BioBlue.Lab

euromex
microscopes holland

user manual

v.424421

Contents

1.0 General safety instructions

Intended use: a non-medical device
This microscope is intended for general observation of cells and tissues, with transmitted/reflected illumination and with the specimen fixed on a slide

1.1 Dangers associated with the operation

- Improper use could result in injury, malfunction or damage to property. It must be ensured that the operator informs every user of existing hazards
- Danger of electrocution. Disconnect the power to the entire lighting system before installing, adding or changing any component
- Not to be used in corrosive or explosive environments
- Avoid direct exposure of eyes to the collimated light beam or direct light from the light guides or fibres
- To avoid a hazard to children, account for all parts and keep all packing materials in a safe place

1.2 Photobiological safety LED, important safety instructions

- Avoid direct eye exposure to any LED light source while switched on
- Before looking through the eyepieces of the microscope, lower the intensity of the LED illumination
- Avoid long and high-intensity exposure to LED light because this may cause acute damage to the retina of the eye

1.3 Prevention of biological and infectious hazards

Infectious, bacterial or viral biohazard substances under observation may be a risk to the health of humans and other living organisms

- **Biological hazards**: keep a logbook of all the biological substances or pathogenic microorganisms that were under observation with the microscope and show it to everybody before they use the microscope or before they do some maintenance work on the microscope! Agents can be bacterial, spores, enveloped or non-enveloped virus particles, fungi or protozoa
- **Contamination hazard:**
  - A sample that is properly enclosed with a cover glass never comes in direct contact with the microscope parts. In that case prevention of contamination lies in the handling of the slides; as long as the slides are decontaminated before use and are undamaged and treated normally, there is virtually zero risk of contamination
  - A sample that is mounted on a slide without cover glass, can come in contact with components of the microscope and may be a hazard to humans and/or the environment. Therefore, check the microscope and accessories on possible contaminations. Clean the microscope surfaces and its components as thoroughly as possible. Should you identify a possible contamination, inform the local responsible person in your organisation
  - Microscope operators could be contaminated from other activities and cross-contaminate components of the microscope. Therefore, check the microscope and accessories on possible contaminations. Clean the microscope surfaces and its components as thoroughly as possible. Should you identify a possible contamination, inform the local responsible person in your organisation. it is recommended to wear sterile gloves when preparing the slides and handling the microscope in order to reduce contamination by the operator
- **Infection hazard:** direct contact with the focusing knobs, stage adjustments, stage and eyepieces/tubes of the microscope can be a potential source of bacterial and/or viral infections. The risk can be limited by using personal eyeshades or eyepieces. You can also use personal protections such as operation gloves and/or safety goggles, which should be changed frequently to minimize the risk
- **Disinfectant hazards:** before cleaning or disinfecting, check if the room is adequately ventilated. If not, wear respiratory protective gear. Exposure to chemicals and aerosols can harm human eyes, skin and respiratory system. Do not inhale vapours. During disinfection, do not eat, drink or smoke. Used disinfectants must be disposed of according to local or national regulations for health and safety

1.4 Disinfection and decontamination:

- Exterior casing and mechanical surfaces must be wiped with a clean cloth, dampened with a disinfectant
- Soft plastic parts and rubber surfaces can be cleaned by gently wiping a clean cloth, dampened with a disinfectant. Discoloration can occur if alcohol is used
- The front lens of eyepieces and objectives are sensitive to chemicals. We recommend not to use aggressive disinfectants but to use lens paper or a soft fibre-free tissue, damped in cleaning solution. Cotton swabs may also be used. We recommend you use personal eyepieces without eyeshades in order to minimize risk
- Never immerse or dip the eyepiece or objective into a disinfectant liquid! This will damage the component
- Never use abrasive compounds or cleaners that may damage and scratch optical coatings
- Properly clean and disinfect all possible contaminated surfaces of the microscope or contaminated accessories before storing for future use. Disinfection procedures must be effective and appropriate
- Leave the disinfectant on the surface for the required exposure time, as specified by the manufacturer. If the disinfectant evaporates before the full exposure time, reapply disinfectant on the surface
- For disinfection against bacteria, use a 70% aqueous solution of isopropanol (isopropyl alcohol) and apply for at least 30 seconds. Against viruses, we recommend to refer to specific alcohol or non-alcohol based disinfection products for laboratories

Before returning a microscope for repair or maintenance through a Euromex dealer, an RMA (return authorization form) together with a decontamination statement must be filled in! This document - available from Euromex for any reseller- must be shipped together with the microscope at all times

Reference documents:
World Health Organisation:
https://www.who.int/ihr/publications/biosafety-video-series/en/
Robert Koch Institut:
https://link.springer.com/content/pdf/10.1007/s00103-013-1863-6.pdf
US Centre for Disease Control and prevention
https://www.cdc.gov/infectioncontrol/guidelines/disinfection/index.html

Handle with care

- This product is a high quality optical instrument. Delicate handling is required
- Avoid subjecting it to sudden shocks and impacts
- Impacts, even small ones, can affect the precision of the instrument

Handling the LED

Note: Always disconnect the power cord from your microscope before handling the LED bulb and power unit and allow the system to cool down approximately 35 minutes to avoid burns

- Never touch the LED with your bare hands
- Dirt or fingerprints will reduce the life span and can result in uneven illumination, lowering the optical performance
- Use only original Euromex replacement LEDs
- The use of other products may cause malfunctions and will void warranty
- During use of the microscope the power unit will get hot; never touch it while in operation and allow the system to cool down approximately 35 minutes to avoid burns

Dirt on the lenses

- Dirt on or inside the optical components, such as eyepieces, lenses, etc., affects the image quality of your system negatively
- Always try to prevent your microscope from getting dirty by using the dust cover, prevent leaving fingerprints on the lenses and clean the outer surface of the lens regularly
- Cleaning optical components is a delicate matter. Please, read the cleaning instructions further on in this manual

1.5 Environment, storage and use

- This product is a precision instrument and it should be used in a proper environment for optimal use
- Install your product indoors on a stable, vibration free and level surface in order to prevent this instrument to fall thereby harming the operator
- Do not place the product in direct sunlight
- The ambient temperature should be between 5 to +40°C and humidity should be within 80% and 50%
- Although the system is anti-mold treated, installing this product in a hot, humid location may still result in the formation of mold or condensation on lenses, impairing performance or causing malfunctions
- Never turn the right and left focus knobs in opposite directions at the same time or turn the coarse focus knob past its farthest point as this will damage this product
- Never use undue force when turning the knobs
- Make sure that the microscope system can dissipate its heat (fire hazard)
- Keep the microscope away from walls and obstructions for at least approximately 15 cm
- Never turn the microscope on when the dust cover is in place or when items are placed on the microscope
- Keep flammable fluids, fabric, etc. well out of the way

Disconnect power
Always disconnect your microscope from power before doing any maintenance, cleaning, assembling or replacing LEDs to prevent electric shocks

Prevent contact with water and other fluids
Never allow water or other fluids to come in contact with your microscope, this can cause short circuiting your device, causing malfunction and damage to your system

Moving and assembling

- This microscope is a relatively heavy system, consider this when moving and installing the system
- Always lift the microscope by holding the main body and base of the microscope
- Never lift or move the microscope by its focusing knobs, stage or head
- When needed, move the microscope with two persons instead of one

2.0 Introduction

With your purchase of a BioBlue.Lab microscope you have chosen for a quality product. The BioBlue.Lab microscopes are developed for use at universities and laboratories

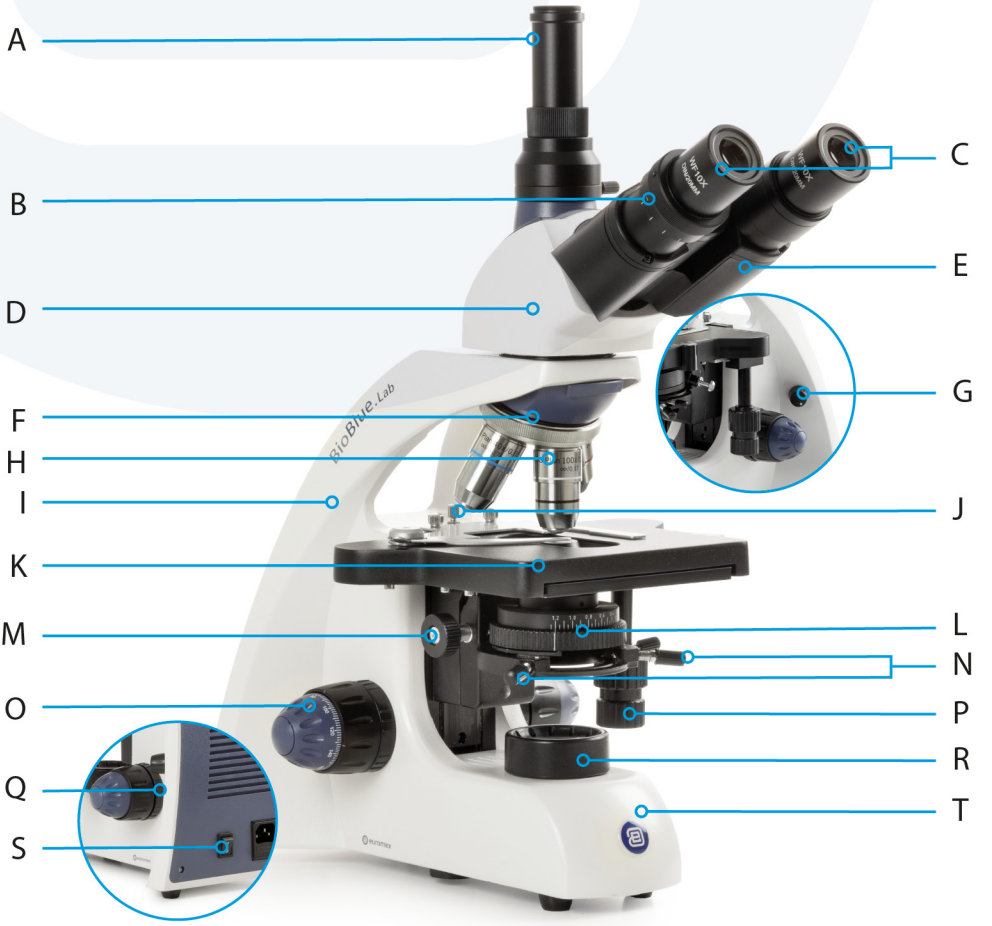
The maintenance requirements are limited when using the microscope in a decent manner

This manual describes the construction of the microscope, how to use the microscope and about its maintenance

3.0 Construction of the microscope

The names of the several parts are listed below and are indicated in the picture of BB.1153-PLI

A. Photo tube	**K.** Object stage with mechanical stage
B. Diopter adjustment	**L.** Condenser with irisdiaphragm and filter holder
C. Eyepieces	**M.** Height ajustment of condenser
D. Head (bino/trino 360° rotatable)	**N.** Condenser centering screws
E. Eyepiece tube	**O.** Coaxial coarse-and fine adjustment
F. Revolving nosepiece for 4 objectives	**P.** Coaxial stage controls
G. Light dimmer (right side of microscope)	**Q.** Tension adjustment
H. Objectives	**R.** Lamp housing
I. Stand arm	**S.** On/off switch
J. Safety device (rack stop)	**T.** Stand base



4.0 Functions of the microscope

The stand consists of a stand arm (I), stand base (T) and an object stage (K)

Hold the microscope at the top of the stand arm with one hand and support the base with the other hand when it needs to be moved

4.1 Eyepiece tube

The eyepiece tube (E, either binocular or trinocular) is equipped with WF10x eyepieces (C)

4.2 Revolving nosepiece

The revolving nosepiece (F) can be equipped with four objectives (H)

4.3 Optical specifications of the BioBlue.Lab range

The BioBlue.Lab range microscopes come with two widefield eyepieces WF10x/20mm (C), Plan finite, IOS infinity Plan or IOS infinity Plan Phase contrast objectives

The S40x and S100x objectives are equipped with a spring mount, to prevent damage to the frontlens and the slide. The total magnification can be calculated by multiplying the magnification of the eyepiece with the magnification of the objective. The magnifications are displayed in the table below:

Eyepiece	Objective	Magnification
10x	4x	40x
10x	10x	100x
10x	40x	400x
10x	60x	600x
10x	100x	1000x

4.4 Object stage

The stage is equipped with a mechanical stage (K) and can be carefully moved into X- and Y- directions. Centering the specimen is done by using the coaxial X and Y stage control (P)

4.5 Coarse- and fine adjustment

The coarse- and fine adjustment knobs (O) for the height adjustment of the object stage are mounted together on one axe (co-axial). On both fine adjustment knobs there is a graduation with intervals of 0.002 mm. This can be used to measure depths in a specimen

4.6 Abbe condenser with iris diaphragm

- Beneath the object stage an Abbe condenser (L) N.A. 1.25 is mounted. The condenser can be adjusted in height by means of turning the knob (M)
- The condenser collects a maximum of collimated light from the light source and concentrates it into a cone of light to illuminate the specimen. The iris diaphragm of the condenser allows adjusting the contrast of the image. The height of the condenser and iris diaphragm must be adjusted each time an objective is selected in order to maximize both contrast and optical resolving power
- With the phase contrast models an Zernike phase contrast condenser is mounted with annuli for 10x, 20x, S40x and S100x objectives and one position with Abbe condenser for brightfield

4.7 Illumination

The illumination of the BioBlue.Lab is equipped with NeoLed. This makes the illumination intensity much higher and more homogenous distributed than by regular LED's
The illumination has the following specifications:
LED: 3W, NeoLed

5.0 Preparing the microscope for use

Remove the packing and put the microscope on a flat table. The objectives are pre mounted.
Put the plug into the mains supply and switch on the microscope. Sit comfortably down in front of the microscope and take a relaxed position while looking through the eyepieces

6.0 Working with the microscope

Please read the following instructions to achieve the best microscope observing results

6.1 Setting the illumination

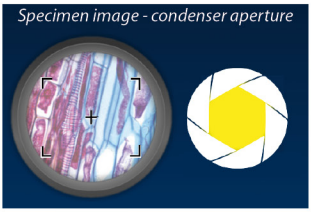
- Before starting to use the microscope and looking through the eyepieces, lower the intensity (G) in order to avoid high-intensity exposures to light that may harm your eyes!
- Start with the lowest magnification available on the microscope (e.g. the 4x or 10x objective)
- Look through the eyepieces and adjust the light intensity to a comfortable level
- Fully open the iris diaphragm of the condenser
- Focus on the specimen
- Turn the condenser higher or lower until the best homogeneous illumination is observer (somewhere close to the condenser)
- Close the condenser diaphragm untill you start observing dark shadows entering from the edges into the field of view. Re-open a little untill the dark shadows have left the field of view (this operation can be repeated for every other seleccted objective)

Caution:
The maximum light intensity when using the 4x and 10x can damage the eyes!

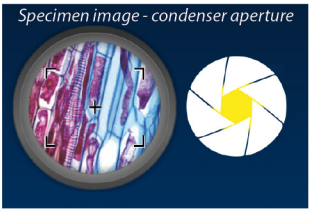
6.2 Köhler illumination

(only for models with a field diaphragm)
Prior to setup the Köhler illumination be sure that the light source is well centered

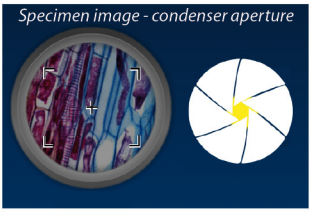
1. Place the specimen on the stage, fully open the field diaphragm - if present - fully open the iris diaphragm of the condenser. Select an objective (H) and adjust light intensity to a comfortable level by using the intensity adjustment
2. Focus on the specimen with the coarse and fine adjustments (O)
3. In order to optimize contrast and resolving power,
   - Adjust the condenser in height (M)
     The higher the magnification the higher the condenser should be positioned
   - Adjust the opening (aperture) of the field iris diaphragm
     The higher the magnification, the smaller the aperture should be in order to optimize the resolving power by eliminating all light rays that are not participating at the construction of the image as seen in the field of view



Aperture condenser
set at 80%
lack of contrast
poor resolving power



Aperture condenser
set at 60%
good contrast & resolution
best resolving power



Aperture condenser
set at 20%
too contrasted image
loss of resolving power

- adjust the opening (aperture) of the iris diaphragm of the condenser to control the contrast

The user must find the best balance between image contrast and resolving power (smallest detail of the specimen that you can observe). Most of the time its primarily contrast that defines if the image is acceptable to the eye. The correct setting will vary from specimen to specimen

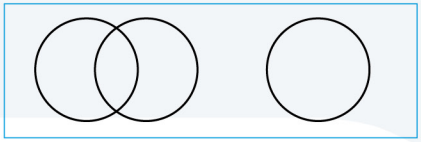
Together with the opening (aperture) of the iris diaphragm of the condenser, the height of the condenser determines the numerical aperture (and resolving power) of the optical system. The numerical aperture of the condenser should match the aperture of the selected objective in order to obtain the highest resolving power possible.

4. When another objective is selected, repeat the previous steps A2 and A3

6.3 Setting the interpupillary distance

Using a binocular or trinocular tube is less tiring for the eyes than the use of a monocular tube

- Set the interpupillary distance so that only a single field of view is observed. This can be done by squeezing the tubes together or pulling them apart to decrease/increase the separation between the eyepiece tubes



Field of view before adjustment

Field of view after adjustment

6.4 Adjusting the diopter

- Position the diopter mark on the zero point (wearers of glasses can leave them on)
- Look into the eyepieces with both eyes and focus on a specimen with the coarse and fine adjustments without touching the diopter adjustment
- Take you eyes from the eyepiece in order to "reset" your eyes for a second
- Close you right eye and look with your left eye into the left eyepiece and re-focus on the sample by only using the diopter adjustment
- Take you eye from the eyepiece in order to "reset" your eyes for a second
- Look into both eyepieces and check if focus is correct. If not, repeat the operation

This procedure should be followed by each individual user

6.5 Safety device - rack stop

Rack stop (or Safety rack stop, (J)): usually set at the factory, the rack stop keeps you from cranking the objective lenses too far down and damaging either the objective lens or the microscope slide. It is recommended to use slides of 1.2 mm thickness (product numbers: PB.5150, PB.5155, PB.5160) in combination with cover glasses of 0.17 mm thickness (product numbers: PB.5165, PB.5168)

6.6 Tension control setting

Between the right-handed coarse adjustment knob and the microscope stand there is a ring for the tension control setting (Q). By means of turning it clockwise- or counter clockwise the tension of the coarse adjustment knobs can be adjusted

6.7 Use of the S100x oil-immersion objective

The microscopes are equipped with a S100x N.A. 1.25 oil immersion objective. Please follow these instructions for using this objective

- Focus the image with the S40x objective
- Turn the revolving nosepiece so the S100x objective almost reaches the click-stop
- Put a small drop of immersion oil on the centre of the slide
- Now turn the S100x objective so that you feel the click stop
- The front lens is in contact with the immersion oil
- Look through the eyepiece (C) and focus the image with the fine adjustment knobs (O)

Note:
The distance between the lens of the objective and the slide is only 0.14 mm!

- In case there are small bubbles visible, turn the S100x objective a couple of times left/right so that the front of the objective moves in the oil and the bubbles will disappear
- After using the S100x objective, turn the table (K) with the focusing knobs (O) downwards until the front lens doesn't touch the oil any longer
- Always clean the front lens of the S100x objective with a piece of lens paper that is moistened with a drop of xylol or alcohol
- Clean the slide after use as well

Caution
Never put a drop of xylol or alcohol directly on the lens of the objective. It could enter the objective and dissolve the glue that holds the lenses! Avoid oil contact with any of the other objectives!

6.8 Models with rotatable phase condensor

The substage phase contrast Zernike condenser can be adjusted in height by means of a rack and pinion movement and knob (M). In this way the light beam is concentrated in the specimen. The condenser is centred with the help of the supplied centring telescope (D) and centering knobs (B)

A. Phase condenser
B. Phase condenser alignment knobs
C. Phase objective
D. Centering telescope
E. Green filter

Take following steps in order to centre the phase rings

1. Turn the condenser disc in his first position, e.g. "10". This brings the phase ring for the 10x objective in the optical path
2. Position the condenser with (M) in almost highest position
3. Turn the nosepiece (F) to select the corresponding phase contrast objective, e.g. 10x
4. Put a specimen on the stage and focus on the specimen with the coarse and fine adjustments (O)
5. Remove the specimen from the stage and don't touch the coarse and fine adjustments (O) anymore
6. Remove one eyepiece and insert in the empty eyepiece tube telescope (D)
7. Bring the objective phase ring in focus with the adjustable lens of the telescope (D)
8. Position - by using the 2 phase condenser alignment knobs (B) - the phase ring of the condenser on top of the phase contrast ring of the objective. See pictures visible in the eyepiece are in one centric line

DON'T use the two adjustments at the same time! Push gently one adjustment (B) at the time into the condenser and turn to move the phase contrast ring internally. Relieve the pressure and repeat alternatively the operation till both the phase contrast rings are superposed

Tip! Changing the height of the condenser can help you to find the correct position. When the colors are homogeneously spread around the phase contrast rings, both are centred

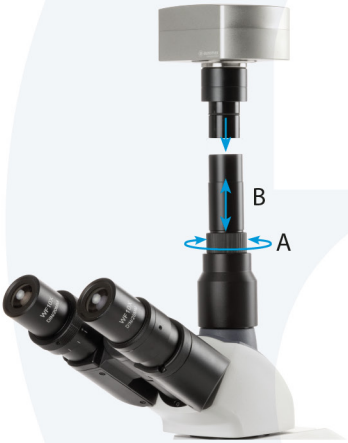
9. Select the next phase contrast objective (typically 20/40/100x) and corresponding phase contrast ring on the condenser
10. Repeat steps 7 to 9

Not centred

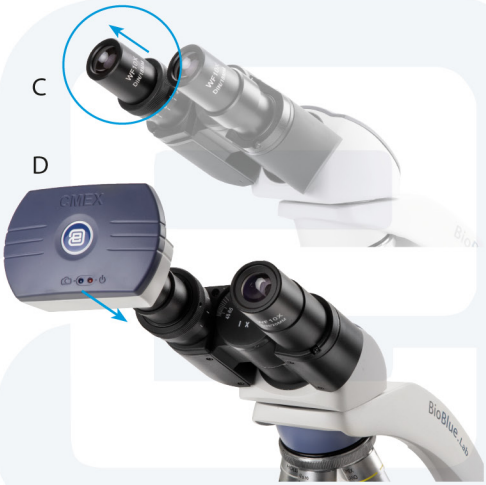
Centred

Caution:
Avoid touching optical parts during centring

7.0 Cameras



Trinocular head with camera in photo port



Binocular head with camera replacing the original eyepiece

- For trinocular models, insert the camera with mounted c-mount adapter into the 23.2 mm photo tube. Take an easy-to-view specimen and focus on the specimen through the microscope's eyepieces. To focus the camera: unscrew the ring (A) and turn the tube (B) in order to make it longer or shorter, while watching the screen till the image is in focus. Then tighten the ring to prevent unwanted movement of the tube
- Digital cameras are designed to be used on the photo tube of the microscope. It is also possible to use the digital camera in combination with a binocular head, monocular head or discussion head. To use the camera on one of these heads, simple remove the eyepiece (C) and then place the camera with mounted c-mount adapter into the eyepiece tube (E). Focus the digital image with the coarse and fine controls of the microscope

Follow the manual that comes with the camera for camera operation

8.0 Maintenance and cleaning

Always place the dustcover over the microscope after use. Keep the eyepieces and objectives always mounted on the microscope to avoid dust entering the instrument

8.1 Cleaning the optics

- When the eyepiece lens or front lens of the 10x or S40x objective are dirty, they can be cleaned by wiping a piece of lens paper over the surface (circular movements)
- When this does not help put a drop of xylol or alcohol on the lens paper
  Never put xylol or alcohol directly on the lens!
- When dirt is clearly visible in the field of view it resides on the lowest lens of the eyepiece. By using the Allen-key the eyepiece can be removed from the tube. Clean the outside of the lens
- In case there is still dust visible please check if the dust is in the eyepiece by turning it. If this is the case, remove the lowest lens carefully from the eyepiece and clean it

Never open an objective and remove internal lenses in order to clean them. This will definitely render the objective useless. Sometimes dust can be removed with high pressured air. There will never be dust in the objectives if the objectives are not removed from the revolving nosepiece

Caution
Use only optical paper or soft, fibre free tissue

8.2 Maintenance of the stand

- Dust can be removed with a brush
- In case the stand or table is really dirty the surface can be cleaned with a non-aggressive cleaning product
- All moving parts like the height adjustment or the coaxial course and fine adjustment contain ball bearings that are not dust sensitive. With a drop of sewing-machine oil the bearing can be lubricated