

Motic[®]

PA43

Operation Manual



Note

If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

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MOTIC HONG KONG LIMITED

CE

This instruction Manual has been prepared for users of the Motic PA43 Upright Microscope.

For your own safety, read this manual carefully and thoroughly before using the product. Do not discard this manual. Always keep it near the product for easy reference.

We are constantly endeavoring to improve our instruments and to adapt them to the requirements of modern research techniques and testing methods. This involves modification to the mechanical structure and optical design of our instruments.

Therefore, all descriptions and illustrations in this instruction manual, including all specifications are subject to change without notice.

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1. GENERAL NOTES ON INSTRUMENT SAFETY







1.1 General safety notes and Instruction

Please familiarize yourself with this Operation Manual before starting to use the Instrument.

In case additional information or support is needed, please contact Motic after sales Service.

To ensure safe operation and optimal function of the Instrument, strictly observe the precautions and warnings given in this Operation manual.


Please observe the following indicators:

	CAUTION, Risk of Danger
	This symbol indicates a possible hazard to the user of the instrument.
	CAUTION, Risk of Dangerous heat
	This symbol indicates a possible hazard to the user of the instrument.
	CAUTION, Risk of Electrical Danger
	Disconnect the plug-in power unit from line power before opening the Instrument.
	INFO
	This symbol refers to a useful information or hint.
	Disposal
	This symbol refers you a advice that must be observed under all circumstances
	Instrument ON
	This symbol refers to the switched on (electrical system active) status of the instrument
○	Instrument OFF
	This symbol refers to the switched off (electrical system inactive) status of the instrument
	Risk of Dangerous Electrical Current
	This symbol refers to potential hazardous electrical voltage/current and must be observed at all circumstances!

1.2 Instrument safety, FCC and EMC conformity

This Instrument has been designed, produced and tested in compliance with required safety standards and regulations. UL, CE, FCC, EMC

“Safety of equipment used for *measurement control and laboratory use*”

 PA43 Microscope Series Products are in conformity with the requirements of the CE Directive 98/79/EC Annex 1 and carries the CE mark accordingly.

Conform to Class B Noise immunity is in compliance with EN 61326 and EMC and Radio-noise suppression is in compliance with EN 5501 1



The instruments listed in this document are disposed of in compliance with WEEE Directive 2002/96/EC.



Lamp bulbs, LED Modules, Lampdrawers become very hot during and after a period of operation. Risk of burn – Do not touch the lamp during or immediately after period of operation.



Don't pick the microscope up from the bottom during equipment operation.

Proper handling of the microscope will ensure years of trouble free service.

If repair become necessary, please contact your Motic agency or our Technical Service directly.

1.3 Transporting, unpacking, storage of the Instrument

Please observe and follow the safety notes for transportation, unpacking and storage given in this document:



- The microscope is delivered as set, packed into commercial standard plastic and cardboard packaging; Please re-use the original packaging only for any transportation.
- It is advised to keep and use the original packaging for longer storage or return to the manufacturer to avoid losing the warranty.
- At receiving and unpacking the equipment, please verify that all parts specified on the delivery note are present.
- Keep Transport and storage temperatures as specified in this Manual.
- Set the microscope up on a stable worktable with solid and smooth top surface suitable for Instrument use.
- Do not touch optical surfaces.

1.4 Instrument Disposal



Please observe the following safety notes for the disposal of the microscope:

Defective Instruments, accessories and consumables should be disposed in compliance with the provisions of the local law.

1.5 Use of the Instrument

The microscope Instrument as well its accessories must not be used for microscopic techniques or purposes other than those described in this Operating Manual.

Please always observe the following safety notes when using the microscope:



Motic cannot assume any liability for other applications than the intended use, including the included modules and components. This includes to service or repair work that is not carried out by authorized Motic service personnel. In case of non-compliance, all warranty claims and liabilities shall be forfeited.



The microscope Instrument should only be operated by trained personnel who are familiar with this Operation Manual and therefore aware of the possible dangers involved.



This Microscope is a high-precision instrument that can be impaired in its performance or even be destroyed when handled improperly.



This Instrument is equipped with a built-in power supply allowing electric-net voltages to be used in the range between 100 - 240 V \pm 10%, 50/60 Hz. In case of any irregularity on the



electrical system observed, please switch off the Instrument, keep it safe guarded and consult the Motic after sales service.



Please only use rated Power cords as described in the Appendix of this Document



Always disconnect the power cable, before opening the instrument and changing the lamp or LED source.



Wait for the lamp to cool down before replacing it and do not touch the new bulb.



The instrument may only be opened by qualified Motic service staff.



The operation of the instrument in explosion-risk environments is not allowed.



Immersion Oil can be harmful. Please only use Motic immersion Oil and follow the safety Instructions given. Immersion oil is to be used for Microscope application only! Please avoid skin contact or swallow or any other use than the intended.

1.6 Intended use of the Microscope

This Microscope is an optical instrument that has been designed to be used to observe and document magnified images of specimens in teaching, routine and research applications.

Do not use this instrument for any other purpose than its intended use.



This Instrument complies with the requirements of directive 98/79/EG concerning in-vitro diagnostic medical devices. CE marking shows the conformity to the directive.

NOTE: This Instrument has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Regulations. These limits are designed to provide protection against harmful interference during operation in a commercial environment. This equipment uses and generates frequencies and energy, if not properly installed in accordance with the instruction manual, those may cause interference to radio communications. Operation of this Instrument in a residential area is not permitted.

FCC WARNING: Changes or modifications would void the Instruments FCC compliance and is therefore not permitted.

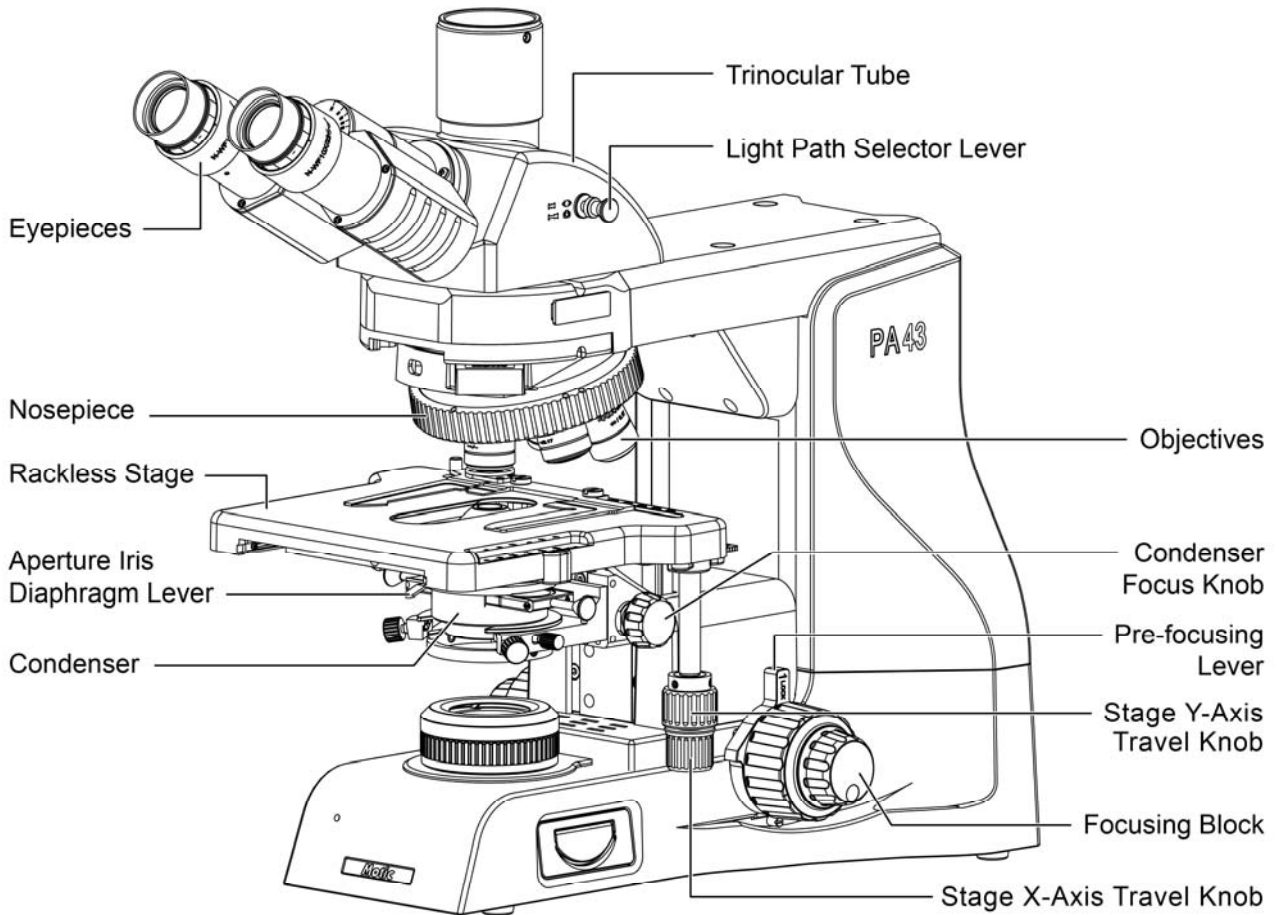
1.7 Instrument warranty

The Instrument should only be used for microcopy applications mentioned and instructed in this operation manual. Please note the following information on the instruments warranty.

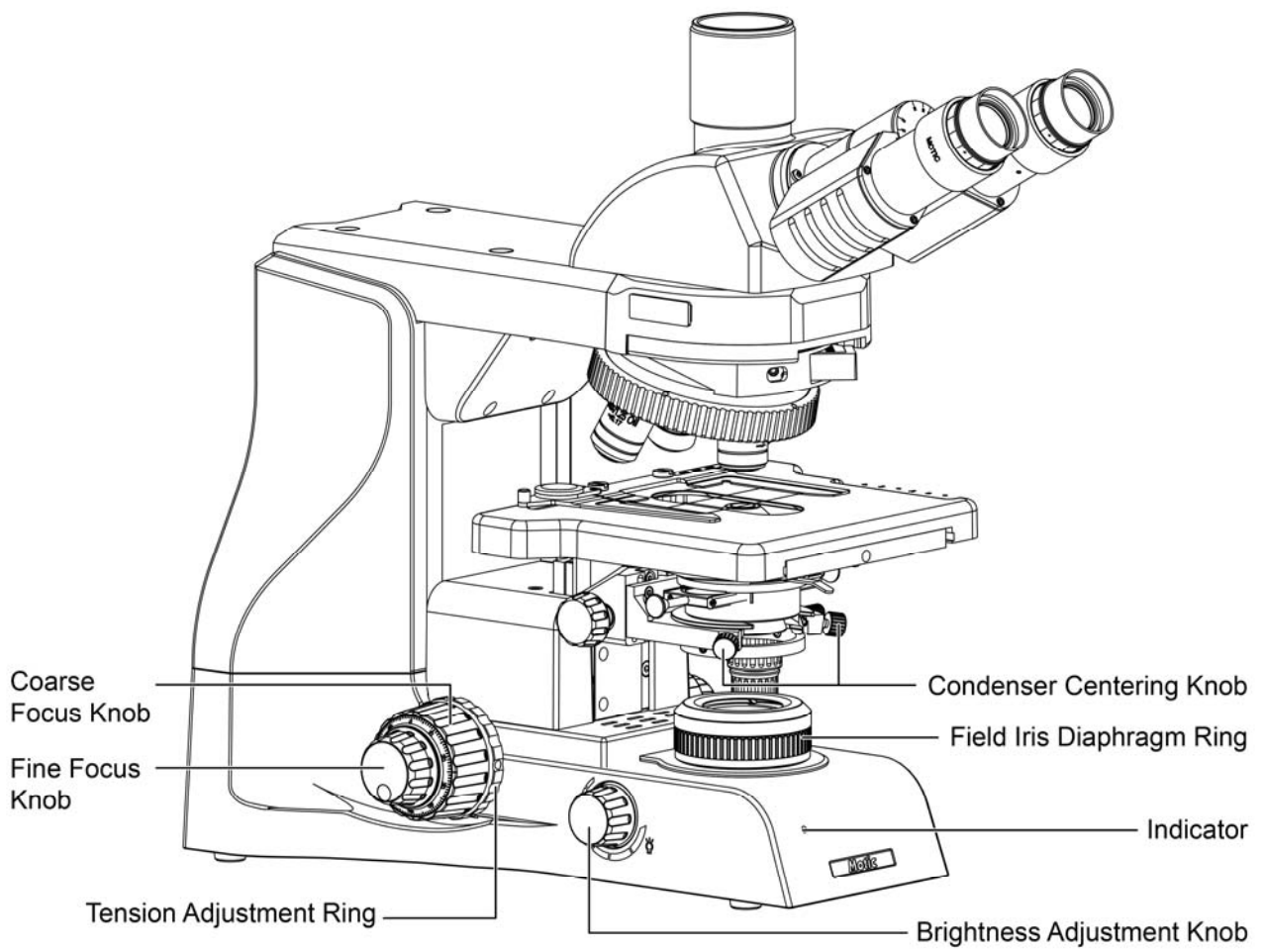
- If possible defects Motic must be notified immediately and steps be taken to minimize damage.
- If notified of such a defect Motic will evaluate the defect and if within warrant, rectify it at his discretion, either by repairing the instrument or by delivering a replacement.
- Natural wear, or defects caused by improper use are not covered by the Instrument warranty.
- Motic shall not be liable for damage caused by faulty operation, negligence or tampering with the Instrument.
- Altering or tampering of the instrument shall lead to a forfeit of all warranty claims

2. NOMENCLATURE

2.1 PA43



(Fig. 1)



(Fig. 2)

3. SETTING UP THE INSTRUMENT

Avoid placing the instrument in locations exposed to direct sunlight, dust, vibration, high temperature, high humidity and where it is difficult to unplug the power supply cord.

3.1 Operating environment

- Indoor use
- Altitude: Max 2000 meters
- Ambient temperature: 15°C to 35°C
- Maximum relative humidity: 75% for temperature up to 31°C decreasing linearly to 50% relative humidity at 40°C
- Supply voltage fluctuations: Not to exceed $\pm 10\%$ of the normal voltage.
- Pollution degree: 2 (in according with IEC60664)
- Installation / Overvoltage category: 2 (in according with IEC60664)
- Air pressure of 75kPa to 106 kPa
- Avoid frost, dew, percolating water, and rain.



Please familiarize yourself with the instructions given in this Operation Manual.

In case of unresolved questions, please contact Motic after sales Service or consult Motic Web services for further instructions.

4. ASSEMBLING THE MICROSCOPE

4.1 Verifying input voltage

- The automatic voltage selection works with a broad range of settings, please check the power rating of your country is admitted before the use of the Instrument under chapter specification. However, always use a power cord that is rated for the voltage used in your area and that has been approved to meet local safety standards. Using the wrong power cord could cause fire or equipment damage.
- If using an extension cord, use only a power supply cord with a protective earth (PE) wire.
- In order to prevent electric shock, always turn the power switch on the power supply off before connecting the power cord.

4.2 Illumination

4.2.1 Halogen bulb

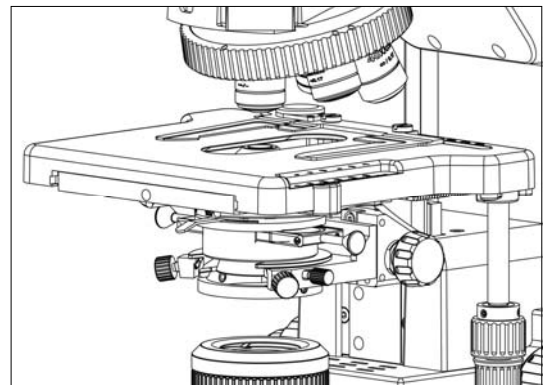
- The quartz halogen bulb, provides a nearly complete vis light specimen with high luminance and natural temperature.
- The halogen bulb maintains the same level of brightness and color temperature through its full lifespan.

4.2.2 LED

- LED is more economical and environmental friendly and combines the advantages of low heat and long life span. There are two different color temperature available. High contrast blue/warm color temperature.

4.3 Rackless Stage

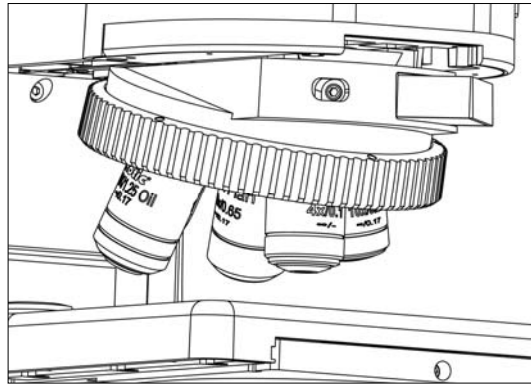
- Stage is fitted with a Rackless providing more clearance for the user and avoid the possibility to scratch the users hand.



(Fig. 3)

4.4 Objectives

- Lower the stage completely. Screw the objectives into the revolving nosepiece so that clockwise rotation of the nosepiece brings the next higher magnification objective into position.

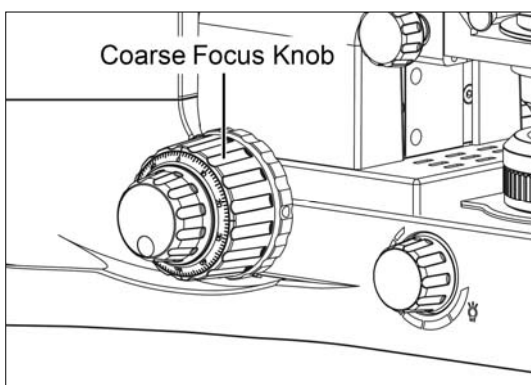


(Fig. 4)

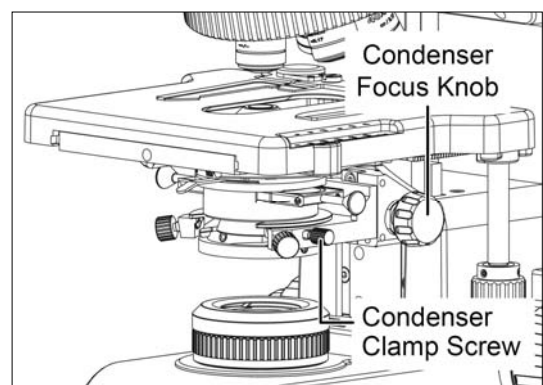
4.5 Condenser

- Raise the stage by turning the coarse focus knob.
- Completely lower the condenser carrier by turning the condenser focus knob. (Fig. 5-1)
- Insert the condenser into the dovetail mount with aperture scale facing forward towards the user. Secure it with the condenser clamp screw. (Fig. 5-2)
- Turn the condenser focus knob to raise the condenser as far as it will go. (Fig. 5-1)

Please consider this is the tentative alignment procedure, more detailed and accurate alignment should refer to Kohler illumination alignment procedure listed at 5.4 and 5.5 of this manual.



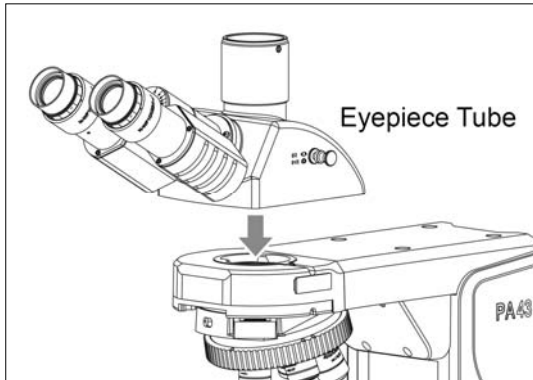
(Fig. 5-1)



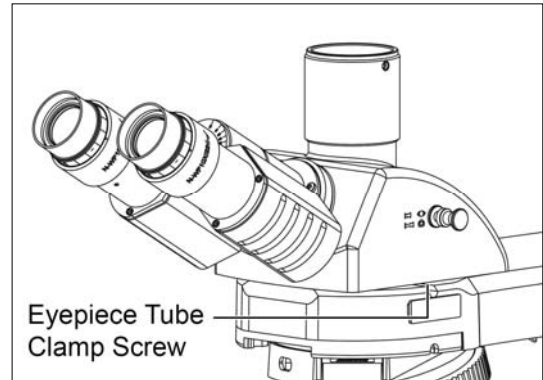
(Fig. 5-2)

4.6 Eyepiece tube

- Loosen the eyepiece clamp screw (Fig. 6-2). Insert the round dovetail mount on the eyepiece tube into the round dovetail mount on the microscope arm (Fig. 6-1). Tighten the eyepiece tube clamp screw to secure the eyepiece tube in place. (Fig. 6-2)



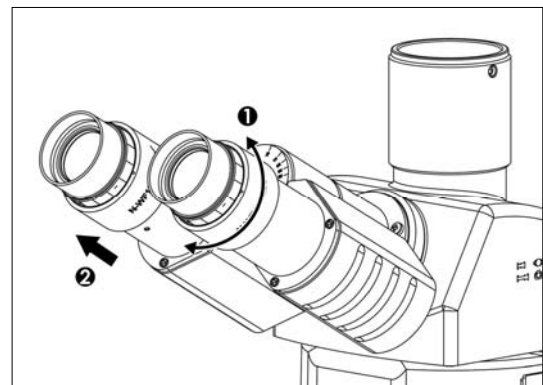
(Fig. 6-1)



(Fig. 6-2)

4.7 Eyepieces

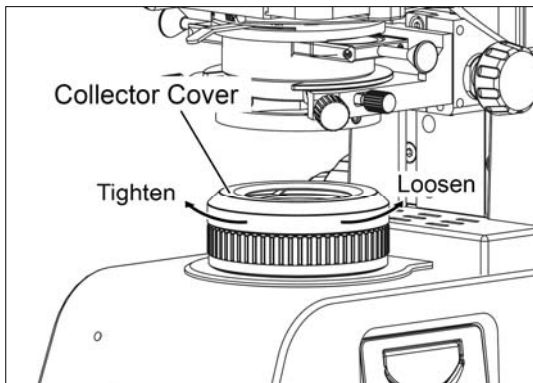
- Use the same magnification eyepieces for both the eyes.
- To secure the eyepiece in the eyepiece sleeve, tighten the clamp screws.
- Twist the eyepiece (anti-clockwise or clockwise) with 20~30 degree (Fig. 7.1) and pull the eyepieces gently out when removing the eyepiece. (Fig. 7.2)



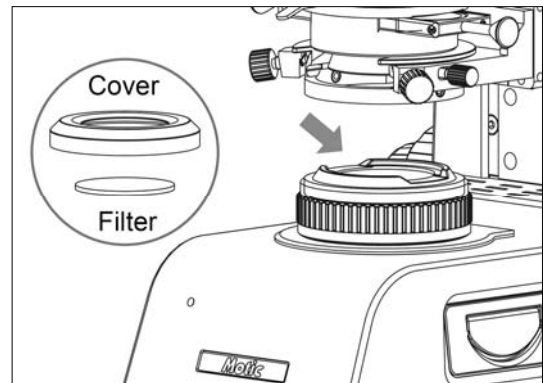
(Fig. 7)

4.8 Filters

- Remove the collector cover (Fig. 8-1) and place the filter in the filter holder located around the field lens (Fig. 8-2), screw back the collector cover (Fig. 8-1), taking care that dust, dirt and fingerprints do not get on the filter and the field lens.



(Fig. 8-1)



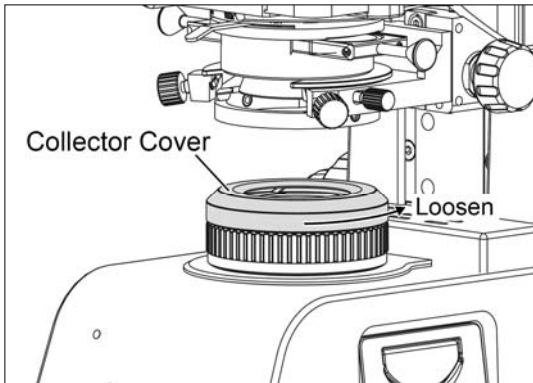
(Fig. 8-2)

- Filter selection:**

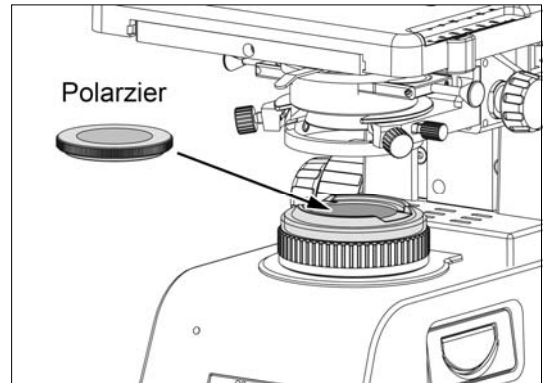
Filter	Function
ND2 (T=50%)	For brightness adjustment in photomicrography
ND4 (T=25%)	
ND16 (T=6.25%)	
Blue filter (colour balance filter)	For routine microscopy and photomicrography
Green interference (546nm)	For phase contrast and contrast adjustment with black and white film
HE (didymium filter)	For colour photomicrography of HE stained specimen with tungsten type film

4.9 Installing the Polarzier with the filter holder

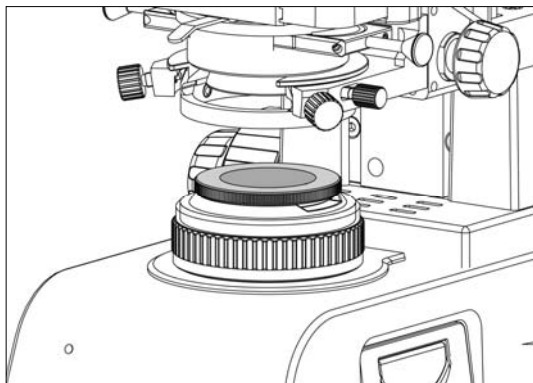
- Remove the collector cover (Fig. 9-1) and place the polarzier in the filter holder located around the field lens (Fig. 9-2), taking care that dust, dirt and fingerprints do not get on the filter and the field lens.



(Fig. 9-1)



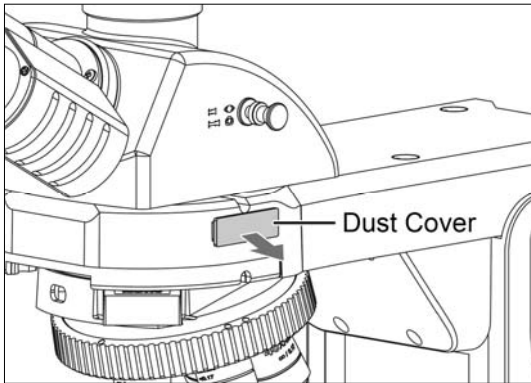
(Fig. 9-2)



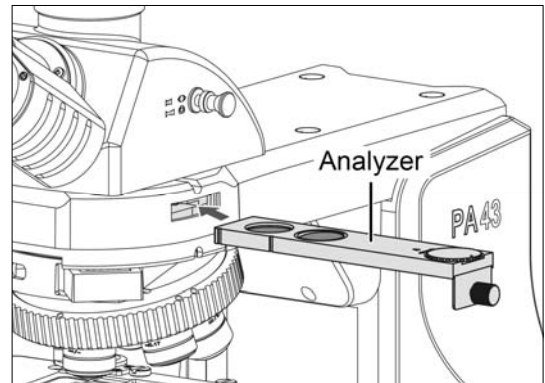
(Fig. 9-3)

4.10 Installing the Analyzer with the analyzer slot

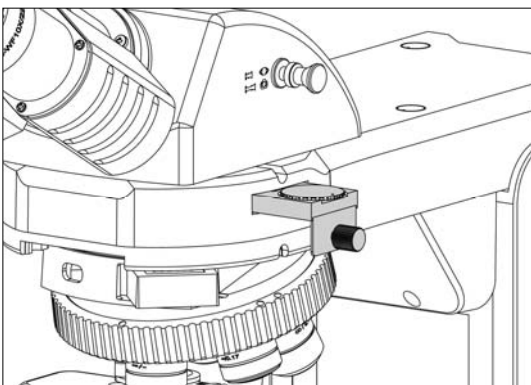
- Remove the dust cover (Fig. 10-1) and insert the Analyzer into the analyzer slot. (Fig. 10-2)



(Fig. 10-1)



(Fig. 10-2)



(Fig. 10-3)

4.11 Power cord

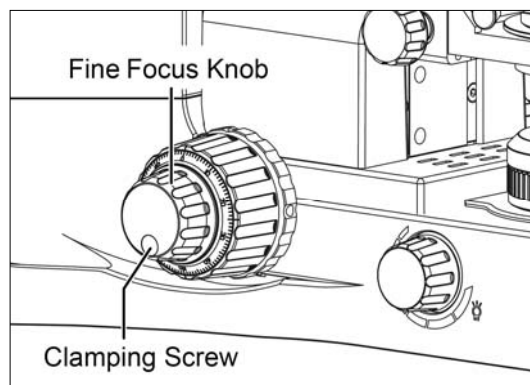
- Connect the socket of the power cord to the AC inlet on the rear of the base of the microscope. Plug in the other end of the cord to an AC outlet with ground conductor.

5. USAGE OF MICROSCOPE COMPONENTS

5.1 Focusing Block

5.1.1 Replacing the Fine Focus Knob

- The fine focus knob (Fig. 11) is designed detachable to prevent interference with hand during manipulation of the fine adjustment knob or XY-axis knob.
- Usually attach the knob on the opposite side to the XY-axis knob.
- Using the Allen screwdriver, loosen the clamping screw (Fig. 11) and remove the fine focus knob.



(Fig. 11)

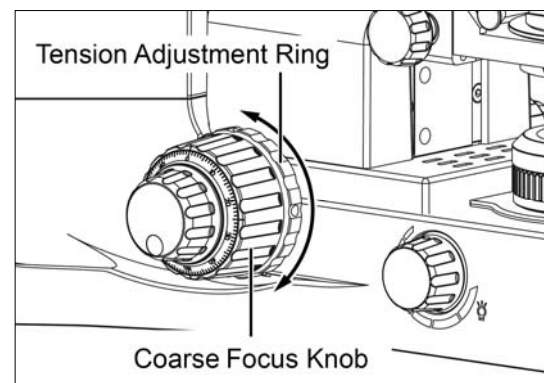
5.1.2 Adjusting the Coarse Focus Knob Tension

- If desired, you can change the coarse adjustment tension using the tension adjustment ring.
(Fig. 12)
- Turning the ring clockwise increase tension, and vice versa.

NOTE

If the tension is too low, the stage drops by itself and focus is quickly lost after adjustment with the fine focus knob.

In this case, turn the ring clockwise to increase tension.



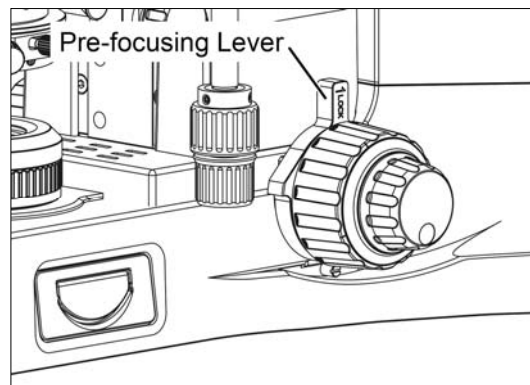
(Fig. 12)

5.1.3 Pre-focusing Lever (Fig. 13)

- The pre-focusing lever ensures that the objectives does not come in contact with the specimen and simplifies focusing.
- After focusing on the specimen with the coarse adjustment knob, turn this lever clockwise and lock. The upper limit on coarse adjustment movement is set at the locked position.
- After changing a specimen, refocusing is easily accomplished by rotating the coarse adjustment knob to reach the pre-focused position, then making fine adjustment with the fine adjustment knob.
- Turn the lever counterclockwise to unlock.

NOTE

When the pre-focusing lever is locked, a coarse movement stroke is reduced due to the microscope's mechanism, causing the stage not to be able to be lowered to the lower limit. To lower the stage to the lower limit, release the pre-focusing lever.



(Fig. 13)

5.2 Interpupillary distance adjustment

- Before adjusting the interpupillary distance, bring a specimen into focus using the 10x objective.
- Adjust the interpupillary distance so that both the right and left field of view become one.
- This adjustment will enable the user to observe the specimen with both eyes
- Depending on the working environment and its demands, the PA43 has a solution. Each eyepiece tube allows a 360°swiveling movement (Fig. 14-1) as well as a flexible adjustment of the interpupillary distance between 48 and 75mm. The “Butterfly mode” increase the viewing height by 40mm. (Fig. 14-2)



360°swiveling movement
(Fig. 14-1)



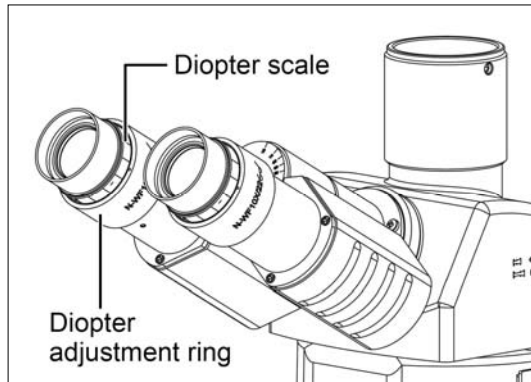
Butterfly movement
(Fig. 14-2)

5.3 Diopter adjustment



Every human eye is different, to adjust the Instrument to best performance adjustment can be necessary.



- Set the diopter on both eyepieces to the “0” position.
- Change to 10x Magnification and the image of the specimen into focus using one eye only.
- Change to the other eye and follow below steps.
 - Correct the focus for the second eye by using only the diopter adjustment ring (Fig. 15), do not use the coarse / fine focusing knob!
 - Change to a higher magnification to verify the result and if necessary repeat the procedure to match the sharpness for higher magnification.
 - Keep this final diopter position for all magnification / lenses. The diopter position for each user can be recorded from the scale (Fig. 15), so it can easily be reset.

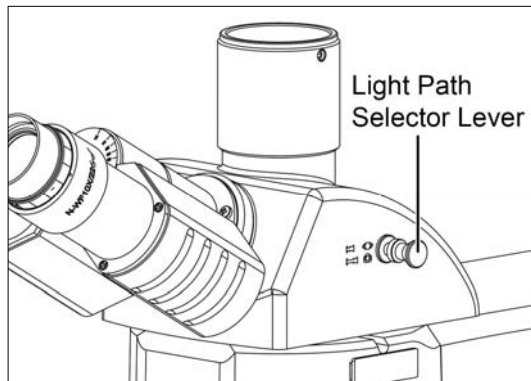


(Fig. 15)

5.3.1 Selecting the Light Path of the Trinocular Tube

- Slide the light path selector lever to select the desired light path. (Fig. 16)

Light Path Selector Lever	Indication	Light Path Ratio
Pushed-in position		Binocular 100%
Pulled-out position		TV & Photo 100%



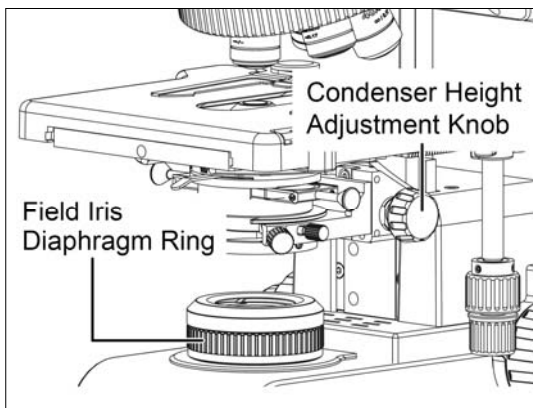
(Fig. 16)

5.4 Kohler Illumination alignment procedure: Centering the Condenser

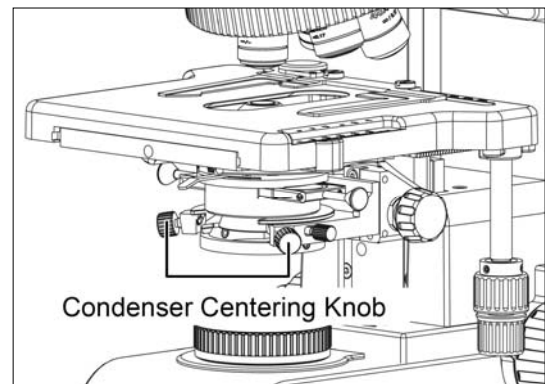
- Turn the condenser height adjustment knob (Fig. 17-1) to raise the condenser to its upper limit.
- Focus on the specimen using the 10x objectives.
- Rotate the field iris diaphragm ring (Fig. 17-1) in the direction of the clockwise so that the diaphragm image comes inside the field of view.
- Manipulate the condenser height adjustment knob to focus on the diaphragm image.
- Turn the two condenser centering knob (Fig. 17-2) to move the iris diaphragm image to the center of the field of view.
- Gradually open the field iris diaphragm. The condenser is properly centered if the iris image is centered and inscribed in the field of view.
- During actual use, open the field diaphragm slightly until its image circumscribes the field of view.

NOTE:

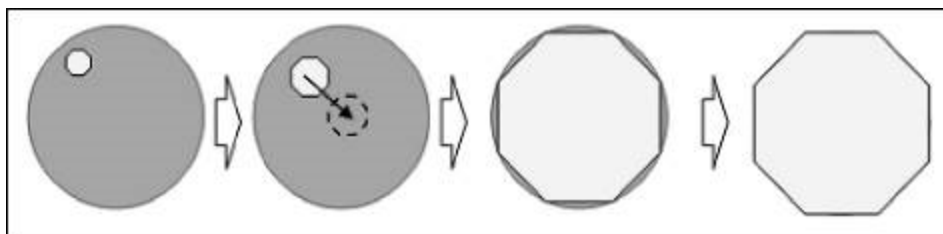
The field iris diaphragm restricts the diameter of the beam of light entering the objectives and thus excludes extraneous light, improving image contrast. The diameter of the field iris should be adjusted for objective power to the extent that it just circumscribes the field of view.



(Fig. 17-1)



(Fig. 17-2)

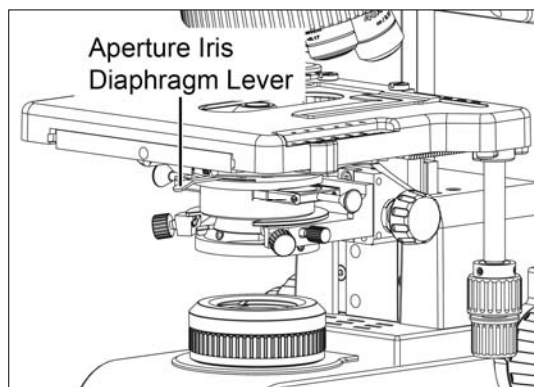


(Fig. 18)

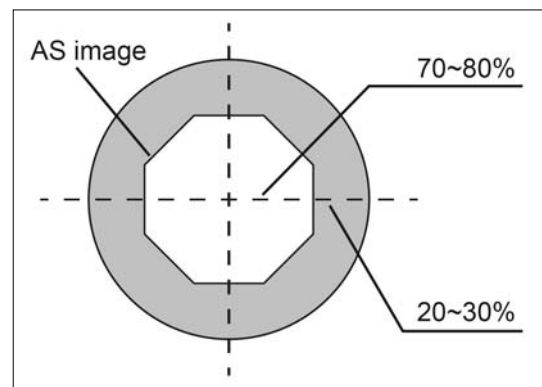
5.5 Kohler Illumination alignment procedure: Setting the Aperture Iris Diaphragm

- The aperture iris diaphragm determines the numerical aperture of the illumination system. It has an effect of adjusting image resolution and contrast.
- Since the contrast of microscope specimens is ordinarily low, setting the condenser aperture iris diaphragm to between 70 and 80% of the NA of the objectives in use is usually recommended.
- Remove one of the eyepieces, look into the eyepiece sleeve and adjust the aperture iris diaphragm lever until the image is about 70% of objective's exit pupil.
- You can use the condenser numerical aperture scale to adjust the aperture iris diaphragm.

(Fig. 19)



(Fig. 19)



(Fig. 20)

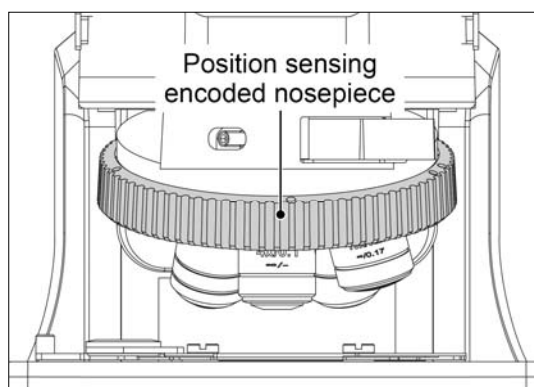
5.6 Brightness and contrast adjustment

- Neutral density filters are used for brightness adjustment in routine microscopy and photomicrography.
- For phase contrast and contrast adjustment with black and white film, a green interference filter (546nm) is recommended.
- An HE (didymium) filter for colour photomicrography, Haematoxylin, Eosin (HE) or Fuchsin stained specimen with tungsten type film is available.

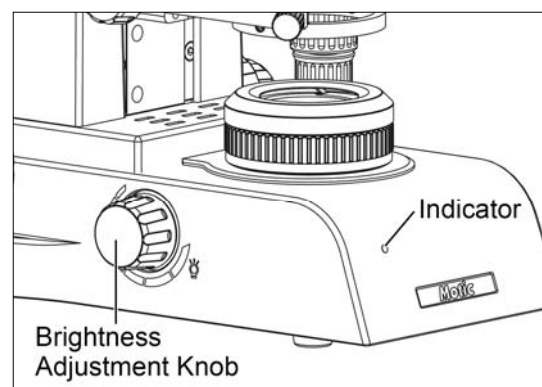
5.7 Illumination brightness adjustment

5.7.1 PA43 with light manager

- To adjust the brightness, turn the brightness adjustment knob (Fig. 21-2) and observe change in brightness until the desired level has been reached.
- If the illumination has not been changed for 3 seconds, the actual value will be stored for this objective magnification.
- The light value stored is independently for each objective lens and will be automatically restored once the user returns to the objective lens.



(Fig. 21-1)



(Fig. 21-2)

5.8 Standby mode



Standby mode self activates after 15 minutes of idle time in order to conserve energy and protect the specimen from overexposure.

- To activate standby mode, double click the intensity knob or leave the microscope alone for 15 minutes.
- Touch the intensity knob or nosepiece to turn standby mode off. Intensity will be adjusted to the last memorized status.



If the LED indicator shows flickering, then standby mode is activated. (Fig. 21-2)

6. PHOTOMICROGRAPHIC PROCEDURE

- To ensure vibration free operation, set the microscope on a sturdy vibration free table or a bench with a vibration proof device.
- Pull the optical path selection lever of the trinocular eyepiece tube all of the way out to the limit, the ratio of light entering the observation tube and standard phototube will be 20:80.
- For the same total magnification, select a combination of the highest possible objective magnification and lowest possible projection lens magnification to achieve the utmost image definition and contrast.
- To ensure optimal illumination, check the position and centring of the lamp and position of the condenser.
- Select a blue filter for routine application. An additional colour-compensating filter can also be used depending on the colour rendition.
- Adjusting the field diaphragm is important for the purpose of limiting extraneous light that may cause flare and lower the contrast. Stop down the diaphragm to achieve an illuminated area slightly larger than that of the field of view.
- A change of depth of focus, contrast and resolution of image is attainable with an aperture setting that is $\frac{2}{3}$ of the objective N.A.
- For specific photomicrographic procedures, refer to the manual of the specific camera being used.

7. USING OIL IMMERSION OBJECTIVES

- Oil immersion objectives are labelled with the additional engraving “Oil” and are to be immersed in oil between the specimen and the front of the objective.
- The immersion oil supplied by Motic is synthetic, non-fluorescing and non-resining oil, with a refractive index of 1.515.
- The small bottle of oil supplied with every immersion objective facilitates application of the oil to the cover slip.
- Remove any air bubbles in the nozzle of the oil container before use.
- Immersion oil must be used sparingly. After the examination, the oil should be wiped off the objective with a lens cleaning tissue and the residual film removed with soft cloth moistened with petroleum benzene or absolute alcohol.
- Locate the field of interest with a lower magnification objective. Swing the objective out of the light path, and add one drop of immersion oil over the site of the specimen. Swing in the oil immersion objective. There should be a small column of oil from the cover slip to the objective lens. Use the fine focus to make the image sharp.
- At operating with Immersion Oil, the space between Objective and Cover glass must be free of any Air bubbles

8. CARE AND MAINTENANCE

8.1 Do not disassemble

- Disassembly may significantly effect the performance of the instrument, and may result in electric shock or injury and will void the terms of the warranty.
- Never attempt to dismantle any parts other than described in this manual. If you notice any malfunction, contact your nearest Motic representative.

8.2 Cleaning the microscope

8.2.1 Lenses and filters

- To clean lens surfaces or filters, first remove dust using an air blower. If dust still persists, use a soft /clean brush or gauze.
- A soft gauze or lens tissue lightly moistened with Isopropyl alcohol should be used to remove grease or fingerprints.
- Use isopropyl alcohol) to remove immersion oil from objective lenses.



Warning: alcohol is highly flammable liquid, be careful handling around open flame and always observe the local security advise how to handle such substances

8.2.2 Cleaning of painted or plastic components

- Do not use organic solvents (thinners, alcohol, ether, etc.). Doing so could result in discolouration or in the peeling of paint.
- For stubborn dirt, moisten a piece of gauze with diluted detergent and wipe clean.
- For plastic components, only moisten a piece of gauze with water and wipe clean.

8.3 Disinfecting the Microscope

- Follow the standard procedures for your laboratory.

8.4 When not in use

- When not in use, cover the instrument with vinyl dust cover and store in a place low in humidity where mould is not likely to form.
- Store the objectives, eyepieces and filters in a container or desiccators with drying agent.
- Proper handling of the microscope will ensure years of trouble free service.
- If repair becomes necessary, please contact your Motic agency or our Technical Service direct.

Note:

- If equipment is used in a manner not specified by the manufacturer, the warranty may be void.
- To avoid getting wet, do not use the microscope near water.

8.5 Bulb replacement



The lamp and the lamp drawer become very hot during and after a period of operation.

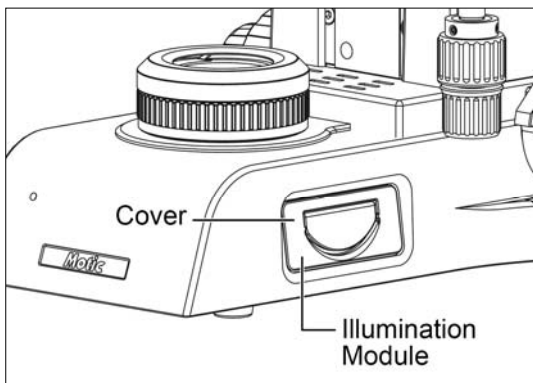
Risk of burn – Do not touch the lamp during or immediately after period of operation.

Make sure the lamp has cooled sufficiently before attempting to replace the lamp.

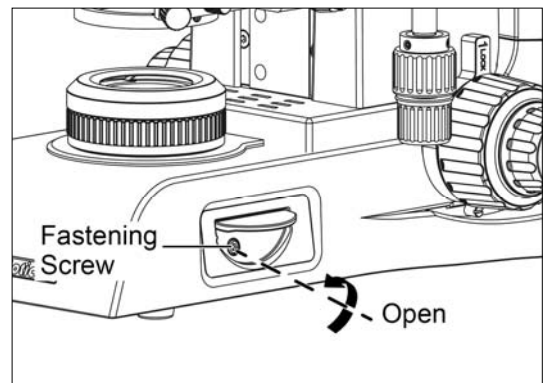
- In order to prevent electric shock always turn the power switch off and unplug the power cord before installing or replacing the bulb.

8.5.1 Replacing the 6V 30W halogen module or the two different LED module

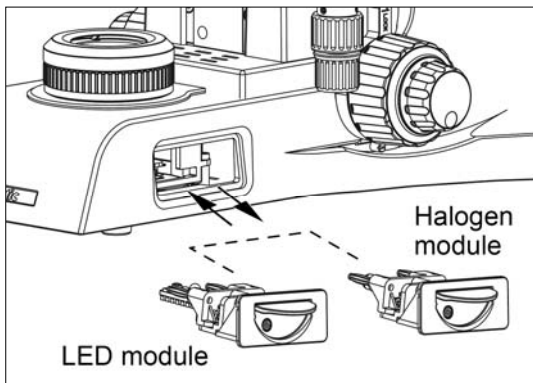
- Left up the cover of illumination module. (Fig. 22-1)
- Loosen the fastening screw of the illumination module. In doing so, slightly press the screw against the spring and turn it by 90° (counter clockwise). (Fig. 22-2)
- Pull the illumination module out of the stand. (Fig. 22-3)
- If the stand is equipped with a 6V 30W halogen lamp, remove the halogen lamp from the lamp carrier and insert the new halogen lamp. Do not touch the new lamp with naked fingers and this will reduce lamp life.
- If the stand is equipped with an LED lamp replace the complete illumination module including the LED.
- Push the illumination module back into the stand and lock it by means of the screw. In doing so, slightly press the screw against the spring and turn it by 90° (clockwise). (Fig. 22-4)



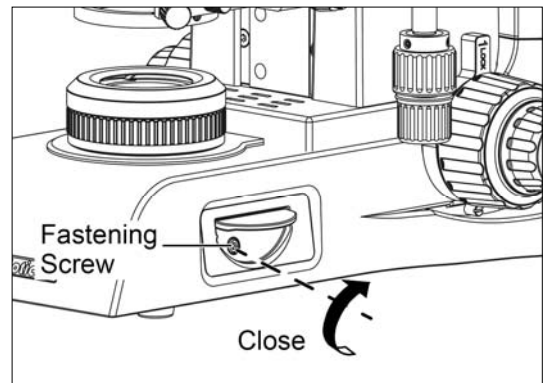
(Fig. 22-1)



(Fig. 22-2)



(Fig. 22-3)



(Fig. 22-4)

8.5.2 Electrical Specifications:

Input: AC100-240V~, 50/60Hz, 1.5A (max)

Reflected Lamp: 30W Halogen or 3W LED

LED module, high color temperature: 5500K~ 6000K

LED module, low color temperature: 3000K ~ 3500K

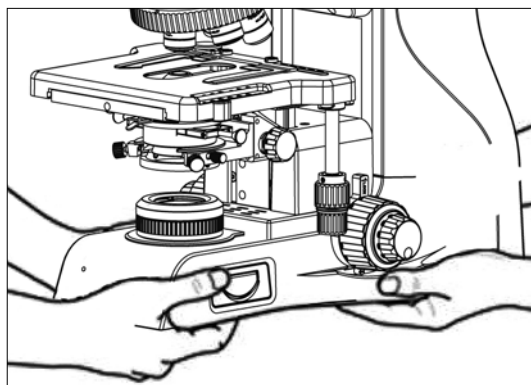
8.6 Shifting of Instrument

Caution:

To avoid the risk of electric shock, this equipment must only be connected to a supply main with protective earth.

The protection provided by the equipment may be impaired if the equipment is used in a manner not specified by the manufacturer.

- When moving the microscope, grasp rear handle and the base with more than two peoples as shown below.



(Fig. 23)

9. SPECIFICATION

Model		PA43
Optical System		Colour Corrected Infinity Optical System (CCIS®)
Observation Tube		Trinocular - Light distribution (100:0 / 20:80), Incline angle 30°
Eyepieces		Wide-Field WF10X/22, Diopter adjustable +/- 5 dpt (option)
Revolving Nosepiece		5-position nosepiece
Objective	Plan UC	Plan UC 4X
		Plan UC 10X
		Plan UC 20X
		Plan UC 40X
		Plan UC 60X
		Plan UC 100X (oil)
	Plan UC PHASE	Plan UC PH Ph10X-Ph1
		Plan UC PH Ph20X-Ph2
		Plan UC PH Ph40X-Ph2
		Plan UC PH Ph100X (oil)-Ph3
Base unit	Focus	Stroke range: 25 mm
		Coarse and Fine focusing knob
		Coarse: 17.7 mm/revolution
		Fine: 0.1 mm/revolution (1 jam scale)
		Upper limit stopper, Torque adjustment ring
Condenser		N.A 0.9/1.25 Abbe condenser with slider slot
Stage	Rackless stage	180 x 170mm surface, 80 x 55 mm movement, coaxial controls
Transmitted Illumination		Kohler illumination system
		Brightfield
		Halogen 6V/30W and LED 3W

10. TROUBLESHOOTING TABLE

As you use your microscope, you may occasionally experience a problem.

The troubleshooting table below contains the majority of frequently encountered problems and the possible causes.

10.1 Optical

Problem	Possible Cause
Vignetting or uneven brightness in the field of view or field of view only partially visible	Lamp not installed properly
	Lamp not centred
	Diffuser is in intermediate position
	Condenser not mounted correctly
	Condenser is not centred
	Condenser is set too low
	Condenser top lens not fully swung in/out
	Field diaphragm closed too far
	Aperture diaphragm closed too far
	Improper condenser objective combination
	Revolving nosepiece not clicked into position
	Trinocular eyepiece tube optical path selector lever in intermediate position
Dust or dirt in the field of view	Aperture diaphragm closed too far
	Condenser is set too low
	Dust or dirt on specimen surface
	Dust or dirt on field lens, filter, condenser or eyepiece
Poor image (low contrast or resolution)	Condenser is set too low
	Aperture diaphragm closed too far
	No cover glass
	Too thick or thin cover glass
	Immersion oil not used with oil immersion lens
	Air bubbles in immersion oil
	Specified immersion oil not used
	Immersion oil on dry objective
	Greasy residue on eye lens
Incorrect illumination	

Unequal focus	Stage installed on inclined plane
	Specimen holder not fixed securely on stage
	Specimen not secured in position
Image tinged yellow	Lamp voltage is set too low
	Blue filter is not being used
Focusing is not possible with high magnification objectives	Slide is upside down
	Cover glass is too thick
High magnification objectives strike the specimen when changing over from low to high magnification	Slide is upside down
	Cover glass is too thick
	Eyepiece diopter not adjusted
Insufficient parfocality of objectives	Eyepiece diopter not adjusted
No cohesion of binocular image	Magnification or field of view of left and right eyepieces differ
	Interpupillary distance not adjusted
	Eyepiece diopter not adjusted
Eye strain or fatigue	Interpupillary distance not adjusted
	Diopter adjustment not made
	Field of view of left and right eyepiece differ
	Inadequate illumination

10.2 Electrical

Lamp does not light	Power supply not plugged in
	Lamp not installed
	Lamp burnt out
Inadequate brightness	Specified lamp not being used
Lamp blows out immediately	Specified lamp not being used
Lamp flickers	Connectors are not securely connected
	Lamp near end of service life
	Lamp not securely plugged into socket

11. SELECTION OF THE POWER SUPPLY CORD

Motic Instruments are certified and tested for safety and environmental conformity. Only power supply cords which are conform with below listed certification marks and countries are applicable.

CAUTION : Do not use non-approved power cord for Motic products, Motic can no longer warrant the electrical safety of the equipment.

Table 1 Certified Cord

	Specifications
Voltage Rating	125V AC (for 100-120V AC area) or, 250V AC (for 220-240V AC area)
Current Rating	6A minimum
Temperature Rating	60 C minimum
Length	3.05 m maximum
Fitting Configuration	Grounding type attachment pull cap Opposite terminates in molded-on EC con-figuration appliance coupling.

The power supply cord should be certified by one of the agencies listed in Table 1, or comprised of cordage marked with an agency marking per Table 1 or marked per Table 2. The fittings are to be marked with at least one of agencies listed in Table 1.






















Country	Agency	Certification Mark	Country	Agency	Certification Mark
Argentina	IRAM		Italy	IMQ	
Australia	SAA		Japan	JQA, JET, TÜV, UL-APEX/MITI	 
Austria	OVE				
Belgium	CEBEC		Netherlands	KEMA	
Canada	CSA		Norway	NEMKO	
Denmark	DEMKO		Spain	AEE	
Finland	FEI		Sweden	SEMKO	
France	LTTE		Switzerland	SEV	
Germany	VDE		United Kingdom	ASTA BSI	 
Ireland	NSAI		U.S.A	UL	

Table 2 HAR Flexible Cord

Approval Organizations And Cordage Harmonization Marking Methods

Approval Organization	Printed or Embossed Harmonization Marking (May be located on jacket or insulation of internal wiring)		Alternative Marking Utilizing Black-Red-Yellow Thred (Length of color section in mm)		
			Black	Red	Yellow
Comite Electrotechnique Belge (CEBEC)	CEBEC	<HAR>	10	30	10
Verband Deutscher Elektrotechniker (VDE) e.V.	<VDE>	<HAR>	30	10	10
Union Technique de Electricity	USE	<HAR>	30	10	30
Instituto Italiano del Marchio di Qualita (IMQ)	IEMMEQU	<HAR>	10	30	50
British approvals Service for Electric Cables (BASEC)	BASEC	<HAR>	10	10	30
N.V. KEMA	KEMA-KEUR	<HAR>	10	30	30
SEMKO AB Svenska Elektriska Matenelkontrollanstalter	SEMKO	<HAR>	10	10	50
Österreichisher Verband fur Elektrotechnik (ÖVE)	<ÖVE>	<HAR>	30	10	50
Danmarks Elektriske Materialkontroll (DEMKO)	<DEMKO>	<HAR>	30	10	30
National Standards Authority of Ireland (NSAI)	<NSAI>	<HAR>	30	30	50
Norges Elektriske Materiellkontroll (NEMKO)	NEMKO	<HAR>	10	10	70
Asociacio Electroteca Y Electronica Espanola EE)	<UNED>	<HAR>	30	10	70
Hellenic Organization for Standardization	ELOT	<HAR>	30	30	70
Institute Portages da Qualidade (IPQ)	np	<HAR>	10	10	90
Schweizerischer Elektro Technischer Verein (SEV)	SEV	<HAR>	10	30	90
Elektriska Inspektoratet	SETI	<HAR>	10	30	90

MICROSCOPE TERMINOLOGY

Abbe Condenser

A two-lens sub-stage condenser located below the stage of a microscope and functions to collect light and direct it onto the object being examined. Its high numerical aperture makes it particularly suited for use with most medium- and high-magnification objectives.

Aperture, Numerical (N.A.)

The numerical aperture is an important factor determining the efficiency of the condenser and objective. It is represented by the formula: (N.A. = $n \sin \alpha$), where n is the refractive index of a medium (air, water, immersion oil etc.) between the objective and the specimen or condenser, and α is half of the maximum angle at which light enters or leaves the lens from or to a focused object point on the optical axis.

Cover Glass Thickness

Transmitted light objectives are designed to image specimens that are covered by a thin cover glass (**cover slip**). The thickness of this small glass piece is now standardized at 0.17 mm for most applications.

Diaphragm, Condenser

A diaphragm, which controls the effective size of the condenser aperture. A synonym for the condenser illuminating aperture diaphragm.

Magnification

The number of times by which the size of the image exceeds the original object. Lateral magnification is usually meant. It is the ratio of the distance between two points in the image to the distance between the two corresponding points in the object.

Micrometer: *um*

A metric unit of length measurement
= 1×10^{-6} meters or 0.000001 meters

Nanometer (nm)

A unit of length in the metric system equal to 10^{-9} meters.

Phase-contrast (microscopy)

A form of microscopy, which converts differences in object thickness and refractive index into differences in image amplitude and intensity.

Real Viewfield

The diameter in millimetres of the object field.

$$\text{Real Viewfield} = \frac{\text{Eyepiece Field of View}}{\text{Objective Magnification}}$$

Example:

Eyepiece field of view = 20mm

Objective magnification = 10X

Diameter of the object field = 20/10

= 2.0mm

Diopter adjustment

The adjustment of the eyepiece of an instrument to provide accommodation for the eyesight differences of individual observers.

Depth of Focus

The axial depth of the space on both sides of the image plane within which the image is sharp. The larger the N.A. of objective, the shallower the depth of focus.

Field of View (F.O.V.)

That part of the image field, which is imaged on the observer's retina, and hence can be viewed at any one time. The field of view number is now one of the standard markings of the eyepiece.

Filter

Filters are optical elements that selectively transmit light. It may absorb part of the spectrum, or reduce overall intensity or transmit only specific wavelengths.

Immersion Oil

Any liquid occupying the space between the object and microscope objective. Such a liquid is usually required by objectives of 3-mm focal length or less.

Resolving Power

A measure of an optical system's ability to produce an image which separates two points or parallel lines on the object.

Resolution

The result of displaying fine details in an image

Total Magnification

The total magnification of a microscope is the individual magnifying power of the objective multiplied by that of the eyepiece.

Working Distance

This is the distance between the objective front lens and the top of the cover glass when the specimen is in focus. In most instances, the working distance of an objective decreases as magnification increases.

X-axis

The axis that is usually horizontal in a two-dimensional coordinate system. In microscopy X-axis of the specimen stages is considered that which runs left to right.

Y-axis

The axis that is usually vertical in a two-dimensional coordinate system. In microscopy Y-axis of the specimen stages is considered that which runs front to back.



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Design Change: The manufacturer reserves the right to make changes in instrument design in accordance with scientific and mechanical progress, without notice and without obligation.

