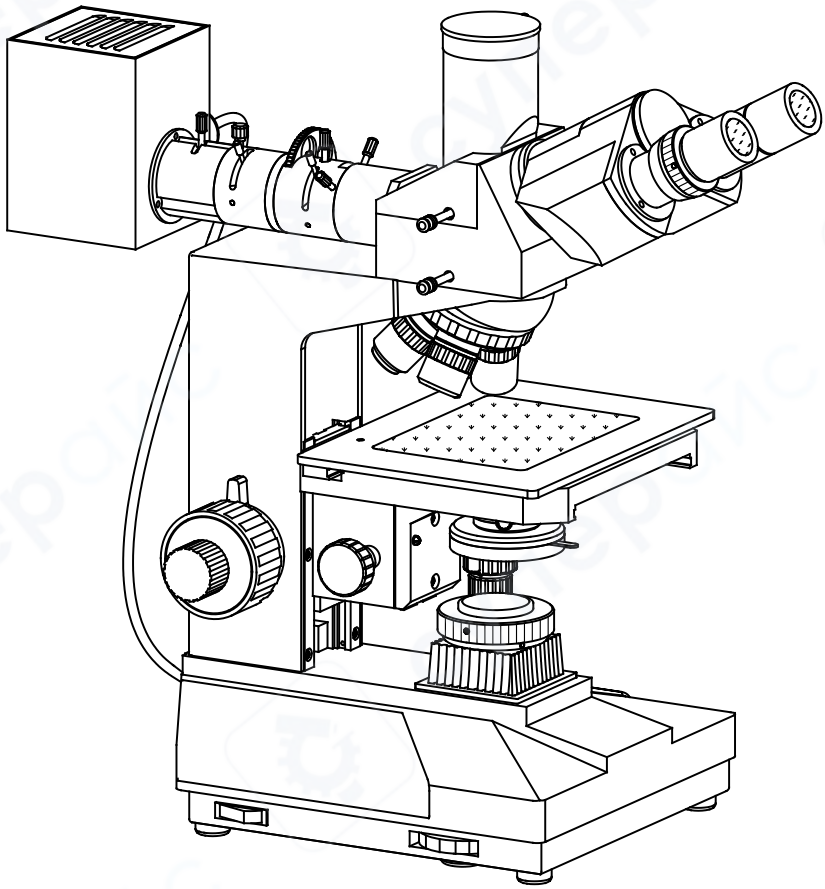
BETICAL
倍特卡尔

Metallurgical Microscope

CR20/CR25

User Guide



Congratulations and Thank You for your purchase

of The Microscope

This precision instrument has been designed to require a minimum of optical and mechanical maintenance. Its excellent design assures years of high quality, reliable service. We recommend you read this entire manual carefully before beginning to use the instrument.

WARNING

PLEASE DISCONNECT PLUG FROM MAINS SOCKET BEFORE REMOVING THE BOTTOM PLATE, OPENING THE LAMP REPLACEMENT DOOR, OR REMOVING THE LAMP HOUSE

WARNING

THE POWER CORD PROVIDED WITH THE EQUIPMENT HAS A GROUNDED PLUG. ALWAYS USE THE POWER CORD WITH A PROPERLY GROUNDED WALL OUTLET.

DO NOT EXPOSE THE INSTRUMENT TO HIGH TEMPERATURES OR HUMIDITY. AVOID USING THE INSTRUMENT IN EXTREMELY DUSTY LOCATIONS.

OPERATING TEMPERATURE 5℃ TO 35℃

OPERATING HUMIDITY: 20% TO 80% @ 25℃

CAUTION: NEVER IMMERSE THE INSTRUMENT IN WATER OR SOLVENT

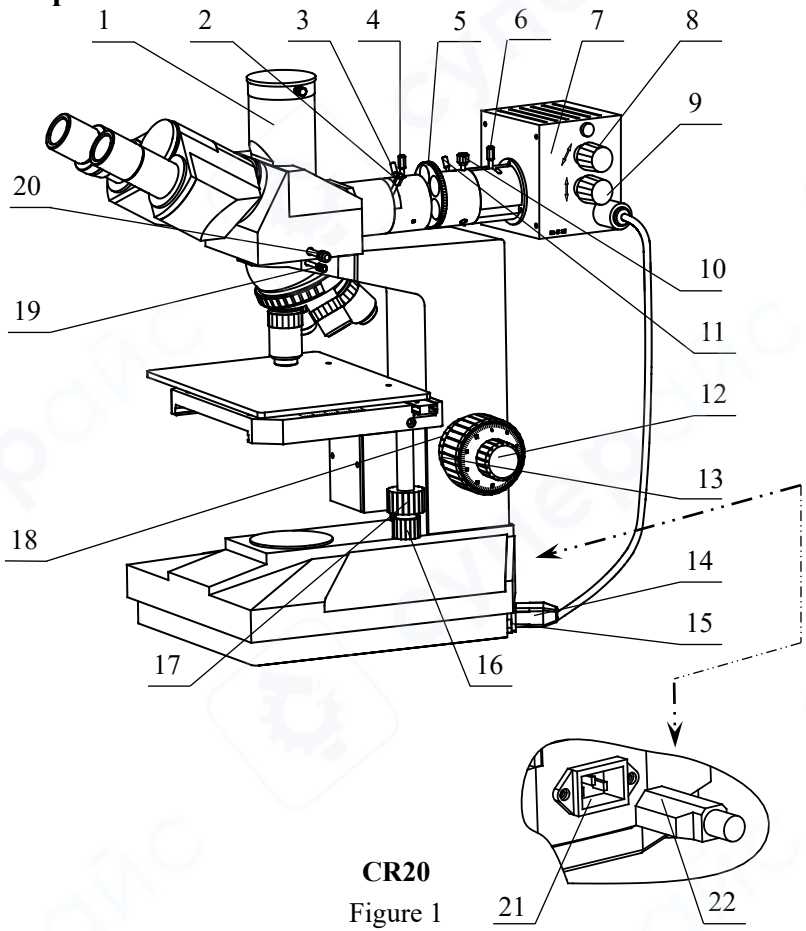
CAUTION: DO NOT PUT ANY FOREIGN OBJECTS IN THE FRAME OR INTO ANY MOVING MECHANICAL PARTS

Table of Contents

Getting Started

This guide is written on the assumption that it will be used by advanced students and experienced microscopists. It covers the essential adjustments and controls of microscopes. No attempt has been made to include fundamentals of microscopy. Read this guide prior to unpacking the microscope. This guide is designed to illustrate a sequential method for assembly and operation. We recommend the instructions be followed in a sequential process. After assembling the instrument, re-read the guide and become familiar with all adjustments and functions before using your new microscope.

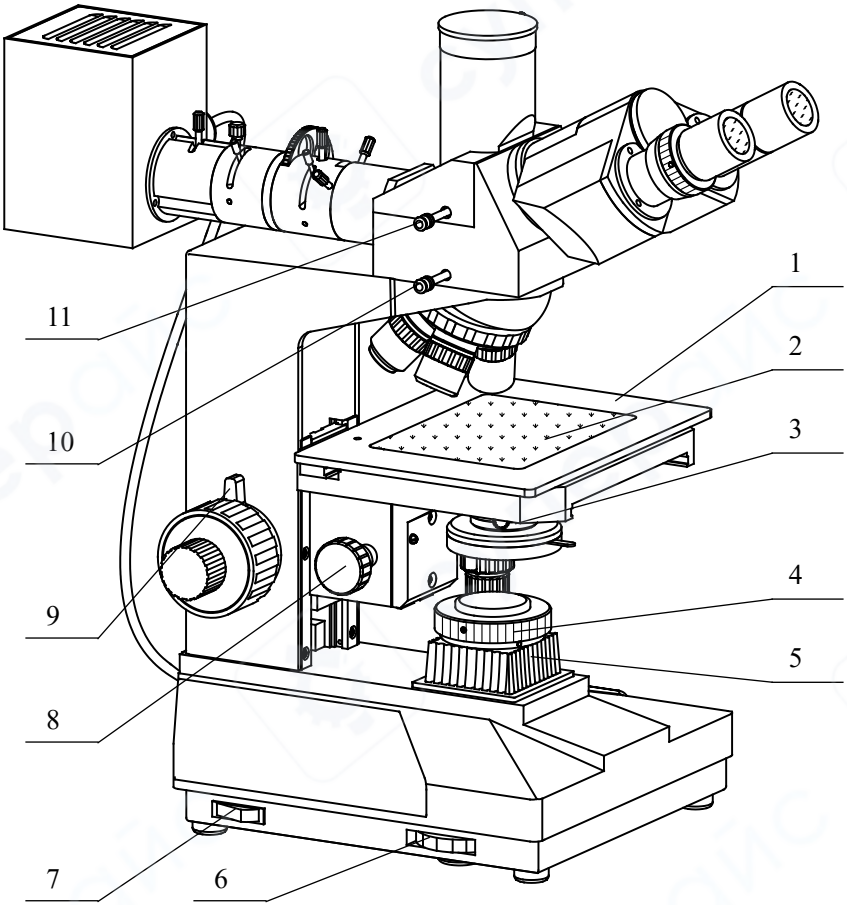
Components



CR20

Figure 1

1. Trinocular 2. Polarizer 3. Field Diaphragm Adjustment Lever 4. Field Diaphragm Centering Screw 5. Filter Wheel 6. Focusing Lens Adjustment Lever 7. Lamp House 8. Lamp Transverse Adjustment Knob 9. Lamp Vertical Adjustment Knob 10. Lamp House Set Screw 11. Aperture Diaphragm Adjustment Lever 12. Fine Focus Control Knob 13. Coarse Focus Control Knob 14. Lamp House Power Inlet 15. Lamp House Power Outlet 16. Stage Transverse Adjustment Knob 17. Stage Longitudinal Adjustment Knob 18. Focus Tensional Adjustment Knob 19. Thumbscrew 20. Push Rob for Analyzer 21. Power Outlet 22. Power Inlet



CR25

Figure 2

1. Stage 2. Glass 3. Condenser (With Iris Diaphragm) 4. Field Diaphragm 5. Collector 6. Brightness Control Knob 7. Power Switch 8. Substage Adjustment Knob 9. Up Stop Knob 10. Blue Rod for Normal Upper Light 11. Push Rod to Direct Image to Binocular Eyepieces or Camera Port

Technical Specifications

Trinocular: Inclined 30°, able to rotate a full 360° (Analyzer with field diaphragm to switch).

Objectives: Plan achromatic objectives with long working distance (no cover glass):

5X/0.12、10X/0.25、40X/0.60 and 60X/0.75 (spring).

Nosepiece: Quadruple nosepiece ball-bearing reversed nosepiece with positive click stops and smooth operation.

Eyepieces: 10X Wide field eyepiece, Focal Length 25mm, Field Φ18mm.

Stage: 180mm X 145mm, range of motion 75mm X 50mm.

Condenser: N.A. 1.25 Abbe Condenser with iris diaphragm, rack and pinion focus.

Illumination: 6V/20W halogen lamp illumination with brightness control.

Setup Instructions

1. **Remove all parts from their packing materials and retain the packaging in the event you need to transport the product.**
2. **Connect the power cord to a suitable power supply.**

Basic Operation

1. Illumination controls

1) The power switch to the reflected illuminator and the brightness control are located on the base. The electrical system is fuse protected and the fuse holder is located on the base.

2) Turn on the light with the power switch, see figure 3. If the light does not appear to be ON, check the brightness control to see if it's on a sufficiently low setting. Then adjust the brightness control until image can be observed comfortably.

3) **For CR25:** The power switch on the right side of the base controls the vertical illuminator, see figure 4.

Note: Don't let the brightness control at the highest so long that reducing the life time of the lamp.

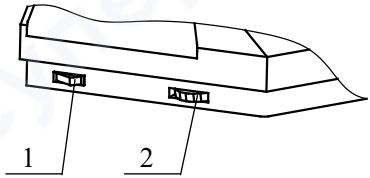


Figure 3

1. Power Switch （control the reflected illuminator） 2. Brightness Control Knob

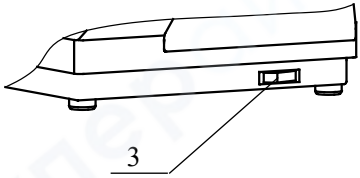
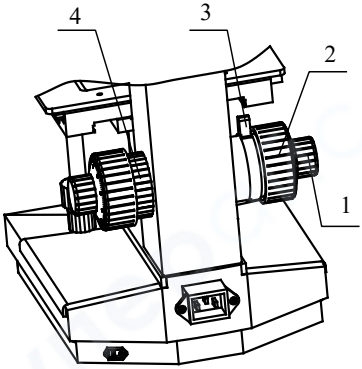


Figure 4

3. Power Switch （control the vertical illuminator）



1.Fine Focus Control Knob 2.Coarse Focus Control Knob 3.Up Stop Knob 4.Substage Adjustment Knob

Figure 5

2. Focusing Controls

1) **Focusing adjustment** is accomplished by using the large coarse focus knobs located comfortably on each

side of the frame. Fine adjustment is accomplished using the smaller knobs located on the same focus shaft. This coaxial arrangement allows for easy, precise adjustment without drift or discomfort.

2) **Focus Control** Turning either of the coarse focus control knobs will raise or lower the stage. The smallest graduation on the fine adjust knob index scale is 2μm of vertical.

3) **Focus Tension Adjustment** The tension of the coarse focus is adjustable and preset at the factory for ease of use. If you wish to adjust the coarse focus tension, first locate the tension adjustment ring, it is located between the frame and coarse adjustment knob. Turning the ring toward the rear of the microscope increases the tension, and toward the front of the microscope loosens it. If tension is too high, it will induce discomfort control.

4) **Pre-focusing or Focus Stop Control** Use of this feature will insure that the shorter working distance objectives don't contact the stage or specimen when using the microscope. Its use also simplifies focusing. After focusing on the specimen with the coarse adjustment by low magnification eyepiece, rotation of the lever toward the front of the microscope will set and upper limit on the coarse adjustment movement. After changing slide glass or objectives, focusing is easily accomplished by rotating the coarse adjustment knob to reach the pre-focused position, then making fine adjustments with the fine adjustment knob. Focusing movement with the fine adjustment isn't affected by using the pre-focusing lever.

3. Diopter and Interpupillary Adjustments

1) **Diopter Adjustment** Proper correction for individual vision is accomplished via the diopter adjustment located at the left eyepiece, see figure 6. Using the 40X magnification objective, bring an

image into focus with your right eye only. Once the image is well focused, observe with left eye, make fine adjustments with the diopter adjustment ring to correct for your vision.

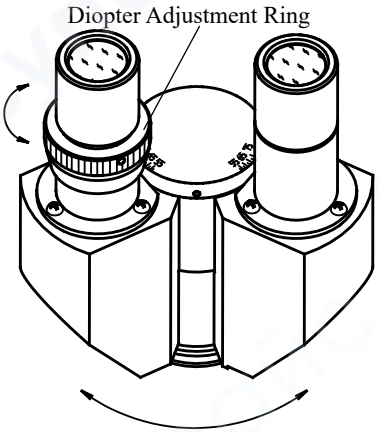
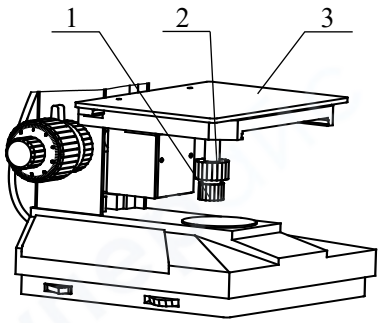


Figure 6

2) **Proper interpupillary distance**, or the distance between eyepieces, is crucial to the comfort of the user. Adjusting the interpupillary distance is accomplished through a "folding" action of the optical head, at figure 6, allowing for quick and easy adjustment.

4. **Mechanical Stage Controls**, (CR20 see figure 7, CR25 see figure 8), the coaxial transverse / longitudinal knob allow for easy adjustment.

5. **Condenser Components** – are located below the stage as follows, see figure 8: Abbe condenser; its Mounting Ring with lock screw and two large centering screws at either side for adjusting condenser/iris assembly in the optical center of the light path; the adjustment knob for raising and lowering the condenser lens. The substage lamp house includes a field iris diaphragm for Kohler

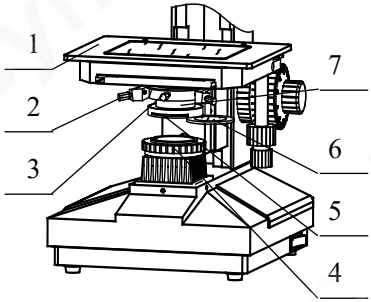


1. Transverse Adjustment Knob 2. Longitudinal Adjustment Knob 3. Stage
Figure 7

illumination and a recess for installation of a filter, if desired.

6. Condenser Alignment

Adjustments to the substage condensing system, see figure 7, are crucial for proper illumination and performance. There are three basic adjustments to be made: centering, vertical focusing and aperture adjustment.



1. Stage 2. Condenser Centering Screw 3. Condenser Set Screw 4. Field Diaphragm 5. Iris Diaphragm 6. Filter Holding Tray 7. Condenser

Figure 8

Figure 9

a) Centering–The condenser must be centered in the light path to ensure proper light control. One simple method for centering follows:

i) Rotate the objective nosepiece until the 5X objective is in the light path.

ii) While looking into the microscope, close the field diaphragm to the smallest setting using the knurled ring at the top of the light exit window assembly.

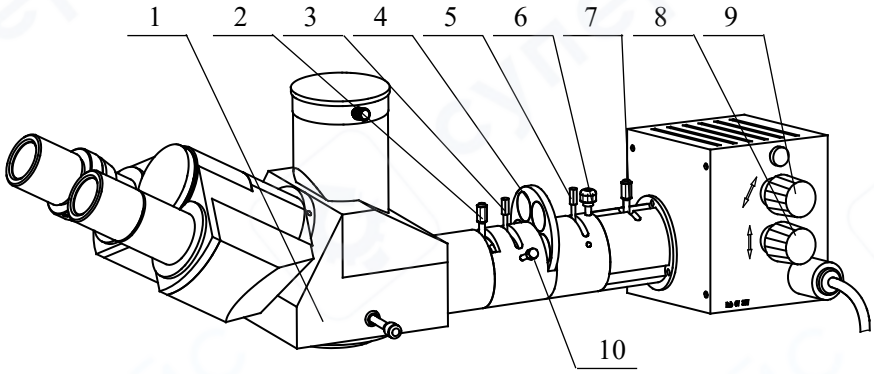
iii) Closing the iris in this manner will reduce the field so that a small white circle is visible within a black field, see figure 9A. This white circle is the light that is passing through the iris and it should be centered in the black field as in figure 9B. If it is not centered, move it to the center using the centering screws.

iv) By opening the iris until the white circle almost fills the entire field, see figure 9C.

b) Vertical Focusing–The condenser can be raised and lowered with the substage adjustment knob in order to focus the light for optical illumination.

7. Aperture Adjustment–The contrast can be adjusted with the iris diaphragm adjustment lever on the condenser assembly. Aperture adjustments are made to induce contrast into a specimen, not to adjust light intensity.

8. The Part of Vertical Illumination, See Figure 10.



1. Trinocular 2. Polarizer 3. Field Diaphragm Adjustment Lever 4. Filter Wheel 5. Iris Diaphragm Adjustment Lever 6. Lamp House Set Screw 7. Focusing Lens Adjustment Lever 8 Lamp Transverse Adjustment 9. Lamp Vertical Adjustment 10. Field Diaphragm Adjustment Screw

Figure 10

1) The iris diaphragm near the illuminator house in the vertical illuminator tube may be adjusted slightly to change contrast.
2) To center the illuminator house

a) Put a piece of paper and place it on the stage. Take out one objective from nosepiece and rotate the nosepiece until this objective opening hole is in position over the paper.

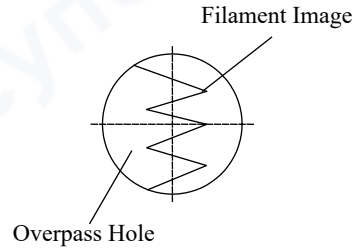


Figure 11

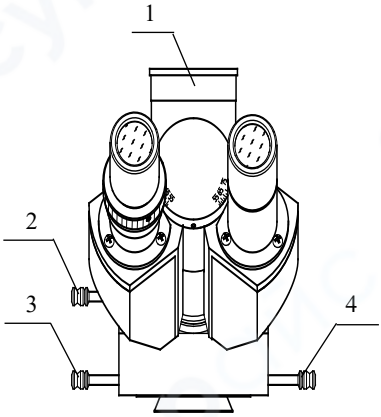
b) Turn the power on and adjust the brightness control to establish sufficient light.

c) This paper will allow for focusing of the lamp filament on it. If the filament image is not centered in the overpass hole, reduce the iris diaphragm, adjust the light bulb transverse and vertical adjustment to obtain a uniform image. Adjust the focusing lens lever until a sharp image of the lamp filament is attained, refer to figure 11 for this step.

3) Reinstall the objective again.

4) Adjust the focusing control until the image clear. If brightness of field not equality, you may move the light bulb adjustment and focusing lens adjustment lever slightly to make the brightness of field equality.

5) Reduce the field diaphragm,



1. Camera Port 2. Push Rod to Direct Image to Binocular Eyepieces or Camera Port (White) 3. Blue Rod for Normal Upper Light 4. Green Rod for Analyzer

Figure 12

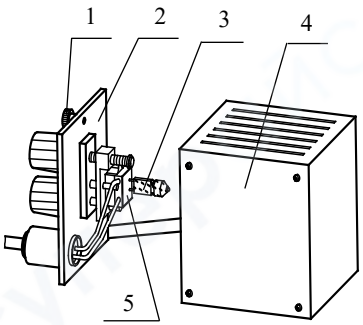
If it is not centered, move it to the center using the centering screw. Adjustment can be done by opening the field diaphragm.

6) The filter wheel contains a green, yellow, blue filter and ground glass, you may turn anyone to the light path to obtain an image of good quality.
7) The polarizing analyzer is used in conjunction with the polarized filter cube, selected by pushing in the green filter rod, see figure 10. The analyzer used with the polarized filter cube for transmitted light work, rotate the polarizer, see figure 10. While watching the brightness in the field and let the polarizer and analyzer orthogonally.
8) The push rod to direct image to binocular eyepieces or camera port to the upper left of the trinocular head will send 100% of light to the binocular eyepieces or to the top port. It satisfies high-grape photography.

Changing the Lamp

CR20/CR25: Changing the lamp in the lamp house, see figure 13.

1. Turn off and unplug the microscope.
2. Loosen the set screw, see figure 13, remove the entire cover board from the lamp house.
3. Grasp the lamp and pull it firmly from its fixture. **Take care not to touch the lamp with bare fingers, as the lamp will be hot.**
4. Insert a new halogen lamp into the same fixture. When



1.Set Screw 2.Cover Board 3.Lamp 4.Lamp House 5.Lamp Socket

Figure 13

installing the new lamp, be careful not to touch the glass with your fingers. Usually, the new lamp should be supplied in a plastic protective envelope. If not, use a tissue or other medium to grasp the lamp. This will prevent contamination from your hand and reducing the lamp's intensity and life.

5. Reinstall the cover board to the lamp house and retighten the screw.
6. If necessary, you may need to readjust the lamp as previously described.

CR25: Changing the lamp in the base, see figure 14.

1. Disconnect the power plug and **wait to be sure the lamp is cool**. On the bottom of the frame there is a hinged door for replacing the lamp. The lamp door retaining screw is to the front of the frame, and the lamp centering screw is located in the middle of the lamp door. Open the lamp door using the lamp door retaining screw as shown in figure 14.

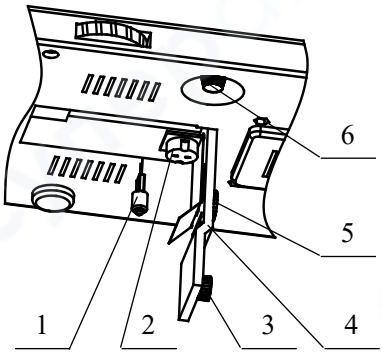


Figure 14
1. Lamp 2. Lamp Base 3. Holding Screw 4. Lamp Base Board 5.Lamp Centering Screw 6. Fuse Holder

2. Pull the old lamp straight out of the socket. Always use a clean cloth or lens tissue to prevent grease or oil getting on the glass of the new lamp. Insert the lamp pins straight into the socket. Close the lamp door and center the lamp in the field of view using the lamp centering screw at the center of the lamp door, see figure 14.

3. Pull out power supply plug from socket, take out socket of fuse. Change the fuse. Install socket of fuse and plug again, see figure 14.

Changing the Fuse

The fuse holders are both under the base of CR20 and CR25, so you can take out the holder and change the fuse, then reinstall it to use.

Preventative Maintenance

1. Cleaning frame and stage

Disconnect the plug from mains socket before cleaning. Clean the frame and stage with a soft cloth moistened with a mild detergent solution. Be sure the instrument is dry before using.

2. Cleaning optical parts

Microscope eyepieces and objectives are coated.

They should not be wiped while dry as dirt or dust may scratch the coating. It is best to remove parts from the frame prior to cleaning. Always blow loose dust away first. Use cotton swabs or lens tissue moistened with a lens cleaner or a small amount of alcohol, then wipe the surface clean with a good quality lens tissue. Solvents such as Xylene should NOT be used as cleaner.