observation field uniform.

☉ The mercury burner needs not be centered again until the time it is replaced.

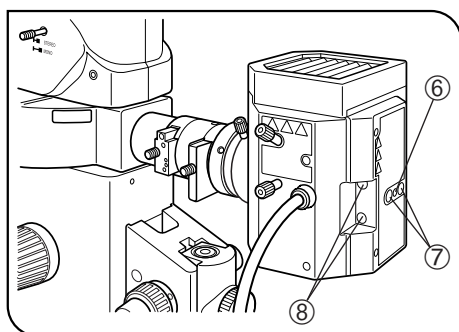


Fig. 47

Precise Centering of the Mirror

Ⓢ The position of the mirror has been adjusted and locked before shipment. Only if you want more precise adjustment of the mirror position, proceed to the following steps immediately after the procedure in the previous paragraphs.

Note that, once the following steps are completed, it is no longer possible to restore the mirror position in the factory shipped condition.

1. Using a pair of tweezers, etc., peel off the two blind stickers ⑦ on the rear of the lamp housing.
2. Fit the Allen screwdriver into each of the screws hidden below the stickers and loosen them. Loosening the two screws releases the locking of the mirror.
3. Peel off other two blind stickers ⑧ to expose the mirror centering holes.
4. Insert the Allen screwdriver into the screw in each mirror centering hole and adjust the centering of the mirror-reflected image.

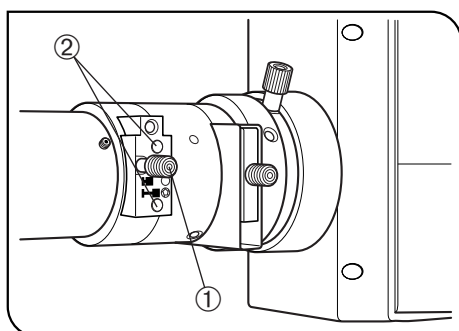
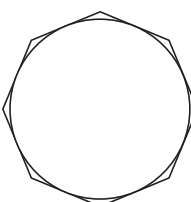
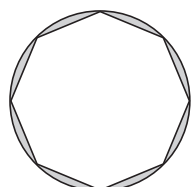
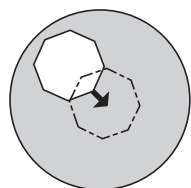


Fig. 48

2 Centering the Field Iris Diaphragm

(Fig. 48)

1. Set the shutter knob to "●" to close the light path with the shutter.
2. Rotate the mirror unit turret to engage a mirror unit in the light path.
3. Set the shutter knob to "○" to open the shutter.
4. Place a specimen on the center of the base and bring the specimen into approximate focus.
5. Pull out the field iris diaphragm lever ① on the illuminator to stop down the field iris diameter near the minimum size.
6. Insert the Allen screwdriver, provided with the microscope body, into the two field iris diaphragm centering screw ② and adjust so that the field iris image comes on the center of the field.
7. Push in the field iris diaphragm lever ① until the field iris image inscribes the field of view. If the field iris image is found to be eccentric, adjust centering again.
8. Open the iris until the field iris image size becomes equivalent to the field size (i.e. until the field iris image circumscribes the field of view).



■ 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		USA	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
Comité Électrotechnique Belge (CEBEC)	CEBEC ‹HAR›	10	30	10
VDE Verband der Elektrotechnik Elektronik Informationstechnik e.V.	‹VDE› ‹HAR›	30	10	10
Union Technique de l'Électricité (UTE)	USE ‹HAR›	30	10	30
Istituto Italiano del Marchio di Qualità (IMQ)	IEMMEQU ‹HAR›	10	30	50
British Approvals Service for Cables (BASEC)	BASEC ‹HAR›	10	10	30
N.V. KEMA	KEMA-KEUR ‹HAR›	10	30	30
SEMKO AB Svenska Elektriska Materielkontrollanstalten	SEMKO ‹HAR›	10	10	50
Österreichischer Verband für Elektrotechnik (ÖVE)	‹ÖVE› ‹HAR›	30	10	50
Danmarks Elektriske Materielkontrol (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
Asociación Electrotécnica Española (AEE)	‹UNED› ‹HAR›	30	10	70
Hellenic Organization for Standardization (ELOT)	ELOT ‹HAR›	30	30	70
Instituto Português da Qualidade (IPQ)	np ‹HAR›	10	10	90
Schweizerischer Elektrotechnischer 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

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