Inverted Metallurgical Microscope IMM480

Or

MJ42/MJ42BD Inverted Metallurgical Microscope

Operating Manual

Thank you for buying our product!

This unit is a precision optical instrument. Our product has been design 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!**	Negligence in heeding the warning of this symbol may cause personal injury or damage to this unit!
Caution!	Negligence in heeding 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.

To prevent electric shock or fire, 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. Do not discard the damaged mercury lamp carelessly in order to avoid creating environmental poll

Table of Contents

I. Characteristics and applications of this unit

MJ42/MJ42BD Inverted metallurgical microscope is equipped **e**xcellent UIS optical system and modularization function design so that update system expediently and achieved polarization, dark field observation. Compact and steady main frame body is embodiment for the shock resistance. The ideal ergonomic design is adopted in this unit and has easier operation and wider space. This is ideal optical instrument for micro observation in metallographic structure and surface morphology. It is suitable for research in metallography, mineralogy, precision engineering, etc.

II.Structural features of this unit

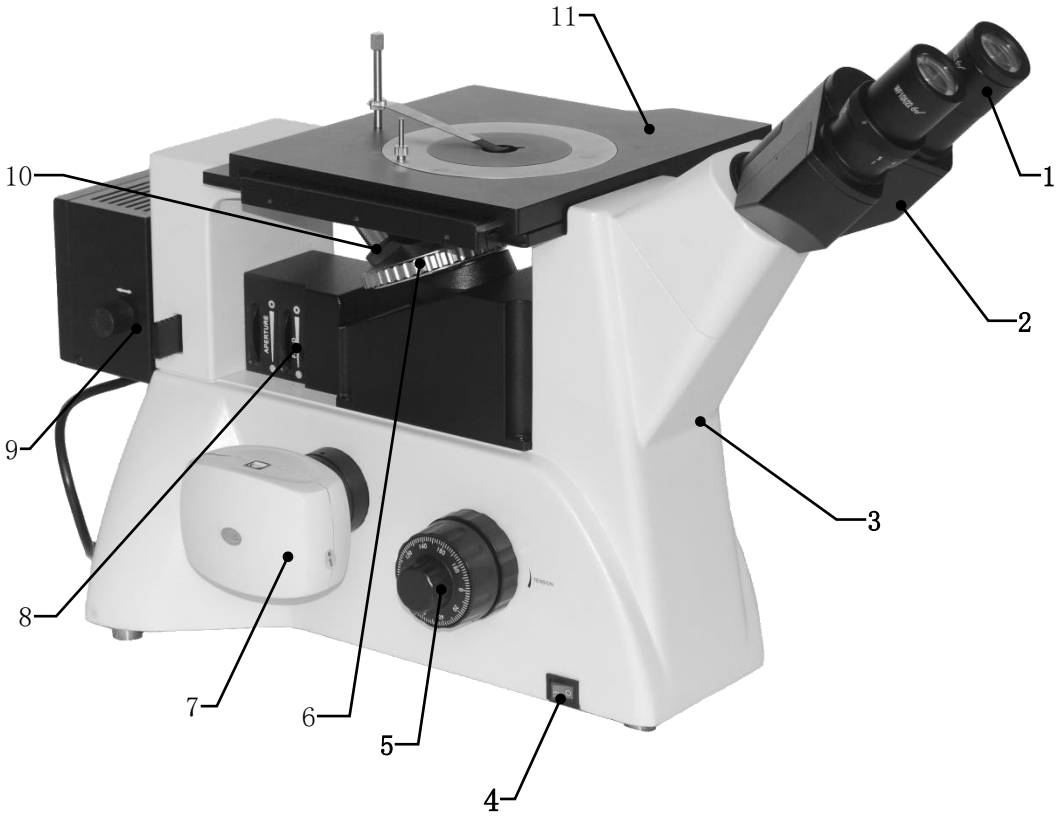

Fig.1

1. Eyepiece 2. Eyepiece tube 3. Main frame 4. Power switch 5. Coarse/fine focusing mechanism 6. Nosepiece 7. Photography device 8. Reflected illuminator 9. Lamp house 10. Objective 11. Stage

III. Installation of this unit

1. Installation diagram

Caution ! Before installing, be sure every components is clean, no score any parts or glass surface.

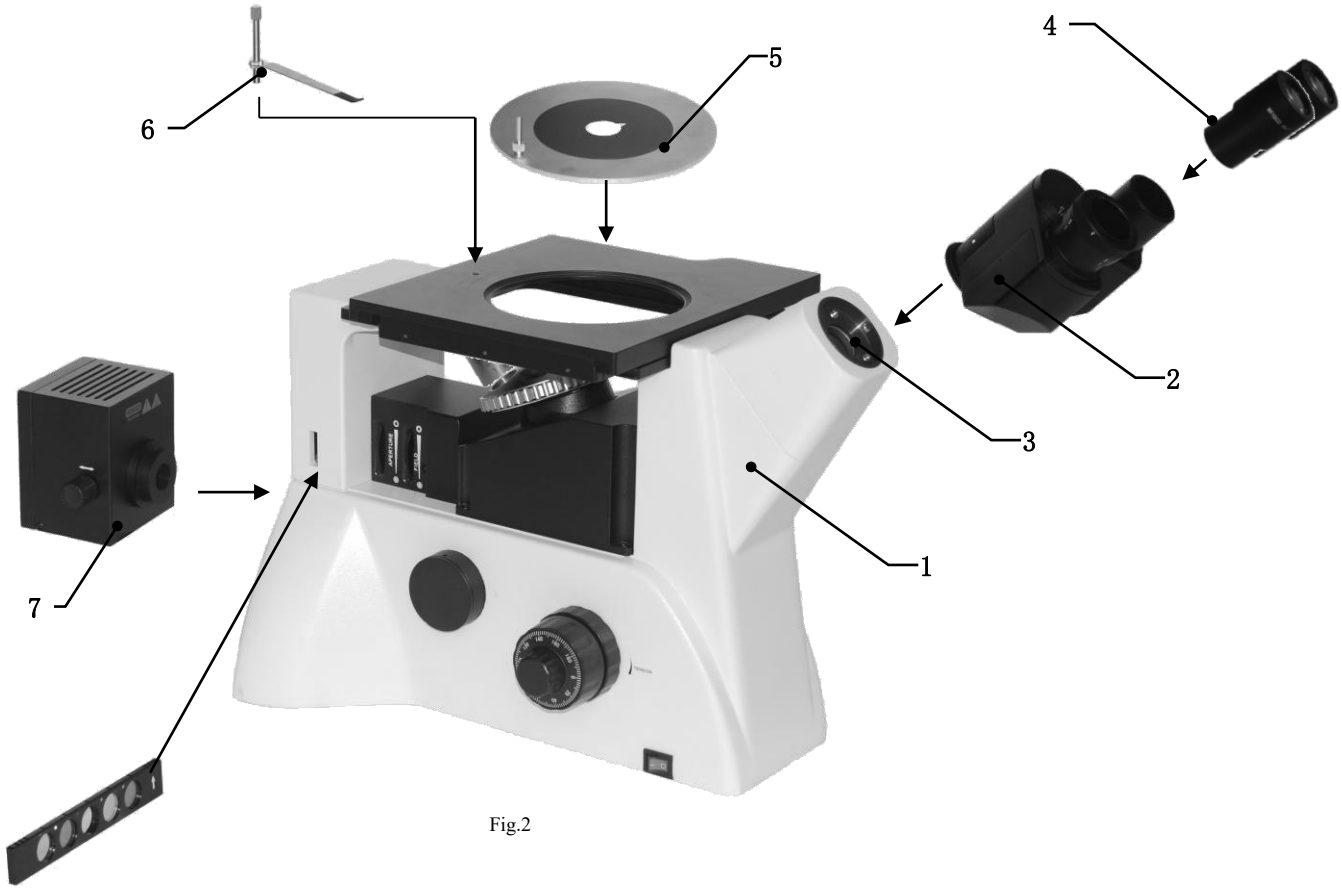

Fig.2

2. Installation steps

(1) Unpack this unit, take out the main frame body 1 and place it on a stable work bench, and remove the supporting package and the dust cap (bag).

(2) Take out the eyepiece tube 2 and remove the dust cap of it , then install it into the holder 3 of the main frame, locked the eyepiece tube 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) Put the cirque substage 5 into the slot of the moving stage and install spring clip 6 and pole 7.

(5) Take out lamp house and mount it into the holder on the back of main frame body and locked it with a inside hexagonal screw.

(6) 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 mis-placemen.

IV.Technical specifications

Technical specifications (standard)		
Eyepiece	10X wide field plan eyepiece and field of view number is Φ22mm, the eyepiece interface is Φ30mm	
Infinity plan achromatic objectives	IMM48 0- MJ42 （Equipped bright field objective）	PL L10X/0.25 working distance：20.2 mm
		PL L20X/0.40 working distance：8.80 mm
		PL L50X/0.70 working distance：3.68 mm
		PL L100X/0.85（dry） working distance：0.40 mm
	MJ42BD （Equipped with dark / bright field objective）	PL L5X/0.12 BD working distance：9.70 mm
		PL L10X/0.25 BD working distance：9.30 mm
		PL L20X/0.40 BD working distance：7.23mm
		PL L50X/0.70 BD working distance：2.50 mm
Eyepiece tube	Hinged binocular tube, with an observation angle of 45°, and a pupil distance of 53-75mm	
Focusing system	Coaxial coarse/fine focus, with tension adjustable and up stop minimum division of fine focusing is 2μm.	
Nosepiece	Quintuple (Backward ball bearing inner locating)	
Stage	Mechanical stage overall size: 242mmX200mm and moving range : 30mmX30mm.	
	Rotundity and rotatable stage size: maximal measurement is Φ130mm and minimal clear aperture is less then Φ12mm	
Illumination system	MJ42	6V30W halogen and brightness enable control.
	MJ42BD	12V50W halogen and brightness enable control.
	Integrated field diaphragm , aperture diaphragm and puller type polarizer.	
	Equipped with frosted glass and yellow ,green and blue filters	

V.Operation

● MJ42 inverted metallurgical microscope in bright field

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

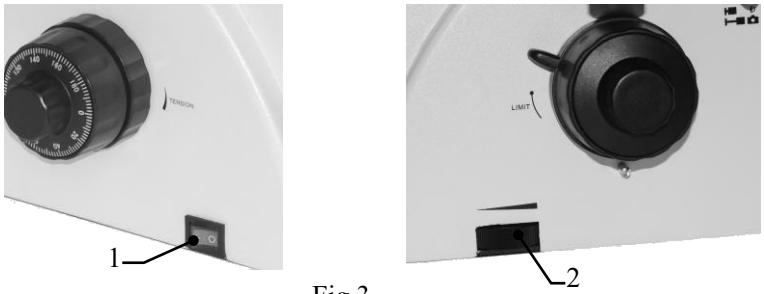

Fig.3

> **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.

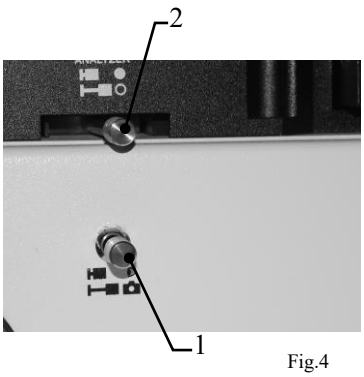

Fig.4

3. Check the position state of analyzer pole 1. 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 2. Push the polarizer into optical, as show the remark “ ”. Pull the polarizer out optical, as show the remark “ ”. As shown in Fig.5.

4. Reset diopter adjustment ring

Turn the diopter adjustment ring 1 on the left eyepiece tube, so that the “0” diopter position is aligned with the side scale (remark white line), as shown in 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 circles, as shown Fig.6-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. 6-b.

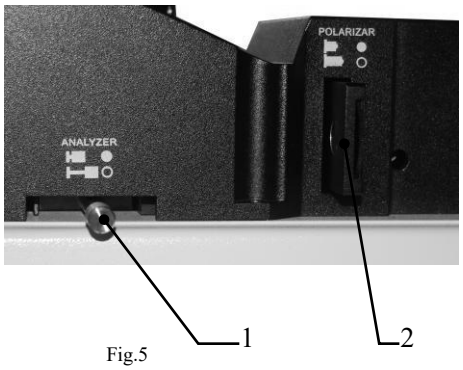

Fig.5

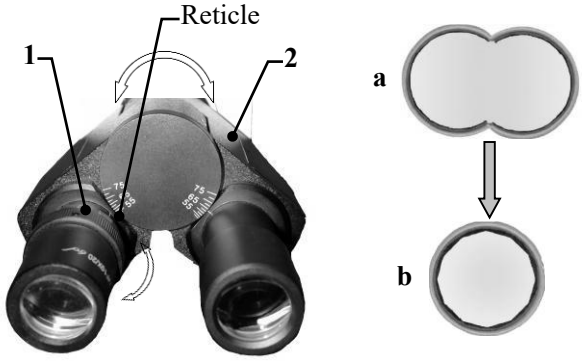

Fig.6

6. Check the center of light source

The optical system center of light souce 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. 7-a.

（2）Take out a objective and turn the nosepiece to make the through-hole into optical path, as shown in Fig.7-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.7-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.7-d, the bulb center should be adjusted, adjust the lamp transverse adjustment knob 2 and vertical adjustment knob 3 to calibrate bulb center.

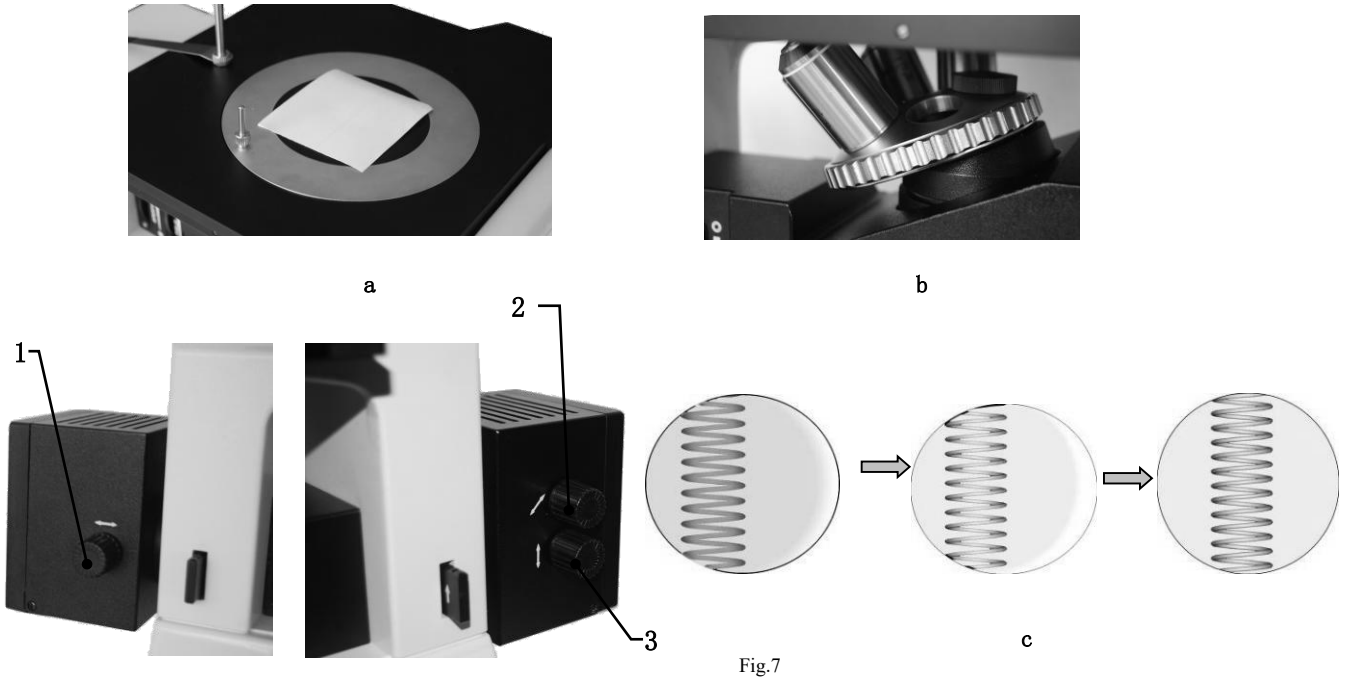

Fig.7

7. Inspect 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.8-a.

(3) If the light spot deviates from the center of the field of view, as shown in Fig.8-a, take out the plastic dustproof caps 3 and adjust the centering adjustment screw with two inner hexangular wrench to make the field diaphragm center superposition with the field of view center , as shown Fig.8-b, then cover the adjusting hole again.

(4) Open the field diaphragm, so that the observed specimen image fills field, as shown in Fig.8-c.

8. Adjust the aperture diaphragm

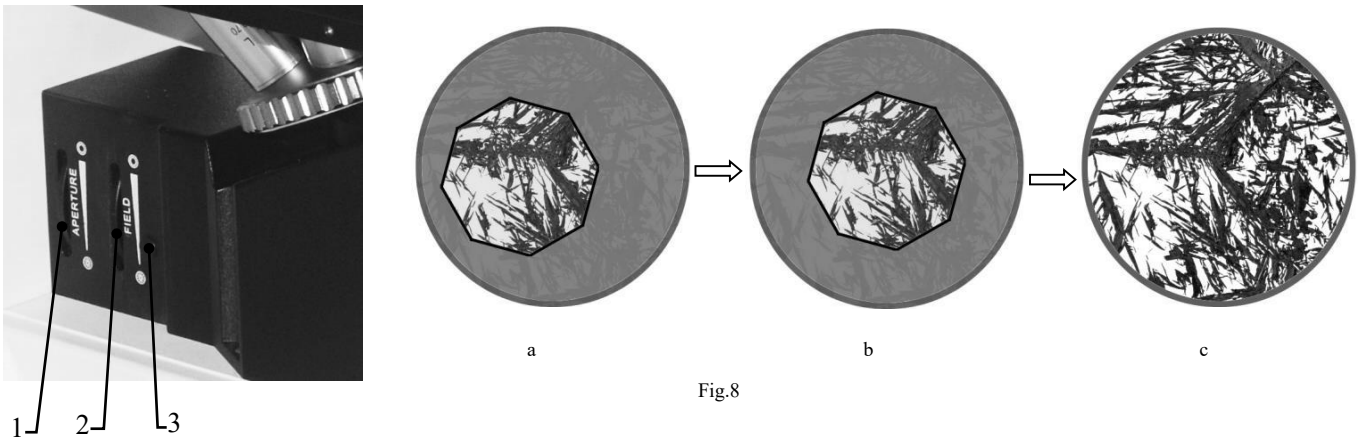

Fig.8

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.

9. Adjust the filters

The filters are fixed in the round slots of filters slider 1, have yellow, green, blue filter and ground glass, through-hole. Switch different filters or ground glass through push-pull the puller to exchange the image underlay or adjust the brightness of illumination. Pay attention to the direction when install the puller, insert from right of maine frame to left, the position slot is located up according the direction of arrow " " that marked in the puller， as shown in Fig. 9.

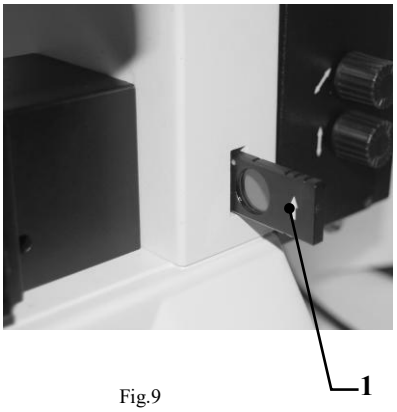

Fig.9

10. Place the metallurgical specimen or sample

Place the metallurgical specimen or sample on the stage and pin it with spring clip 2, pay attention to the press that can press out the specimen or sample, no make the stage deformation. Turn the control knob 3 and 4 to adjust the stage longitudinal (Y) and transverse (X) movement , make the specimen or sample observation area located top the objective, as shown in Fig. 10.

11. Operate stage

The knob 3 control longitudinal movement, the knob 4 control transverse movement. The stage mobile range is 0~30mm for X and Y. The center stage 1 that a abnormity through-hole in middle can be rotated and take out, maximum bear weight of the center stage should be less than 2.0 kilogram.

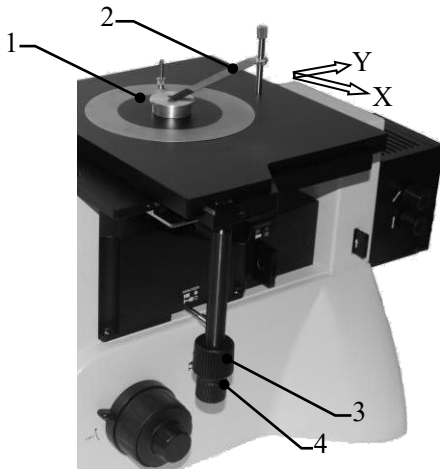

Fig.10

12. Operate coarse and fine focusing control knob

(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. 11.

(2) Turn the coarse focusing control knob 3 to lift the objective to the highest point, then observe and turn the coarse focusing control knob slowly to lower the objective, micro-image will appear in the field of view, stop turning the coarse focusing control knob.

(3) Turn the fine focusing control knob 2 for fine focusing to make micro-image clear.

(4) Lock the objective lifting limit hand wheel 4 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 objective 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 5 to tension adjustment.Turn the wheel clockwise decrease the tension, and anticlockwise increases it.

Caution!

Too high tension may be affected operation and physical discomfort.

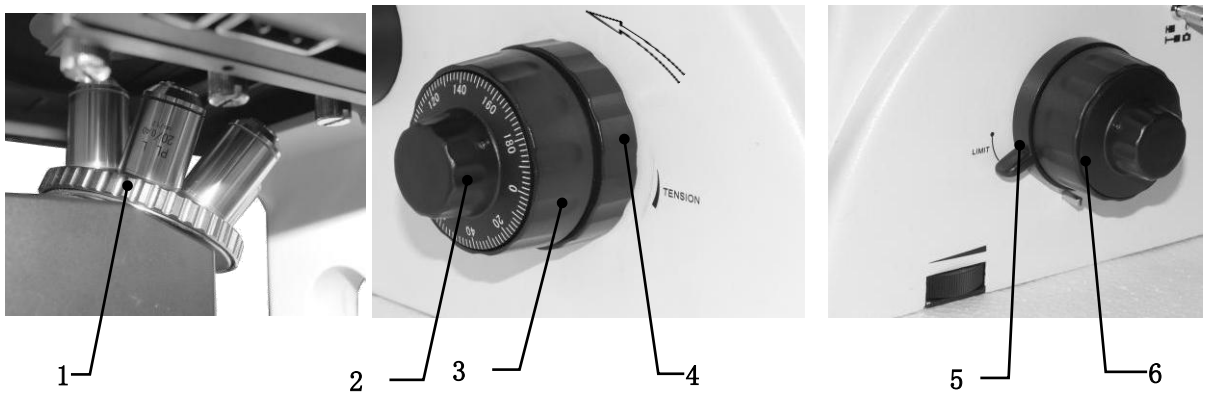

Fig.11

13. 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 40X 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=±5 diopters, as shown in Fig.12.

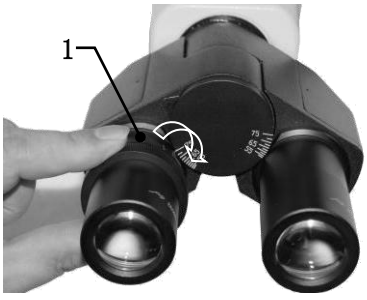

Fig.12

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° ~360° and drawed out, but the analyzer can't be adjusted and drawed out. Push the anaylzer pole and polarizer into optical path, rotate the turnplate of

polarizer to make orthogonal polarization，the field of view will be dark. Push the pole 3 to ramate the center stage and observe in different condition micro-image. Pay attention to the direction when install the polarizer, insert from right of illuminator to left, the position slot is located up according the direction of arrow " UP" that marked on the polarizer，as shown in Fig. 13.

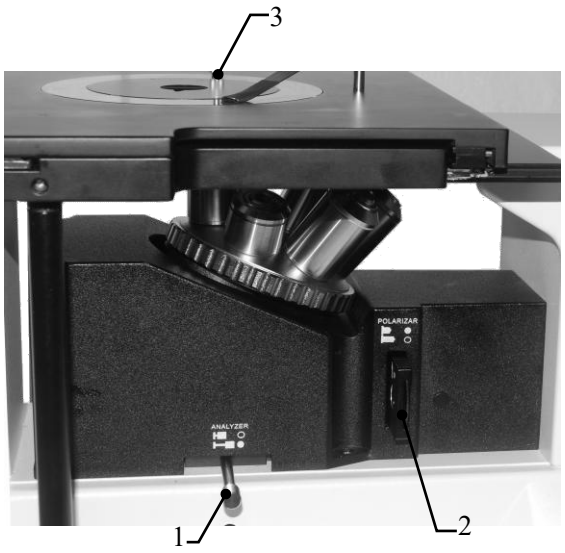

Fig.13

15. Operate trinocular device

This unit performs eyepiece and photographic observation, switch by push-pull rod 3, located at the right side of main frame body. The photography output 1 is located at the left side and covered by a dust-proof cap 2. The following is peration steps.

（1）Loosen the fastening screws of the photography output terminal, and remove the dust-proof cap.

(2) Mount the photography device on the output terminal, then tighten the fastening screws again.

(3) Turn the 10X objective into the light path.

(4) Push the push-pull rod 3 in and focus to make micro-image clear.

(5) Push the push-pull rod 3 out to see whether the image with photograph clear. If unclear, adjust the fine focusing control knob to make the image clear.

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

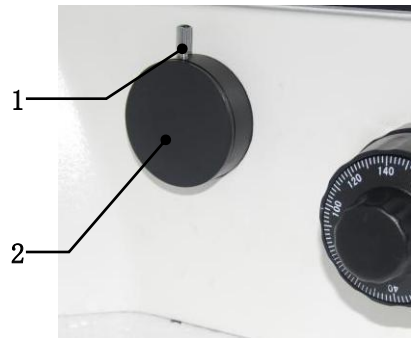

Fig.14

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. 15-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. 15-b.

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 screws 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 , 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.

Fig.15

a **b**

● **MJ42BD inverted metallurgical microscope in bright / dark field**

MJ42BD inverted metallurgical microscope is equipped with bright/dark field illumination switching device. Observe in bright field of view according *MJ42 inverted metallurgical microscope* operating manual, the following instruction is only included usage microscope in dark field of view.

1. Push the bright/dark field switching rod 1out， as shown the remark “ F

2. Push the analyzer pole 2 out， as shown the remark “ ○ ”, mean that the analyzer is out of optical path. Draw out the polarizer 4， as shown the remark “ ”, mean that the polarizer is out of optical path.

3. Open the field diaphragm 3 and aperture diaphragm 2 to maximum.

4. Place the metallurgical specimen or sample on the stage and pin it with spring clip, pay attention to the press that can press out the specimen or sample, no make the stage deformation. Turn the control knob of stage to adjust longitudinal (Y) and transverse (X) movement , make the specimen or sample observation area located top the objective.

5. Focus to make micro-image clear in dark field. If no any micro-image in the dark field, may be view in bright field to look for objective image and focus clear firstly, then view in dark field.

6. If asymmetry in the field, should adjust the collector lens focusing knob and lamp position adjusting knob to make the illuminator facula at the center of field.

Reminder!

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

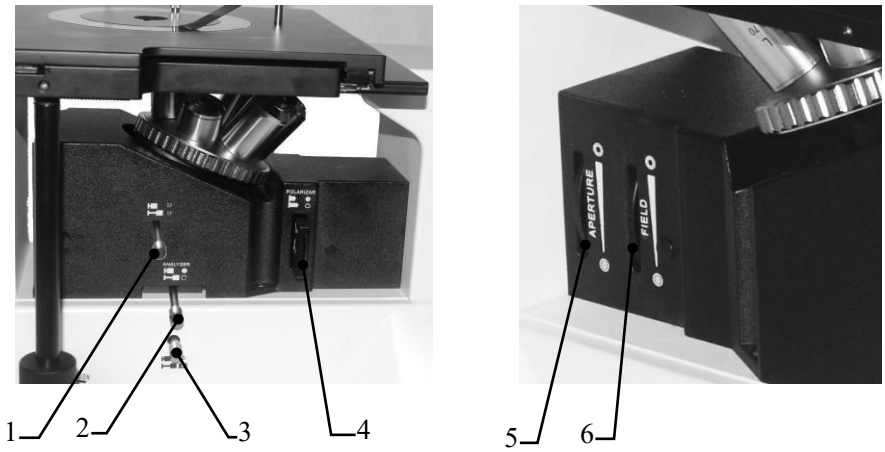

Fig.16

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 6V30W for the model MJ20 and 12V50W for the model MJ20BD. When replace the halogen lamp, should ensure the specification in order 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. 17-a, 17- 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）Catch hold of the lamp house back cover and pull out backward，take out the defective bulb 3 and replace a new one. Close the back cover again. as shown in Fig. 17-c, 17- d.

（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 .

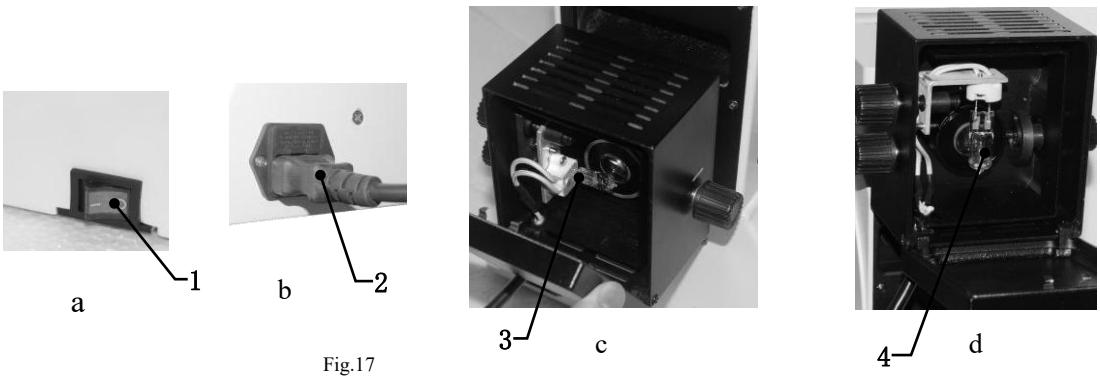

Fig.17