Installation and Operating Instructions

# Cole-Parmer®

# MSU-400 Series Compound Microscopes

Models 78904-02, -04, -07, -10, -13

78904-02

78904-07

78904-13

CE

## Contents



## Introduction

Thank you for purchasing a Cole-Parmer MSU-400 Series compound microscope. The MSU-400 series has been designed with all kinds of Educational and Life Sciences applications and great durability in mind. This resulted in a modern, robust and high-level microscope for advanced use, equipped with the best optical and mechanical components. Specific attention to production methods resulted also in an excellent price/performance ratio

Please read this manual carefully before using this product to ensure correct and safe usage

- The content of this manual is subject to change without notice
- The appearance of the actual product can differ from the models described in this manual
- Not all equipment mentioned in this manual has to be part of the set you have purchased
- All optics are anti-fungus treated and anti-reflection coated for maximum light throughput

# 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.

## 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 fibers
- To avoid a hazard to children, account for all parts and keep all packing materials in a safe place

## 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

## 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. Special precautions should be taken:

- **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 organization
  - 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 organization. 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

## 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 fiber-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
- 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 Cole-Parmer dealer, an RMA (return authorization form) together with a decontamination statement must be filled in! This document must be shipped together with the microscope at all times

**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 MSU-400 Series 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

## Environment, storage and use

- Maximum altitude: 2000 m
- Pollution degree: 2
- 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 20 to 80% RH
- 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

## Models

The Cole-Parmer MSU-400 Series compound microscopes are equipped with HWF 10x/20 mm eyepieces, and are available in the following brightfield and phase contrast models. Model 78904-13 includes a fluorescence attachment with four 5 W LEDs for fluorescence excitation from 450 to 470 nm (blue), 515 to 535 nm (green), 390 to 400 (violet) and 360 to 370 nm (ultraviolet; and a UV protection shield.

***Please note***: on coleparmer.com you can find the latest updates about MSU-400 models and accessories

| Model | Type | Objectives | Working distance | Stand | Illumination | Power | Weight |
|---|---|---|---|---|---|---|---|
| 78904-02 | Binocular | 4x/10x/S40x/ S100x, semi-plan | 48 to 76 mm | Rackless integrated X-Y mechanical stage | 3 W adjustable Kohler NeoLED | 100–240 VAC, 50/60 Hz | 14.3 lb (6.5 kg) |
| 78904-04 | Trinocular | 4x/10x/S40x/ S100x, semi-plan | 48 to 76 mm | Rackless integrated X-Y mechanical stage | 3 W adjustable Kohler NeoLED | 100–240 VAC, 50/60 Hz | 14.7 lb (6.6 kg) |
| 78904-07 | Trinocular | 4x/10x/S40x/ S100x, plan | 48 to 76 mm | Rackless integrated X-Y mechanical stage | 3 W adjustable Kohler NeoLED | 100–240 VAC, 50/60 Hz | 14.7 lb (6.6 kg) |
| 78904-10 | Trinocular | 10x/20x/S40x/ S100x, plan, phase contrast | 48 to 76 mm | Rackless integrated X-Y mechanical stage | 3 W adjustable Kohler NeoLED | 100–240 VAC, 50/60 Hz | 14.7 lb (6.6 kg) |
| 78904-13 | Trinocular | 4x/10x/S40x/ S100x, plan | 48 to 76 mm | Rackless integrated X-Y mechanical stage | 3 W adjustable Kohler NeoLED; four 5 W LED Epi-illumination for fluorescence | 100–240 VAC, 50/60 Hz | 14.7 lb (6.6 kg) |

## Objectives

| Eyepiece magnification | Objective magnification | Total m magnification |
|---|---|---|
| 10x | 4x | 40x |
| 10x | 10x | 100x |
| 10x | 20x | 200x |
| 10x | 40x | 400x |
| 10x | 60x | 600x |
| 10x | 100x | 1000x |

The total magnification of the microscope can be calculated by multiplying the magnification of the eyepiece with the magnification of the objective. The magnifications are displayed in the table. The S40x, S60x and S100x objectives are equipped with a spring mount, to prevent damage to the front lens and the slide

## Components of the microscope

The names of the several component parts are listed below and are indicated in the picture:


| | | | |
|---|---|---|---|
| A | Camera focus adjustment ring | J | Diopter adjustment |
| B | Trinocular tube | K | Slide for polarization filter |
| C | Microscope head | L | Nosepiece |
| D | Transport handle | M | Objectives |
| E | Height adjustment condenser | N | Stage with X-Y mechanical stage |
| F | Slide protection handle | O | X-Y stage controls |
| G | Coaxial coarse-and fine adjustment | P | Condenser with iris diaphragm |
| H | Light intensity adjustment knob | Q | Köhler iris diaphragm |
| I | Eyepieces | R | Collector lens |

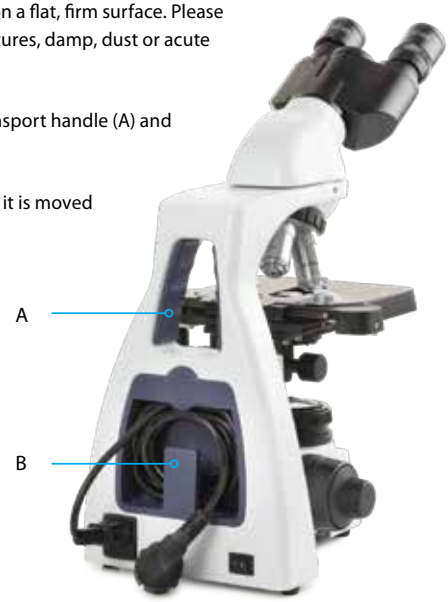
## Preparing the microscope for use

Carefully remove the items from its packaging and place them on a flat, firm surface. Please do not expose the microscope to direct sun light, high temperatures, damp, dust or acute shake. Make sure the table or surface is flat and horizontal

When moving the microscope, use the left hand to hold the transport handle (A) and hold the base of the microscope with the right hand

***Caution!*** Hold the microscope at the top of the stand arm when it is moved

Insert the power cord into the back of the microscope and use the cable storage system (CSS) to store excessive cable while in use or to store the cable after use (B)




***Caution!*** If the bacterial solution or water splatters over the stage, objective or head, pull out the power cord immediately and dry the microscope

## Assembling steps

**Mounting the objectives**

1. Rotate the coarse focusing knob to lower the stage to its lowest position
2. Install the objectives into the objective nosepiece from the lowest magnification to the highest in a clockwise direction from the rear side of the microscope. When operating, start using the low magnification objective (4X or 10X) to search for specimen and focus, then continue with high magnification objective to observe

**The microscope head**

The standard MSU-400 series configuration is supplied with the head assembled. However, if your order contains a fluorescence attachment (model 78904-13) then this should be mounted first; see pages 14-16 for supplementary manual.

**Placing the eyepieces**

The standard MSU-400 series configuration is supplied with the eyepieces assembled. However, if your order contains additional eyepieces, please follow these steps to mount/replace them:

1. Unscrew the current eyepiece from the eyepiece tube with a screwdriver (see pictures A and B)

***Note:*** The eyepiece tube with the diopter adjustment has three screws. In order to remove the eyepiece you need to unscrew the one aligned with "0" (see picture C)

2. Insert the eyepiece into the eyepiece tube
3. Lock the eyepieces with a screwdriver



**The eyeshades (optional)**
The eyepieces can be equipped with optional rubber eyeshades. This prevents damage to the lens, and prevents stray light. The eyeshade can simply be slipped over the eyepiece

**Connecting the power cord**
The MSU-400 microscopes support a wide range of operating voltages: from 100 to 240 VAC. Please use a grounded power connection

- Make sure the power switch is off before connecting
- Insert the connector of the power cord into the power socket, and make sure it connects well
- Insert the other connector into the mains socket, and make sure it connects well. Do not bend or twist the power cord, it will get damaged. Use the power cord that is supplied by Cole-Parmer. If it is lost or damaged, choose one with the same specifications

**Replacement of the Power Cord**
If the power cord requires replacement, ensure that it is suitably rated. If in doubt consult your local dealer or qualified electrician

# Operation

## Setting up the illumination

For optimal contrast and resolution one should follow the below procedure:

1. Place a specimen on the object stage and focus using the 4x objective, with a fully opened iris diaphragm
2. Turn light intensity to lowest position, then look through the eyepiece(s) and turn up to the comfortable light intensity level
3. Turn the condenser in the highest position (for phase contrast models, please set condenser to brightfield position)
4. Close the iris diaphragm, until it is just visible on the edge of the field of view

The microscope is properly set for use with the 4x objective. For each other magnification in brightfield use this procedure should be repeated to ensure the best balance between contrast and resolution. Phase contrast set up is explained later in this manual


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

## Placing the specimen slide

1. Push the arm of the specimen holder backwards
2. Release the arm slowly clamping the slide with the cover glass facing up
3. Rotating the X and Y-axis knob will move the specimen to the center for alignment with the center of the objective

## Focusing and slide protection

1. Select the 4x objective and make sure that it is placed correctly in the optical path
2. Move the stage to the top by using the coarse adjustment knob and focus till the image appears
3. Rotate the fine focusing knob to sharpen the image
4. When you perform focusing with a S100x objective, you need to lock the slide protection handle. The slide protection handle protects the slide by limiting the travel range of the mechanical stage. This way the objectives will not touch or damage your slides

## Adjusting the focusing tension

The tension of the focusing knobs can be adjusted. You can set it from light to heavy according your own preference. Please note that when the specimen leaves the focus plane after focusing or the stage declines out of its own, then you need to adjust the tension

To tighten the focusing knob (more heavy), rotate the tension adjustment ring counter-clockwise; to loosen it, please turn it in the clockwise direction


## Eyepieces

Using a binocular (or trinocular) tube is less tiring for the eyes than a monocular tube. In order to obtain a smooth "compound" image, we recommend you to go through the below steps:

**1. The interpupillary distance**

The correct interpupillary distance is reached when one round image is seen in the field of view (see image below). This distance can be set by either pulling the tubes towards each other or pulling them away from each other. This distance is different for each observer and thus should be set individually. When more users are working with the microscope it is recommended to remember your interpupillary distance for a quick set-up during new microscopy sessions. The MSU-400's swiveling eyepiece tube can be rotated 360º. You can select corresponding eye point height according to your own preference

**2. The correct eye point**

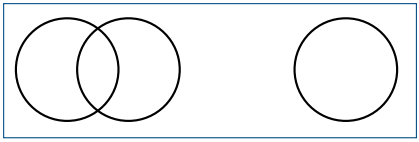
The eye point is the distance from the eyepiece to the user's pupil. To obtain the correct eye point, move the eyes towards the eyepieces until a sharp image is reached at a full field of view

**3. Adjusting the diopter**

Using a binocular (or trinocular) tube is less tiring for the eyes than the use of a monocular tube. In order to obtain the right interpupillary setting, one should go through the below steps

- Set diopter adjustment ring to zero
- Close the left eye and focus the right tube by adjusting the coarse- and fine adjustment knobs
- Close the right eye and focus the left tube with the diopter adjustment ring

This procedure should be followed by each individual user. When more users are working on the same microscope it is recommended to remember your own diopter setting for a quick set-up during new microscopy sessions



## Abbe condenser

Beneath the object stage an Abbe condenser N.A. 1.25 is mounted. The condenser can be adjusted in height by moving the rack and pinion knob beneath the mechanical stage. By adjusting the condenser you can focus the light on the specimen for a optimized contrast. The condenser is factory pre-centered. If needed, the following procedure can be followed to center the condenser

1. Move the condenser to its highest position
2. Select the 10x objective and place it into the light path and focus the specimen
3. Rotate the field diaphragm adjustment ring to put the field diaphragm to the smallest position
4. Adjust the condenser to the point where the image is the sharpest
5. Adjusting the center adjustment screw and put the image to the center of the field of view
6. Open the field diaphragm gradually
7. The condenser is centered correctly if the image remains in the center when you open the field diaphragm and inscribed to the field of view

## The field (Köhler) diaphragm (see A in picture below)

By limiting the diameter of the beam entering the condenser, the field diaphragm can prevent other light from entering and increase the image contrast. When the image is just on the edge of the field of view, the objective will show the best performance and obtain the clearest image. The diaphragm is factory pre-centered.

## Adjusting the aperture diaphragm (see B in picture below)

- The aperture diaphragm is used to select the numerical aperture (N.A.) of the illumination. When the N.A. of illumination matches with the N.A. of the objective, you get the highest possible resolution, depth of field and contrastare obtained
- When contrast is low, rotate the diaphragm adjustment ring to 70%-80% of the N.A. of objective this will improve the contrast of the image. The diaphragm is factory pre-centered

### Use of the S100x oil-immersion objective

The MSU-400 Series microscopes are equipped with an S100x N.A. 1.25 oil immersion objective. Please follow the below instructions on how to use this objective:

1. Remove the dust protection cap from the revolving nosepiece to mount the S100x objective
2. Focus the image with the S40x objective
3. Lock the slide protection handle
4. Turn the revolving nosepiece so the S100x objective almost reaches the click-stop
5. Put a small drop of immersion oil on the center of the slide
6. Now turn the S100x objective so that you feel the click stop
7. The front lens is in contact with the immersion oil
8. Look through the eyepiece and focus the image with the fine adjustment knobs
9. The distance between the lens of the objective and the slide is very small!
10. In case there are small bubbles visible, turn the S100x objective a couple of times from left to right so that the front of the objective moves in the oil and the bubbles will disappear
11. After using the S100x objective, loosen the slide protection handle and turn the table with the course adjustment knobs downwards until the front lens doesn't touch the oil any longer. Clean the front lens of the S100x objective
12. Always clean the front lens of the S100x objective with a piece of lens paper that is moistened with a drop of isopropanol.
13. Clean the slide after use as well

### Illumination

The illumination has the following specifications:

**LED** : 3W NeoLED for binocular and trinocular models.
**Power supply** : Primary 100-240 VAC, 50/60 Hz
**Fuse specification** : 250V 1A

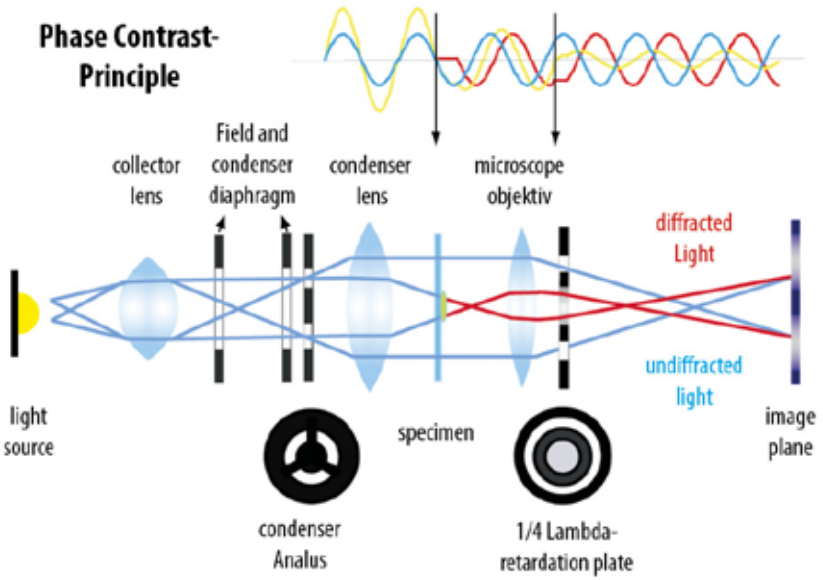
## Phase contrast (model 78904-10)

### Use of phase contrast

The phase contrast method was designed in 1934 by the Dutchman Frits Zernike to observe very thin or transparent objects. This technique uses the fact that light travelling through tissue undergoes a phase shift due to diffraction. By recombining the phase shifted light with the background light, a contrasted image appears in the eyepiece.

### Using the Zernike phase contrast set

Any MSU-400 model with a Zernike phase contrast set comes with the phase contrast condenser and objectives already mounted and centered on your microscope. If you suspect misalignment or want to check the alignment please see the next point for "centering the phase rings". The height of the condenser can be adjusted by turning the rack and pinion up and down. By doing this the light beam will be focused more on the specimen for maximum resolution.

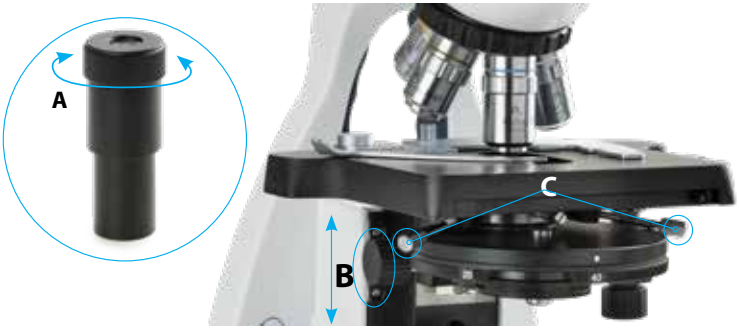



**Centering the phase rings**

The Zernike phase disc has five positions: 0 for brightfield observation (this position also has an iris diaphragm), 10, 20, 40, and 100.

These positions correspond to the respective phase contrast objectives 10x, 20x, 40x and 100x.
When the condenser is in the "0" position, the objectives can be used for brightfield observation. For phase contrast, the condenser position should match the objective used, meaning that when the condenser is in position "40" the objective used should also be 40x.

- Rotate the 10× infinity phase contrast objective into the field of view, then set the Zernike phase disc to position "10" to match the objective
- Take the eyepiece out of the tube and insert centering telescope in its place. When looking through the centering telescope, the dark and bright ring images should coincide with each other as shown in the pictures below. If the ring images cannot be observed clearly, focus the centering telescope first (A) and if this does not solve the issue then try to adjust the condenser by turning it up and down (B).
- If the bright ring and dark ring images do not coincide as shown below, adjust the position of the ring by moving the ring at the bottom of the condenser with the centering knobs (C). Move it until the bright and dark ring images superimpose. Repeat for all objectives/Zernike disc positions



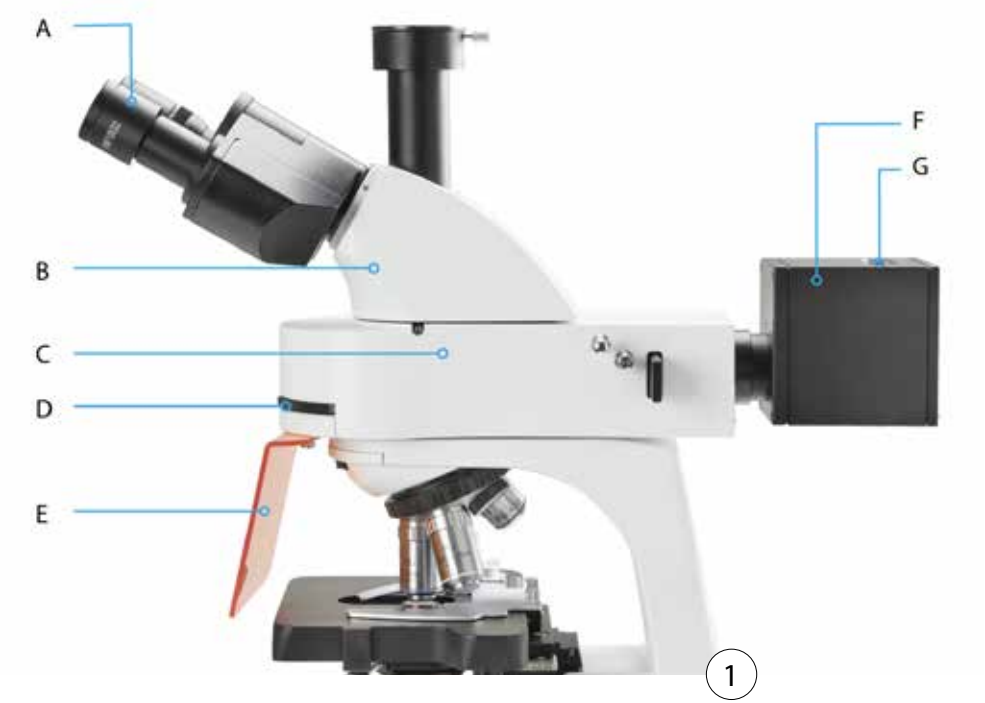

*Not centered*

*Centered properly*

# Supplementary manual for fluorescence attachment (model 78904-13)

## Installation of the fluorescence illuminator and microscope head

Most parts are already mounted on the microscope. Only two parts are packed separately. The microscope head (B) and the fluorescence illuminator (F).




**A.** Eyepieces
**B.** Microscope head
**C.** Fluorescence attachment
**D.** Turret for fluorescence filters
**E.** Protection screen
**F.** Fluorescence illuminator
**G.** Turret for LEDs

## Installation steps

- Take the microscope with fluorescence attachment, fluorescence illuminator and head from its packaging
- Place the head on the fluorescence attachment and fasten the screw (on the right side of the microscope) with a hexagon wrench
- Install the eyepieces into the eyepiece tubes if these are not already installed (fig 1, A)
- Mount the fluorescence illuminator to the back of the fluorescence attachment and fasten the screw with a hexagon wrench
- Plug the power cord into the power supply, but don't turn it on yet

## Operation of reflected illumination system (LED fluorescence unit)

To get the best result when observing with fluorescence please pay attention to the following:

1. Select the fluorescence filter that matches the fluorochrome and fluorescent characteristic
2. No autofluorescence specimen or device should be in the optical system, such as the cedar immersion liquid which has cyan autofluorescence
3. Always turn off the transmitted illumination before turning on the reflected illumination system

## Set and adjust the fluorescence unit

The most important part of the unit is the fluorescence filters assembly. There are four fluorescence filters, Blue, Green, Violet and Ultraviolet, mounted in the turret (fig. 1, D) and are indicated as B, G, V and UV on the turret. There is also a brightfield option and it is indicated as 0 on the turret.

The fluorescence filters in the turret correspond with the LEDs in the fluorescence illuminator (see table). There is a turret (fig. 1, G) on top of the fluorescence illuminator and has the same indication of B, G, V and UV as the turret for the fluorescence filters.

| Fluorescence filters | LED light source |
|---|---|
| B | B |
| G | G |
| V | V |
| UV | UV |

When selecting the filter, turn the turret (D) to the correct filter and choose the corresponding LED by turning the turret on the illuminator (G).

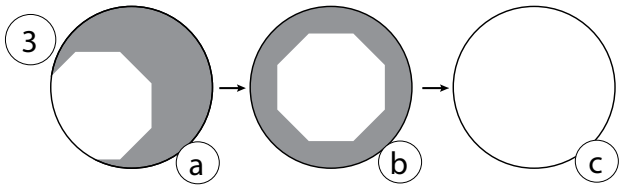
***Remark:*** For brightfield observation please choose position 0 on the turret (D) and switch off the fluorescence illuminator and turn on the transmitted illumination

## Operation of the field diaphragm

The field diaphragm has been pre-centered and is ready to use, but due to possible vibration or inclination during transport it may deviate, therefore always double check.

If it is not pre-centered, then please follow the following steps:

1. Use objective 10x
2. Push in the field diaphragm switch (the one in the front, (fig.2, A), a light spot will be visible in the field of view
3. Adjust the centering if the light spot deviates from the center of the view of view (fig. 3, a) by using the adjustment screws behind the field diaphragm switch (fig. 2, B). The light spot should be centered as shown in fig. 3, b
4. Pull out the switch so that the image fills the field of view as shown in fig. 3, c

## Maintenance and cleaning

Always place the dust cover over your microscope after use. Always keep the eyepiece and objectives mounted on the microscope to avoid dust entering the instrument

### 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 alcohol on the lens paper and wipe it. ***Never put xylol or alcohol directly on the lens!***

It is not necessary – and not recommended – to clean the lens surfaces at the inner side of the objectives. 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

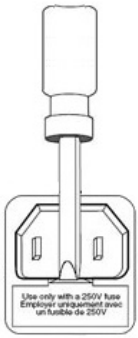

***Caution***
Cleaning cloths containing plastic fibers can damage the coating of the lenses!

### Maintenance of the stand

Dust can be removed with a brush. In case the stand or table is really dirty then you can clean the surface 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 you can lubricate the bearing can be lubricated

### Replacing the fuse

To change the fuse, please follow these procedures below:




- Remove the power cord from the back of the microscope
- Locate the fuse compartment, which has a fuse image. It is typically located beneath the power connector
- Remove the fuse compartment. To do so, insert a flat head screw driver in between the metal power tines and gently pry the fuse compartment loose with a slight downward and outward motion
- Insert the new fuse into the compartment, and then replace the fuse compartment cover to where it originally was
- Power up the microscope and test
- Fuse specification: 250V, 150 mA

***Note:*** The fuse may blow.in order to prevent internal damage to the microscope. And iIn most cases, replacing the fuse with a correctly rated fuse will resolve the issue. However, should you encounter a blown fuse frequently, please contact your distributor for further assistance

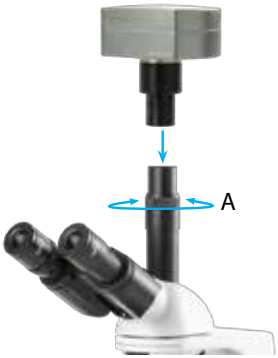
### Using the Kensington™ security slot

At the backside of the microscope a Kensington™ security slot is placed, which can be used to secure the instrument from theft using a Kensington™ lock (not supplied)

## Digital cameras

For trinocular models, slide the camera with mounted C-mount adapter into the 23,2mm tube of the photo port. Take an easy-to-view specimen and focus the image through the microscope's eyepieces. For focusing the camera, slowly move tube (A) up and down while watching at the screen untill the camera view is in focus

Follow the manual that comes with the camera for camera operation




*Trinocular MSU-400 head with camera in photo port*

## Accessories and spare parts

For current accessories and spares, please visit our website coleparmer.com

## Warranty

These microscopes come with a five (5) year factory warranty against manufacturing defects, covering labor and parts. Warranty does not apply for consumable accessories and parts such as bulbs, batteries, fuses, cords, optical components, or any add-on accessories such as mechanical specimen holders that are not built into the microscope stage as an integral part of the original manufacture, etc. Warranty does not cover microscopes, lenses cameras or other accessories that have become inoperable due to dirt or damage due to misuse or lack of maintenance.

**Note:** Buyers are responsible for return shipping and handling cost for warranty services. Warranty covers parts and labor only.

## Notes

WolfLabs

**Pricing on any accessories shown can be found by keying the part number into the search box on our website.**

The specifications listed in this brochure are subject to change by the manufacturer and therefore cannot be guaranteed to be correct.
If there are aspects of the specification that must be guaranteed, please provide these to our sales team so that details can be confirmed.

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Please contact us if this literature doesn't answer all your questions.