

MProbe MSP
(Microscope accessory)
Operating Manual



Thank you for buying our product.

This unit is a precision optical instrument. Our product has been designed to provide the highest level of safety, however, improper operation or negligence in following the instructions in this manual may cause personal injuries and property losses. In order to ensure your safety, prolong the life of this unit and maintain it properly, please read this manual carefully before operating this unit.

.....

Caution!

This manual uses the following symbols for safety reminders. Be sure to observe these warnings in order to operate this unit properly and safely.

**Warning!**

Neglecting the warning of this symbol may cause personal injury or damage to this unit!

**Caution!**

Neglecting the caution of this symbol may affect the viewing performance of this unit.

**Reminder !**

Provide instructions and skills in operating this unit.



Pay attention to environmental protection.

Safety Reminder



Warning!

1. Be sure to turn off the power switch and remove the power cord before installing this unit, replacing the bulb or fuse, plugging and unplugging the power supply.



Warning!

2. Do not disassemble

Except the removable parts mentioned herein, no part of this unit shall be removed, otherwise the performance of this unit may be reduced, or may cause an electric shock, injury or damage to this unit. Please contact the supplier if any fault occurs.



Warning!

3. Input voltage

Check if the input voltage is consistent with your local voltage supply. If not, do not operate this unit and contact the supplier. Improper input voltage may cause a short circuit or fire thereby causes damage to this unit.



Warning!

4. Use specific bulb, fuse and power cord

Use of an improper bulb, fuse or power cord may cause damage or fire to this unit. Any extended power cord used must be grounded (PE).



Warning!

5. Protect this unit from high temperatures, dampness and foreign objects

To prevent short circuit or any other fault, do not expose this unit to any high temperatures or dampness environment for a prolonged period of time. A suitable operating environment is designated at a temperature of 5°C-35°C, and relative humidity of 20%-80% (at 25°C). If water splashes on this unit, turn off the power switch and remove the power cord immediately, and then wipe the water off with dry cloth. When any foreign object enters or drips onto this unit, please stop operating the unit and contact the supplier.



Warning!

6. Heat of light source

The lighting bulb generates high temperatures during operation. Do not touch the collector lens or lamp box when the lamp is illuminated, and do not touch the bulb within 10 minutes after the lamp goes out due to high temperatures arising from operation. When replacing the bulb, make sure it has cooled down properly (the lamp should be off for at least 10min).

- ★ To prevent burn, do not touch the bulb when the lamp is illuminated or within 10min after it goes out.
- ★ To prevent fire, do not place any fibrous product, paper, flammable or explosive material (e.g., gasoline, petroleum ether, alcohol) near the halogen lamp housing or mercury lamp housing.

**Warning!****7. Coarse/fine focusing knobs**

This unit employs a coarse/fine coaxial focusing mechanism. Do not turn the left/right coarse/fine focusing knob in the opposite direction. When the objectives lifting device reaches the limit of motion, do not continue to turn the coarse focusing knob, otherwise the focusing mechanism may be damaged.

Caution!**8. Storage place**

This unit is a precision optical instrument, and improper operation or storage may cause damage or its precision may be adversely affected. Consider the following when selecting a storage place:

- ☐ Avoid placing the unit under direct sunlight, directly under interior lighting or any other bright place.
 - ☐ A suitable operating environment is designated at a temperature of 5°C-35°C, and relative humidity of 20%-80% (at 25°C). Do not expose this unit to high temperatures, dampness or dust for a prolonged period of time, otherwise mist or mold may develop or dust may deposit on the lens, thus cause damage to this unit and shortening its life.
-

Caution!**9. Installation of bulb**

Do not touch the glass surface of the bulb directly with bare hands. When mounting the bulb, wear gloves or wrap it with cotton material.

- ※ Wipe off any dirt on the surface of the bulb with a clean cotton fabric dipped in alcohol. If the dirt is not thoroughly removed, it would etch the surface of the bulb weakening its brightness and shortening its life.
 - ※ Mount the bulb with care to avoid slipping off or injuries to your fingers.
 - ※ When replacing the bulb, make sure its contact is intact. If its contact is damaged, the bulb may be disabled or short-circuited.
 - ※ When replacing the bulb, the feet should be inserted into the holder as deeply as possible. If the feet are not tightly inserted, the bulb may go out or short circuit.
-

Caution!**10. Instrument handling**

This precision optical instrument is heavy and should be handled with care. Strong impact and rough handling are strictly prohibited; it may cause damage to this unit.

**11. Environmental protection**

Please dispose the wastes from the packaging and operation of this unit by category such as cartoon, foam, plastic, bulb and etc.

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I. Characteristics and applications of this unit

MSP Microscope is suitable for work with MProbe Vis, VisHR MProbe UVVis, and NIR system. Units for UVVis and NIR systems are configured with corresponding optics (UV or NIR). Microscope adapter comes standard with Vis, VisHR and NIR system and allowed viewing of the sample during the measurement. Standard microscope viewing using polarized light and optional DIC accessory is available. Long working distance APO lenses (95mm parfocal length) allow comfortable measurement and reviewing of the samples. Compact and steady main frame body absorb vibration – small spot size measurement ($\sim 2\ \mu\text{m}$) can be done in normal lab conditions without additional vibration isolation. Improved ergonomic design is adopted in this unit that has easier operation and wider space.

II. Structural features of this unit



Fig. 1

III. Installation of this unit

1. Installation diagram

Caution !

Before installing, be sure every component is clean.

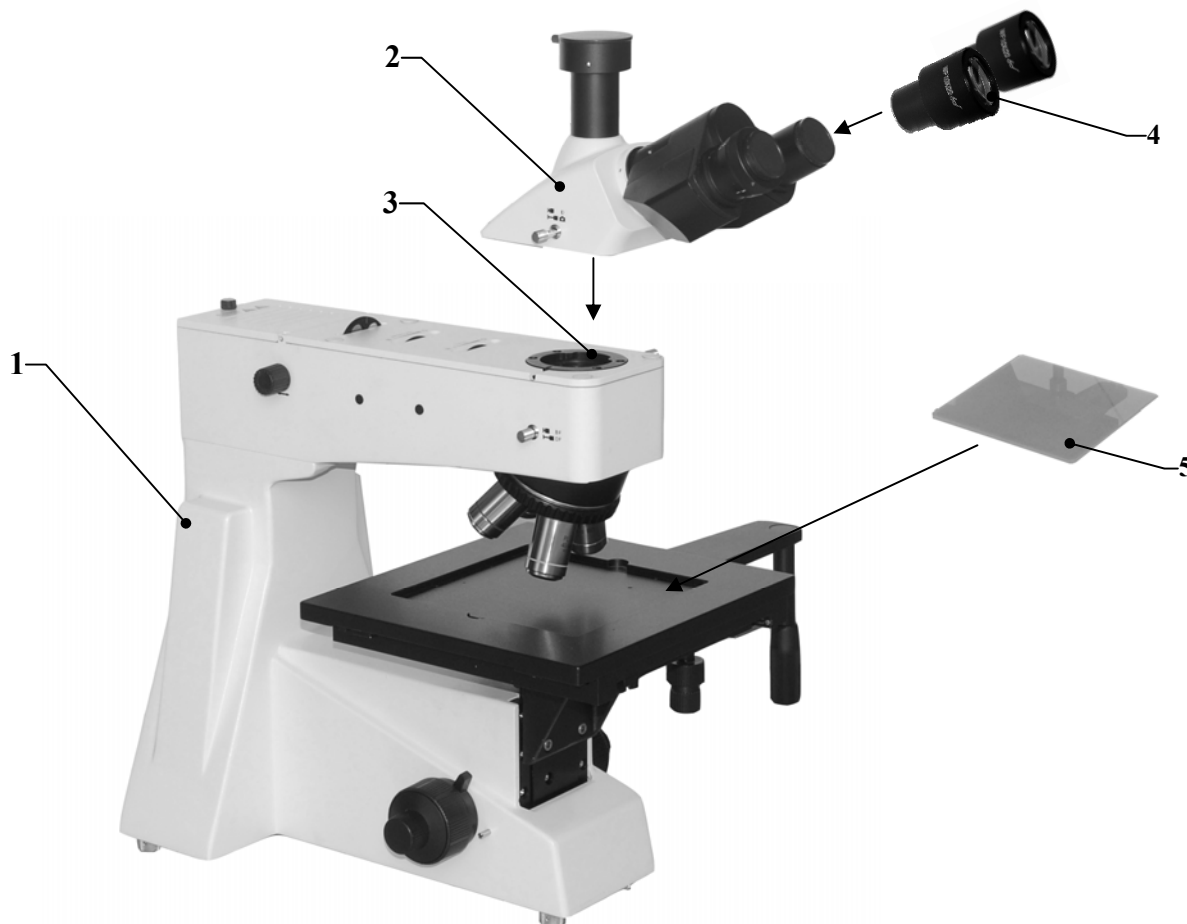


Fig.2

2. Installation steps

- (1) Unpack this unit, take out the main frame body 1 and place it on a stable work bench, remove the supporting package and the dust cap (bag).
- (2) Take out the trinocular 2 and remove the dust cap of it , then install it into the holder 3 of the main frame, locked the trinocular with a inside hexagonal screw.
- (3) Take out 2 pcs eyepieces 4 and insert them into the eyepiece tube, turn eyepieces so that fits the eyepiece tube well.
- (4) Take square glass or Delrin cover 5 and put it on the slot of the moving stage.

- (5) Connect the power cord to the power supply socket of the body.
- (7) Check if the above installation is secure and safe.
- (8) Inspect and gather the accessories and tools enclosed in the package and keep them in a safe place to avoid misplacement.

IV. Technical specifications

Technical specifications (standard)		
Eyepiece	10X wide field plan eyepiece and field of view number is $\Phi 18\text{mm}$, the eyepiece interface is $\Phi 23.2\text{mm}$	
APO plan achromatic objectives	MSP is equipped with bright field objectives	APO 10x/0.28 working distance : 34 mm
		APO 20x/0.29 working distance : 30.8 mm
		APO 50x/0.42 working distance : 20.5 mm
		APO 8x/0.14 working distance : 45 mm (UV-NIR lens)
Eyepiece tube	Trinocular inclined 30° , can be used in 100% light flux.	
Focusing system	Coaxial coarse/fine focus system, with tension adjustable and limit stopper, minimum division of fine focusing: $0.7\mu\text{m}$.	
Nosepiece	4 objectives nosepiece (Backward ball bearing inner locating)	
Stage	Mechanical stage, overall size : $280\text{mm} \times 270\text{mm}$, moving range: $204\text{mm} \times 204\text{mm}$	
Illumination system	Transmission illumination	(optional)
	Reflecting illumination	12V50W halogen and brightness enable control.

V. Operation

● Operation in reflecting light illumination.

1. Turning on the power switch and adjust brightness control



Warning

Before turning on the power switch, check if the input voltage is consistent with local voltage supply. If not, do not operate this unit. If this unit uses an improper input voltage, short circuit or fire may arise, thereby cause damage to this unit!

Turn on the toggle switch 1 on the right of the main body frame (turn it to the “-” position), so that the transmitted halogen bulb is illuminated. Turn the brightness control knob 2 to adjust the brightness of







Fig.3

the bulb, and make the brightness of the field of view suitable for visual inspection. As shown in Fig. 3.

Caution!

Do not keep the brightness control knob at the brightest position for a prolonged period of time, otherwise the life of the bulb may be shortened! When this unit is not in use, turn the brightness adjusting knob to the low position to maintain the electric functions of this unit.

2. Check the position state of observation / photography switch pole 1. Push the pole into optical path, as show the remark “ ”, The remark “ ” means is photography. As shown in Fig.4.

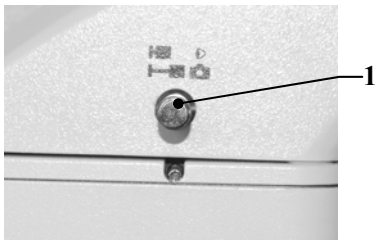


Fig.4

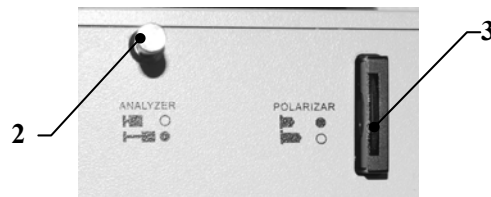










Fig.5

3. Check the position state of analyzer pole 2. Push the pole into optical path, as show the remark “ ”. Pull the pole out optical path, as show the remark “ ”. Check the position state of polarizer 3. Push the polarizer into optical, as show the remark “ ”. Pull the polarizer out optical, as show the remark “ ”. As shown in Fig.5.

4. Diopter adjustment

Adjust the diopter adjusting ring 1 on the left eyepiece tube to calibrate diopter, which is difference between both eyes of different user.

(1) Turn 50X objective into optical path, observe micro-image in right eyepiece which the eyepiece tube has no diopter adjusting ring, and focus to make micro-image clear

(2) Observe micro-image in left eyepiece only. If the image unclear, it is necessary to adjust the diopter adjusting ring 1 to make image clear. The diopter adjusting range is $N=\pm 5$ diopters, as shown in Fig.6.

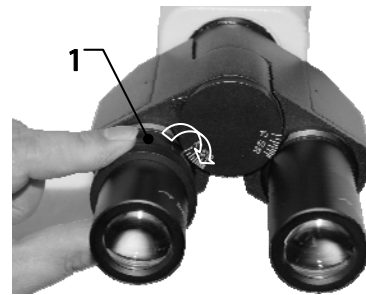


Fig.6

5. Adjust interpupillary distance

Parallax can be eliminated by adjusting the interpupillary distance so that the distance of the eyepiece tube is identical with interpupillary distance and enable to observe more comfortably and clearly. When observe through two eyepieces, if the field of view consists of two overlapping

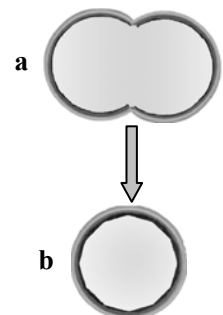


Fig. 7

circles, as shown Fig.7-a, alter the exit pupil center distance of the eyepiece tubes by turning the left or right frame body 2 until the field of view becomes a fully overlapped circle, as shown in Fig. 7-b.

6. Check the center of light source

The optical system center of light source has been calibrated before factory release. But the center may deviate due to any possible violent vibration or inclination during transport, so that check the center of light source according the following steps.

- (1) Prepare a piece of white paper (about 40mmX50mm) and place it on the stage, as shown in Fig. 8-a.
- (2) Take out a objective and turn the nosepiece to make the through-hole into optical path, as shown in Fig.8-b.
- (3) **Open the** field diaphragm and aperture diaphragm, At this point, a bright light spot will be shown on the white paper, with a filament image inside, as shown in Fig.8-c.
- (4) If the filament image is unclear, adjust the collector lens to make clear by adjusting knob 1.
- (5) If the filament image deviates from the center of the bright light spot, as shown in Fig.8-d, the bulb center should be adjusted, adjust the lamp transverse adjustment knob 2 and vertical adjustment knob 3 to calibrate bulb center.

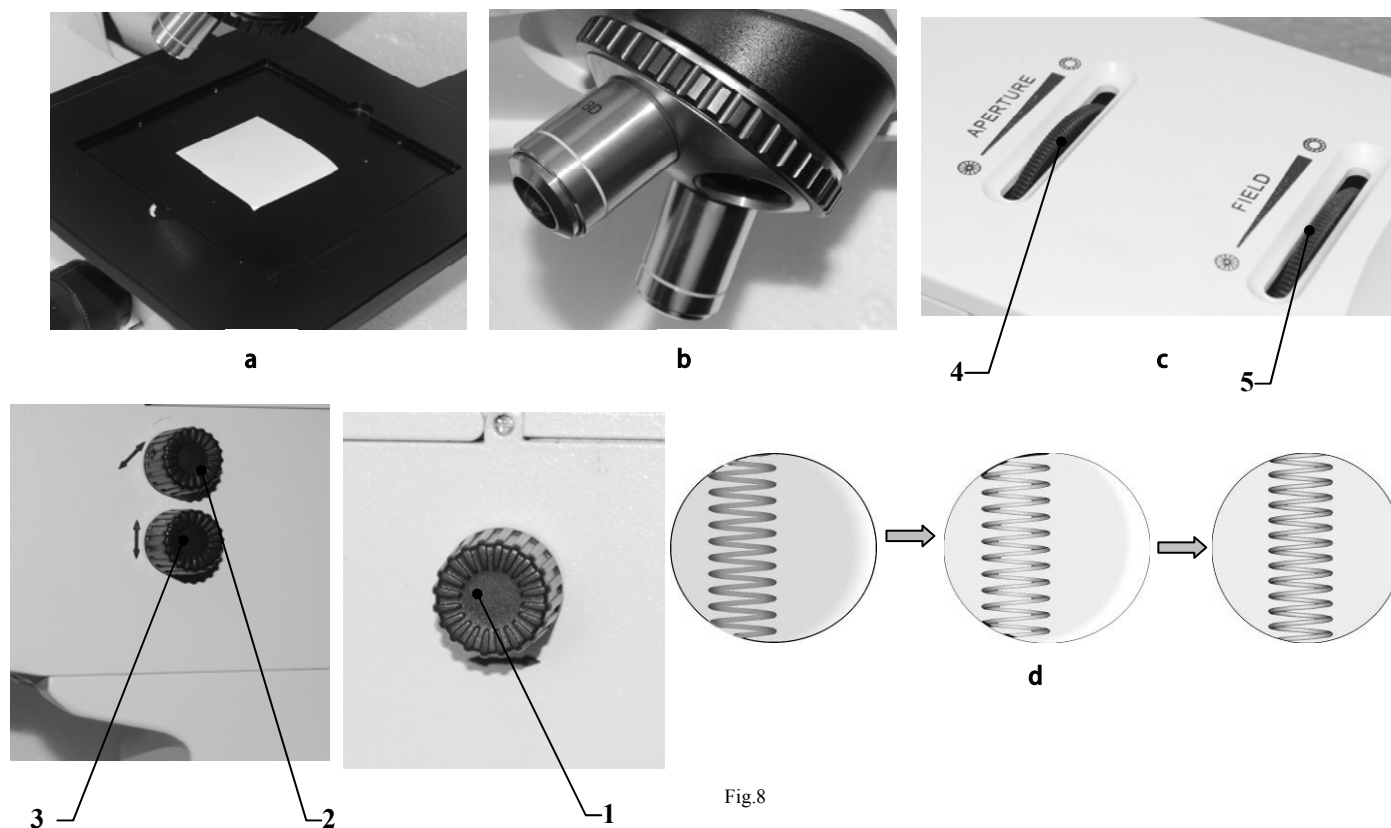


Fig.8

7. Inspecte the center of field diaphragm

(1) Turn the 10X plan objective into optical path.

(2) Open the aperture diaphragm 2, and close the field diaphragm 1, a light spot will be seen in the field of view, as shown in Fig.9-a.

(3) If the light spot deviates from the center of the field of view, as shown in Fig.9-a, take out the plastic dustproof caps 3 and adjust the centering adjustment screw with two inner hexangular wrenchs to make the field diaphragm center superposition with the field of view center , as shown Fig.9-b, then cover the adjusting hole again.

(4) Open the field diaphragm, so that the observed specimen image fills field, as shown in Fig.9-c.

8. Adjust the aperture diaphragm

The center of aperture diaphragm 1 has been calibrated before factory release, so that it has no use for centering. When use low magnification objective, adjust the aperture diaphragm bigger, use high magnification objective, adjust the aperture diaphragm smaller.

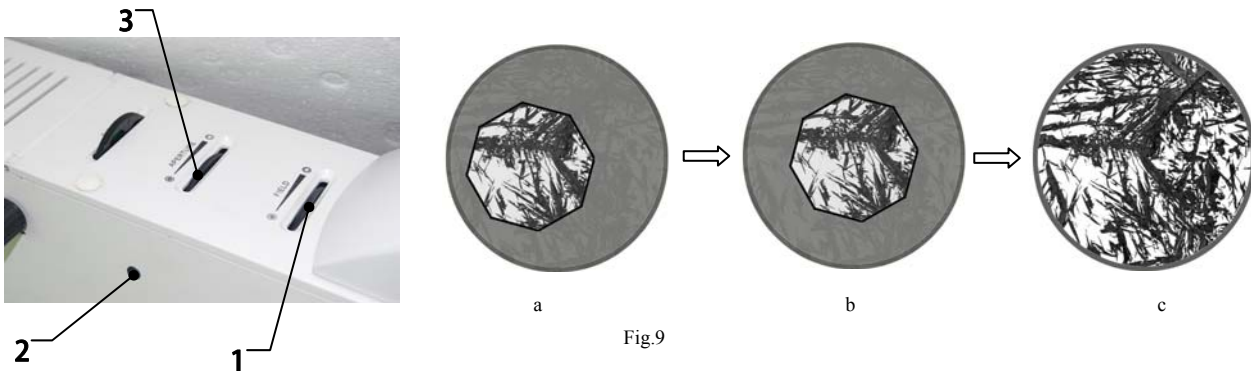


Fig.9

9. Adjust the filters

The filters are fixed in the slots of turnplate 1, there are yellow, green, blue filter and ground glass, through-hole. Turn the turnplate to switch different filters or ground glass through to exchange the image underlay or adjust the brightness of illumination, as shown in Fig. 10.

10. Place the metallurgical specimen or sample

Place the metallurgical specimen or sample on the stage or quadrate glass substage. Turn the control knob 2 and 3 to adjust the stage longitudinal (Y) and transverse (X) movement , make the specimen or sample observation area

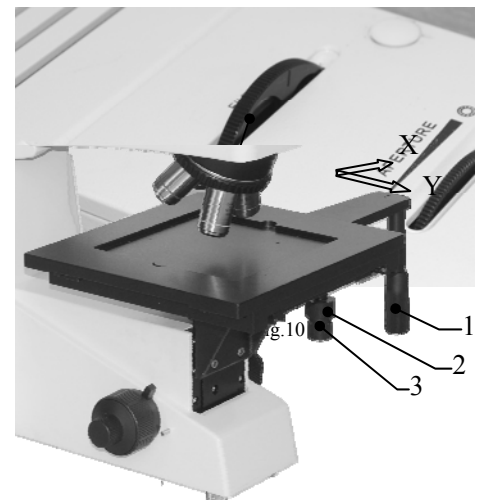


Fig.11

located down the objective, as shown in Fig. 11.

11. Operate stage

The knob 2 control longitudinal movement, the knob 3 control transverse movement. The stage mobile range is 0~204mm for X and Y. The handle 1 is used for quickly moving stage to locate the specimen.

12. Operate coarse and fine focusing control knob

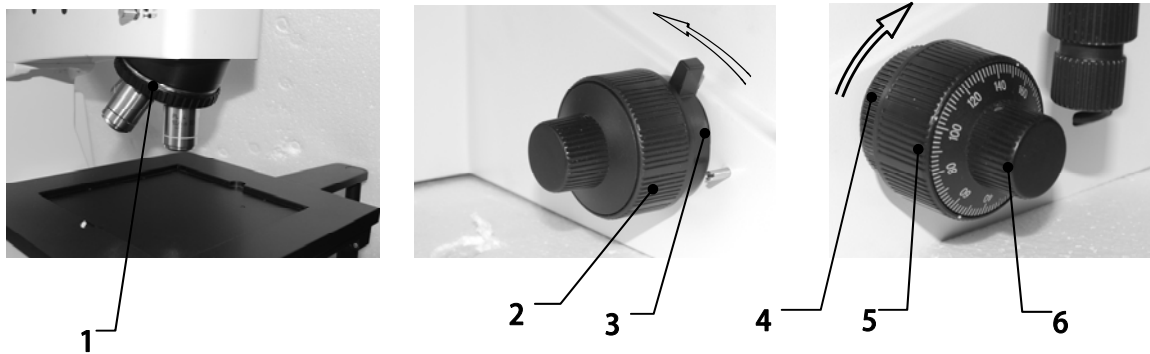


Fig.12

(1) Focus with the 10X objective

Turn the nosepiece 1 to make 10X objective into optical path (when it turns in place, the objective will snap automatically), as shown in Fig. 12.

(2) Turn the coarse focusing control knob 2 or 5 anticlockwise to lift the stage to the highest point, then observe and turn the coarse focusing control knob slowly clockwise to lower stage, micro-image will appear in the field of view, stop turning the coarse focusing control knob.

(3) Turn the fine focusing control knob 6 for fine focusing to make micro-image clear.

(4) Lock the stage lifting limit hand wheel 3 as indicated by the arrow in the figure.

Reminder!

When use a high magnification objective, first use 10X objective to focus and set the lifting limit hand wheel, then exchange high magnification objective, raise the stage to the limit height with a coarse focusing control knob directly, and then focus finely with the fine focusing control knob.

(5) Focus Tension Adjustment

The tension of the coarse focus control knob is adjustable and preset at the factory for ease of use. If wish to adjust the coarse focus tension, turn the knob 4 to tension adjustment. Turn the wheel anticlockwise decrease the tension, and clockwise increases it, as indicated by the arrow in the figure.

Caution!

Too high tension may be affected operation and physical discomfort.

14. Observe in polarized light

Observe in polarized light to distinguish double refraction features matter, such as crystal of liquid macromolecule polymer, biomedical polymer and liquid crystal, widely used in geology, mechanics, metallurgy, electron and etc. Equipped with polarizer 2 and analyzer 1, the polarizer can be adjusted from $0^{\circ} \sim 360^{\circ}$ and drawn out, but the analyzer can't be adjusted and drawn out.

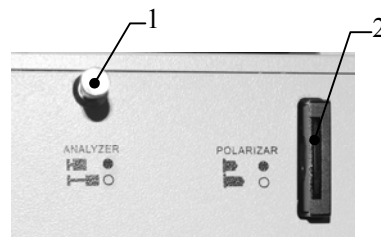


Fig.13

Push the analyzer pole and polarizer into optical path, rotate the turnplate of polarizer to make orthogonal polarization, the field of view will be dark. Pay attention to the direction when install the polarizer, insert it from right of illumination or to left, the position slot is located up according to the direction of arrow “ ” that marked on the polarizer, as shown in Fig. 13.

15. Differential Interference Contrast observation (optional accessory require additional parts)

The DIC-groups of this instrument are not suitable to all the objectives. Each DIC-group should match with the right objective, in order to get the Differential Interference Contrast observation image well.

Before getting the Differential Interference Contrast observation, please follow to item 12 above (“Operating coarse and fine focusing control knob”). Turn the coarse and fine focusing control knob to make the image clear in the field of view.

And then, follow item 13 (“Observe in polarized light”), adjusting the instrument to orthogonal polarization.

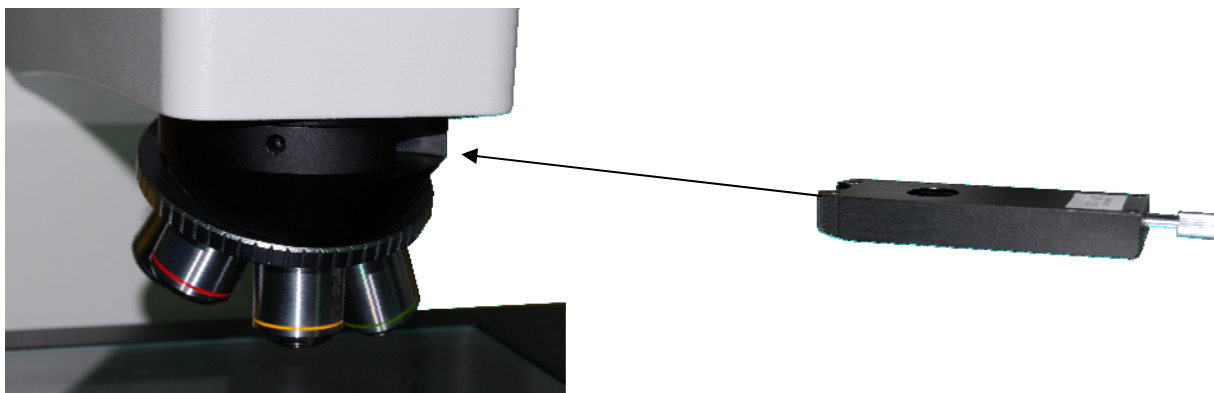


Fig.14

After finishing the former steps, insert the DIC-group which is match to the right objective as the fig 14 shown, and then minimum the aperture diaphragm and maximum the brightness.

Rotate the differential interference knob 1, to make the interference colour uniform in the view field, also observation image should be clear and embossed. As the fig15, locking the screw to fix the DIC-group, so that the image can keep stabilizing, after adjusting the DIC prism to the best position.

While change to another objective, it should change the suitable DIC-group to match with it. The adjustment is the same as above-mention.

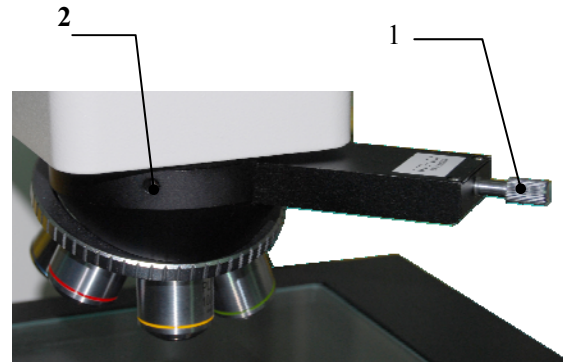


Fig.15

16. Operate trinocular device

This unit performs eyepiece and camera observation, switch by push-pull rod 4, located at the right side of main frame body. The camera output is located at the top side of trinocular and covered by a dust-proof cap 2. The following are operation steps.

- (1) Loosen the fastening screws 1 of the photography output terminal, and remove the dust-proof cap.
- (2) Mount microscope adapter (with camera and Fiberoptics cable). Connect fiberoptics cable to spectrometer port of the MProbe unit.
- (3) Turn the 10X objective into the light path.
- (4) Push the push-pull rod 4 in and focus to make camera image clear.
- (5) Push the push-pull rod 4 out to see whether the image is clear. If unclear, adjust the fine focusing control knob to make the image clear.

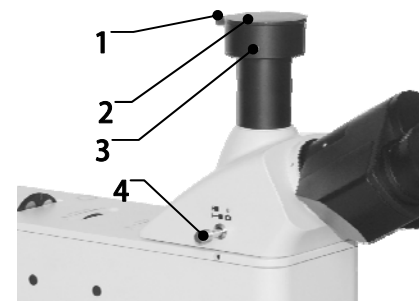


Fig.16

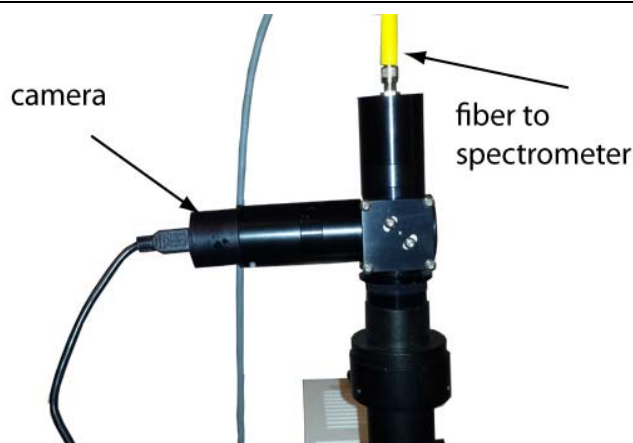


Fig. 17 Microscope adapter

(6) Adjust fiber holder position to have maximum intensity and clear image position at the same time

(7) If there is strict synchronization requirement for eyepieces and camera images (consistency between the center and direction of the image), synchronization adjustment will be necessary as follows:

- a. Push in push-pull rod, observe with eyepieces. Find a feature point in the field of view (a readily identifiable target, such as *S* point in Fig. 17-a), move it to the center of the field of view. If there is a division eyepiece, move the target to the reticle intersection of the division eyepiece, as shown in Fig. 17-b.

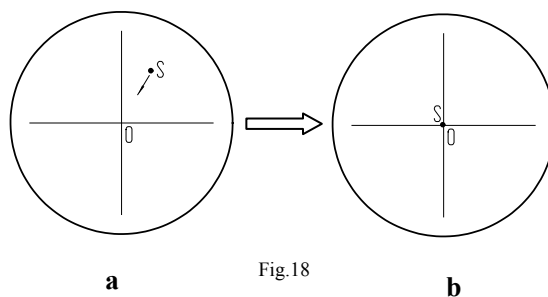


Fig.18

- b. Push the push-pull rod, view the image in monitor or display screen, and see if the identified target image is at the center of the displayed window. If it deviates from the center of displayed window, Adjust the 3 pcs screws 3 on the output terminal to move the identified target to center.
- c. Move the specimen and see if the image in the monitor or display screen moves in the same direction as the specimen. If move in different direction, it is necessary to adjust the direction of the photographic device. Loosen the fastening screws 1 , turn the photographic device to make the displayed direction of the image inline with the direction of stage motion, then fasten the screws.
- d. Push push-pull rod in, observe the specimen image with both eyes, and focus to make the specimen image clear.

- e. Push the push-pull rod out to see if the image in the monitor or display screen is clear. If not, adjust the fine focusing control knob to make the image clear.

● Observation operation of transmission type

16. Open the power switch and adjust the brightness

When using MSP for transmission measurement/observation, please switch off the power switch 3, and switch on the transmission light switch 2, turn the brightness adjustment knob 1 to the right brightness of field for eyes, as shown in Fig.19

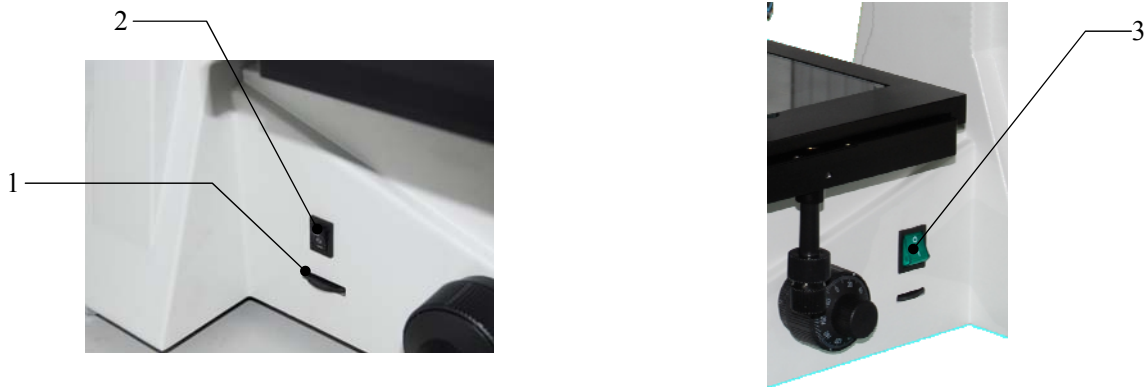


Fig.19

Reminder!

General requirement upper illumination brightness in dark field, so that the brightness control is turned up.

VI. Replace Bulb and Fuse



Warning!

To replace the bulb and the fuse, turn off the power switch and unplug the power cord, otherwise fire, personal injury or damage to this unit may occur due to electric short circuit.

1. Replace bulb

The unit light source is 12V50W for all MSP models. When replace the halogen lamp, please check that the bulb is 12V (50W) to avoid electrical trouble. The following is operating steps.

- (1) Turn off the power switch 1, and unplug the power cord 2, as shown in Fig. 20-a, 20- b.

- (2) Wait at least 30 minutes until the bulb and its surroundings have cool down. This is to prevent hand getting burnt by heat.
- (3) Loose the plastic screw and open the lamp house cover as shown in fig.19-d, take out the defective bulb and replace a new one. Close the back cover again.
- (4) Connect the power cord and turn on power switch.
- (5) Check and adjust the center of the bulb according to the above-mentioned centering method for alignment of illuminator in the inverted microscope .

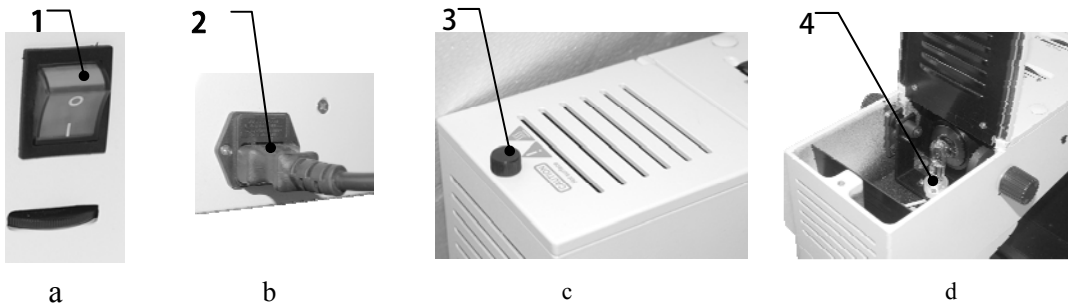


Fig.20

2. Replace fuse

The fuse is used in the main unit's circuit for halogen lamp, and is integrated into the power input socket 3, replace according the following steps.

- (1) Turn off the power switch and unplug the power cord.
- (2) Remove the fuse holder 2 with a flat screwdriver 1 or any other tool as shown in the figure, remove the damaged fuse, and replace a new one. Replace the fuse holder into the power input socket of the main unit, as shown in Fig. 20.
- (3) **Connect the power cord and turn on the power switch to check whether the fuse well.**

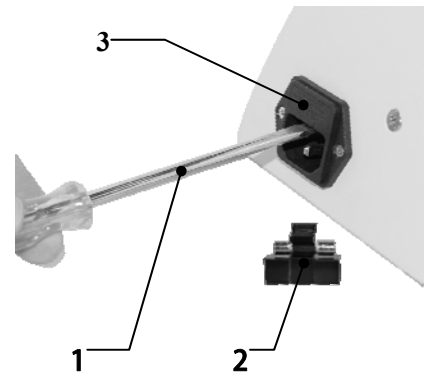


Fig.20

VII. Maintenance

1. The power switch of the main unit is the power control. When finish using this unit, press the switch to "O" to cut off the power supply, unless the electric components in this unit are still operating. When this unit is not to be used for a long time, remove the power plug from the supply socket and keep all cables properly.
2. This unit should be kept clean. Remove any oil on the lens and clean the body with clean gauze (or silk fabric or absorbent cotton) dipped with a little alcohol. Put on the dust shield until this unit is completely cool and dry.
3. Cleaning the lens

Blow off or wipe off any dust on the lens with a blower ball or a soft brush; heavy dirt and fingerprints can be removed with lens tissue or soft cloth dipped with a little mixture of alcohol and ethyl ether gently (the mix ratio is: alcohol 20-30%

Reminder!

It is easier to clean the lens by wiping them from inside out as shown in the figure.



Wrong



Right

and ethyl ether 70-80%).

4. Cleaning the surface of this unit: Wipe it with clean soft cloth; heavy dirt may be wiped off with a neutral detergent.
5. Keeping: When this unit is not to be used for a long time, turn off the power supply of this unit, allow the bulb to cool down sufficiently, put on the dust shield, store this unit at a dry, ventilated and clean place free from any acid, alkali or steam, otherwise mold may develop on the lens.
6. Periodic inspection: This unit should be inspected and maintained periodically to maintain its performance.

Caution!

Do not wipe this unit with any organic solvent (e.g., alcohol, ethyl ether or its dilute solution), otherwise the surface paint of this unit may come off. It is suggested that a layer of non-corrosive lubricant is applied on the moving parts of this unit before the dust shield is put on, and place the eyepiece and the objectives in a container with desiccant.

VIII. Troubleshooting

Fault	Cause	Disposition
Electric system		
No light shown in the field of view using halogen lamp	The power switch is not turned on.	Turn on the power switch.
	The halogen lamp is damaged.	Replace the halogen lamp.
	The fuse is damaged.	Replace the fuse.
	The connector of the electric chassis is in bad contact.	Check and have professional repair it.

	The halogen lamp mounted is nonconforming.	Use a conforming halogen lamp.
Optical system and imaging		
There is a black shadow on the edge of the field of view or unevenly illuminated, making it impossible to observe the whole field of view.	The nosepiece has not been turned to the fixed position.	Turn the nosepiece to the fixed position.
	The filament image deviates from the center of the collector.	Reposition the lighting bulb.
	There is dirt or oil on the surface of the objective, eyepiece or condenser	Wipe the lens surface or replace the lens.
Oil or dust is found in the field of view.	There is oil or dust on the eyepiece lens.	Wipe the eyepiece.
Defocusing or low resolution	The objective is damaged.	Repair the objective (by a professional).
	There is oil or dust on the surface of the lens of the objective or eyepiece.	Wipe the objective or the eyepiece.
	The aperture of the aperture diaphragm is too small.	Adjust the aperture of the aperture diaphragm based on the objective magnification (or numerical aperture) used.
	The objective deviates from the light path.	Turn the nosepiece to the fixed position.
The focal plane of the image is inclined (brighter on one side and darker on the other)	The lighting bulb is seriously inclined.	Reposition the lighting bulb.
	The specimen is not laid flatly.	Lay the specimen flatly on the object stage and hold it stably.
Mechanical system		
The image cannot remain clear during observation.	The focusing mechanism flows (slides down) automatically.	Adjust the coarse adjusting hand wheel.
	The fine focusing mechanism fails	Check and have professional repair it.
	The stage loosens or is inclined.	Check and have professional repair it.