MAGUS METAL D600
METALLURGICAL DIGITAL MICROSCOPE

USER MANUAL

MAGUS

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Before using the microscope, please read this user manual carefully to study the instrument design, operation modes and procedures, operational limitations, and safety precautions.

Due to the continuous improvements in the microscope design, this manual may not reflect minor design changes that do not affect the microscope performance and operation procedures.

SAFETY PRECAUTIONS

MICROSCOPE

1. To avoid electric shock or fire, switch off and unplug the microscope before assembling the microscope, replacing the bulb or fuse.
2. Do not disassemble the microscope, except for the removable parts specified in this manual. This can seriously damage its performance. In case of malfunction, please contact a qualified service center.
3. Make sure that the input voltage of the microscope matches that of the local power supply. Using the power supply with the wrong input voltage may cause a short circuit or fire.
4. Using an incorrect bulb, fuse, or power cord may damage the microscope or cause a fire. The power cord must be grounded reliably.
5. In order to avoid a short circuit or any other malfunction, do not expose the microscope to high temperatures or humid or moist environments for a long period of time.
6. If water splashes on the microscope, immediately switch the power off, unplug the power cord, and wipe off the water with a dry cloth.
7. The microscope light bulb generates high temperatures during operation. To avoid burns, do not touch the collector lens or the bulb itself for 10 minutes after the lights have been switched off. To prevent fire, do not place paper or flammable or explosive materials near the air vents on the underside of the base.
8. The microscope employs a coaxial coarse/fine focusing mechanism. Do not turn the left/right coarse/fine focusing knobs in opposite directions. When the limit is reached, you should no longer rotate the coarse focusing knob.
9. Do not expose the microscope to direct sunlight or other light sources. Do not expose the microscope to high temperatures, humidity, or dust; otherwise, it may cause condensation, mold growth, or contamination of the optical parts.
10. Do not touch the lens surfaces with your fingers. Use a brush and special lens-cleaning solution to keep the lenses clean.

11. Bulb installation:

— Do not touch the glass surface of the bulb with your bare hands. When installing the bulb, wear gloves or wrap the bulb with a cotton cloth.

— Use a clean cotton cloth moistened with alcohol-based disinfectant to wipe dirt off the surface of the bulb. Dirt may etch the surface of a bulb, thereby reducing its brightness and shortening its life.

— Check the bulb contact condition. If contact damage occurs, the bulb may stop working or cause a short circuit.

— When replacing the bulb, its base should be inserted as deeply as possible into the socket. If the bulb is not correctly inserted, it may pop out of the socket or cause a short circuit.

DIGITAL CAMERA

1. Never view the sun, another bright source of light or a laser through a camera - THIS IS DANGEROUS FOR YOUR EYESIGHT!
2. Do not disassemble the camera yourself.
3. Keep the camera away from moisture and do not use it in the rain.
4. Protect the camera from shocks, excessive stress from other objects.
5. Store the camera away from corrosive environments, household and car heaters, switched-on light bulbs and open flames.
6. If there is dirt on the optical surfaces, first blow off dust and small particles or brush them off with a soft brush, then clean the surface with a soft, clean cloth moistened with alcohol or ether.
7. If any instrument part or power component has been swallowed, seek medical attention immediately.

CONTENTS

MAGUS Metal D600 Metallurgical Digital Microscope has been designed and tested in accordance with the international safety standards. If properly used, the microscope is safe for the customer's health, life, property, and the environment. Proper maintenance of the microscope is a prerequisite for its reliable and safe operation.

1 DESCRIPTION

PURPOSE

The microscope is designed for studying the microstructure of metals, alloys, semiconductor materials, paint coatings, and other opaque objects in reflected light on flat and polished thin sections. The reflected light illuminator allows for the brightfield and polarization microscopy techniques. The built-in transmitted light illuminator is suitable for examining translucent films and objects: air, water, oil samples, etc.

The microscope is used in the metallurgical, engineering, chemical, aerospace, nuclear, and energy industries, as well as in research laboratories and technical universities.

SPECIFICATIONS (TABLE 1)

Microscope	
Magnification, x	50–600 (50–1000/1250/1500/2000/ 2500**)
Tube length	Infinity (∞)
Microscope head	Trinocular (Siedentopf type) 30° inclined Interpupillary distance: 48–75mm Eyepiece diameter: 30mm Diopter adjustment (left barrel): ±5dp
Eyepieces, magnification, x/field, mm	10x/22mm, eye relief: 10mm 10x/22 mm with a scale (scale division is 0.01mm*); 12.5x/14mm*; 15x/15mm* 16x/15mm*, 20x/12mm*; 25x/9mm*
Revolving nosepiece	5 objectives
Optical design	Infinity plan achromatic objectives, parfocal distance: 45mm
Objectives, magnification, x/aperture, working distance	PL L 5x/0.12 WD: 26.1mm PL L 10x/0.25 WD: 20.2mm PL L 20x/0.40 WD: 8.8mm* PL L 40x/0.60 WD: 3.98mm PL L 50x/0.70 WD: 3.68mm* PL L 60x/0.70 WD: 2.08mm PL L 80x/0.80 WD: 1.25mm* PL L 100x/0.85 (dry) WD: 0.4mm*
Stage	Two-axis mechanical stage Stage size: 210x140mm XY moving range: 75x50mm With rectangular glass stage plate
Focusing mechanism	Coaxial coarse & fine focusing knobs on both sides Coarse focusing travel: 25mm Fine focusing scale value: 2µm Coarse focusing lock knob Coarse focusing tension adjusting knob
Illumination method	Transmitted and reflected light
Reflected light illumination	Built-in field and aperture diaphragms, built-in analyzer and removable polarizer Color filters: frosted glass, yellow, green, and blue

Reflected light source	12V, 30W halogen bulb, brightness-adjustable
Transmitted light illumination	Built-in field diaphragm Abbe condenser (NA 1.25). Centerable With adjustable aperture diaphragm and flip-down lens. Height-adjustable Screw type fastening
Transmitted light source	12V, 30W halogen bulb, brightness-adjustable
AC power supply: Voltage Frequency	 220±22V 50Hz
Operating temperature range	+5... +35 °C
Operating humidity range	20... 80%
Dimensions without package	260×545×456mm
Package dimensions	305×750×352mm
Weight without package	12kg
Weight with package	14.5kg

Digital camera

Number of megapixels	6.3
Sensor	SONY Exmor CMOS
Color/monochrome	color
Maximum resolution, px	3072x2048
Sensor size	1/1.8" (7.37x4.92mm)
Pixel size, µm	2.4x2.4
Light sensitivity	425mV with 1/30s
Signal/noise ratio	0.15mV with 1/30s
Exposure	0.02ms–15s
Video recording	+
Frame rate, fps at resolution, px	59@3072x2048 59@1536x1024
Image format	*.jpg, *.bmp, *.png, *.tif
Video format	*.wmv, *.avi, *.h264 (Win 8 or above), *.h265 (Win 10 or above)
Spectral range, nm	380–650 (IR-filtered)
Shutter type	ERS (electronic rolling shutter)
White balance	auto/manual
Exposure control	auto/manual
Software features	image size, brightness, exposure
Port	USB 3.0, 5Gbps
System requirements	Windows 8/10/11 (32bit and 64 bit), Mac OS X, Linux, up to 2.8GHz Intel Core 2 or higher, minimum 2GB RAM, USB 3.0 port, CD-ROM, 17" or larger display
Software	MAGUS View
Mount type	C-mount
Body	cast aluminum
Power supply	DC 5V from the USB port of the computer
Operating temperature range, °C	–10... +50
Operating humidity range, %	30... 80

*** Not included in the kit, available on request.**

**** The magnification of the microscope can be increased by using optional eyepieces and objectives.**

The manufacturer reserves the right to make changes to the product range and specifications without prior notice.

MICROSCOPE KIT

The microscope kit includes the following main components:

— stand with built-in power source, transmitted light illuminator, condenser, coarse and fine focusing mechanism, stage, and revolving nosepiece
— reflected light illuminator with lamphouse
— trinocular head
— set of objectives and eyepieces
— digital camera
— set of spare parts and accessories
— packaging
— user manual.

See Section 8 of the User manual for a full kit contents.
The general view of the microscope is given in Fig. 1, 2 and 3.

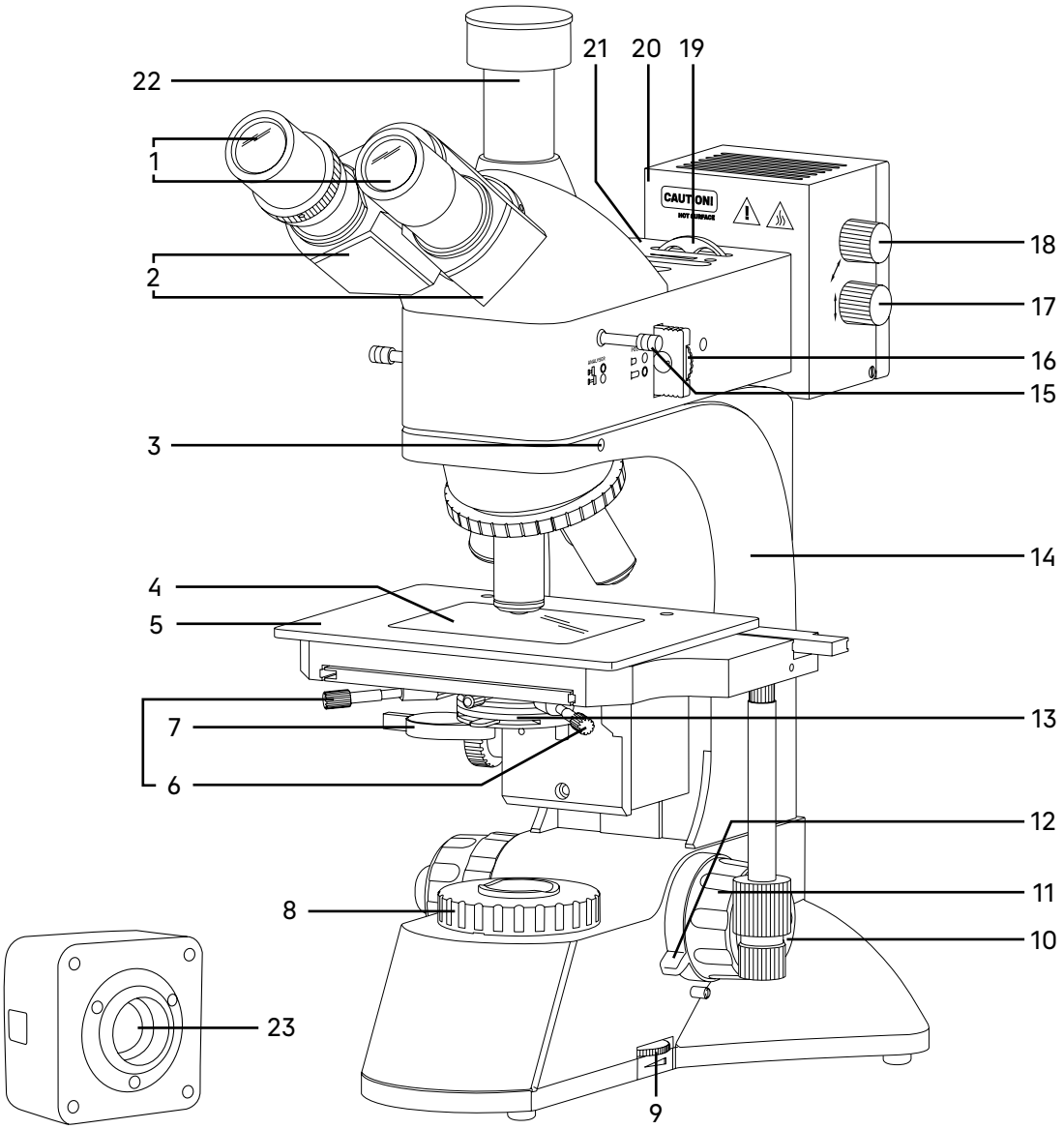


Fig. 1. MAGUS Metal D600 Microscope. View from the right

1. Eyepieces
2. Eyepiece tubes
3. Locking screw of the reflected light illuminator
4. Glass stage plate
5. Stage
6. Condenser centering knobs
7. Flip-down top condenser lens
8. Field diaphragm of transmitted light illuminator
9. Brightness adjustment ring
10. Fine focusing knob
11. Coarse focusing knob
12. Coarse focusing lock knob
13. Abbe condenser
14. Stand
15. Analyzer
16. Polarizer
17. Up/down lamp adjustment knob
18. Left/right lamp adjustment knob
19. Color filter set
20. Lamphouse with halogen bulb
21. Reflected light illuminator
22. Trinocular tube
23. Digital camera

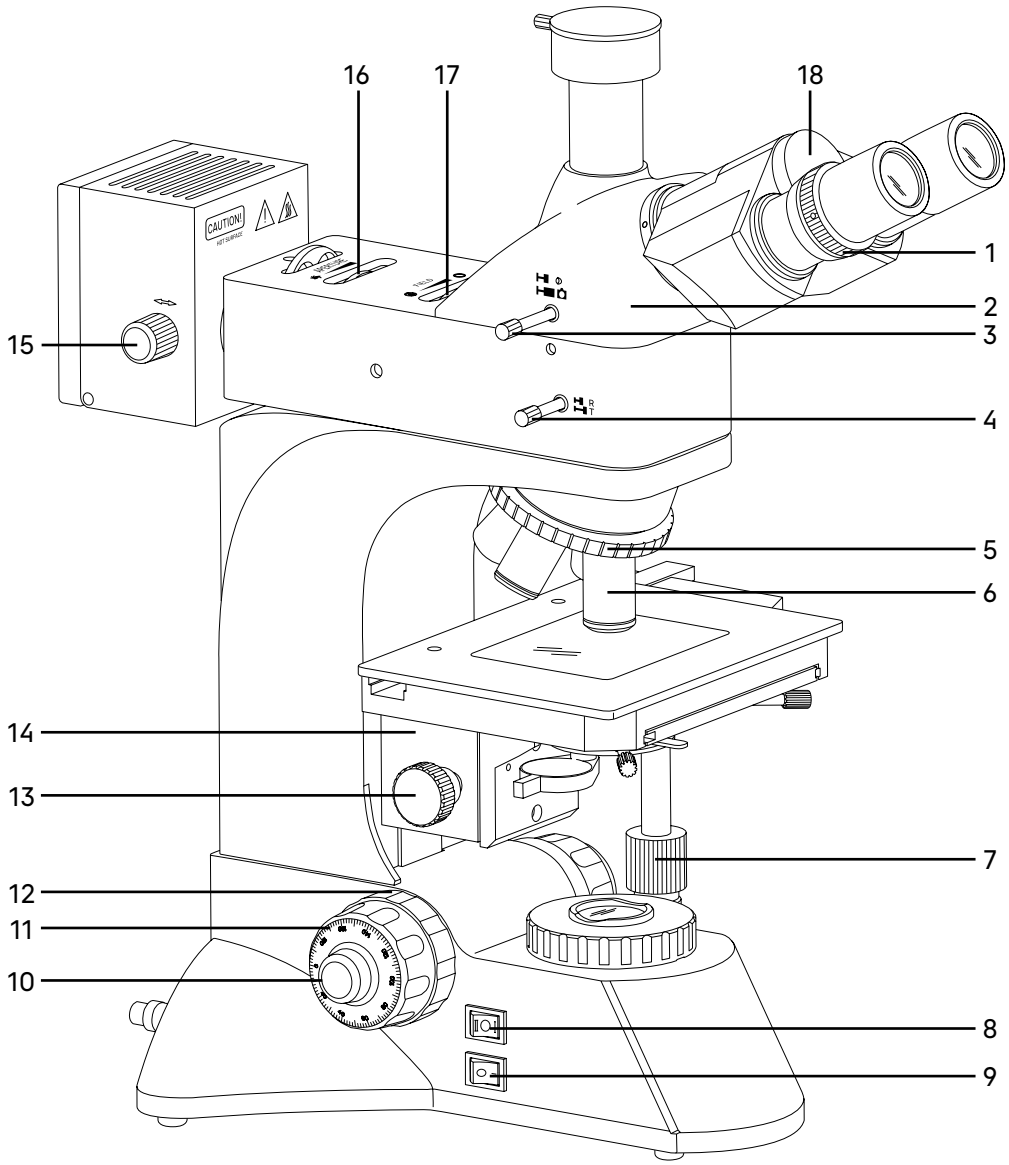


Fig. 2. MAGUS Metal D600 Microscope. View from the left

1. Diopter adjustment ring
2. Microscope head
3. Beam splitter lever
4. Reflected/transmitted light switch lever
5. Revolving nosepiece
6. Objectives
7. Stage control knobs
8. Transmitted/reflected light illuminator switch
9. ON/OFF switch
10. Fine focusing knob
11. Coarse focusing knob
12. Coarse focusing tension adjusting knob
13. Condenser focus knob
14. Condenser mount
15. Lamp focusing knob
16. Aperture diaphragm of the reflected light illuminator
17. Field diaphragm of the reflected light illuminator
18. Interpupillary distance adjustment scale

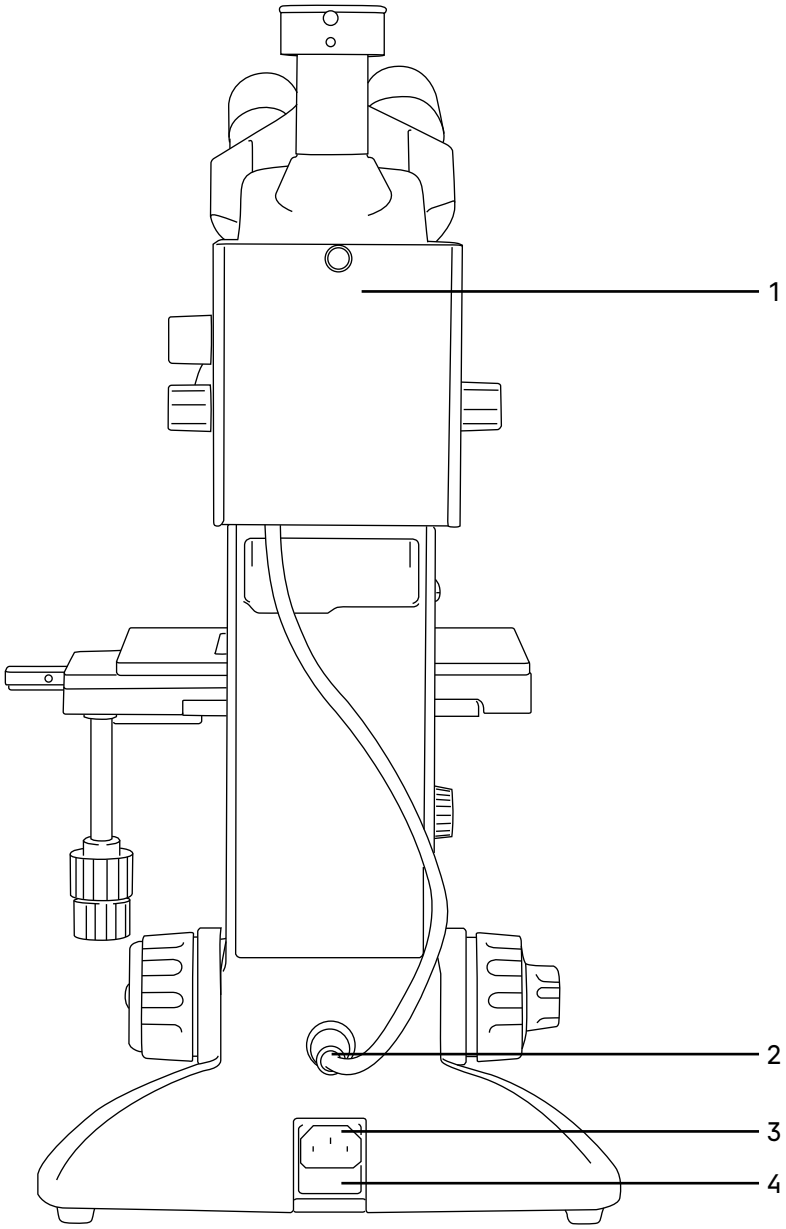


Fig. 3. MAGUS Metal D600 Microscope. Rear view

1. Cover of the lamphouse with a halogen bulb
2. Connector for the power cord of the reflected light illuminator
3. Connector for the microscope power cord
4. Fuse holder and slot for a spare fuse

2 COMPONENTS

STAND

The stand is a one-piece structure with the Y-shaped base.

Parts attached to the stand 14 (Fig. 1):

— revolving nosepiece 5 (Fig. 2) with objectives 6 (Fig. 2)

— stage 5 (Fig. 1)

— condenser mount 14 (Fig. 2).

Inside the stand is the focusing mechanism and the power supply for the illuminator. The power supply converts AC voltage to the required voltage to power the halogen bulbs of the transmitted and reflected light illuminators.

There is an ON/OFF switch 9 (Fig. 2) on the left side of the base. The power is on when the switch is in "–" position. The power is off when the switch is in "0" position.

There is also a transmitted/reflected light switch lever 8 (Fig. 2) on the left of the base. Position "I" corresponds to the transmitted light illuminator, position "II" – to the reflected light illuminator.

There is a brightness adjustment ring 9 (Fig. 1) on the right side of the base.

The back panel of the microscope stand contains a connector for the power cord of the reflected light illuminator 2 (Fig. 3), a fuse holder and a slot for the spare fuse 4 (Fig. 3), and a connector for the AC power cord 3 (Fig. 3), which connects the microscope to a 220V AC outlet.

FOCUSING MECHANISM

The focusing mechanism is located inside the microscope stand. The mechanism has coaxial design: Coarse and fine focusing knobs, coarse focusing tension adjustment, and coarse focusing lock are mounted on the same axis.

Focusing on the specimen is achieved by adjusting the height of the stage 5 (Fig. 1). Coarse focusing is performed by rotating the coaxial knobs 11 (Fig. 1 and 2) on both sides of the microscope stand.

Fine focusing is performed by rotating the knobs 10 (Fig. 1 and 2) on both sides of the microscope stand. Fine focusing allows for more precise focusing on the specimen and re-focusing the microscope to get an accurate image resolution when changing objectives.

The coarse focusing tension adjusting knob 12 (Fig. 2) is the ring between the stand and the coarse focusing knob on the left side. The ring adjusts the coarse focusing tension so that the tension is comfortable for the user, but the stage does not lower spontaneously during operation.

The coarse focusing lock knob 12 (Fig. 1) is located on the right side. Once the coarse focusing is completed, we recommend rotating the knob clockwise as far as it will go. This secures the coarse focusing position to allow for rapid re-focusing after the specimen is changed.

Fine focusing scale value: 2μm.

To prevent the focusing mechanism from damage:

— do not turn the left/right coarse/fine focusing knobs in opposite directions

— do not rotate the coarse focusing knob after the knob reaches its limit.

MICROSCOPE HEAD

Trinocular microscope head: binocular eyepiece tubes with the vertical tube for mounting a camera.

The microscope head 2 (Fig. 2) provides the visual observation of the specimen image.

The interpupillary distance is adjusted by rotating the eyepiece tubes 2 (Fig. 1) in the range of 48–75mm. The distance between the eyepieces matching the observer's interpupillary distance is marked on the adjustment scale 18 (Fig. 2) on the microscope head.

For convenience, the microscope head is inclined at 30°.

Microscope head magnification: 1x.

Eyepiece diameter: 30mm.

The diopter adjustment on the left eyepiece tube is intended to compensate for the observer's ametropia. The axial position of the eyepiece is adjusted by the ring 1 (Fig. 2). The second eyepiece tube is fixed.

A C-mount 1x adapter is installed in the trinocular tube 22 (Fig. 1) of the microscope head to fix the camera (video eyepiece). The camera is used to transmit the image to a computer screen or monitor/TV. You can switch the light path to the trinocular tube using the lever 3 (Fig. 2). The lever has two positions: 100/0 and 0/100.

EYEPIECES

The microscope kit includes eyepieces 1 (Fig. 1). The eyepieces have long eye relief and are designed to work with or without glasses.

Eyepiece diameter: 30mm.

Eyepiece magnification: 10x. Field of view: 22mm. Eye relief: 10mm.

Eyepieces with a different magnification and a 10x eyepiece with 0.1mm scale are not included and are optional.

REVOLVING NOSEPIECE

Revolving nosepiece 5 (Fig. 2) allows for the installation of five objectives 6 (Fig. 2). Objectives are changed by rotating the knurled ring of the revolving nosepiece until the objective fits into place.

Do not rotate the revolving nosepiece by holding the objectives.

The revolving nosepiece rotates clockwise and counter-clockwise.

It is mounted to the upper part of the microscope stand. The objectives are screwed clockwise into the revolving nosepiece in order of increasing magnification. For convenience, the objectives are turned "away from the observer".

OBJECTIVES

The objectives are designed for the infinity-corrected tube length. Parfocal distance: 45mm, linear field of view: 22mm. The objectives have long focal length.

Each objective has the following inscriptions: "PL L" correction type, linear magnification, numerical aperture, "∞" tube length, "0" or "–" coverslip thickness, objective magnification color code according to the international standard. Objectives with the "∞/0" inscription may be used with specimens without coverslips. Objectives with the "∞/–" inscription may be used with specimens with or without coverslips.

The specifications of the objectives (Table 2):

Objective identification	Microscopy technique	Magnification	Numerical aperture	Working distance, mm	Color marking
PL L 5x/0.12	Brightfield	5x	0.12	26.1	Red
PL L 10x/0.25	Brightfield	10x	0.25	20.2	Yellow
PL L 20x/0.40	Brightfield	20x	0.4	8.8	Green
PL L 40x/0.60	Brightfield	40x	0.65	3.98	Light blue
PL L 50x/0.70	Brightfield	50x	0.70	3.68	Light blue
PL L 60X/0.70	Brightfield	60	0.70	2.08	Blue
PL L 80X/0.80	Brightfield	80	0.80	1.25	Blue
PL L 100x/0.85	Brightfield	100x	0.85	0.4	White

If objectives are damaged, we recommend repairing them in the service center.

The objectives are intended to image the specimens through air. Do not use immersion oil.

STAGE

The X/Y stage 5 (Fig. 1) allows for moving the specimen in two mutually perpendicular directions using the knobs 7 (Fig. 2) located on the same axis.

Stage size: 210mm×140mm. The stage moving range is 75mm in X-axis direction and 50mm in Y-axis direction. The glass stage plate 4 (Fig. 1) allows working with transparent and translucent objects.

The sample is placed with its examined surface facing upwards.

CONDENSER

The basic microscope kit comes with the brightfield N.A. 1.25 Abbe condenser.

The condenser 13 (Fig. 1) is installed using the mount 14 (Fig. 2) under the microscope stage. It has screw type fastening. You can move the condenser along the optical path of the microscope using the condenser focus knob 13 (Fig. 2) located on the left of the observer under the stage. The condenser focusing range is at least 13mm.

The condenser is centered in the optical path using two screws 6 (Fig. 1).

The aperture diaphragm is adjusted (opened/closed) by the knob on the condenser 13 (Fig. 1). For best image quality, the aperture diaphragm of the brightfield condenser should be closed to approximately 1/3 of the objective exit pupil diameter.

There is a frame with a flip-down lens 7 (Fig. 1) attached to the brightfield condenser from below, which is used to improve illumination and obtain a clearer image of the specimen. When 4x objectives are used, it is recommended to introduce it into the optical path.

TRANSMITTED LIGHT ILLUMINATOR

The illuminator built into the base of the microscope includes a collector with the field diaphragm 8 (Fig. 1) and a light source – a halogen bulb.

The bulb is powered from the AC power supply through a power source built into the stand. The illuminator is switched on by means of an ON/OFF switch 9 (Fig. 2) and a switch 8 (Fig. 2). The brightness is adjusted using the ring 9 (Fig. 1).

The field diaphragm is adjusted (opened/closed) by rotation of the mount ring 8 (Fig. 1).

REFLECTED LIGHT ILLUMINATION SYSTEM

The reflected light illuminator is shown in Fig. 4.

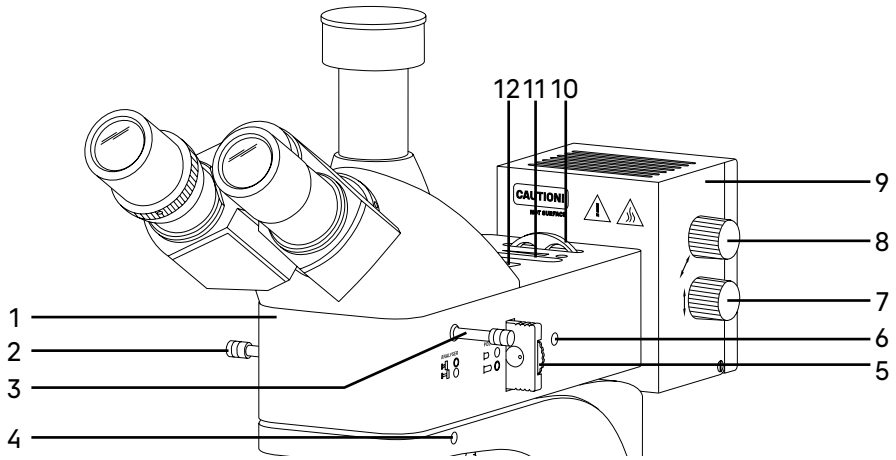


Fig. 4. Reflected light illuminator

1. Illuminator body
2. Reflected/transmitted light switch lever
3. Analyzer
4. Illuminator locking screw
5. Polarizer
6. Aperture centering knob of the reflected light illuminator
7. Up/down lamp centering knob
8. Left/right lamp centering knob
9. Reflected light illuminator lamphouse
10. Ring with color filter set
11. Reflected-light aperture diaphragm ring
12. Reflected-light field diaphragm ring

The illuminator body 1 (Fig. 4) is mounted on top of the stand and secured with the screw 4 (Fig. 4) using an Allen wrench. The illuminator body houses:

— a polarizer/analyzer set: rotating polarizer 5 (Fig. 4) and built-in analyzer 3 (Fig. 4)

— a field diaphragm 12 (Fig. 4) and an aperture diaphragm 11 (Fig. 4)

— a fixed ring with a color filter set 10 (Fig. 4) that has five positions, including a free slot and 4 filters: frosted glass, yellow, green, and blue

— lever 2 (Fig. 4) for switching to the reflected/transmitted light mode. For transmitted light observations (to study transparent and translucent films and objects), pull out the lever 2 (Fig. 4) all the way; to enable the reflected light microscopy (to illuminate opaque objects, such as metals and alloys, and observe the surface of a sample to reveal its texture, microstructure, and defects), set the lever to the pushed-in position.

There is a connection adapter on the illuminator, by means of which the lamphouse with the reflected light illuminator is installed on the illuminator body and secured to it with a screw.

The microscope head is mounted on top of the illuminator body and secured with a screw.

POLARIZER/ANALYZER SET

To allow the polarized light observations of opaque objects, the microscope is equipped with a polarizer/analyzer set, which includes a built-in analyzer and a removable polarizer.

The polarizer 5 (Fig. 4) is located in the illuminator between the light source and objectives. The polarizer has two positions: free slot and polarization filter. The polarizer rotates 0–360°. It should be inserted all the way in to be introduced into the optical path. Polarized light is transmitted through the objective to the specimen.

The analyzer 3 (Fig. 4) is located between the objective and the microscope head. The analyzer has two positions: free slot and polarization filter. It should be inserted all the way in to be introduced into the optical path.

You should rotate the polarizer ring to change the angle of crossed rays.

LAMPHOUSE

The lamphouse 9 (Fig. 4) is secured to the illuminator 1 (Fig. 4). Inside the lamphouse is the light source – halogen bulb. The bulb is centered on three axes by the knobs 15 (Fig. 2) and 7, 8 (Fig. 4).

The halogen bulb heats up during operation, so there is a grid on the lamphouse for natural cooling of the light source.

Do not place anything on the lamphouse or cover it with anything to avoid overheating the bulb.

The cable of the illuminator connects the power supply built into the stand and the light source in the lamphouse.

There is a collector lens where the lamphouse is attached to the stand.

COLOR FILTERS

The microscope kit includes a fixed slider with color filters 19 (Fig. 1). The slider has 5 positions: frosted glass, yellow, green and blue filters, and a free slot. Color filters help to properly adjust color reproduction depending on the specimen, improve color balance, and enhance image contrast and brightness.

DIGITAL CAMERA

The digital camera is intended for the brightfield observations. It features low noise and high light sensitivity.

The camera is mounted into the trinocular tube using the C-mount adapter from the microscope kit.

The camera is powered through the USB port of a computer.

3 UNPACKING AND ASSEMBLING

The assembly procedure is given in Fig. 5.

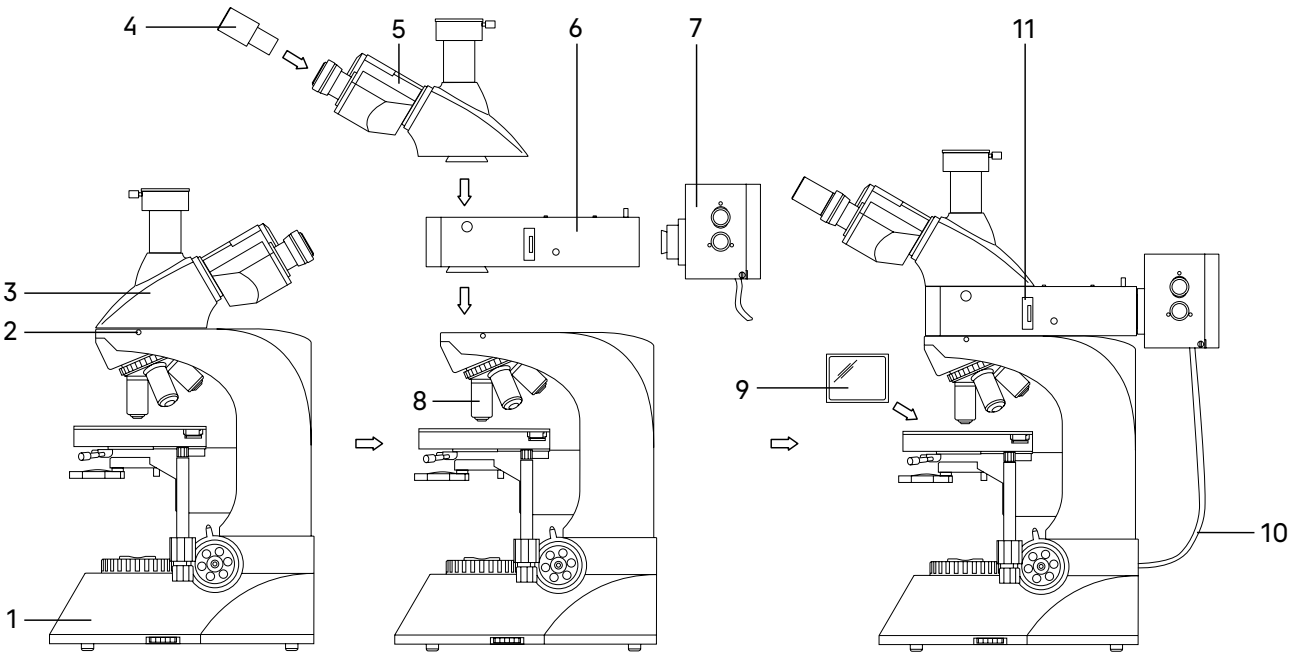


Fig. 5. Assembling the microscope

1. Stand
2. Attachment screw
3. Microscope head
4. Eyepieces
5. Eyepiece tubes
6. Illuminator body
7. Lamphouse
8. Objectives
9. Glass stage plate
10. Reflected light illuminator power cord
11. Slot for polarizer

1. Unpack the microscope and check the scope of delivery using Section 8 of the User Manual.
2. Remove the stand **1** and the microscope head **3** from the package. Place the stand on a stable work table and remove packaging and the dust cover.
3. Loosen the attachment screw **2** using the Allen wrench from the microscope kit and remove the microscope head from the stand.
4. Remove the reflected light illuminator **6** and lamphouse **7** from packaging. Remove the dust caps from the illuminator.
5. Mount the illuminator **6** on the stand **1**. Secure it with the attachment screw **2** using an Allen wrench.
6. Place the microscope head **3** on the illuminator **6**. Turn the illuminator so that the eyepiece tubes face the stage. Secure the attachment screw on the left side of the microscope using an Allen wrench.
7. Remove the dust caps from the eyepiece tubes.
8. Insert the eyepieces **4** into the tubes **5** of the microscope head. Rotate the eyepieces, making sure they are tightly seated in the tubes.
9. Mount the lamphouse **7** on the illuminator **6**. Secure the attachment screw using an Allen wrench.
10. Plug the power cord of the reflected light illuminator **10** to the power output connector on the stand.
11. Remove the glass stage plate **9** from packaging. Place it on the stage.

12. Insert the objectives **8** into the slots of the revolving nosepiece in increasing order of magnification.
13. Insert the polarizer into the slot **11** with the correct side (arrow facing yourself) as far as it will go.
14. Plug the power cord to the connector on the stand **1**. Plug the power cord into an AC outlet.
15. Make sure that all the components are securely and safely mounted.
16. Check and sort the supplied accessories and tools in the correct order. Keep them in proper order to avoid confusion.
17. Keep the packaging should you need to transport the microscope.
18. Once you have completed observations, switch off the power supply, wait for the lamp to cool down, and cover the microscope with the dust cover.

4 BRIGHTFIELD OBSERVATIONS IN TRANSMITTED LIGHT

SWITCHING ON THE ILLUMINATION

Before switching on the ON/OFF switch, make sure that the input voltage of the microscope power supply matches the local mains voltage. If not, do not switch on the microscope. Improper input voltage may result in a short circuit or fire.

Turn the ON/OFF switch 1 (Fig. 6) to "–" position. Adjust the brightness using the ring 2 (Fig. 6) so that the light brightness is 70% of full power.

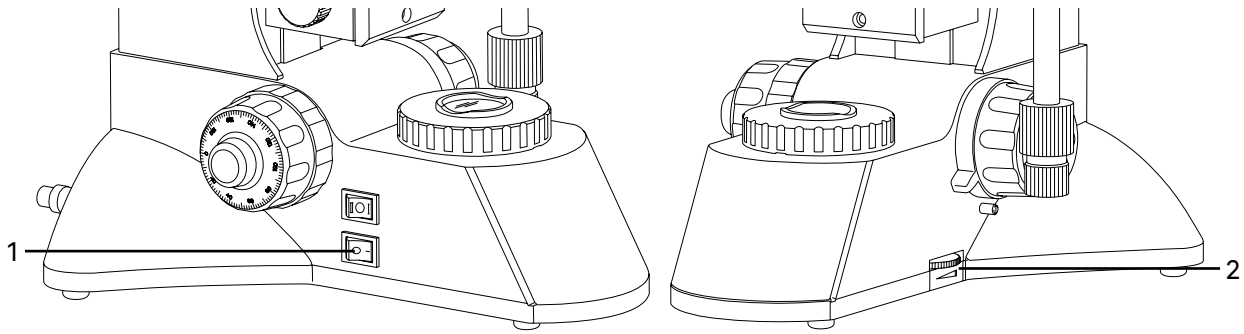


Fig. 6. Switching on the illumination and adjusting the brightness

Do not keep the brightness adjustment ring in the maximum brightness position for a long period. This may shorten the life of the bulb. Before switching off the microscope, reduce the light intensity to the minimum.

PLACING THE SPECIMEN

Place the specimen in the center of the stage 1 (Fig. 7).

The stage attachment features an XY control system. The control knobs are coaxial, i.e. located on the same axis.

The knob 2 (Fig. 7) controls Y-axis movement, the knob 3 (Fig. 7) controls X-axis movement. Moving range: 75mm in X-axis direction and 50mm in Y-axis direction.

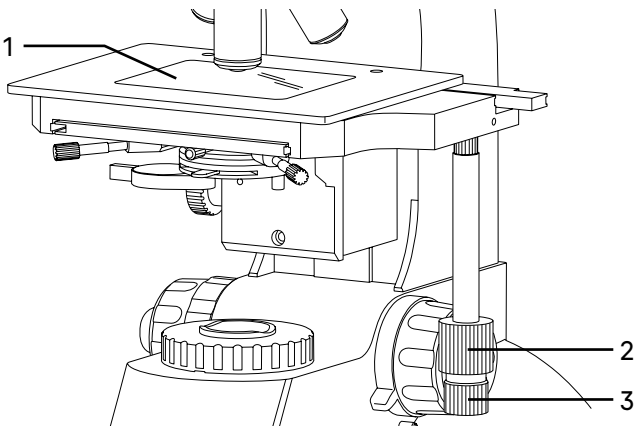


Fig. 7. Placing the specimen

USING THE BEAM SPLITTING

Check the position of the beam splitter lever 1 (Fig. 8).

Set it to the "eyepiece observation" position matching the symbol .

Symbol means that the light path is switched to the camera port.

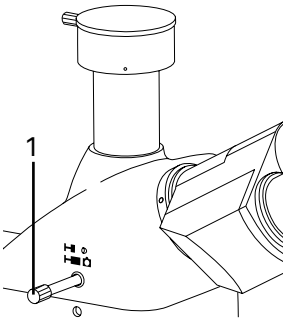


Fig. 8. Using the beam splitting

FOCUSING ON THE SPECIMEN

Focusing on the specimen is achieved by coarse and fine focusing knobs.

Perform the focusing using the 10x objective.

Rotate the revolving nosepiece 1 to place the 10x objective in the optical path, as shown in Fig. 9. The revolving nosepiece is rotated until locked.

Rotate the coarse focusing knob 2 (Fig. 9) to raise the stage all the way up. Looking into the eyepiece and slowly rotating the focusing knob, lower the stage. When you see the specimen image in the field of view, stop rotating the coarse focusing knob.

Rotate the fine focusing knob 3 (Fig. 9) to focus on the specimen and get a crisp image.

Engage the coarse focusing lock knob 4 (Fig. 9).

When using high-magnification objectives, raise the stage all the way up by rotating the coarse focusing knob and enable the coarse focusing lock knob. After that, focus on the specimen using the fine focusing knob.

Adjust the coarse focusing tension.

The tension of the coarse focusing knob is adjustable and is preset by the manufacturer for convenient use. If you need to adjust the tension of the coarse focusing, rotate the coarse focusing tension adjusting knob 5 (Fig. 9). By rotating it clockwise, you loosen the tension, and by rotating it counter-clockwise, you tighten it.

Too high a tension can affect the microscope performance and cause inconvenience in the operation.

Note that when the coarse focusing lock knob is locked in position, you should not rotate the coarse focusing knob after the stage has reached the stop. This may cause the focusing mechanism to break.

If a new specimen has a different thickness and you fail to focus on the object, unlock the coarse focusing lock knob.

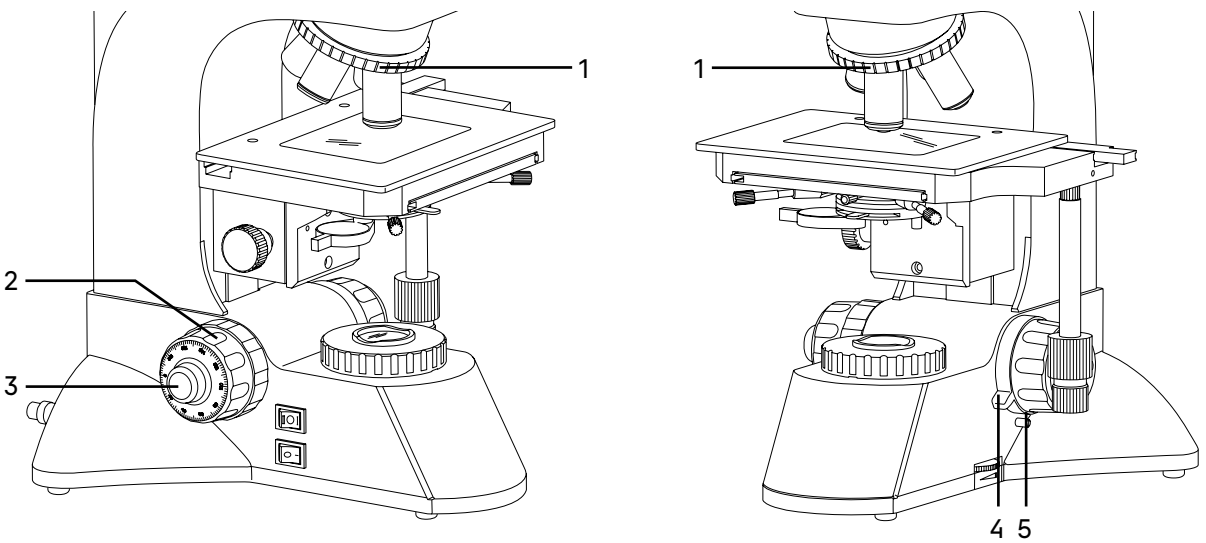


Fig. 9. Focusing on the specimen

ADJUSTING THE EYEPIECE TUBES

To compensate for the observer's ametropia, rotate the diopter adjustment ring **1** on the left eyepiece tube to "0" position, as shown in Fig. 10. While looking through the right eyepiece (with your left eye closed), bring the specimen into focus. While looking through the left eyepiece (with your right eye closed) and not touching the focusing knobs, bring the specimen into sharp focus in the left eyepiece by rotating the diopter adjustment ring **1**.

The adjustment range is ±5 diopters. The number on the ring corresponds to the diopter adjustment of the eyes. The indicator on the side is used for marking.

We recommend memorizing your diopter adjustment value for future reference.

Fig. 10. Adjusting the diopter adjustment mechanism

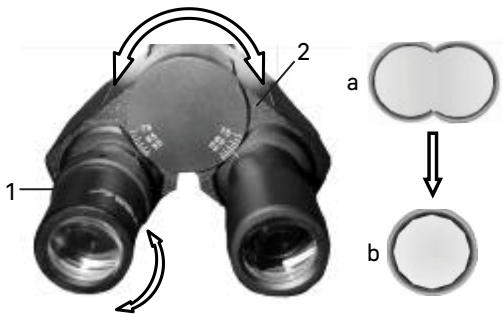


Fig. 11. Adjusting the interpupillary distance

Adjust the interpupillary distance. Adjust the distance between the eyepieces to your interpupillary distance by rotating the eyepiece tubes 2 (Fig. 11) around the central axis until you see a single circular image when looking through the eyepieces with both eyes (Fig. 11a, b).

SETTING UP KÖHLER ILLUMINATION

In the light optical microscope, the image quality depends equally on the optics and on the illumination system, so adjusting the illumination is an important preparatory step. The illumination system affects the image resolution, comfort during long observation, and photo quality when using digital cameras.

The Köhler illumination is one of the features of professional microscopes. Proper set-up of Köhler illumination offers the following benefits:

— the highest possible resolution on each objective

— focusing on the specimen image, removing the images of artifacts: dust on the illuminator or on the specimen, glare

— even illumination of the entire field of view with no edge darkening.

Set up Köhler illumination in transmitted light as follows:

— Make sure that the power supply is on: button 8 (Fig. 12) has been moved to the "–" position.

— Switch on the transmitted light illuminator by setting the switch 7 (Fig. 12) to position "I". Let it run for a while to achieve a stable illumination level.

— Pull out the lever 4 (Fig. 2) to position T for switching to transmitted light observations.

— Place the sample on the stage 3 (Fig. 12), introduce the 10x objective into the optical path, focus on the specimen, and adjust the eyepieces.

— Open the field diaphragm 6 (Fig. 12) and the condenser aperture diaphragm, and raise the condenser all the way up using the condenser focus knob 2 (Fig. 12).

— While looking through the eyepieces, close the field and aperture diaphragms so that only the center of the field of view is illuminated – Fig. 12a.

— Use the condenser centering screws 4 (Fig. 12) to move the image to the center of the eyepiece field of view – Fig. 12b.

— Carefully moving the condenser up and down by rotating the condenser focus knob 2 (Fig. 12), place the condenser into the working position. In this position, the edges of the octagon-shaped image of the closed field diaphragm are sharp and the diffracted blue-green color at the edge of the diaphragm is directed beyond the edge of the diaphragm and not into the field of view.

— Open the field diaphragm until it just disappears outside of the field of view – Fig. 12c. Additional centering may be required.
— Remove the eyepiece from the right tube with no diopter adjustment and, while observing the objective exit pupil, open the aperture diaphragm to 2/3 of the objective exit pupil. This value will be slightly less than the objective aperture.
— Insert the eyepiece into the tube.
— Proceed to the brightfield observations.

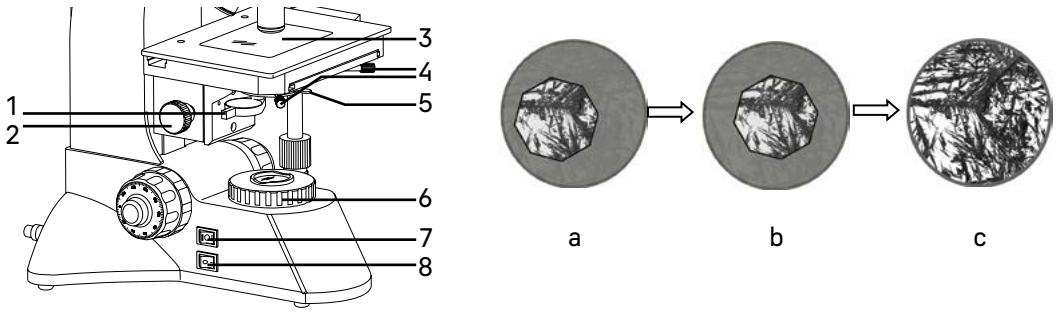


Fig. 12. Centering the condenser

1. Condenser lens for using low-magnification objectives
2. Condenser focus knob
3. Stage
4. Condenser centering screws
5. Aperture diaphragm adjustment knob
6. Field diaphragm
7. Transmitted/reflected light lever
8. ON/OFF switch

When you switch to the objectives of other magnifications, do not change the height of the condenser, only adjust the opening of the field and aperture diaphragms.

While adjusting the illumination, you should keep in mind that changing the size of the field diaphragm only affects the size of the illuminated field. For each objective you should open the field diaphragm so far that its image is close to the edge of the microscope's field of view, not outside of the field. Magnification and field of view values are inversely proportional. High magnification will give a small field of view. Therefore, when you switch to higher magnification objectives, close the field diaphragm. When you switch to lower magnification objectives, open the field diaphragm.

The size of the aperture diaphragm affects the image contrast. Do not increase the image brightness by opening the aperture diaphragm, as this will result in loss of contrast and low resolution. The brightness is only adjustable with the brightness adjustment ring. The greater the magnification of the objective, the larger is its aperture, and the larger is the opening of the condenser diaphragm. The final opening of the aperture diaphragm depends not only on the objective but also on the specimen, so the aperture diaphragm is opened in such a way that the best contrast of the specimen image is produced.

CALCULATING THE TOTAL MAGNIFICATION

The total magnification is the eyepiece power multiplied by the objective power.

For example, if the eyepiece is 10x/22mm, and the objective is 40x/0.60, the total magnification of the microscope is 10 x 40 = 400x.

CALCULATING THE FIELD OF VIEW

The field of view is calculated by dividing the eyepiece field number by the objective magnification.

For example, if the eyepiece is 10x/22mm, and the objective is 40x/0.60, the field of view of the microscope is 22mm/40x = 0.55mm.

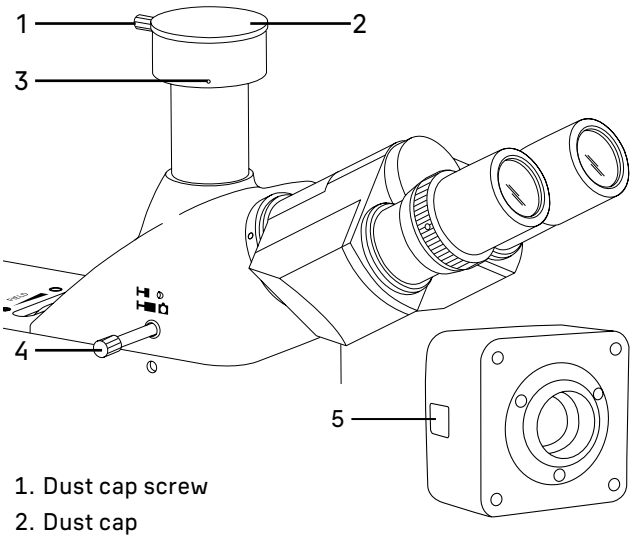
A stage micrometer (calibration slide) is used to accurately determine the field of view of the microscope.

USING THE DIGITAL CAMERA

The digital camera is intended for the brightfield observations. The camera is equipped with a 6.3MP sensor and it produces a realistic image in 4K resolution (3072x2048 pixels) when connected via USB 3.0. The camera is recommended to be used with 4x, 10x, 20x, and 40x objectives. The camera allows capturing more details with low magnification objectives.

The microscope is designed to observe a specimen through the eyepieces and to photograph the specimen. The digital camera is mounted in the trinocular tube 22 (Fig. 1) located on the top of the microscope head. When not in operation, it is covered with the dust cap 2 (Fig. 13). You can switch to the trinocular tube using the knob 4 (Fig. 13). The knob is located on the left side of the microscope head.

It is important that you choose the proper camera to solve specific tasks with a microscope: using low or high magnification objectives, in the bright field or using other contrast techniques. You should pay attention to the camera's light sensitivity, pixel and sensor size, resolution, and data rate. The wrong camera will not allow taking good quality pictures, which will distort the results of the observation.



1. Dust cap screw
2. Dust cap
3. Trinocular tube centering screw
4. Beam splitter lever
5. Camera

Fig. 13. Using the camera

To enable the camera:

— Loosen the dust cap screw 1 (Fig. 13). Remove the dust cap 2 (Fig. 13) from the trinocular tube.

— The microscope kit includes a C-mount adapter. Connect the camera 5 (Fig. 13) to the adapter.

— Fit the camera 5 (Fig. 13) into the trinocular tube and secure it with the screw 1 (Fig. 13).

— Pull out the beam splitter lever 4 (Fig. 13) as far as it will go. The knob is in the pushed-in position when the trinocular tube is not used.

— Switch on the camera 5 (Fig. 13) as per the manual and adjust the image.

— If the image is blurred, adjust the focus using the fine focusing knob to ensure an accurate and sharp image.

If there is a strict requirement to synchronize the image in the eyepieces and camera (coincidence between the image center and direction), you should adjust the camera image using three centering screws 3 (Fig. 13). Do it as follows:

— Set the beam splitter lever 4 (Fig. 13) to the eyepiece position. While observing the specimen through the eyepieces, find a distinctive point in the field of view (an easily identifiable target, such as point S in Fig. 14a), move the specimen on the stage so that the point is in the center of the field of view, as shown in Fig. 14b. To do this, you should use a special calibration slide with crosshairs in place of an ordinary sample and an eyepiece with crosshairs in place of an ordinary one.

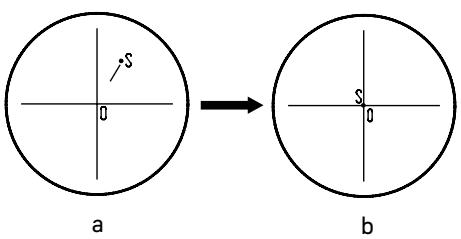


Fig. 14. Adjusting the camera image

— Pull out the beam splitter lever 4 (Fig. 13) to the camera position. Look at the specimen on a monitor or display screen and make sure that the image of the target is in the center of the field of view. If the image deviates from the center of the field of view, adjust three centering screws 3 (Fig. 13) on the trinocular tube to move the target towards the center.

— Move the specimen and check whether the image of the specimen on the monitor or display screen moves in the same direction as the specimen does. If the image moves in another direction, you should adjust the camera position. Loosen the lock screw 1 (Fig. 13) and rotate the camera 5 (Fig. 13) to make the displayed image direction in line with the direction of stage movement, and then secure the screw.

5 REFLECTED LIGHT OBSERVATIONS

Switch on the illumination, place the specimen, check the trinocular tube, and focus on the specimen as you would do for transmitted light observations.

Set the lever 4 (Fig. 2) to the pushed-in position R for reflected light observations.

Switch on the reflected light illuminator by setting the switch 8 (Fig. 2) to position "II". Let it run for a while to achieve a stable illumination level.

CENTERING THE LIGHT SOURCE

The manufacturer performs centering of the light source in the optical path before shipping the microscope. Re-centering may be required after transportation.

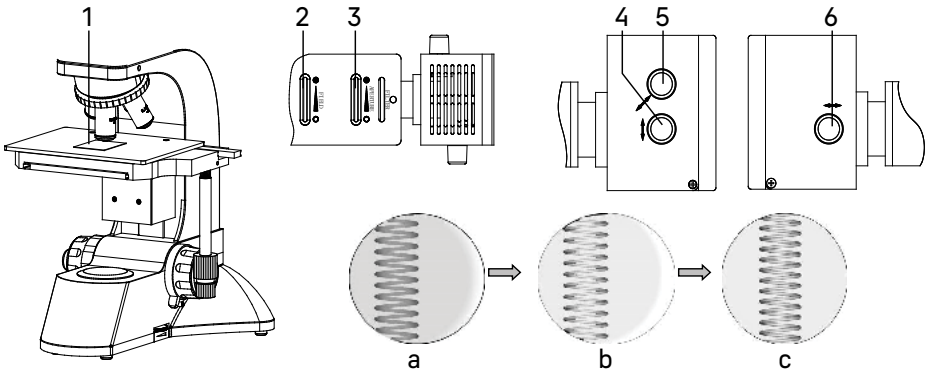


Fig. 15. Centering the light source

The light source is centered as follows:

1. Place a sheet of white paper 1 (approximately 40x50mm) on the stage as shown in Fig. 15.
2. Introduce the free slot of the revolving nosepiece – the slot with no objective – into the optical path.
3. Open the field 2 and aperture 3 diaphragms (Fig. 15). A brightly illuminated spot will appear on the paper showing the filament, as shown in Fig. 15c.
4. If the filament image is blurry, adjust the position of the collector using the knob 6 (Fig. 15).
5. If the filament image is offset from the center of the light spot, as shown in Fig. 15b, manipulate the lateral alignment knob 4 and the vertical alignment knob 5 (Fig. 15) to center the light source.

SETTING UP KÖHLER ILLUMINATION

Set up Köhler illumination in reflected light as follows:

— Make sure that the power supply and and the illuminator are switched on: switch 5 (Fig. 16) is in the "–" position, switch 4 (Fig. 16) is in the "II" position, and the lever 4 (Fig. 2) is in the reflected light position.

— Introduce the 10x objective into the optical path, place the specimen on the stage 1 (Fig. 16), focus, and adjust the eyepieces.

— While looking through the eyepieces, close the field 6 (Fig. 16) and aperture 7 (Fig. 16) diaphragms so that only the center of the field of view is illuminated.

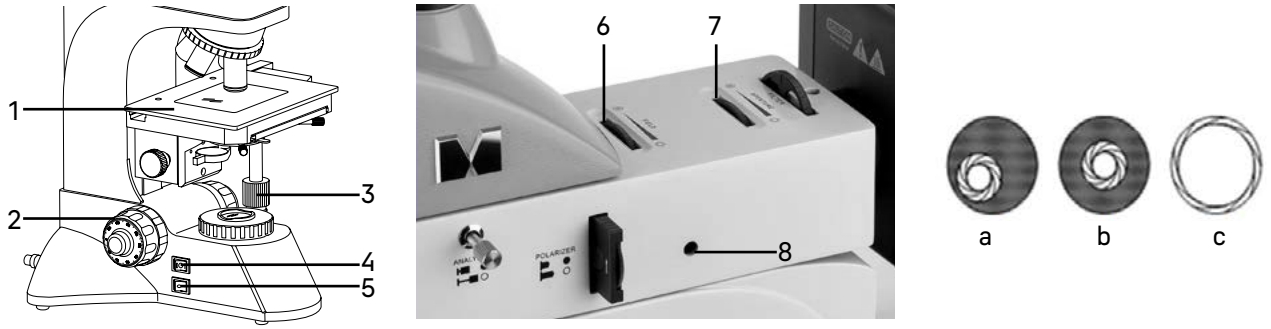
— Verify the centering of the field diaphragm image. If necessary, center the image with two centering wrenches, having previously installed them in the sockets 8 (Fig. 16) located on both sides of the illuminator.

— Open the field diaphragm 6 (Fig. 16) until it just disappears outside of view. Close the aperture diaphragm 7 (Fig. 16) to achieve the desired contrast and the optimal level of illumination.

— Proceed to observations.

— When you change an objective, adjust the opening of the field diaphragm 6 (Fig. 16). It should always be slightly larger than the field of view.

— When you change an objective, adjust the opening of the aperture diaphragm 7 (Fig. 16). When using low-magnification objectives, reduce the aperture diaphragm opening; when using high-magnification objectives, increase the aperture diaphragm opening. Make sure that the image is clear and high-contrast.



1. Stage
2. Coarse focusing knob
3. Stage control knobs
4. Transmitted/reflected light lever
5. ON/OFF switch
6. Field diaphragm
7. Aperture diaphragm
8. Field diaphragm centering slots

Fig. 16. Centering the field diaphragm

While adjusting the illumination, you should keep in mind that changing the size of the field diaphragm only affects the size of the illuminated field. For each objective, you should open the field diaphragm so far that its image is close to the edge of the microscope's field of view, not outside of the field. Magnification and field of view values are inversely proportional. High magnification will give a small field of view. Therefore, when you switch to higher magnification objectives, close the field diaphragm. When you switch to lower magnification objectives, open the field diaphragm.

The size of the aperture diaphragm affects the image contrast. Do not increase the image brightness by opening the aperture diaphragm, as this will result in loss of contrast and low resolution. The brightness is only adjustable with the brightness adjustment ring. The final opening of the aperture diaphragm depends not only on the objective but also on the specimen, so the aperture diaphragm is opened in such a way that the best contrast of the specimen image is produced.

USING THE COLOR FILTERS

The fixed slider with color filters 1 (Fig. 17) is pre-installed by the manufacturer.

Choose the required filter color to match the specimen and microscopy technique: brightfield or polarization microscopy.

To switch to the appropriate color filter or free slot, rotate the slider until it clicks left or right.

A properly selected color filter allows you to smooth out optical distortions.

Fig. 17. Using the color filters

Fig. 18. Polarized light observations

POLARIZED LIGHT OBSERVATIONS

Polarization reveals polymers, dirt and foreign materials, increases image contrast, and removes any glare from bright metal surfaces.

The microscope kit includes a polarizer/analyzer set, which consists of a built-in analyzer 1 (Fig. 18) and a rotatable removable polarizer 2 (Fig. 18).

Rotate the ring to adjust the polarizer to the position where the field of view is dark. Adjust the light intensity so that it is close to the maximum – the desired fragments will be clearly visible in this position.

Once you have completed polarized light observations, reduce the brightness. Prolonged observations at maximum brightness may cause visual impairment!

6 USING OPTIONAL EQUIPMENT

EYEPIECE WITH A SCALE

The eyepiece with a scale or grid can be used to make comparative analysis of the linear dimensions of the individual components of an object. The scale is installed in the plane of the field diaphragm of the 10x eyepiece. The eyepiece with a scale is installed in the tube in place of the eyepiece of your microscope.

You should use a special stage micrometer (calibration slide) to determine the linear dimensions (in millimeters or microns).

The calibration slide (Fig. 19) is a transparent glass that has a micrometer scale with a scale division of 0.01mm etched on the surface.

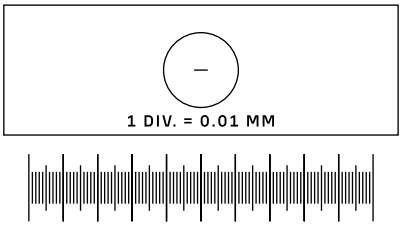


Fig. 19. Calibration slide

Place the calibration slide on the stage instead of the specimen with the scaled side facing up. Using the scale of the calibration slide, calibrate the eyepiece scale for each objective that will be used for measurements. To do this, bring the image focus of the calibration slide scale into sharp focus in the plane of the eyepiece scale and rotate the eyepiece in the tube, setting the strokes of both scales in parallel. Determine how many divisions of the calibration slide fit in the eyepiece scale (with the medium and high magnification objectives) or how many divisions of the eyepiece scale are covered by the entire calibration slide (for low magnification objectives).

Work out the value for one eyepiece division using each objective by formula **E = TL/A**, where:

E – eyepiece division value

T – stage division value specified on the stage micrometer (0.01mm)

L – number of stage micrometer divisions

A – number of eyepiece divisions.

We recommend entering the obtained data in a size chart:

Objective magnification	Eyepiece division value
5	
10	
20	
40	
50	
60	
80	
100	

Using these data to determine the actual linear size of the specimen, you just need to count the number of divisions of the eyepiece scale aligned with the area of the specimen being measured, and multiply this number by the scale division value specified in this table.

USING A CALIBRATION SLIDE WITH A CAMERA

The calibration slide (stage micrometer) is used to calibrate the image analysis software for measurements in actual units. In the calibration mode, you should capture an image of the micrometer scale with every objective magnification and indicate the known distance. That lets you establish a scale of the image in actual units (micrometer, millimeter, etc.). Calibration:

1. Place the calibration slide on the microscope stage.
2. Select the desired objective and set the maximum camera resolution.
3. Get a contrast image of the scale on the monitor screen and capture the image.
4. Select the "Calibrate" function in the software you are using.
5. Double-click on the maximum visible distance and enter the value in actual units.
6. Enter the calibration setting and check the result. The program will save the calibration factor.
7. You can select any measurement unit later, and all the results will be re-calculated in accordance with this selection.

7 TROUBLESHOOTING

Potential problems and remedies (Table 3):

Problem	Cause	Remedy
	ELECTRICAL COMPONENTS	
No illumination in the field of view	The ON/OFF switch is off	Switch on the ON/OFF switch
	The halogen bulb is damaged	Replace the halogen bulb
	The fuse has blown	Replace the fuse
	Poor electrical contact	Check all the connectors. Have it repaired by a qualified electronics technician
	The installed bulb does not comply with the specifications	Use the appropriate bulb
	OPTICS AND IMAGE REPRODUCTION	
Darkened edges of the view field and uneven illumination of the field of view	The revolving nosepiece with objectives is not clicked in the observation position (the objective is not in the optical path)	Rotate the revolving nosepiece it clicks into place correctly, i.e. position the objective into the optical path
	The condenser is incorrectly positioned - lowered too far or skewed	Adjust the condenser – set up Köhler illumination
	The diaphragm is not properly centered or closed too much for this objective	Center the diaphragm. Open the diaphragm to illuminate the entire field of view
	The polarizer and/or analyzer are not fully introduced in the optical path or not fully removed	Install the polarizer and analyzer to the end positions: Fully introduce them in the optical path or fully remove
	The ring with color filters is in the wrong position	Rotate the slider with color filters until it clicks
	There is dirt on the objective, eyepiece, or condenser surfaces	Remove dust using a special puffer or brush. Clean the lens surfaces with a tissue moistened with O-xylene

Dust is visible in the field of view	There is dust on the eyepiece lens	Remove dust using a special puffer or brush
Poor image quality (low resolution, poor contrast)	The objective is damaged	Have the objective repaired by a qualified technician or replaced
	The aperture diaphragm is opened too wide	Adjust the opening to match the numerical aperture of the objective used
	The objective is not correctly engaged in the optical path	Rotate the revolving nosepiece until it clicks into place correctly
	The specimen does not lie flat on the stage	Place the specimen flat on the stage
	The coarse focusing tension adjusting knob is loosened, causing the stage to lower spontaneously	Adjust the coarse focusing tension adjusting knob
	The coarse tension adjusting knob is overtightened	Loosen the tension of the coarse focusing knob
MECHANICAL COMPONENTS		
The image does not remain sharp during observation	The coarse focusing tension adjusting knob is loosened, causing the stage to lower spontaneously	Adjust the coarse focusing tension adjusting knob
The coarse focusing knob is too tight to rotate	The coarse tension adjusting knob is overtightened	Loosen the tension of the coarse focusing knob
The specimen image when viewed with two eyes in two eyepieces does not coincide	The eyepiece tubes of the binocular head are not adjusted to the observer's interpupillary distance	Adjust the microscope head

8 SCOPE OF DELIVERY

The scope of delivery (Table 4):

Component	Pcs	Note
MICROSCOPE		
MAIN COMPONENTS		
Stand with built-in power source, built-in transmitted light illuminator and focusing mechanism	1	
Centerable Abbe condenser	1	
Reflected light illuminator with a lamphouse	1	
Trinocular microscope head	1	
Revolving nosepiece	1	Mounted on the stand
Stage with a glass plate	1	Mounted on the stand
REPLACEABLE PARTS		
Infinity plan achromatic objective: PL L 5x/0.12 WD: 26.1mm	1	
Infinity plan achromatic objective: PL L 10x/0.25 WD: 20.2mm	1	
Infinity plan achromatic objective: PL L 20x/0.40 WD: 8.80mm	1	Optional
Infinity plan achromatic objective: PL L 40x/0.60 WD: 3.98mm	1	
Infinity plan achromatic objective: PL L 50x/0.70 WD: 3.68mm	1	Optional
Infinity plan achromatic objective: PL L 60x/0.70 WD: 2.08mm	1	
Infinity plan achromatic objective: PL L 80x/0.80 WD: 1.25mm	1	Optional

Infinity plan achromatic objective: PL L 100x/0.85 (dry) WD: 0.4mm	1	Optional
10x/22mm eyepiece with eye relief	2	
10x/22mm eyepiece with a scale (D 30mm)	1	Optional
12.5X/14mm eyepiece (D 30mm)	1	Optional
15X/15mm eyepiece (D 30mm)	1	Optional
15x/15mm eyepiece (D 30mm)	1	Optional
20X/12mm eyepiece (D 30mm)	1	Optional
25x/9mm eyepiece (D 30mm)	1	Optional
Polarizer	1	Installed in the illuminator
Analyzer	1	Built into the illuminator
Ring with color filter set	1	Built into the illuminator
1x C-mount adapter	1	
0.5x C-mount adapter	1	Optional
0.65x C-mount adapter	1	Optional
Eyecups	2	
Calibration slide	1	Optional
MAGUS monitor	1	Optional
ACCESSORIES AND SPARE PARTS		
Head locking screw	1	Installed in the slot of the reflected light illuminator
Allen wrench	1	
12V/30W halogen bulb	1	In the transmitted light illuminator
12V/30W halogen bulb	1	In the reflected light illuminator
1A/250V Fuse	2	One in the transmitted light illuminator
Microscope power cord	1	
Reflected light illuminator power cord	1	
Dust cover	1	
User manual	1	
DIGITAL CAMERA		
Digital camera	1	
USB cable	1	
Flash drive with drivers and software	1	
User manual and warranty card	1	

9 CARE AND MAINTENANCE

REPLACING THE FUSE

Before replacing the fuse, turn the ON/OFF switch to "0" position (off). Unplug the power cord from the power outlet. The fuse holder is located on the back panel of the stand under the AC power input. Using a flathead screwdriver, hook and remove the fuse block from the fuse holder. Replace the blown fuse with a new one. Return the fuse block to the holder. Plug the power cord and turn on the ON/OFF switch to check that the fuse is working.

For convenience, there is a slot for a spare fuse at the base of the fuse block. Once you have used the spare fuse from the block, we recommend placing a new fuse in the slot. This will save time for searching a new fuse if the fuse is blown during operation.

REPLACING THE HALOGEN BULB OF THE TRANSMITTED LIGHT ILLUMINATOR

This microscope employs a halogen bulb as a transmitted light source.

Before replacing the bulb, turn the ON/OFF switch to "0" position (off). To avoid burning your hands, wait 10 minutes for the lamp to cool down.

Use a screwdriver to loosen the screw 1 (Fig. 20) and then remove the cover from the transmitted light lamphouse.

Replace the halogen bulb with a new one. Do not touch the bulb with bare hands, as fingerprints on the surface may shorten its life. While replacing the bulb, use gloves or a cloth.

Re-install the cover and secure it with a screw 1 (Fig. 20).

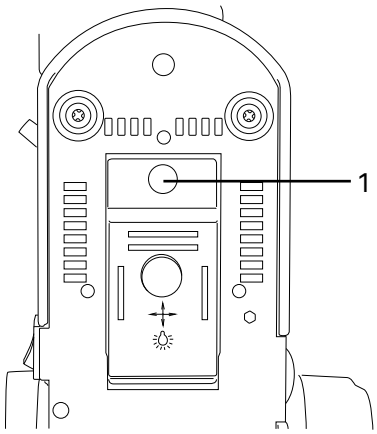


Fig. 20. Replacing the bulb in the transmitted light illuminator

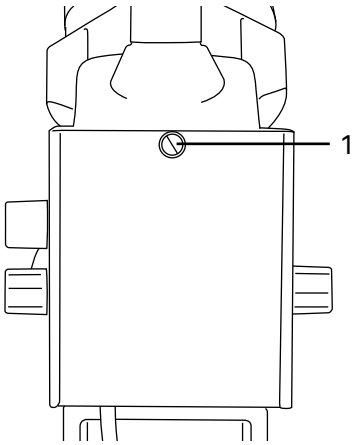


Fig. 21. Replacing the bulb in the reflected light illuminator

REPLACING THE HALOGEN BULB OF THE REFLECTED LIGHT ILLUMINATOR

This microscope employs a halogen bulb as a reflected light source.

Before replacing the bulb, turn the ON/OFF switch to "0" position (off). To avoid burning your hands, wait 10 minutes for the lamp to cool down.

Loosen the screw 1 (Fig. 21) and carefully remove the cover from the reflected light Illuminator.

Replace the halogen bulb with a new one. Do not touch the bulb with bare hands, as fingerprints on the surface may shorten its life. While replacing the bulb, use gloves or a cloth.

Re-install the cover and secure it with a screw 1 (Fig. 21).

MAINTENANCE

1. Once you have finished using the microscope, switch off the power supply. When not using the microscope for a long time, switch off the power supply.
2. The microscope should be kept clean. Do not install the dust cover unless the microscope is completely cooled down and dry.
3. Cleaning lenses:
   Remove dust from the lenses with a soft brush. Significant contamination can be removed using a soft cloth moistened with a small amount of a mixture of alcohol and ethyl ether (mixture proportion: 20-30% alcohol and 70-80% ethyl ether) or special O-xylene solution. Wipe the lenses from the center outward.

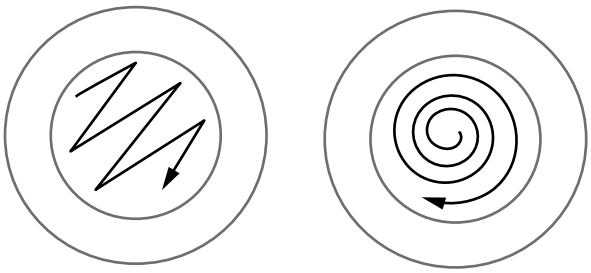


Fig. 22. Cleaning lenses

4. Cleaning the surfaces: wipe with a clean soft cloth; significant contamination can be wiped off with a neutral detergent.

   Do not wipe the microscope stand with any organic solvent (e.g., alcohol, ethyl ether or its diluted solution). This may cause damage to the coating of the microscope stand surface.
5. Cleaning the camera: blow off dust and small particles or brush them off with a soft brush, then clean the surface with a soft, clean cloth moistened with alcohol or ether.
6. Storage: when not using the microscope for a long time, switch off the power, wait for the lamp to cool down, cover the microscope with a dust cover. Store the microscope in a dry, ventilated and clean place, with no exposure to acids, alkalis, or steam, otherwise mold may form on the lenses.

   It is recommended to apply a layer of rust-preventive coating to the moving parts of the microscope.
7. Periodic inspection: the microscope should be regularly inspected and serviced to maintain its performance.

9 MAGUS WARRANTY

MAGUS provides a **5-year international warranty** from date of purchase (valid for the entire life of the instrument). The Levenhuk company warrants the product to be free from defects in materials and workmanship. The Seller warrants that the MAGUS product you have purchased meets specification requirements, provided that the Buyer complies with terms and conditions of transport, storage, and operation of the product. The warranty period for accessories is **6 (six) months** from the date of purchase.

For more information on warranty terms and conditions, see www.magusmicro.com

For warranty service, please contact your nearest Levenhuk representative office.

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