

# **Smart-POL Polarizing Microscope**

## **User Manual**



Please read operating manual before installation and operation.

**Drawell International Technology Limited**

**Chongqing Drawell Instrument Co., Ltd.**

**Shanghai Drawell Scientific Instrument Co.,Ltd.**

**Address :** Suite 2705,Building No.12,Shiyu Road No.1, Yuzhong District,  
Chongqing China.

**Homepage :** [www.drawell.com.cn](http://www.drawell.com.cn)

**Tel :** 0086-023-63268643

**Email :** [sales05@drawell.com.cn](mailto:sales05@drawell.com.cn)

## CONTENT

Attentions	2
.....	
1. Parts Name	3
.....	
2. Performance Parameter	4
.....	
3. Installation And Carry	5
.....	
4. Operation And Use	6
.....	
5. Maintenance	7
.....	
6. Troubleshooting	9
.....	

## **ATTENTIONS**

**1. Purpose**

This microscope is used only for microscopic observation, can not be used for other purposes. Otherwise may cause the damage of the instrument.

**2. Disassembly only by the professionals.**

The microscope has been adjusted before shipping, Unprofessional-person should not disassemble and remove any other parts.

If you have any questions, please contact with manufacturer or local distributor.

**3. Note the input voltage if identical with operating voltage of instruction.**

This instrument designed for wide input voltage (100V~240V,50/60HZ), applicable to most area .But if the supply voltage exceeds this range, the instrument will be seriously damaged.

**4. Use in safe way, prevent burns and fire.**



When the Instrument power in working, temperature of bulb and lamp house will rise sharply to meet the heat balance, so pay attention to anti-hot logo in case of be burned.

Do not use alcohol, gasoline, paper and other combustibles near the instrument, to prevent a fire! !

**5. Notes on replacing the bulb.**

The instrument used with 6V/30W halogen lamp of G4, LED model with 5V~12V/5W, replacement should be used with same specifications of the bulb, or may cause equipment damage.

**Before replacing the lamp, must turn off power switch until bulb is cool off, and unplug it in case of electric shock.!**

★ 5W LED lamp need to contact with local distributor for replacement.

**6. Requirements for handling and using environment**

Please cut off the power and unplug the power plug before moving. Be careful not to crush your finger when placed.

This instrument is a precision instrument, and it should be handle with care, severe shock can cause serious damage to the inner related parts.

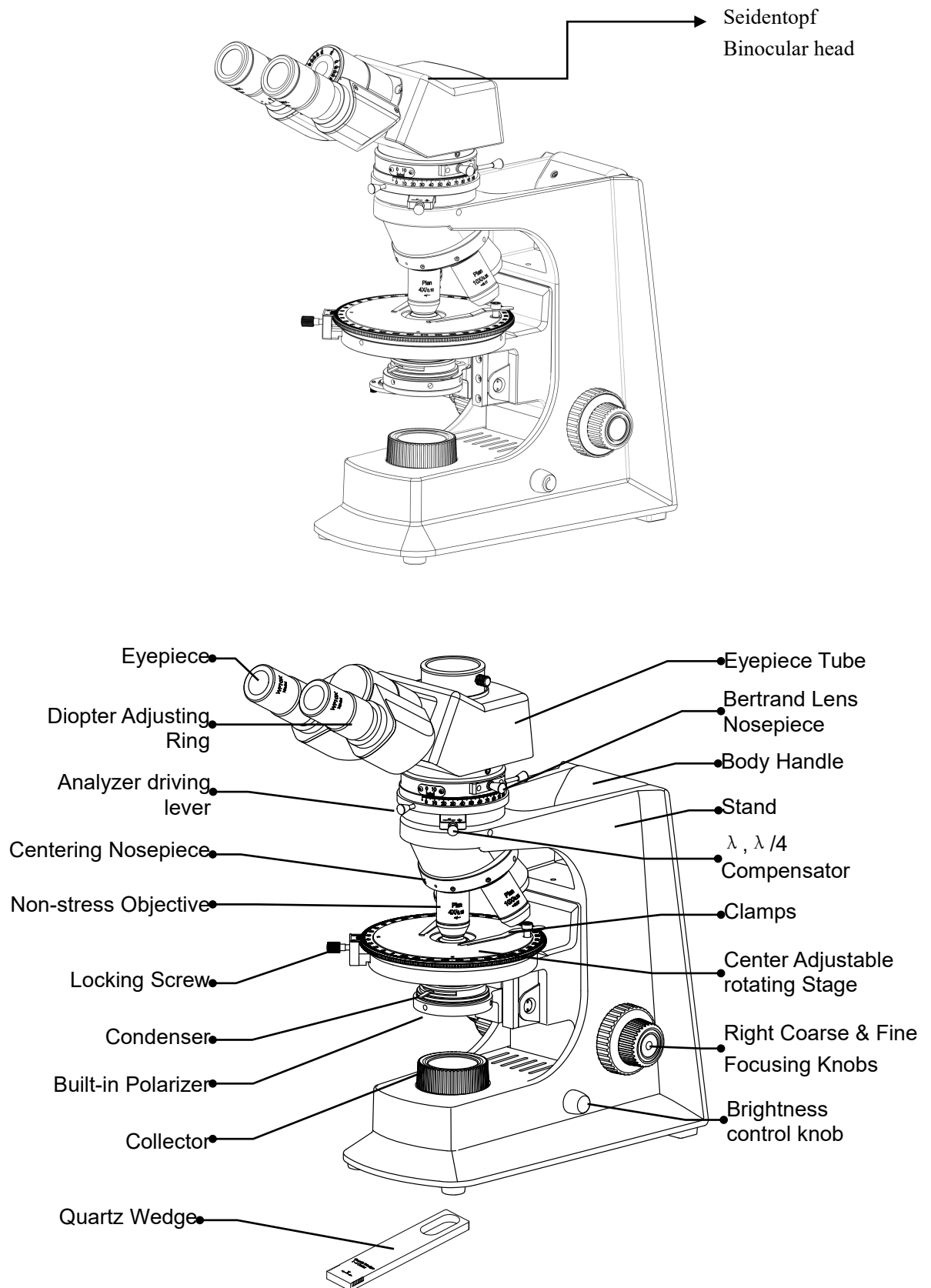
The required available environment for using of the equipment:

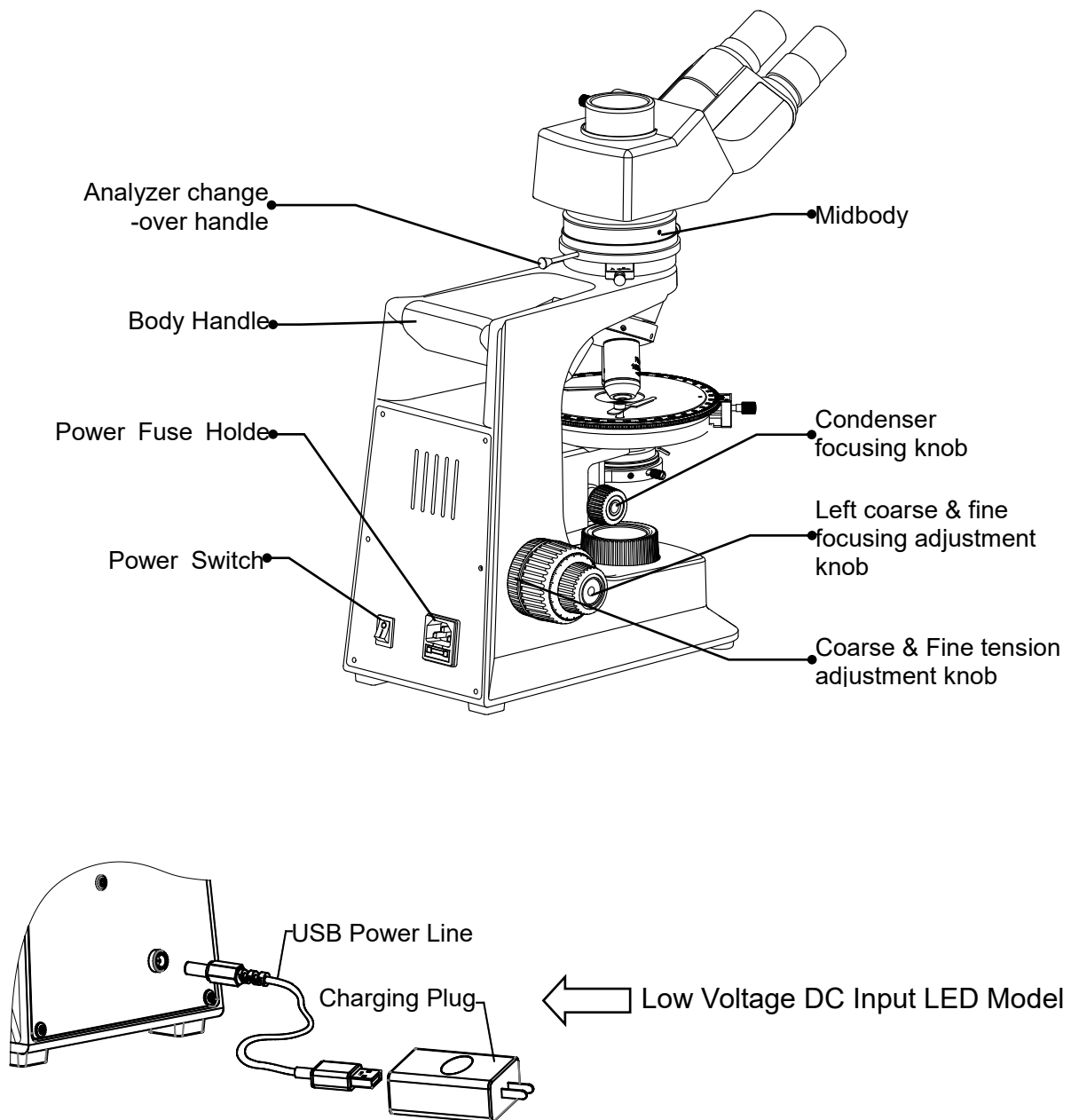
Indoor temperature: 0 °C ~ 40 °C                      Maximum relative humidity: 85%

High temperature or high humidity may cause mildew, fog or dew of the optical components, will result in the instrument not work.

**7. For the protection of the environment, please properly handle the microscope packing waste (such as: cardboard, foam, etc )**

## 1. Parts Name





## 2. Performance Parameter

### 2.1 Magnification ( "O" is optional)

Objective Eyepiece	4×	10×	20×	40×	60×(O)
10×	40×	100×	200×	400×	600×

### 2.2 Objective ( "O" is optional)

Infinity Plan Achromatic Objective	Numerical Aperture N.A.	Objective Field (mm)	Resolution (μm)	Working Distance (mm)
		FOV φ 20		
4×	0.10	5.0	2.8	12.10
10×	0.25	2.0	1.1	4.64
20×(s)	0.40	1.0	0.69	2.41
40×(s)	0.66	0.5	0.42	0.65
60×(s)	0.80	0.33	0.40	0.33
100×(s, oil)	1.25	0.20	0.27	0.12

### 2.3 Eyepiece

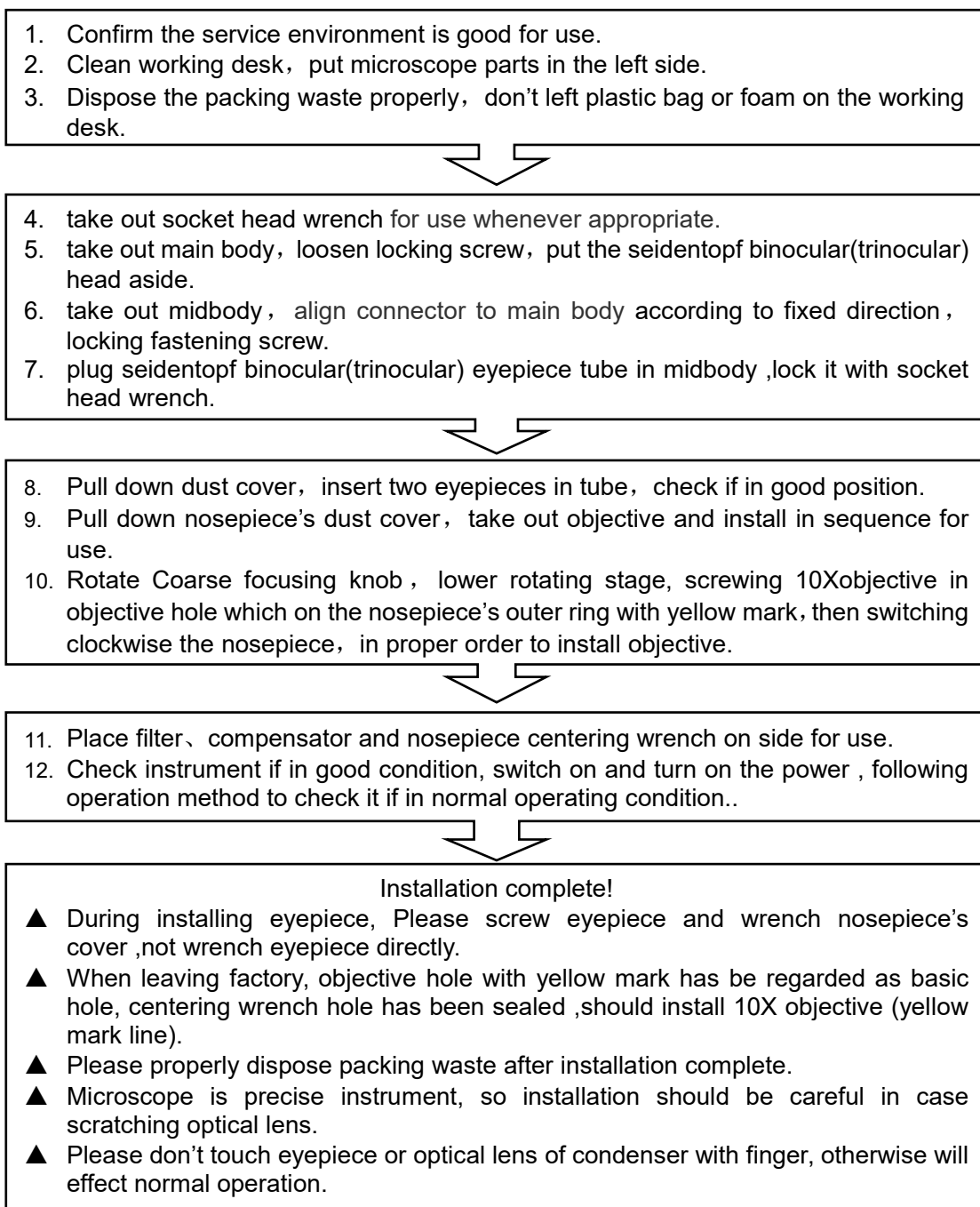
Item	Magnification	FOV (mm)
Reticule cross	10×	20
Normal eyepiece	10×	20

### 2.4 Other Parameters:

- (1) Mechanical Tube Length: 160 mm
- (2) Viewing Head : Inclined 30° , Seidentopf Binocular(Trinocular) head, Interpupillary Distance 48 mm~75 mm ; Dioper Adjusting ±5 ,With antifungus device.
- (3) Midbody : Analyser 360° , Division 2°30',With locking device. Bertrand lens with center Adjustable, Combining slip with Gypsum ( $\lambda$ ) and Mica ( $\lambda/4$ ) ,Quartz Wedge.
- (4) Nosepiece: Quadplex , Center Adjustable.
- (5) Mechanical stage: Revolving Stage, Diameter Φ142 mm ,360° Uniform Scale ,Vernier Division 6'.
- (6) Focusing systems: Coaxial Coarse And Fine Focusing Knobs, Coarse stroke 22mm, up position is optional; Fine division 2μm, Condenser up-down range 22 mm.
- (7) Condenser: Abbe Condenser N.A.1.25 , Adjustable Aperture , Aperture Center Can Be Adjustable , With Polarizer.
- (8) Electric components: Input voltage AC100-240V , 50/60Hz.  
Output voltage DC1.2V~6V .  
Halogen lamp 12V/30W or 5W LED(DC 5V~12V input).  
Fuse 5A Φ5×20
- (9) Filter: Blue (Amber、Green、Neutral Is Optional) .

### 3.Installation And Carry

#### 3.1 Installation Process



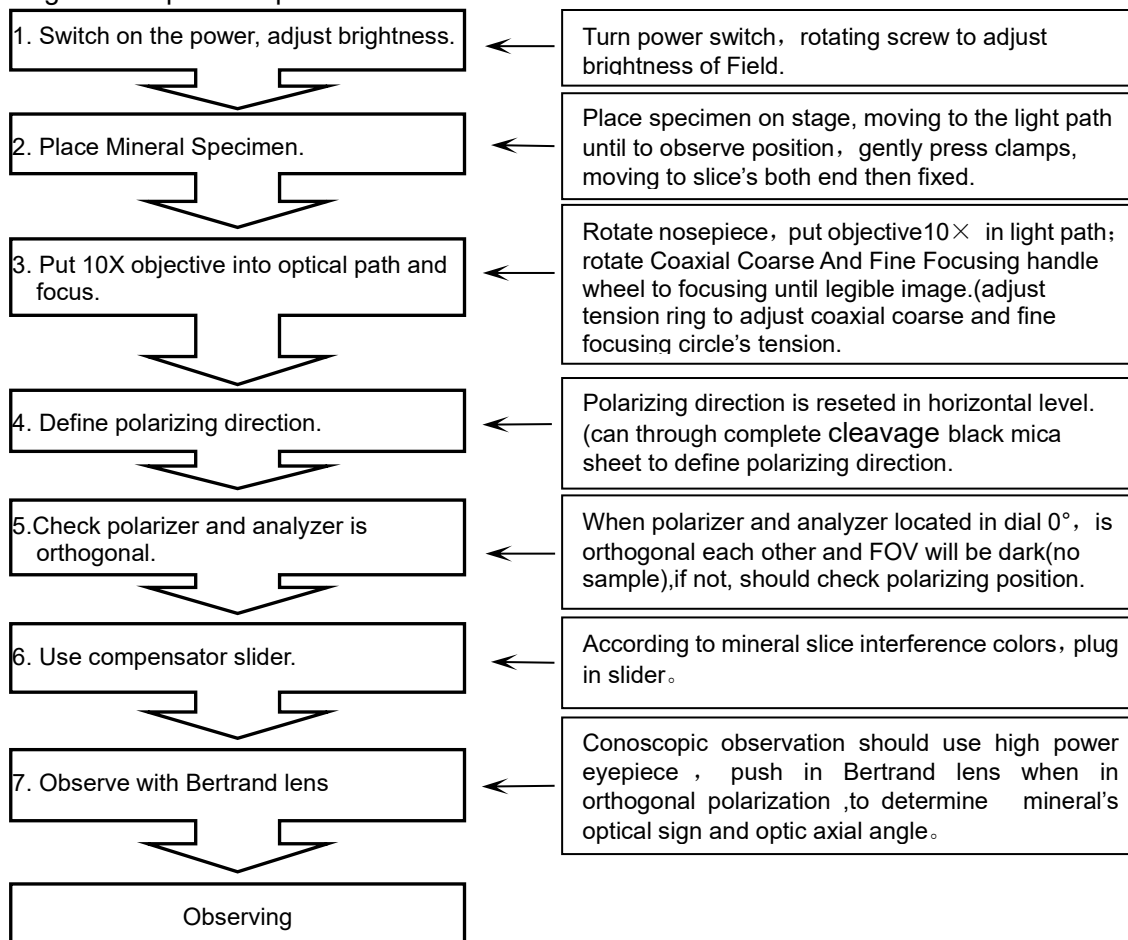
#### 3.2 Carry

Microscope is precision instrument, careful in carry. Shut down power supply, pull out power line. Lock the eyepiece tube and condenser etc, no slice left on stage. Don't move nosepiece, focusing knob, mechanical stage and eyepiece tube etc, don't make the eyepiece off. Avoid stumble into the chair, violent shocks and collision can cause damage.

- a. Single hand carry way: with one hand holding the body, the microscope will be hold by thumb buttoned filed from inside.
- b. Two hands lift way: one hand turn back the microscope slightly by holding body handle, the another hand holding the microscope's forepart.

## 4. Operation And Use

### Bright field operation process instruction



- △ When inspecting to confirm polarizing direction, please finding a cleavage black mica from mineral slice and place it in center of field, then rotate stage again. Stop rotating when black mica's color become very dark, the direction of cleavage seam just present the polarizing direction.
- △ In positive cross polarized light, if interference colours of mineral slice is first class grey, after insert gypsum ( $\lambda$ ) in optical path, please change to second class blue-green if homology radius is parallel; if synonyms radius is parallel, change first class grey to first class orange color.
- △ In positive cross polarized light, if interference colours of mineral slice is first class purplish red, after insert mica ( $\lambda/4$ ) in optical path, please change to second class blue; if synonyms radius is parallel, lower to first class orange color.
- △ Analyzer change-over handle can convert optical path, switching observation from mono polarized light to positive cross polarized light.
- △ Midbody、analyzer、compensator and Bertrand lens bearing.
  1. Compensator socket: can plug in gypsum ( $\lambda$ )、Mica ( $\lambda/4$ ) or Quartz wedge.
  2. Bertrand lens conversion inserted block: pulling it can convert Bertrand lens in light path to make conoscopic observation.
  3. gypsum ( $\lambda$ ) slip (first class red), Orthogonal polarizing appear first class purplish red interference colours.
  4. Mica ( $\lambda/4$ ) slip, Orthogonal polarizing appear first class grey colours.
  5. Quartz wedge, Orthogonal polarizing appear first class to four class interference colours from thin to thick.



## **5.Maintenance**

### **5.1 Clean:**

- (1) Don't touch the lens with hand, Dust on lens should be cleaned by soft brush or absorbent cotton or cleaned by absorbent cotton, lens paper with the mixture of alcohol and ether (proportion 1:4).
- (2) Alcohol and ether all are burnt easily, please take them away from fire. Be careful for turn on and off power.
- (3) Don't clean painted metal and galvanizing metal with organic solvent such as alcohol, ether or the mixture of the both. Silicon cloth or soft cleaning preparation is suggested to clean it.
- (4) Plastic should be cleaned by soft cloth with clear water.

### **5.2 Application environment**

- (1) Should be in cold and dry environment , without shaking ,dust and steam without acid-base and other corrosive gas。
- (2) Normal operation condition: indoor temperature: 0℃~40℃ , maximum relative humidity: 85%
- (3) High humidity area, recommend with dehydrating unit in case of mildew and frog.

### **5.3 Bulb Replacement**

#### **A . Replacement of halogen.**

- ▲ Please use specified bulb in case of damage or fire.

Specified bulb: halogen 12V/30W, LED5V~12V/5W  
LED(According to outfits) .

- (1) shut off the power (switch to "o" side) ,unplug the power socket;

- (2) waiting about 30 minutes until lamp box is cold.

- ▲ Please be sure that the bulb is cool, then follow by the nest operations.

- (3) Lay aside the microscope reliably, unscrew the knurled thumb screw of the lamp housing cover on the underside of base.

- (4) Pull the knurled thumb screw gently outward, turn out lamp holder flap.

- (5) Confirm the bulb is cold down, Pull out the old bulb carefully;

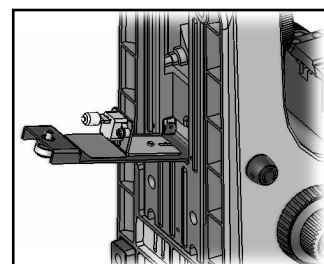
- (6) Hold a new bulb with silk cloth to avoid fingerprint and dust affect bulb brightness and service life, and insert fully the contact pins into the bulb socket;

- ▲ Before replace bulb, confirm if bulb connected strongly with the power cable in case of bad contact.

- ▲ Plug fully contact in bulb socket, or will result in short circuit.

- (7) Push back the lamp holder flap, tighten the knurled thumb screw.

- ▲ After working 10 hours, suggesting the suspension of using about half an hour for continue using.



**B. Replacement of LED**

**5WLED illumination had been adjusted before delivery.**

**5.4 Replacement of fuse**

- (1) First shut off power, pull out the plug.
- (2) Unscrew fuse tube socket in back of base, take out old fuse.
- (3) Replace with same specification fuse, then plug in fuse tube socket again.

**5.5 After operation**

- (1) Please shut off the power, covered by dust cover, keep in dry and cool place.
- (2) The eyepiece and objective should be placed in dry containers (such as moistureproof cylinder) with desiccant.

- ▲ For better performance index, suggest checking the instrument regularly.  
Please keep in touch with local agency if finding trouble need maintenance.

**6. Troubleshooting**

In the period of using Smart series microscope, if there is any trouble occurs, please referring to the following sheet listed some common troubleshooting resolve them or keep in touch with us or local agency.

Trouble	Causation	Remedy
Switch on but bulb dark	No bulb	Install bulb
	Plug is unreliable	Check joint again
	Bulb is broken	Replace bulb
	Fuse is broken	Replace fuse
Bulb is flickering or brightness is unsteady.	Bulb is unstable	Insert again
	Bulb is broken	Replace bulb
Brightness of view field isn't enough or is uneven.	Bulb specification doesn't meet the requirement.	Replace bulb
	Bulb brightness is low.	Rotate potentiometer to adjusting brightness.
	Objective isn't in correct optical path.	Rotate the objective in correct position.
	The size of iris aperture is too Small.	Adjust the size of iris aperture.
	Lens (objective, eyepiece, condenser, light collector) has dust.	Clean it
	Position of Condenser is too low .	Adjust condenser properly.
Image isn't clear (contrast or definition isn't enough)	Cover glass of specimen doesn't meet the requirement.	Use required thickness cover glass (0.17mm).
	Cover glass of specimen isn't in up direction.	Place specimen correctly.
	Surface of objective lens is dirty (especially it is easy for the front lens of 40× objective to dip in immersion oil).	Clean it
	Immersion oil isn't used for 100× objective (oil)	Use immersion oil
	Immersion oil doesn't meet the requirement.	Use immersion oil supplied by us.
	There is bubble in immersion oil.	Clear the bubble away
	Size of iris aperture isn't proper.	Adjust the size of iris aperture.
	Position of condenser is too low.	Readjust again
One side of image is dark or image is moving as focusing.	Objective isn't in correct optical path.	Make the objective in correct position..
	Specimen isn't placed correctly.	Place specimen levelly on stage and clip it with clamp.
Dirt and dust can be seen in Field of view.	Dirt or dust on bulb glass	Clean it
	Dirt or dust on specimen	
	Condenser's front lens has dust or dirt.	
	Lens (objective, eyepiece, condenser, light collector) has dust.	
Objective touching specimen as changing low power to high power	Cover glass of specimen doesn't meet the requirement.	Place specimen correctly.
	Cover glass is too thick.	Use required thickness cover glass (0.17mm).
Image observed by two eyes aren't in superposition entirely.	Interpupillary distance isn't adjusted correctly.	Adjust Interpupillary distance.
	Diopter isn't adjusted correctly	Adjust diopter
	Left and right eyepiece is different.	Replace same eyepieces.
It is easy for eyes to be tired during observing.	Interpupillary distance isn't adjusted correctly.	Adjust Interpupillary distance.
	Diopter isn't adjusted correctly.	Adjust diopter
	Brightness isn't enough	Adjust brightness

**Drawell International Technology Limited**

**Shanghai Drawell Scientific Instrument  
Co.,Ltd.**

**Chongqing Drawell Instrument Co.,Ltd.**



Add: Suite 2705, Building No.12, Shiyu Road No.1, Yuzhong District,  
Chongqing, China

Tel: 0086-023-63268643

Web : [www.drawell.com.cn](http://www.drawell.com.cn)

Email : [sales05@drawell.com.cn](mailto:sales05@drawell.com.cn)