

# User Manual

## Darkfield / Brightfield Trinocular Compound Kohler Microscope

Model M93SBDK Series



[MicroscopeNet.com](http://MicroscopeNet.com)

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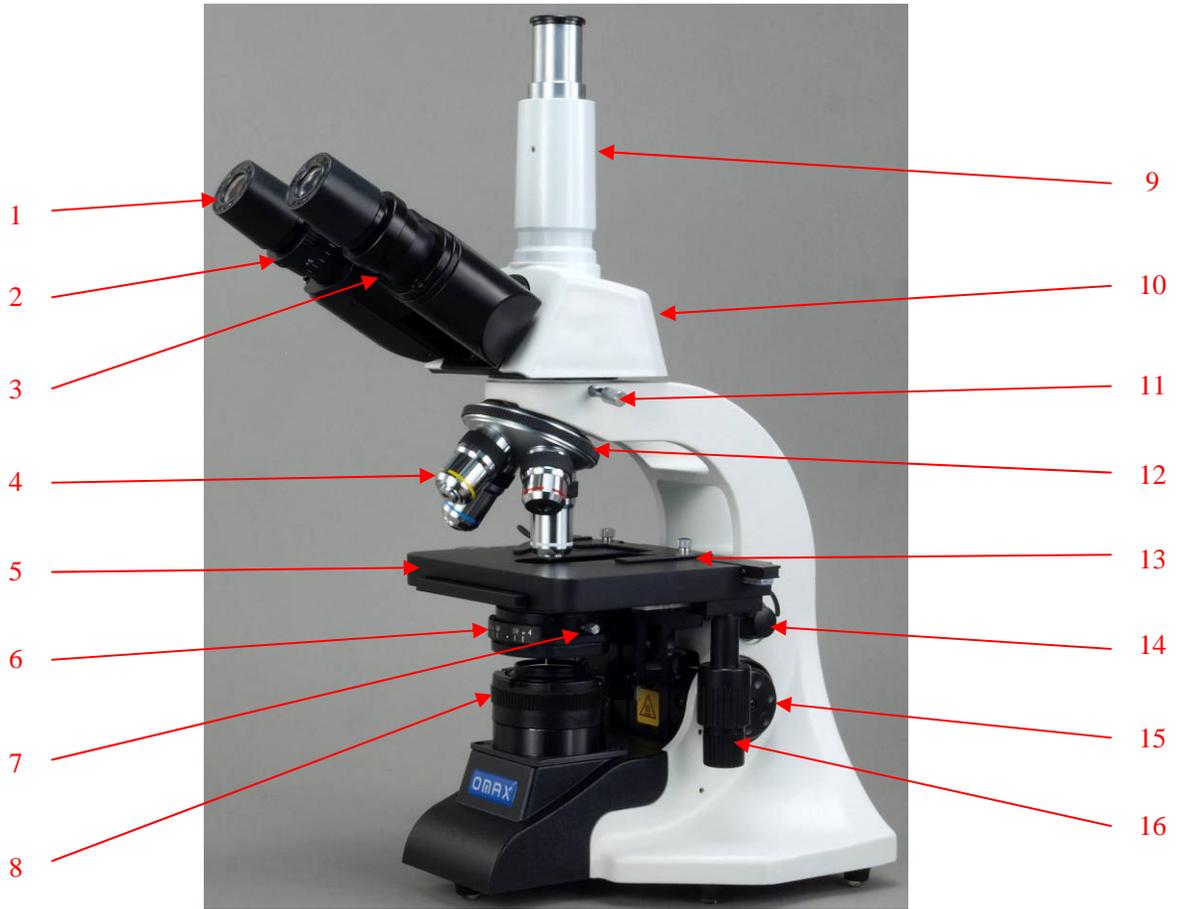
## i. Caution

1. Find the "UP" sign and place the Styrofoam container on your table or bench so that the arrow is pointing upward. Open the shipping carton carefully to prevent any accessory items (i.e. objectives or eyepieces) from dropping and being damaged.
2. Do not discard the molded Styrofoam container. The container should be retained should the microscope ever requires reshipment.
3. Keep the instrument out of direct sunlight, high temperature or humidity, and dusty environments. Ensure that the microscope is located on a smooth, level and firm surface.
4. If any specimen solutions or other liquids splash onto the stage, objective or any other component, disconnect the power cord immediately and wipe up the spillage. Otherwise, the instrument may be damaged.
5. All electrical connectors (power cord) should be inserted into an electrical surge suppressor to prevent damage due to voltage fluctuations.
6. For safety when replacing fuse, be sure the power switch is off, unplug the power cord, and then replace fuse.
7. Confirm that the input voltage indicated on your microscope corresponds to your line voltage. The use of a different input voltage other than that as indicated will cause severe damage to the microscope.

## ii. Care And Maintenance

1. Do not attempt to disassemble any component including eyepieces, objectives or focusing assembly.
2. Keep the instrument clean; remove dirt and debris regularly. Accumulated dirt on metal surfaces should be cleaned with a damp cloth. More persistent dirt should be removed using a mild soap solution. Do not use organic solvents for cleansing.
3. The outer surface of the optics should be inspected and cleaned periodically using an air stream from an air bulb. If dirt remains on the optical surface, use a soft cloth or cotton swab dampened with a lens cleaning solution (available at camera stores). All optical lenses should be swabbed using a circular motion. A small amount of absorbent cotton wound on the end of a tapered stick makes a useful tool for cleaning recessed optical surfaces. Avoid using an excessive amount of solvents as this may cause problems with optical coatings or cemented optics or the flowing solvent may pick up grease making cleaning more difficult. Oil immersion objectives should be cleaned immediately after use by removing the oil with lens tissue or a clean, soft cloth.
4. Store the instrument in a cool, dry environment. Cover the microscope with the dust cover when not in use.

# 1. Components Illustration



- |                           |                        |                                   |
|---------------------------|------------------------|-----------------------------------|
| 1. Eyepiece               | 9. Photo Tube          | 18. Fine Focus Knob               |
| 2. Diopter Ring           | 10. Viewing Head       | 19. Coarse Focus Knob             |
| 3. Eyepiece Tube          | 11. Head Secure Screw  | 20. Tension Ring                  |
| 4. Objective              | 12. Nosepiece          | 21. Brightfield Condenser         |
| 5. Stage                  | 13. Slide Holder       | 22. Aperture Diaphragm Adjust Bar |
| 6. Condenser              | 14. Intensity Knob     | 23. Field Diaphragm Adjust Ring   |
| 7. Condenser Secure Screw | 15. Fine Focus Knob    | 24. Color Filter Holder           |
| 8. Kohler Attachment      | 16. Stage Adjust Knobs |                                   |
|                           | 17. Condenser Lever    |                                   |

## 2. Installation

### 2.1 Installation of the trinocular viewing head

- 1) Loosen the head secure screw (11) on the top of the microscope frame; remove the plastic cover on the top.
- 2) Insert the dovetail of the viewing head into the socket on the top of the frame; tighten the secure screw (11).

*Caution: Do not release the head from your hand grip until you are sure the head is installed securely.*



### 2.2 Installation of the eyepieces

- 1) Remove the protective caps from the eyepiece tubes (3).
- 2) Insert the eyepieces (1) into the eyepiece tubes (3).

### 2.3 Installation of the objectives

- 1) Turn the coarse focus knob (19) until the mechanical stage (5) is at its lowest position.
- 2) Install the 4X objective into the nosepiece (12). Then in a clock-wise direction, rotate the nosepiece and install each succeeding higher magnification objective.

### 2.4 Installation of darkfield condenser

- 1) Turn the coarse focus knob (19) until the mechanical stage (5) is at its highest position.
- 2) Press down the condenser focus lever (17) to raise the condenser to its highest position.
- 3) Hold the Kohler attachment and pull up carefully to remove the attachment.
- 4) Loosen the condenser secure screw (7) and take off the brightfield condenser (21).
- 5) Put the darkfield condenser into the condenser holder.
- 6) Tighten the secure screw (7) and put back the Kohler attachment.

*Note: Follow the same procedures to replace the darkfield condenser with the brightfield condenser.*

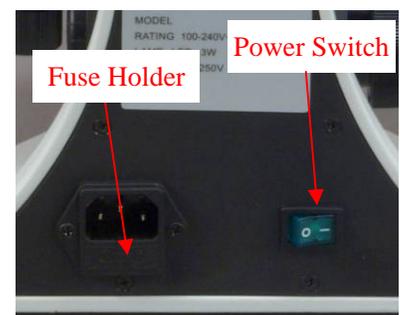


### 2.5 Installation of color filter

Simply put the color filter into the filter holder (23).

### 2.6 Replacing the fuse

- 1) Turn off the power and disconnect the power cord.
- 2) Find the fuse holder at the back of microscope frame, just beneath the power socket.
- 3) Gently pry the fuse holder by a screw driver to take it out.
- 4) Replace the fuse, and then push the fuse holder back in.



### 3. Operation

#### 3.1 Adjusting illumination

- 1) Connect the power cord to the power outlet and the microscope.
- 2) Turn on the power switch.
- 3) Turn the intensity knob (14) to increase or decrease the brightness.

#### 3.2 Placing specimen

- 1) Place a slide on the mechanical stage (5). Use the slide holder (13) to gently secure the slide.
- 2) Turn the X and Y adjustment knobs (16) to position the specimen for viewing.

*Caution: Be sure not to allow an objective to touch a specimen slide when changing objectives.*

#### 3.3 Focusing

- 1) With the 10X objective in position, raise the mechanical stage using the coarse focus knob until the specimen is close to the objective.
- 2) Turn the coarse focus knob until the specimen is in focus. Then use the fine focus knob to obtain a sharp image. You may now switch to another magnification objective.

*Note: When changing the objective magnification, rotate the objective nosepiece until you hear a "click" sound. This ensures the objective is centered in the optical light path.*

#### 3.4 Adjusting brightfield condenser

- 1) Press or lift the condenser focus lever (17) to raise or lower the condenser (21).
- 2) The condenser is raised when using high magnification objectives and lowered when using low magnification objectives.

*Note:*

- *The centering of the condenser and the light axis of the objective are factory adjusted. Do not attempt re-adjustment.*
- *The highest position of the condenser has been factory adjusted. Do not attempt re-adjustment.*

#### 3.5 Adjusting iris diaphragm

Move the iris diaphragm bar (22) left or right to adjust the aperture size.

*Note: The iris diaphragm is designed to adjust the aperture size, not to adjust brightness. If you want to observe the image of the iris diaphragm, remove one eyepiece and look through the tube. You will see a dark circle encroaching on the bottom of the tube.*

#### 3.6 Adjusting interpupillary distance

While observing with both eyes, hold the left and right eyepiece tubes (3), swing in and out the tubes. The interpupillary distance is correct when the left and right fields of view converge completely into one image.

#### 3.7 Adjusting eyepiece diopter

- 1) Using the 10X objective and your right eye only, observe your specimen through the eyepiece and bring it into focus by adjusting the focus knobs.

- 2) Then observe the specimen with your left eye only through the left eyepiece. If the specimen is not in focus, rotate the diopter ring until a sharp image is obtained.

### 3.8 Adjusting tension

The tightness of the tension adjustment ring has been pre-set at the factory. If the mechanical stage drops by itself, turn the tension adjustment ring (20) until the tension is maintained.

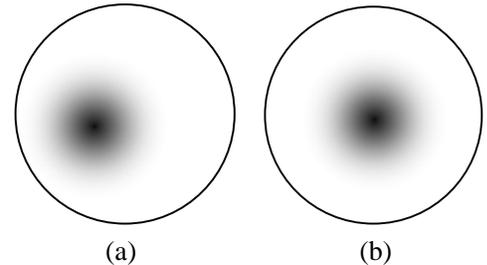
### 3.9 Darkfield observation

- 1) Install darkfield condenser

Follow the procedures in **2.4** to replace the brightfield condenser with the darkfield condenser.

- 2) Centering the darkfield condenser

- i. Turn the 40X objective to the light path.
- ii. Turn the condenser focus knob to slowly lower and raise the condenser till a dark spot showed in the viewing field as shown in the figure (a).
- iii. Turn the condenser translational centering screws to move the dark spot to the center as shown in the figure (b).



- 3) Raise the condenser till the top lens is close to the opening of stage. Apply a drop of immersion oil on the front lens of condenser.
- 4) Place the slide on the stage.
- 5) Raise the condenser and let the oil drop contact the underside of the slide. If air bubbles exist in the oil, clean the oil from the condenser lens and bottom of slide and repeat the procedures.
- 6) Following the procedures from 3.1 to 3.7 to adjust the microscope and observe.
- 7) If observe with 100X objective, insert the funnel stop into the objective (see the figure) and then tighten it.



*Note: The darkfield condenser won't work if no oil drop applied on the condenser top lens.*

### 3.10 Photo/video observing, capturing and recording

- 1) Pull the photo/eyepiece switch bar 14 (see Fig.1) out to the photo position.
- 2) Mount microscope camera (electronic eyepiece) onto the photo tube and connect the USB cable from camera to computer.
- 3) Open image observing software to examine. You also can capture images or record live videos through the software, depending on the functions provided by the software. Please refer to the operation manual of the camera.
- 4) If a conventional camera used, you may need an adapter to connect your camera to the photo tube adapter.

**Note:** Camera is sold separately.

## 4. Specifications

Model	M93SBDK
Total Magnification	40X, 80X, 100X, 200X, 400X, 800X, 1000X, 2000X
Eyepieces	A pair of widefield 10X A pair of widefield 20X
Objectives	Chromatic 4X, 10X, 40X(spring), 100X(spring, oil), A funnel stop for 100X
Viewing Head	Trinocular, inclined 30°, swiveling 360° Interpupillary distance 48-75 mm Adjustable diopter ring on left eyepiece tube
Optical Tube Length	160mm
Nosepiece	Revolving quadruple
Stage	Double layer mechanical stage Dimension: 142 mm x 132 mm (5-5/8" x 5-3/16") Movement range: 75 mm X 40 mm ( 3" x 1-9/16" )
Condenser	Brightfield: Abbe NA=1.25, w/ iris diaphragm and filter holder Darkfield: Immersion NA=1.36 – 1.25, Condenser focus control lever for quick adjustment
Aperture Diaphragm	Iris diaphragm, attached on the condenser
Focusing Mechanism	Coaxial coarse and fine focusing knobs on left side Fine focusing knob on right side Minimum fine focusing adjustment at 0.002mm, range 22mm Tool-free tension adjustment
Illumination	Transmitted, 3W LED light (equivalent to 30W halogen) Variable intensity Kohler illumination attachment with field iris diaphragm
Power Supply	AC 100V-240V, 50/60HZ, 0.5A
Dimension	12-3/16" x 7-7/8" x 17-1/8" (31 cm x 20 cm x 43.5 cm)
Net weight	11 lb 8 oz (5.15 kg)

## 5. Troubleshooting Guide

<b>OPTICAL PROBLEMS</b>		
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Darkness at the periphery or uneven brightness in the field of view	Revolving nosepiece not in click stop position	Revolve the nosepiece to click-stop position by swinging the objective correctly into the optical path
Dirt or dust on the view	Dirt or dust on the lens eyepiece, condenser, objective, collector lens or specimen	Clean the lens with a camera cleaning kit
Poor image quality	No slide cover attached to the slide	Attach a 0.17mm slide cover
	Slide cover is too thick or thin	Use a slide cover of the appropriate thickness (0.17mm)
	Slide may be upside down	Turn slide over so the cover-glass faces up
	Immersion oil is on a dry objective (especially the 40x)	Check the objectives, clean if necessary
	No immersion oil used with 100x objective	Apply immersion oil
	Air bubbles in immersion oil	Remove bubbles
	Condenser aperture is closed or open too much	Open or close properly
	Condenser is positioned too low or too high	Raise or lower the condenser

<b>ELECTRICAL PROBLEMS</b>		
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Lamp does not light when switched on	No electrical power	Check power cord connection
	LED bulb burnt out	Replace bulb
	Fuse blown out	Replace fuse

<b>IMAGE PROBLEMS</b>		
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Image moves while focusing	Specimen rises from stage surface	Secure the specimen in the slide holder
	Revolving nosepiece is not in the click-stop position	Revolve the nosepiece to the click-stop position
Image tinged yellow	Lamp intensity is too low	Adjust the light intensity by turning the intensity control knob
Image is too bright	Lamp intensity is too high	Adjust the light intensity by turning the intensity control knob
Insufficient brightness	Lamp intensity is too low	Adjust the light intensity by turning the intensity control knob
	Aperture diaphragm too closed	Open to the proper setting
	Condenser position too low	Raise the condenser

<b>MECHANICAL PROBLEMS</b>		
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
Image will not focus with high power objectives	Slide upside down	Turn the slide over so the cover glass faces up
	Cover glass is too thick	Use a 0.17mm cover slip
High power objective contacts slide when changed from low power objective	Slide upside down	Turn the slide over so the cover glass faces up
	Cover slip is too thick	Use a 0.17mm cover slip
	Diopter adjustment is not set properly	Readjust the diopter settings
Slippage of focus when using the coarse focusing knob. Fine focus is ineffective	Tension adjustment is set too low	Tighten the tension
	Tension adjustment is set too high	Loosen the tension

<b>DARKFIELD PROBLEMS</b>		
<b>Problem</b>	<b>Cause</b>	<b>Solution</b>
It's totally dark in the view field	The light is not on	Turn on the light
	There is no oil in between the condenser top lens and slide	Apply a drop of oil on the condenser top lens and let it contact the underside of slide
	The darkfield condenser is not in the right position	Raise or lower the condenser
The illumination is insufficient	The intensity of light is too low	Adjust the intensity knob to higher position
	The condenser is not in the right position	Lower or raise the condenser slightly to the position that the specimen is the brightest. Make sure the oil contact the slide during the adjustment.
	The condenser is not centered properly	Adjust the centering screws to center the condenser
Image of the specimen is not clear and lacking in sufficient contrast	The specimen is not suitable for darkfield observation	Switch to brightfield