OPTIKA® ITALY

B-510 Series

INSTRUCTION MANUAL

Model
B-510DK

v 1.0 2018

Table of Contents

1. Warning
2. Symbols and conventions
3. Safety Information
4. Intended use
5. Overview
6. Unpacking
7. Assembling
8. Summary of brightfield observation procedures
9. Summary of darkfield observation procedures
10. Use of the microscope
11. Darkfield microscopy
12. Microphotography
13. Maintenance
14. Troubleshooting

Equipment disposal

1. Warning

This microscope is a scientific precision instrument designed to last for many years with a minimum of maintenance. It is built to high optical and mechanical standards and to withstand daily use. We remind you that this manual contains important information on safety and maintenance, and that it must therefore be made accessible to the instrument users. We decline any responsibility deriving from incorrect instrument use uses that does not comply with this manual.

2. Symbols and conventions

The following chart is an illustrated glossary of the symbols that are used in this manual.

CAUTION
This symbol indicates a potential risk and alerts you to proceed with caution.

ELECTRICAL SHOCK
This symbol indicates a risk of electrical shock.

3. Safety Information

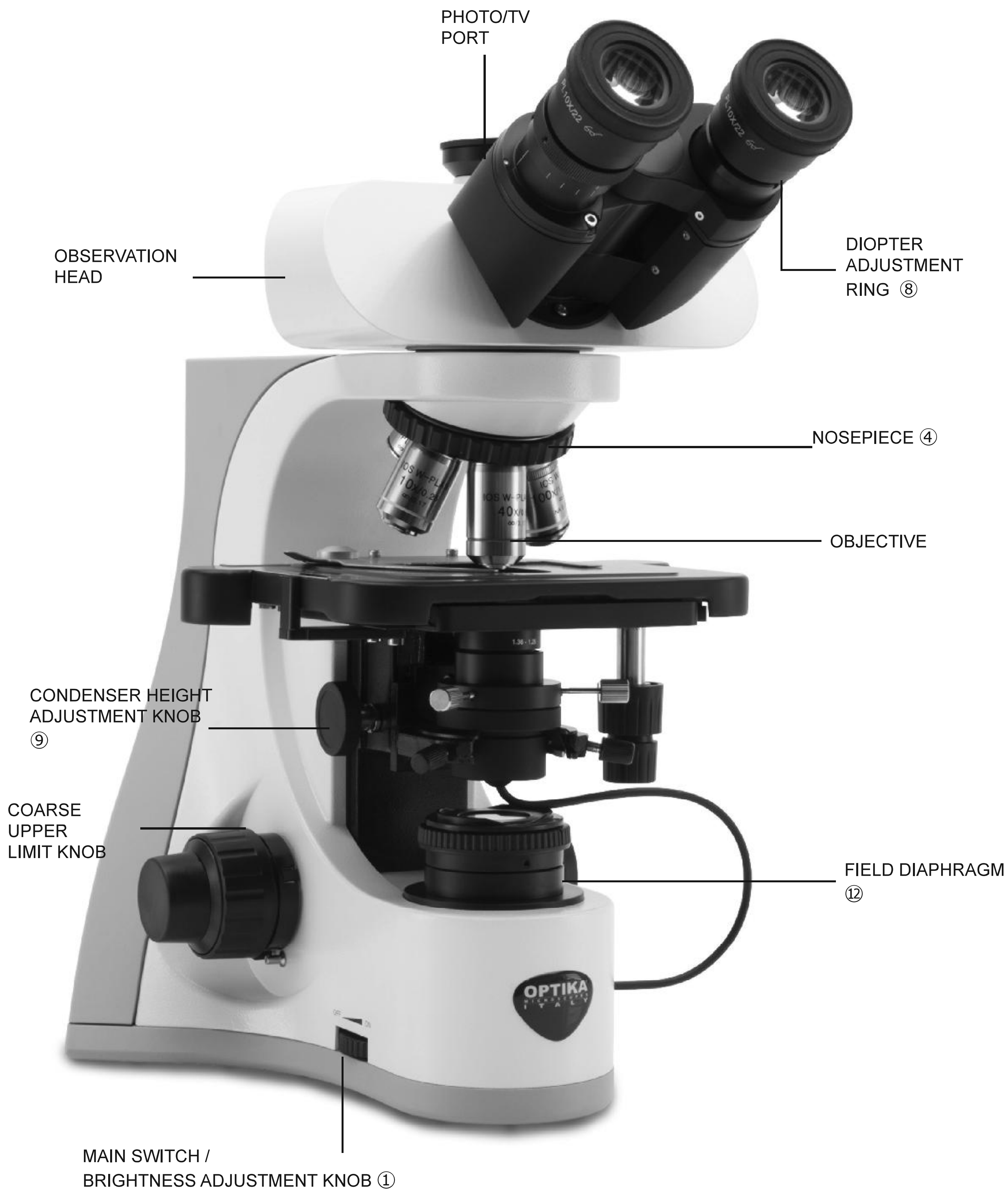
Avoiding Electrical Shock

Before plugging in the power supply, make sure that the supplying voltage of your region matches with the operation voltage of the equipment and that the lamp switch is in off position. Users should observe all safety regulations of the region. The equipment has acquired the CE safety label. However, users have full responsibility to use this equipment safely. Please follow the guidelines below, and read this manual in its entirety to ensure safe operation of the unit.

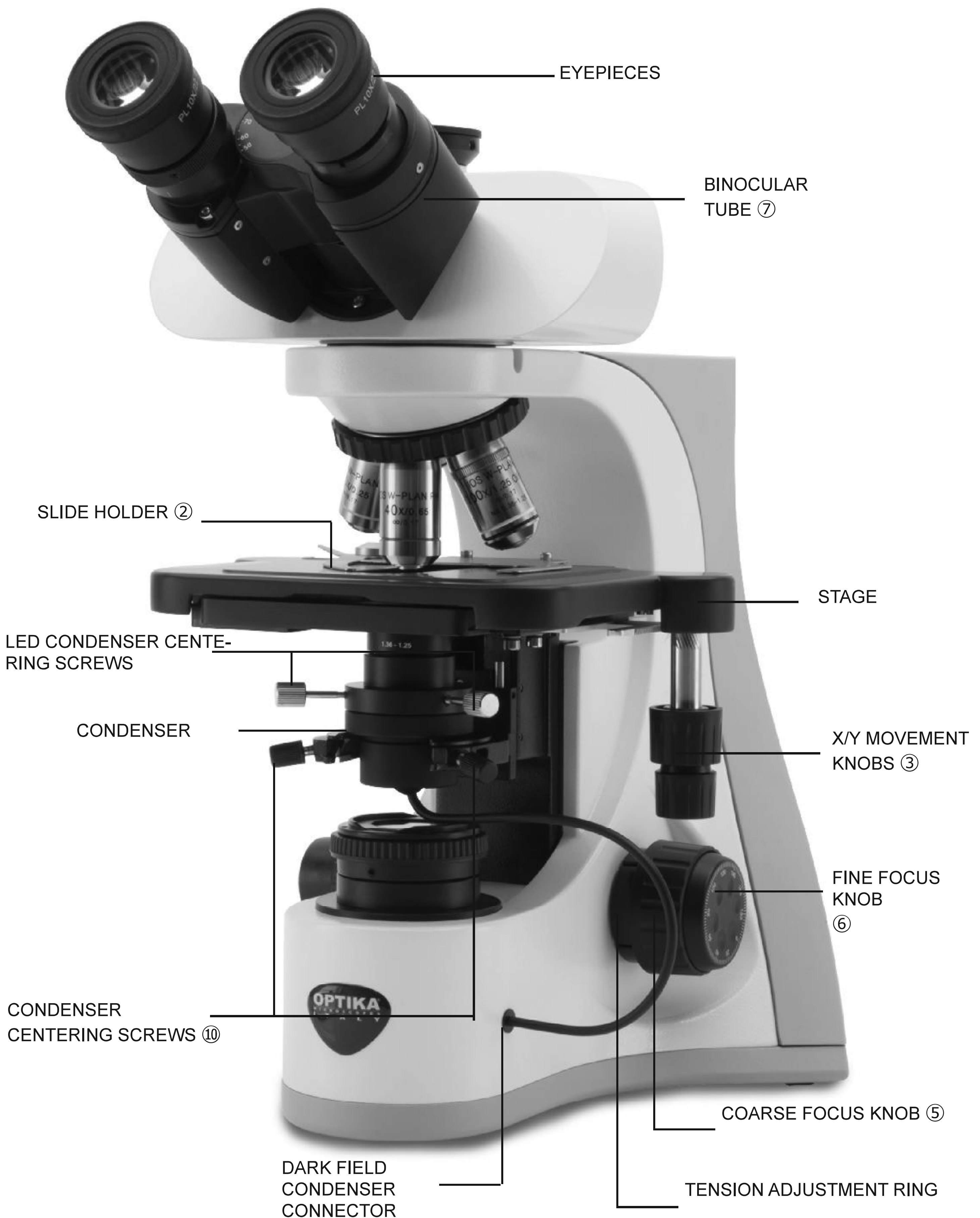
4. Intended use

For research and teaching use only. Not intended for any animal or human therapeutic or diagnostic use.

5. Overview



5. Overview (opposite side)



6. Unpacking (B-510DK)

The microscope is housed in a moulded Styrofoam container. Remove the tape from the edge of the container and lift the top half of the container. Take some care to avoid that the optical items (objectives and eyepieces) fall out and get damaged. Using both hands (one around the arm and one around the base), lift the microscope from the container and put it on a stable desk.

Do not touch with bare hands optical surfaces such as lenses, filters or glasses. Traces of grease or other residuals may deteriorate the final image quality and corrode the optics surface in a short time.

7. Assembling

Once opened the B-510DK box, the microscope parts are the following:

① Microscope frame
② Eyepieces
③ Objectives
④ Observation head
⑤ Immersion oil
⑥ Allen wrench
⑦ Tension adjustment tool
⑧ Dust cover
⑨ Power supply
⑩ Bright field condenser
⑪ Dark field condenser
⑫ centering telescope

Assembling procedure

1. Insert the optical head above the stand and tighten the screw. (Fig.1)

► **Hold the head with one hand during the locking in order to avoid that the head falls.**

Fig.1

2. Insert both eyepieces into the tubes of the optical head. (Fig.2)

Fig.2

3. Screw each objective into the thread of the nosepiece, clockwise with increasing magnification. (Fig.3).

Fig.3

4. Insert the power supply jack in the connector placed at the rear side of the microscope. (Fig.4)

Fig.4

DO NOT DISASSEMBLE THE INSTRUMENT
Do not disassemble the instrument.
This will void the warranty and can cause malfunctions.

- **The microscope is delivered with two condensers: one for brightfield and one for darkfield.**
  Select the suitable condenser forthe observation mode desired.

5. Lower the condenser holder using the height condenser knob ①. (Fig. 5)

Fig.5

6. Insert the condenser round dovetail with the condeser holder. (Fig. 6)

Fig.6

7. Tight the condenser locking screw ②. (Fig. 7)

Fig.7

8. (Only for darkfield condenser)
   Connect the condeser jack to the connector on the right side of the frame. (Fig. 8)

- **When the condenser plug is connected, the light coming from the microscope LED goes out and the internal condenser LED turns on.**

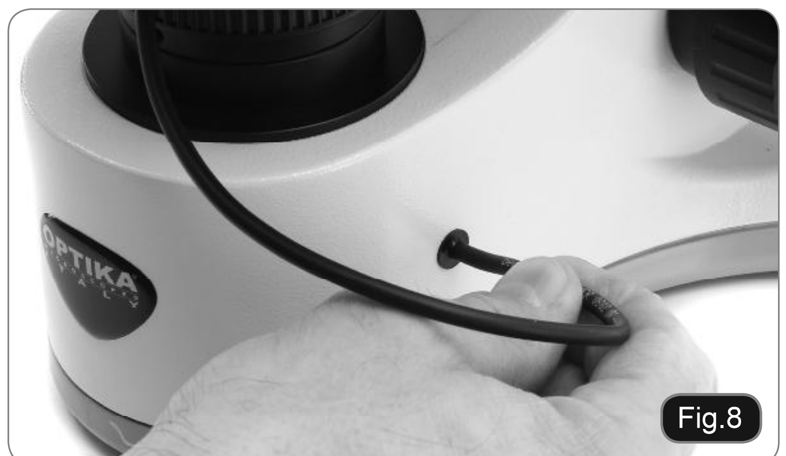
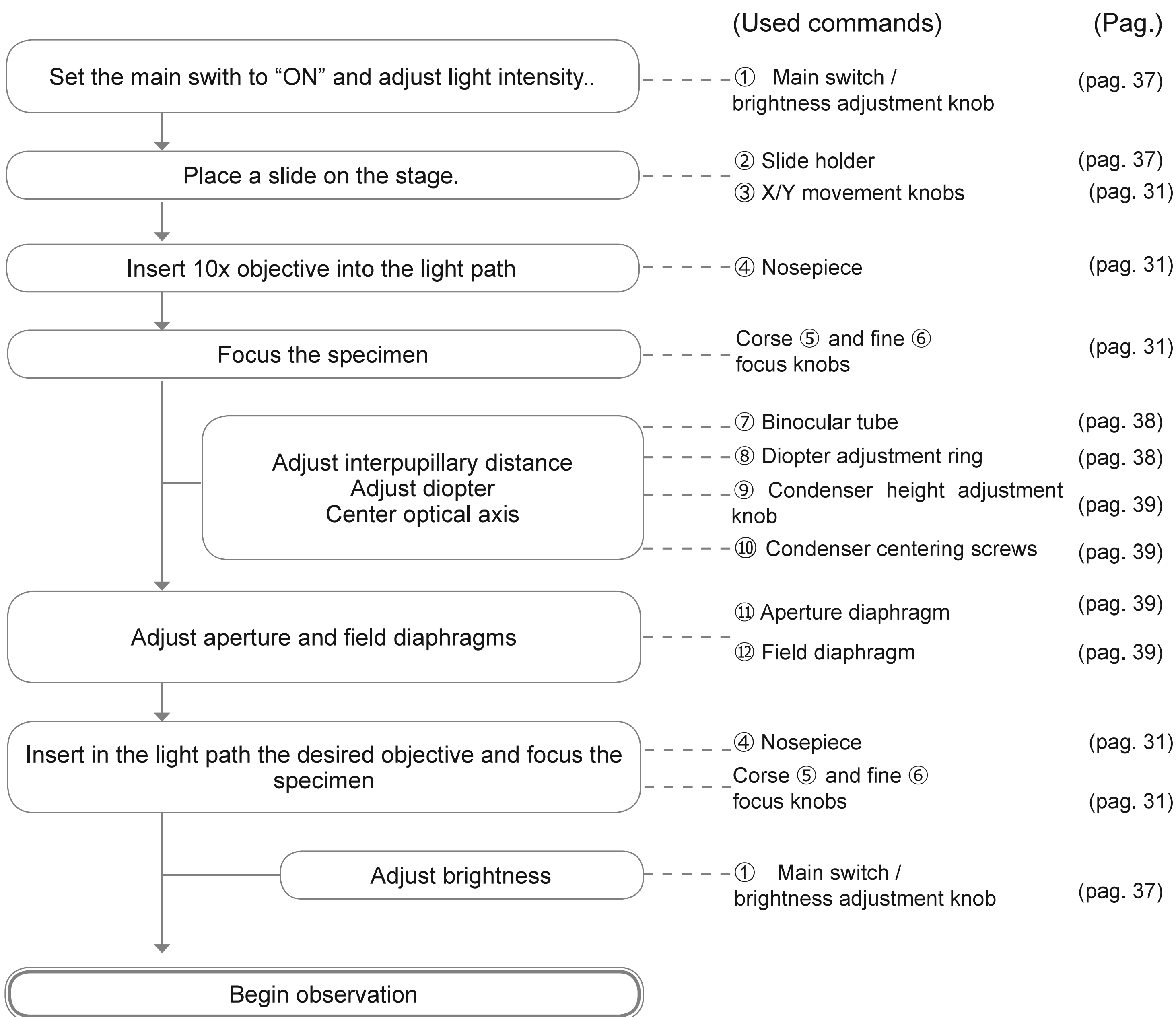
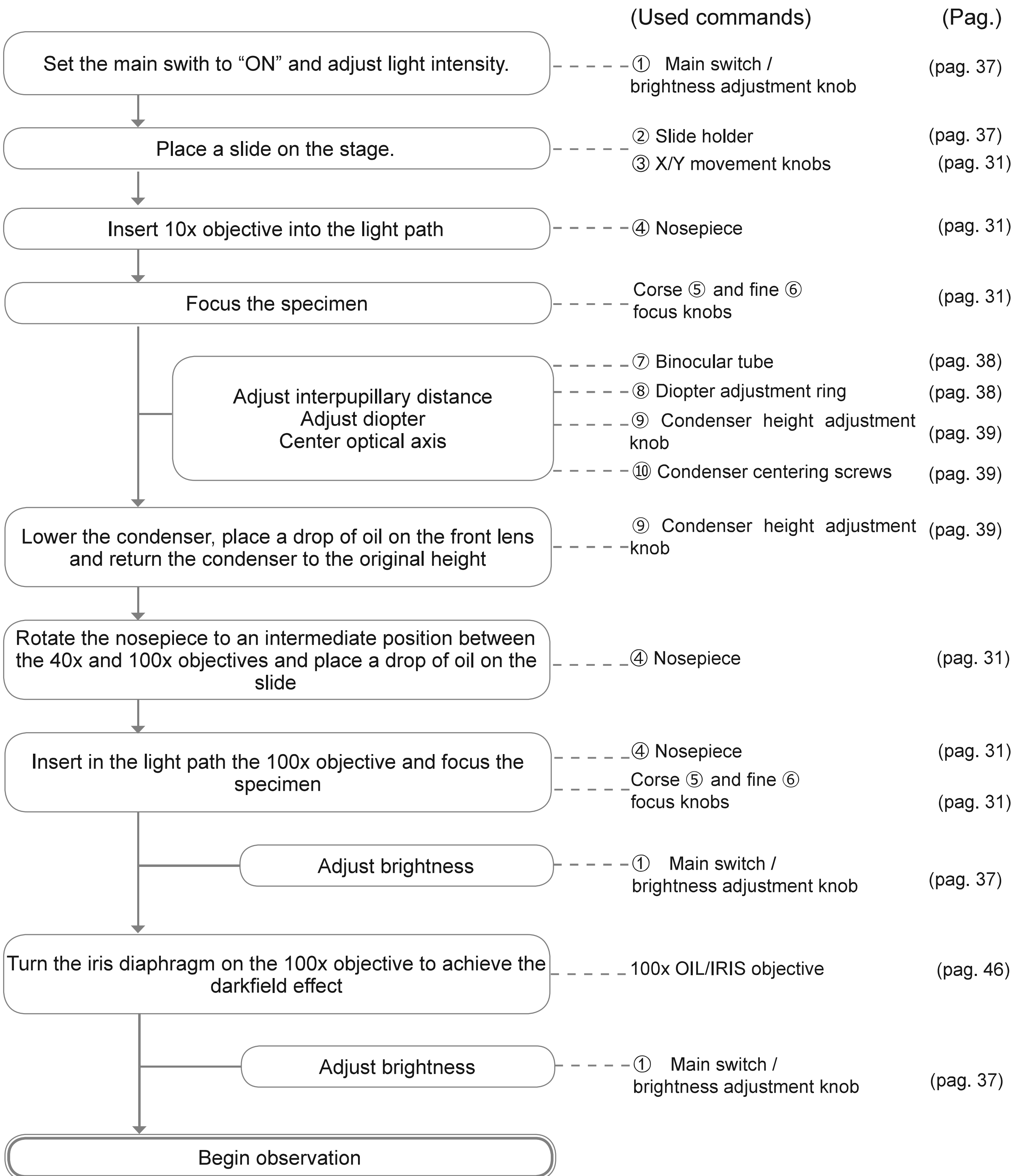


Fig.8

8. Summary of brightfield observation procedures



9. Summary of darkfield observation procedures



9. Use of the microscope

1. Light intensity adjustment

Operate on the light intensity adjustment knob to turn ON / OFF the microscope and to increase / decrease the illumination voltage ①. (Fig.5)

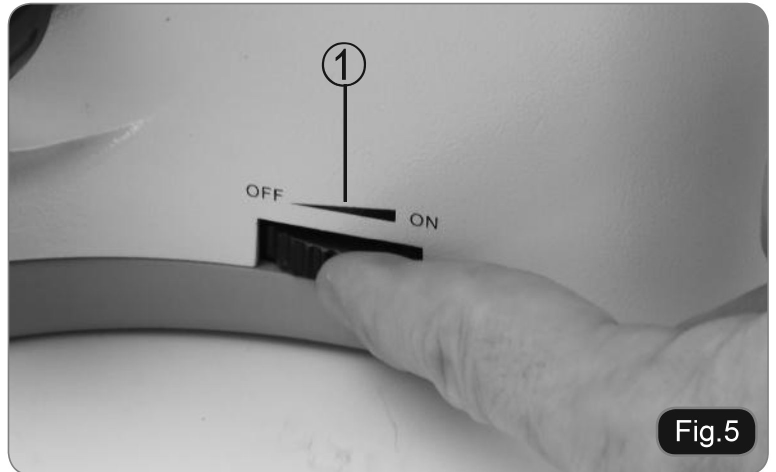


Fig.5

2. Coarse focus tension adjustment

► **Adjust the tension using the provided tool.**

The coarse knob tension is pre-setted in the factory.
To modify the tension according to personal's needs, rotate the ring ② using the provided tool (Fig. 6).
Clockwise rotation increases the tension.
If the tension is too loose, the stage could go lower by itself or the focus easily lost after fine adjustment. In this case, rotate the knob in order to increase the tension.

Fig.6

3. Coarse upper limit knob (Fig. 7)

The upper limit knob has two functions: prevent the contact between slide and objective and acts as "focus memory".
After focussing the specimen, rotate the knob ③ and lock it. In this way the focus upper limit is set. Now one can lower the stage with coarse focus knob, replace the specimen and raise again the stage up to the upper limit: specimen will be in approximate focus and will need a fine adjustment to get the proper focus.
Fine focus movement is not affected by the coarse focus lock.

► **To unlock, move the knob in the opposite direction to the one used for the lock.**

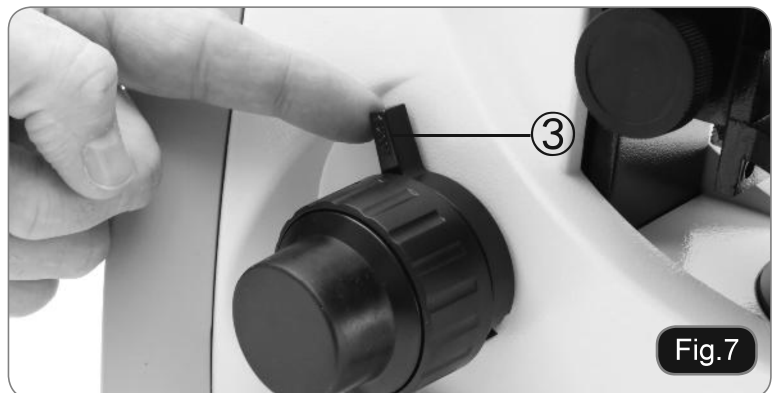


Fig.7

4. Stage (Fig. 8)

Stage accepts standard slides 26 x 76 mm, thickness 1,2 mm with coverlside 0,17mm.
It is possible to place two slides side by side on the stage.

- **Open the spring arm of the slide holder ④ and place frontally the slides on the stage.**
- **Gently release the spring arm of the slide holder.**

► **A sudden release of the the spring arm could cause the falling of the slide.**

Fig.8

5. Dioptric adjustment (Fig. 9)

1. Look into the right eyepiece with your right eye only, and focus on the specimen.
2. Look into the left eyepiece with your left eye only. If the image is not sharp, use the dioptric adjustment ring ① to compensate. (Fig.9)

► **The adjustment range is ±5 diopter. The number indicated on the adjustment ring graduation should correspond to the operator's dioptric correction.**

6. Adjusting the interpupillary distance (Fig. 10)

Observing with both eyes, hold the two eyepiece prism assemblies. Rotate them around their common axis until the fields of view coincide.

► **The graduation on the interpupillary distance indicator ②, pointed by the spot "." on the eyepiece holder, shows the distance between the operator's eyes. (Fig.10)**

The range of the interpupillary distance is 48-75mm.

7. Use of eye shields (Fig.11-12)

- **Use without eyeglasses**
  Raise eye shields and observe at the microscope placing eyes to the shields, avoiding external light to disturb the observation.
- **Use with eyeglasses**
  Fold rubber eyeshields with both hands. Folded eyeshields avoid scratching the lenses of eyeglasses.

Fig.9

Fig.10

Fig.11

Fig.12

8. Centering the condenser (Fig.13)

1. Place the specimen on the stage, insert 10x objective into the light path and focus.
2. Insert the front lens of the swing-out condenser ①.
3. Rotate the field diaphragm ring ② in the direction showed by the arrow, to fully close the diaphragm.
4. Rotate the condenser height adjustment knob ③ to focus the edges of the diaphragm.
5. Rotate the two centering screws ④ to bring the bright spot in the center of the field of view.
6. Gradually open the diaphragm. The condenser is centered when the diaphragm image is symmetrical to the field of view.
7. In normal use, open the diaphragm until it circoscribes the field of view.

Effects of the field diaphragm

Field diaphragm adjusts the illuminated area to obtain a high contrast image.
Set the diaphragm according to the objective in use until it circoscribes the field of view, in order to eliminate unnecessary light to eyepieces.

Aperture diaphragm (Fig. 14)

- The Numerical Aperture (N.A.) value of the aperture diaphragm affects the image contrast. Increasing or reducing this value one can vary resolution, contrast and depth of focus of the image.
- With low contrast specimens set the numerical aperture value ① (printed on the condenser ring) to about 70%-80% of the objective's N.A. If necessary, remove on eyepiece and, looking into empty sleeve, adjust the condenser's ring in order to obtain an image like the one in fig. 15.

  Example: with objective PLAN 40x / 0,65 set the scale to 0.65 x 0.8 = 0,52

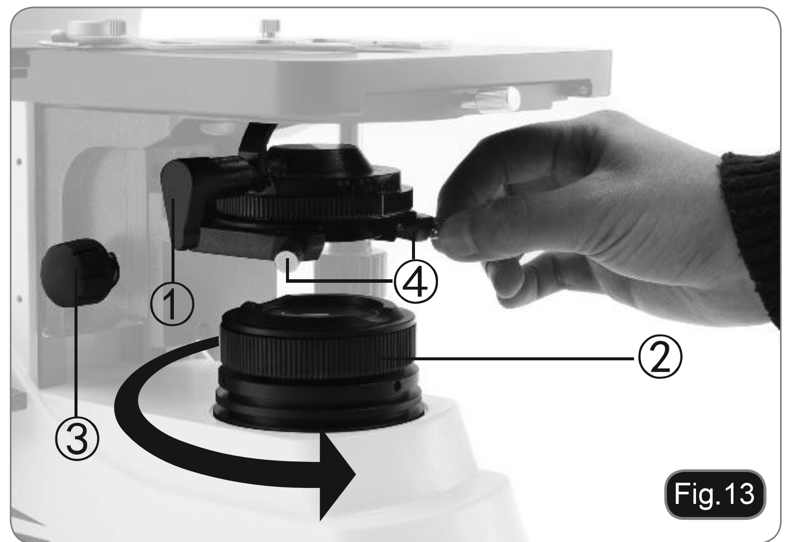


Fig.13

CENTERING THE CONDENSER

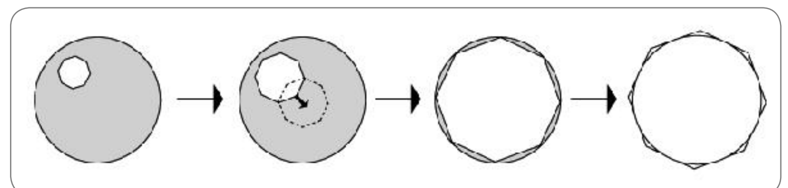


Fig.14

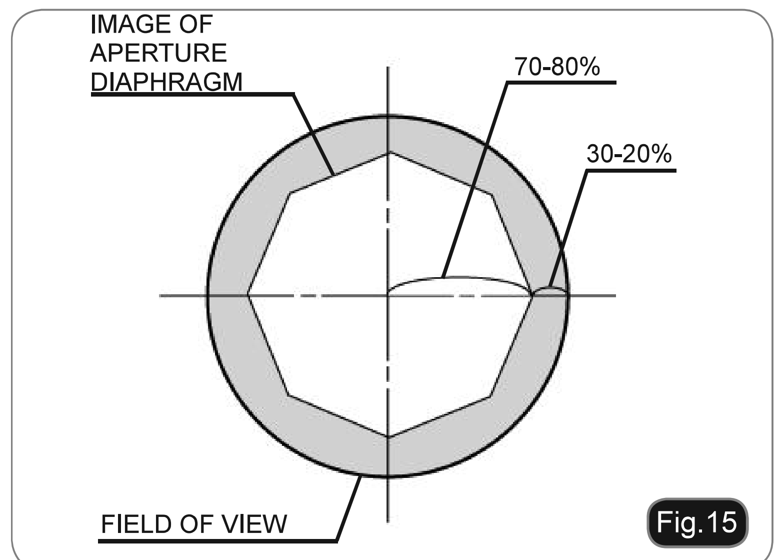


Fig.15

11. Darkfield microscopy

B-5100DK is a darkfield system specific for blood analysis with a 1.36 - 1.25 N.A. special extra efficient darkfield condenser and a 100X plan-achromatic objective with adjustable iris diaphragm.

The X-LED illumination ensures the high level of light intensity typically needed in high magnification darkfield techniques.

In order to correctly use this microscope, one has to gain some familiarity with:
a) oil immersion technique
b) darkfield technique.

In the following manual we present the basics of these methods (chapters 11.1 and 11.2) and then we give a step-by-step guide to configuration of B-510DK (chapter 11.3).

General tips for immersion microscopy are also given (chapter 5).

11.1 Principles of oil immersion microscopy

The ability of a microscope objective to capture deviated light rays from a specimen is dependent upon both the numerical aperture and the medium through which the light travels.

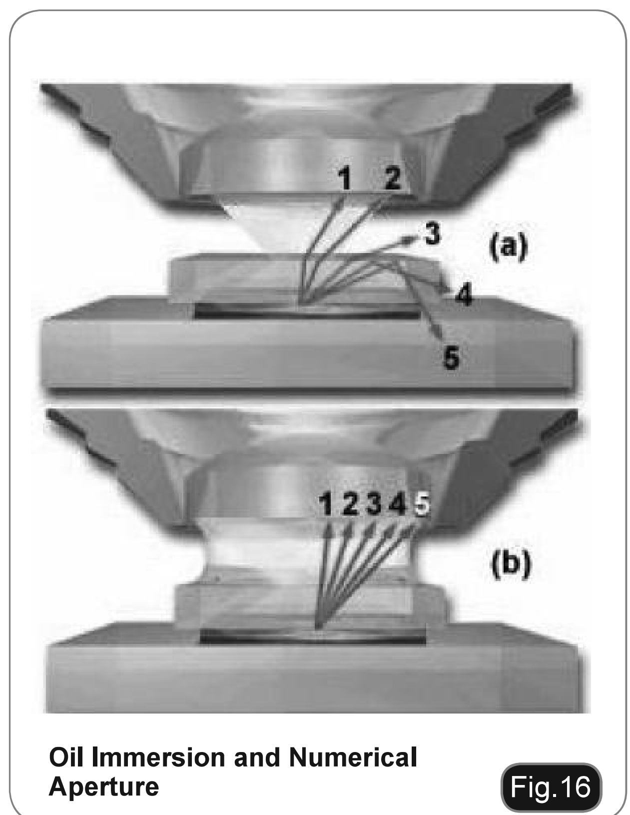
An objective's numerical aperture is directly proportional to the refractive index of the imaging medium between the coverslip and the front lens, and also to the sin of one-half the angular aperture of the objective.

Because sin cannot be greater than 90 degrees, the maximum possible numerical aperture is determined by the refractive index of the immersion medium.

Most microscope objectives use air as the medium through which light rays must pass between the coverslip protecting the sample and front lens of the objective. Objectives of this type are referred to as dry objectives because they are used without liquid imaging media.

Air has a refractive index of 1.0003, very close to that of a vacuum and considerably lower than most liquids, including water (n = 1.33), glycerin (n = 1.470) and common microscope immersion oils (average n = 1.515).

In practice, the maximum numerical aperture of a dry objective system is limited to 0.95, and greater values can only be achieved using optics designed for immersion media.



Oil Immersion and Numerical Aperture

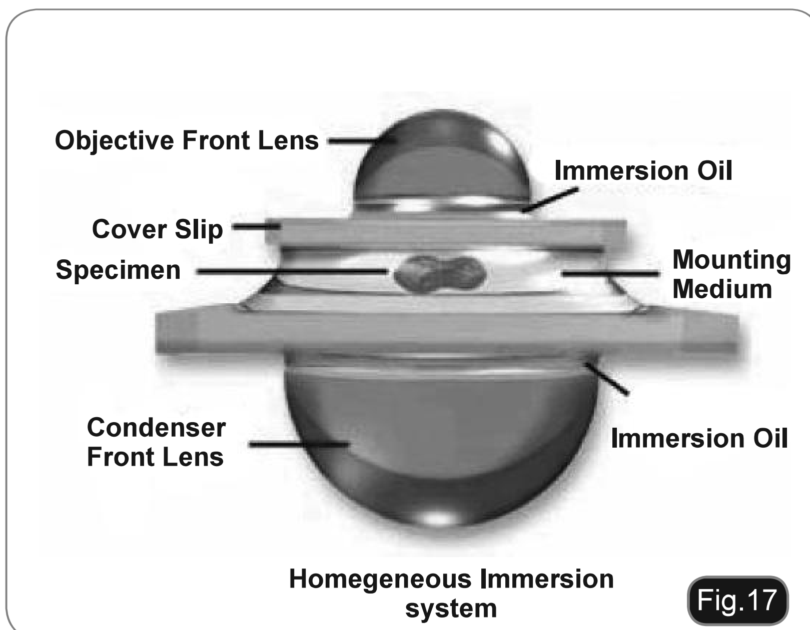
Fig.16

The principle of oil immersion is demonstrated in Figure 16 where individual light rays are traced through the specimen and either pass into the objective or are refracted in other directions. Figure 16 (a) illustrates the case of a dry objective with five rays (labeled 1 through 5) shown passing through a sample that is covered with a coverslip. These rays are refracted at the coverslip-air interface and only the two rays closest to the optical axis (rays 1 and 2) of the microscope have the appropriate angle to enter the objective front lens. The third ray is refracted at an angle of about 30 degrees to the coverslip and does not enter the objective. The last two rays (4 and 5) are internally reflected back through the coverslip and, along with the third ray, contribute to internal reflections of light at glass surfaces that tend degrade image resolution. When air is replaced by oil of the same refractive index as glass, shown in Figure 16(b), the light rays now pass straight through the glass-oil interface without deviation due to refraction. The numerical aperture is thus increased by the factor of n, the refractive index of oil.

Microscope objectives designed for use with immersion oil have a number of advantages over those that are used dry. Immersion objectives are typically of higher correction (either fluorite or apochromatic) and can have working numerical apertures up to 1.40 when used with immersion oil having the proper dispersion and viscosity. These objectives allow the substage condenser diaphragm to be opened to a greater degree, thus extending the illumination of the specimen and taking advantage of the increased numerical aperture.

A factor that is commonly overlooked when using oil immersion objectives of increased numerical aperture is limitations placed on the system by the substage condenser.

In a situation where an oil objective of NA = 1.40 is being used to image a specimen with a substage condenser of smaller numerical aperture (1.0 for example), the lower numerical aperture of the condenser overrides that of the objective and the total NA of the system is limited to 1.0, the numerical aperture of the condenser.



Modern substage condensers often have a high degree of correction with numerical aperture values ranging between 1.0 and 1.40. In order to effectively utilize all the benefits of oil immersion, the interface between the substage condenser front lens and the underside of the microscope slide containing the specimen should be also be immersed in oil. An ideal system is schematically diagramed in Figure 2, where immersion oil has been placed at the interfaces between the objective front lens and the specimen slide and also between the front lens of the condenser and the underside of the specimen slide.

This system has been termed a Homogeneous Immersion System and it is the ideal situation to achieve maximum numerical aperture and resolution in an optical microscope.

In this case, the refractive index and dispersion of the objective front lens, immersion oil, substage condenser front lens, and the mounting medium are equal or very near equal.

In this ideal system, an oblique light ray can pass through the condenser lens and completely through the microscope slide, immersion oil, and mounting medium undeviated by refraction at oil-glass or mounting medium-glass interfaces.

When using high-power achromat oil immersion objectives, it is sometimes permissible to omit the step of oiling the condenser top lens.

This is because the condenser aperture diaphragm must often be reduced with lesser-corrected objectives to eliminate artifacts and provide optimum imaging.

The reduction in diaphragm size reduces the potential increase in numerical aperture (provided by oiling the condenser lens) so the loss in image quality under these conditions is usually negligible.

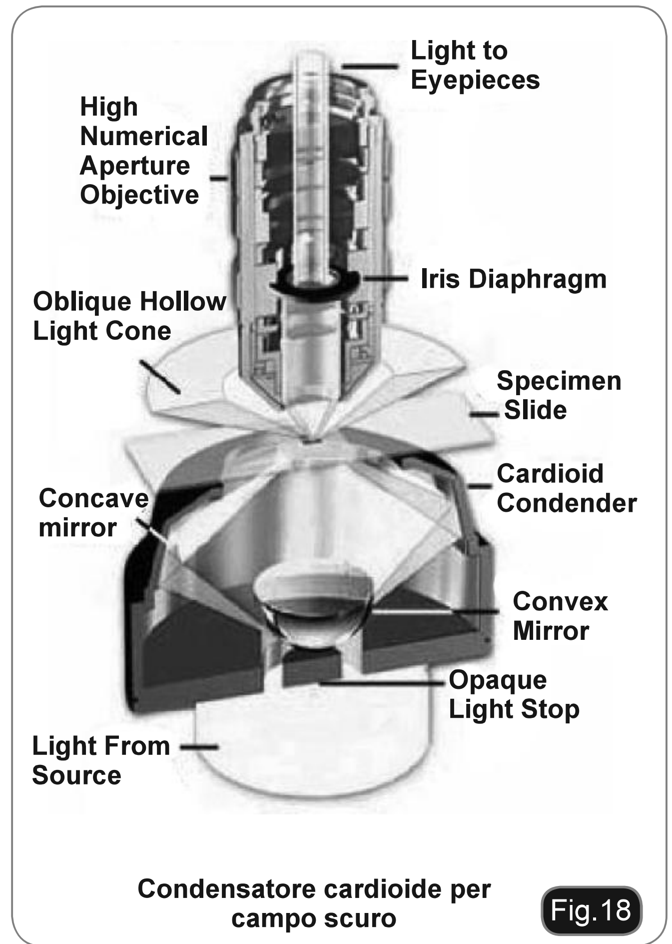
11.2 Principles of darkfield illumination

Darkfield microscopy is a specialized illumination technique that capitalizes on oblique illumination to enhance contrast in specimens that are not imaged well under normal brightfield illumination conditions.

All of us are quite familiar with the appearance and visibility of stars on a dark night, this despite their enormous distances from the earth. Stars can be seen because of the stark contrast between their faint light and the black sky.

This principle is applied in darkfield (also called darkground) microscopy, a simple and popular method for making unstained objects clearly visible. Such objects are often have refractive indices very close in value to that of their surroundings and are difficult to image in conventional brightfield microscopy. For instance, many small aquatic organisms have a refractive index ranging from 1.2 to 1.4, resulting in a negligible optical difference from the surrounding aqueous medium. These are ideal candidates for darkfield illumination.

Darkfield illumination requires blocking out of the central light which ordinarily passes through and around (surrounding) the specimen, allowing only oblique rays from every azimuth to "strike" the specimen mounted on the microscope slide. The top lens of a simple Abbe darkfield condenser is spherically concave, allowing light rays emerging from the surface in all azimuths to form an inverted hollow cone of light with an apex centered in the specimen plane. If no specimen is present and the numerical aperture of the condenser is greater than that of the objective, the oblique rays cross and all such rays will miss entering the objective because of their obliquity. The field of view will appear dark.



Condensatore cardioide per campo scuro

Fig.18

The darkfield condenser/objective pair illustrated in Figure 18 is a high-numerical aperture arrangement that represents darkfield microscopy in its most sophisticated configuration, which will be discussed in detail below. The objective contains an internal iris diaphragm that serves to reduce the numerical aperture of the objective to a value below that of the inverted hollow light cone emitted by the condenser. The cardioid condenser is a reflecting darkfield design that relies on internal mirrors to project an aberration-free cone of light onto the specimen plane.

When a specimen is placed on the slide, especially an unstained, non-light absorbing specimen, the oblique rays cross the specimen and are diffracted, reflected, and/or refracted by optical discontinuities (such as the cell membrane, nucleus, and internal organelles) allowing these faint rays to enter the objective. The specimen can then be seen bright on an otherwise black background. In terms of Fourier optics, darkfield illumination removes the zeroth order (unscattered light) from the diffraction pattern formed at the rear focal plane of the objective. This results in an image formed exclusively from higher order diffraction intensities scattered by the specimen.

Ideal candidates for darkfield illumination include minute living aquatic organisms, diatoms, small insects, bone, fibers, hair, unstained bacteria, yeast, and protozoa.

Non-biological specimens include mineral and chemical crystals, colloidal particles, dust-count specimens, and thin sections of polymers and ceramics containing small inclusions, porosity differences, or refractive index gradients.

Care should be taken when preparing specimens for darkfield microscopy because features that lie above and below the plane of focus can also scatter light and contribute to image degradation.

Specimen thickness and microscope slide thickness are also very important and, in general, a thin specimen is desirable to eliminate the possibility of diffraction artifacts that can interfere with image formation.

11.3 High magnification darkfield microscopy

For more precise work and blacker backgrounds, you may choose a condenser designed especially for darkfield, i.e. to transmit only oblique rays. There are several varieties: “dry” darkfield condensers with air between the top of the condenser and the underside of the slide–and immersion darkfield condensers which require the use of a drop of immersion oil (some are designed to use water instead) establishing contact between the top of the condenser and the underside of the specimen slide. The immersion darkfield condenser has internal mirrored surfaces and passes rays of great obliquity and free of chromatic aberration, producing the best results and blackest background.
Perhaps the most widely used darkfield condenser is the paraboloid, consisting of a solid piece of glass ground very accurately into the shape of a paraboloid.

As discussed above, the dry darkfield condenser is useful for objectives with numerical apertures below 0.75, while the paraboloid and cardioid immersion condensers (Figure 18) can be used with objectives of very high numerical aperture (up to 1.4). Objectives with a numerical aperture above 1.2 will require some reduction of their working aperture since their maximum numerical aperture may exceed the numerical aperture of the condenser, thus allowing direct light to enter the objective.
For this reason, many high numerical aperture objectives designed for use with darkfield as well as brightfield illumination are made with a built-in adjustable iris diaphragm that acts as an aperture stop.

This reduction in numerical aperture also limits the resolving power of the objective as well as the intensity of light in the image. Specialized objectives designed exclusively for darkfield work are produced with a maximum numerical aperture close to the lower limit of the numerical aperture of the darkfield condenser. They do not have internal iris diaphragms, however the lens mount diameters are adjusted so at least one internal lens has the optimum diameter to perform as an aperture stop.

The cardioid condenser is very sensitive to alignment and must be carefully positioned to take advantage of the very sharp cone of illumination, making it the most difficult darkfield condenser to use. In addition, the condenser produces a significant amount of glare, even from the most minute dust particles, and the short focal length may result in poor illumination on objects that exceed a few microns in size or thickness. When choosing microscope slides for quantitative high-magnification darkfield microscopy, make certain to select slides made from a glass mixture that is free of fluorescent impurities.

Careful attention should be paid to the details of oiling a high numerical aperture condenser to the bottom of the specimen slide. It is very difficult to avoid introduction of tiny air bubbles into the area between the condenser top lens and the bottom of the microscope slide, and this technique should be practiced to perfection. Air bubbles will cause image flare and distortion, leading to a loss of contrast and overall image degradation.

Problems are also encountered when using microscope slides that are either too thick or too thin. Many darkfield condensers contain the range of usable slide thickness inscribed directly on the condenser mount. If the slide is too thick, it is often difficult to focus the condenser without resorting to a higher viscosity immersion oil. On the other hand, slides that are too thin have a tendency to break the oil bond between the condenser and the slide. It is a good idea to purchase precision microscope slides of the correct thickness to avoid any of the problems mentioned above.
High numerical aperture condensers, whether intended for use dry or with oil, must be accurately centered in the optical path of the microscope to realize optimum performance.

To achieve this, many darkfield condensers are built with a small circle engraved onto the upper surface to aid in centering the condenser. Centering is performed with a low power (10x-20x) objective by imaging the engraved circle and using the condenser centering screws to ensure the circle (and condenser) are correctly centered in the optical path.

1. Centering of darkfield condenser

1. Select a darkfield specimen and place it onto the microscope stage between the objective and the condenser, insert 10x objective in the light path and focus the specimen.

► **The condenser will project a spot of light onto the sample that can be used for centering the optical path..**

2. Use the condenser centering screws to move the ring of light into the center of the field of view ①. (Fig.19)

► **It could be useful to vary the height of the condenser in order to view the spot.**

► **It is often advantageous to use a low power 10x objective when centering high numerical aperture darkfield condensers.**

► **When viewing a specimen with the 10x objective while slowly raising and lowering the condenser, a point will be reached where a bright spot will appear in the field of view as illustrated in Fig. 20 (a). As the condenser is slightly raised or lowered, a dark spot similar to the one shown in Fig. 20 (b), if the condenser is properly centered. In cases where the condenser is not properly aligned and centered, a typical field of view might look like that shown in Fig. 20(c) and (d). The ideal and correct positioning of the condenser is illustrated in Fig. 20(a), and the condenser should be adjusted until the field of view appears in this manner, with the condenser centering screws.**

3. Remove the slide and put a drop of oil (provided) on the condenser front lens. (Fig. 21)

► **Make sure there are no air bubbles. Air bubbles in the oil damage the quality of the image.**

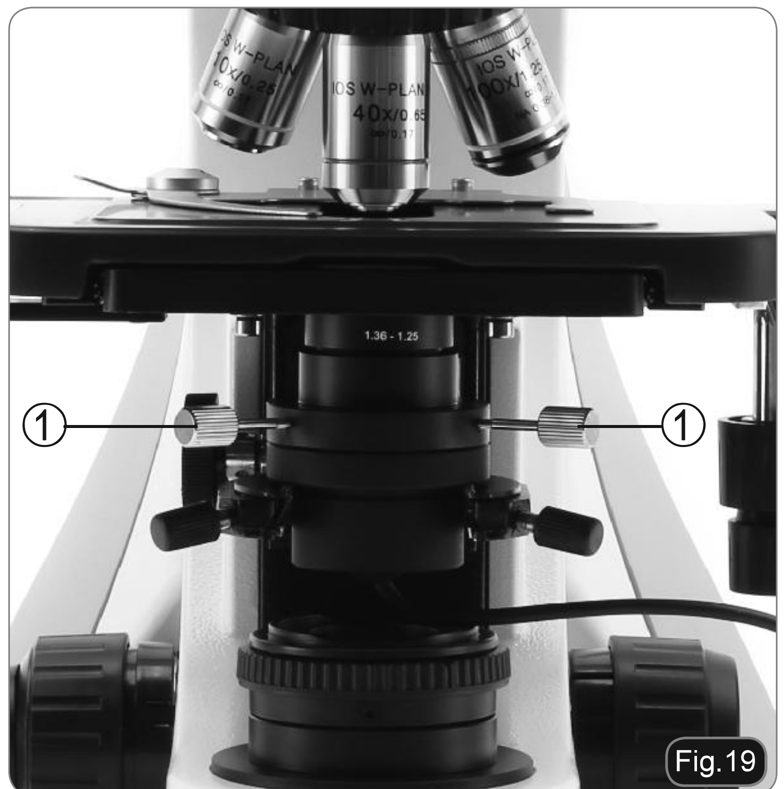


Fig.19

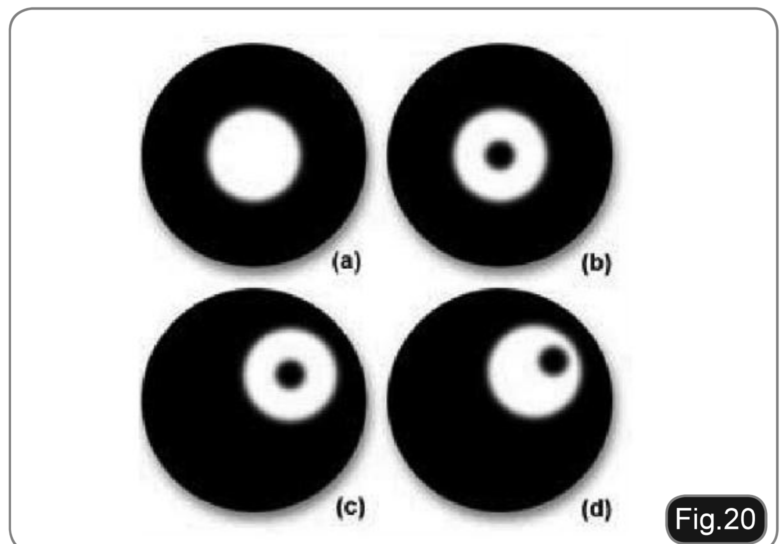


Fig.20

Fig.21

4. Reposition the slide and raise the condenser until the oil on the lens of the condenser is in contact with the slide.

5. Move the area to be observed at the center of the optical path using a low magnification objective (10x or 40x).

6. Focus the specimen.

7. Insert in the light path100X oil/Iris objective. This pre-positions all system components in preparation for adding oil. Move the immersion objective to an adjacent position of the nosepiece and apply the oil to the sample.. (Fig. 22)

8. Actually, the situation must be in which the slide is completely immersed in oil both in the lower part (condenser-glass interface) ①, and in the upper part (glass-lens interface) ②. (Fig. 23)

9. Remove one eyepiece and insert the centering telescope in the empty eyepiece sleeve. (Fig.24)

10. Rotating the upper part of the centering telescope focus the image of the light ring visible in the periphery of the field of view. (Fig.25)

► **If the condenser is not perfectly centered or if the condenser is not at the exact height (too high or too low), the projected image will be similar to the one in Fig. 26.**

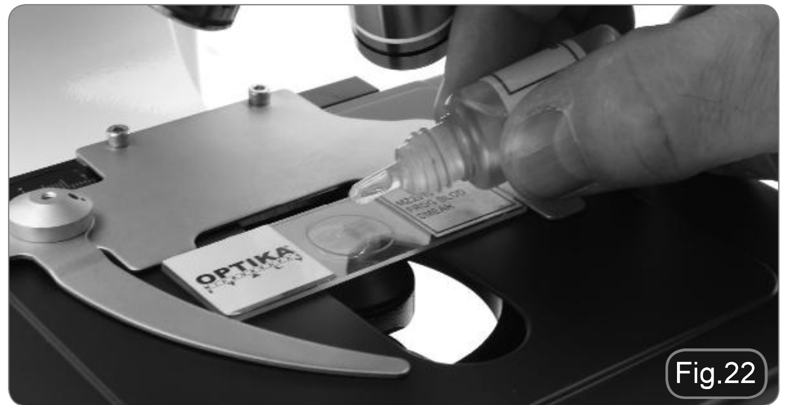


Fig.22

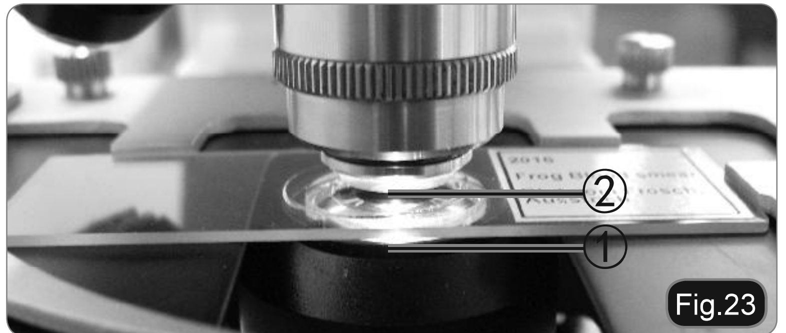


Fig.23

Fig.24

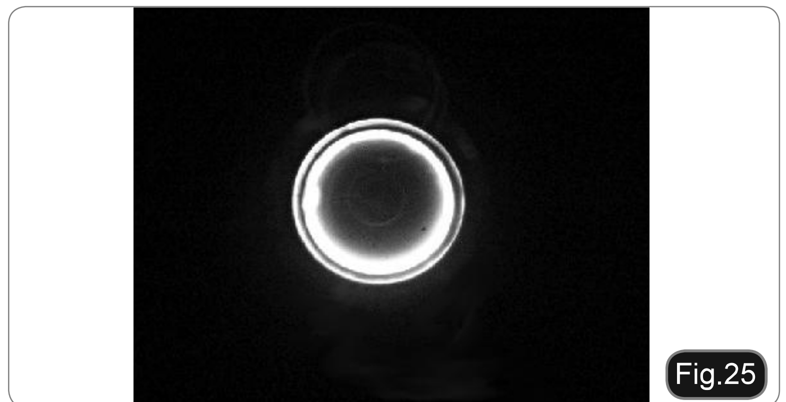


Fig.25

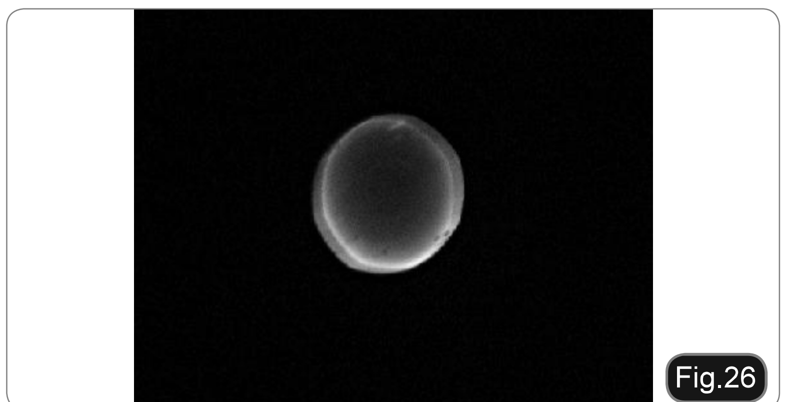


Fig.26

11. Fine adjust the condenser centering using the condenser height adjustment knob, on the condenser ① and LED ② centering screws. (Fig.27)

12. After properly setting the condenser, remove the centering telescope and insert again the eyepiece. Now begin the observation.

13. 100x objective has in internal iris diaphragm that allows the adjustment of the numerical aperture. Rotate the diaphragm to close the iris. (Fig.28)

14. The effect one will obtain switching from a fully opened iris (brightfield observation) to a fully closed iris (darkfield observation) is showed in Fig. 29 and 30.

Fig.27

Fig.28

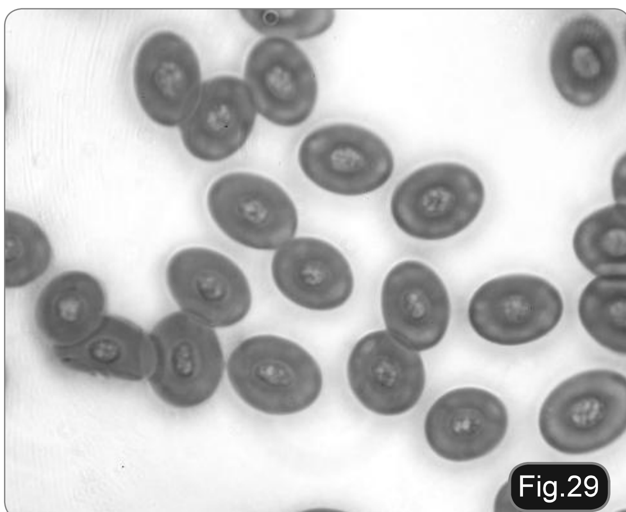


Fig.29

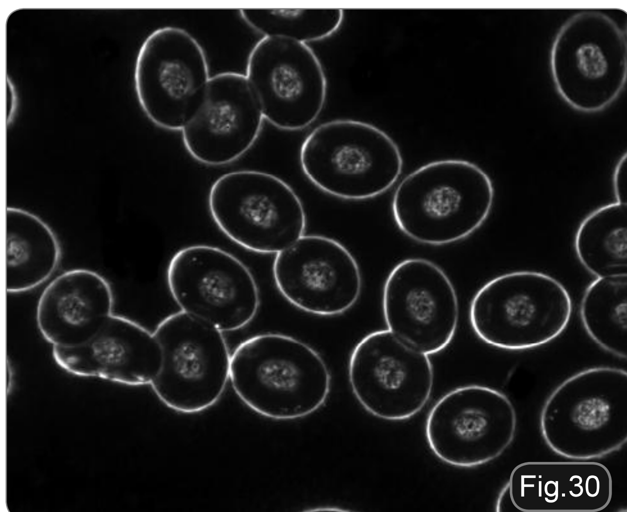


Fig.30

11. Microphotography

Installing the C-mount adapter

1. Loosen the clamping screw ① on the trinocular port and remove the dust cap ②. (Fig.27)
2. Screw the C-mount adapter ③ to the camera ④ and insert the round dovetail of the C-mount into the empty hole of the trinocular port, then tighten the clamping screw ①. (Fig.28)

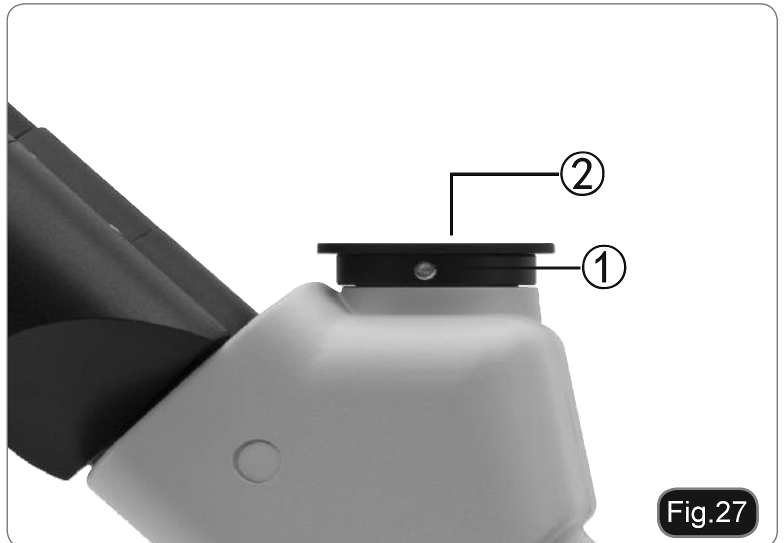


Fig.27

Fig.28

Use of Reflex camera

1. Insert the Reflex adapter ① into the relay tube to the microscope ②.
2. Screw the "T2" ring ③ (not provided) to the reflex adapter.
3. Connect the Reflex camera ④ to the "T2" just installed (Fig. 29).

- "T2" ring is not privided along with the microscope, but is commercialy available.
- While shhoting dark specimens, darken eyepieces and viewfinder with a dark cloth to miminize the diffused light.
- To calculate the magnification of the camera: objective magnification * camera magnification * lens magnification.

► **If using an SLR camera, mirror movement may cause the camera to vibrate.**
We suggest lifting the mirror, using long exposure times and a remote cord.

Fig.29

17. Maintenance

Microscopy environment
This microscope is recommended to be used in a clean, dry and shock free environment with a temperature of 5°-40°C and a maximum relative humidity of 75 % (non condensing). Use a dehumidifier if needed.

To think about when and after using the microscope

- The microscope should always be kept vertically when moving it and be careful so that no moving parts, such as the eyepieces, fall out.
- Never mishandle or impose unnecessary force on the microscope.
- Never attempt to service the microscope yourself.
- After use, turn off the light immediately, cover the microscope with the included dust-cover, and keep it in a dry and clean place.

Electrical safety precautions

- Before plugging in the power supply, make sure that the supplying voltage of your region matches with the operation voltage of the equipment and that the lamp switch is in off-position.
- Users should observe all safety regulations of the region. The equipment has acquired the CE safety label. However, users do have full responsibility to use this equipment safely.

Cleaning the optics
- If the optical parts need to be cleaned try first to: use compressed air.
- If that is not sufficient: use a soft lint-free piece of cloth with water and a mild detergent.
- And as a final option: use the piece of cloth moistened with a 3:7 mixture of ethanol and ether.
  Note: ethanol and ether are highly flammable liquids. Do not use them near a heat source, near sparks or near electric equipment. Use these chemicals in a well ventilated room.
- Remember to never wipe the surface of any optical items with your hands. Fingerprints can damage the optics.
- Do not disassemble objectives or eyepieces in attempt to clean them.

For the best results, use the OPTIKA cleaning kit (see catalogue).

If you need to send the microscope to Optika for maintenance, please use the original packaging.

18. Troubleshooting

Review the information in the table below to troubleshoot operating problems.

PROBLEM	CAUSE	SOLUTION
I. Optical Section:		
LED operates, but field of view remains dark.	Power supply is unplugged.	Connect
	Brightness is too low	Set brightness to a proper level
Field of view is obscured or not evenly illuminated	Revolving nosepiece is not correctly engaged.	Make sure that the revolving nosepiece clicks properly into place.
	The turret of the phase contrast condenser is in an incorrect position	Move the turret to a click stop
Dirt or dust is visible in the field of view.	Dirt/dust on the specimen	Clean the specimen
	Dirt/dust on the eyepieces	Clean the eyepieces
Image looks double	Aperture iris diaphragm is stopped down too far.	Open aperture iris diaphragm.
	The condenser is not well centered or it is in a wrong height	Set the condenser according to Koehler settings.
Visibility is poor. · Image is not poor. · Contrast is poor. · Details are indistinct. · Image glares	Revolving nosepiece is in an incorrect position	Move the nosepiece to a click stop
	Aperture iris diaphragm is too closed or too open.	Adjust aperture iris diaphragm.
	Dust or dirt on lenses (condenser, objectives, eyepieces and slide)	Clean thoroughly.
	For transmitted light observation, the coverglass thickness must not exceed 0.17mm	Use a coverglass with thickness 0.17mm
	For phase contrast observation, a brightfield objective is used instead a phase contrast one	Usa a phase contrast objective
	Phase rings of objective and condenser are not well centered	Operate on centering screws
	Objective in use is not compatible with condenser phase ring	Use a compatible objective
	Focus is not even	Slide holder is not flat. Move the specimen to a flat position.
One side of the image is unfocused	Revolving nosepiece is in an incorrect position	Move the nosepiece to a click stop
	Slide is mounted not in a flat position (tilted)	Place the specimen in a flat position on the stage
	Poor quality of the glass slide	Use a glass slide with higher quality

II. Mechanical Section:		
Coarse focus knob is hard to turn	Tension adjustment ring is too tight	Loosen tension adjustment ring
Focus is unstable	Tension adjustment ring is too loose	Tighten tension adjustment ring
III. Electrical Section		
LED doesn’t turn on.	Power supply not connected	Check for proper connection
Brightness is not enough	Brightness setting is too low	Adjust brightness
Light blinks	Power supply not well con-nected	Check for proper connection
IV. Observation tube		
Field of view of one eye does not match that of the other.	Interpupillary distance is incor-rect.	Adjust interpupillary distance.
	Incorrect diopter adjustment.	Adjust diopter.
	Your view is not accustomed to microscope observation.	Upon looking into eyepieces, try looking at overall field before concentrating on specimen range. You may also find it helpful to look up and into distance for a moment before looking back into microscope.
V. Microphotography		
IImage edge is unfocused	To a certain extent it is due to achromatic objectives features	To minimize the problem, set the aperture diaphragm in a proper position
Bright spots apear on the image	Stray light entering in the micro-scope through eyepieces or camera viewfinder	Cover eyepieces and viewfinder with a dark cloth

Equipment disposal

Art.13 Dlsg 25 july 2005 N°151. “According to directives 2002/95/EC, 2002/96/EC and 2003/108/EC relating to the reduction in the use of hazardous substances in electrical and electronic equipment and waste disposal.”

The basket symbol on equipment or on its box indicates that the product at the end of its useful life should be collected separately from other waste.
The separate collection of this equipment at the end of its lifetime is organized and managed by the producer.
The user will have to contact the manufacturer and follow the rules that he adopted for end-of-life equipment collection.
The collection of the equipment for recycling, treatment and environmentally compatible disposal, helps to prevent possible adverse effects on the environment and health and promotes reuse and/or recycling of materials of the equipment.
Improper disposal of the product involves the application of administrative penalties as provided by the laws in force.

OPTIKA® S.r.l.
Via Rigla, 30 - 24010 Ponteranica (BG) - ITALIA Tel.: +39 035.571.392 - Fax: +39 035.571.435
info@optikamicroscopes.com - www.optikamicroscopes.com

OPTIKA® Spain
spain@optikamicroscopes.com

OPTIKA® USA
usa@optikamicroscopes.com

OPTIKA® China
china@optikamicroscopes.com

OPTIKA® Hungary
hungary@optikamicroscopes.com

OPTIKA® India
india@optikamicroscopes.com