



IM-5000 Metallurgical Microscope

INSTRUCTION MANUAL

3601 E. 34th St. Tucson, AZ 85713 USA Tel. +1-520-882-6598 Fax +1-520-882-6599 email: pace@metallographic.com Web: <https://www.metallographic.com>



Equipment
Type: Metallurgical
Microscope

Model: **IM-5000**

Electrical
Requirements: 110 / 220 Volts
(single-phase)

Frequency: 50/60 Hz

Manual
Revision Date: April 24, 2022

Please read this instruction manual carefully and follow all installation, operating and safety guidelines.



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WARRANTY

Terms and Conditions applying to all PACE Technologies Products

1. LIMITED WARRANTY AND DISCLAIMER:

PACE Technologies microscopes and hardness testers are warranted for one year from the purchase date to be free from defects in material and workmanship under correct use, normal operating conditions, and proper application. PACE Technologies obligation under this warranty shall be limited to the repair or exchange, at PACE Technologies option, of any PACE Technologies Product or part which proves to be defective as provided herein. PACE Technologies reserves the right to either inspect the product at Buyer's location or require it to be returned to the factory for inspection. Buyer is responsible for freight to and from factory on all warranty claims. The above warranty does not extend to goods damaged or subjected to accident, abuse or misuse after release from PACE Technologies warehouse, nor goods altered or repaired by anyone other than specifically authorized PACE Technologies representatives. PACE Technologies shall not in any way be responsible for the consequences of any alteration, modification or misuse unless previously approved in writing by an officer of PACE Technologies. Note: Corrosion is considered a maintenance issue and not a warranty issue.

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3. DELIVERY:

Customer assumes and shall bear the risk of all loss or damage to the Products from every cause whatsoever, whether or not insured, and title to such Products shall pass to Customer upon PACE Technologies delivery of the Products to the common carrier of Pace Technologies choice, or the carrier specified in writing by Customer, for shipment to Customer. Any claims for breakage, loss, delay, or damage shall be made to the carrier by the Customer and Pace Technologies will render customer reasonable assistance in prosecuting such claims.



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4. ACCEPTANCE:

Customer shall inspect the Products promptly upon receipt of delivery. Unless customer objects in writing within thirty (30) business days thereafter, customer shall be deemed to have accepted the Products. All claims for damages, errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

5. PAYMENT:

Customer agrees to provide timely payment for the Products in accordance with the terms of payment set forth on the reverse side hereof or in any proposal submitted herewith. If any payment is not paid on or before its due date, Customer shall pay interest on such late payment from the due date until paid at the lesser of 12% per annum or the maximum rate allowed by law.

6. DEFAULT:

If Buyer is in default (including, but not limited to, the failure by Buyer to pay all amounts due and payable to Seller) under the work or purchase order or any other agreement between Buyer and Seller, Buyer's rights under the warranty shall be suspended during any period of such default and the original warranty period will not be extended beyond its original expiration date despite such suspension of warranty rights.

7. MISCELLANEOUS PROVISIONS:

This agreement has been made in and shall be governed by the laws of the State of Arizona. All disputes arising under or relating to the purchase of the equipment shall be brought and resolved solely and exclusively in the State of Arizona, Pima County. These terms and conditions and the description of the Products on the reverse side hereof or in any proposal submitted herewith constitute the entire agreement and understanding of the parties with respect to this sale and supersede all prior and contemporaneous agreements or understandings, inducements or representations, expressed or implied, written or oral, between the parties with respect hereto. Any term or provision of this Agreement may be amended, and any observance of any term of this Agreement may be waived, only by a writing signed by the party to be bounds. The waiver by a party of any breach shall not be deemed to constitute a waiver of any other breach. Should suit be brought on this Agreement, the prevailing party shall be entitled to recover its reasonable attorneys' fees and other costs of suit including costs and attorneys' fees incurred on appeal or in collection of any judgment., errors, or shortage in Products delivered shall be made by Customer in writing within such five (5) business day period. Failure to make any claim timely shall constitute acceptance of the Products.

8. RESTOCKING FEE:

All Returns are subject to a restocking charge equal to 15% (fifteen percent) of the Invoice, unless the Goods are proved to be non-conformed by PACE Technologies.



1.0 Product Description

IM-5000 Inverted Metallurgical Microscope

Brightfield illumination

Darkfield illumination

Polarized light illumination

Differential interference contrast

The IM-5000 inverted metallurgical microscope features bright-field, dark-field, polarized light and differential interference contrast (DIC) illumination, binocular eyepiece tubes and a digital camera port. The IM-5000 inverted microscope is an excellent choice for a multipurpose economical metallurgical microscope. Objectives range from 0.5X, 10X, 20X, 50X and 100X with wide field 10X, 15X, 20X eyepieces.





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1.1 Technical Specifications

Electrical specifications:	110 / 220V single-phase (50/60 Hz)
Optical system:	Infinity optical system
Viewing head:	Binocular head inclined 45 degrees
Light intensity ratio:	Observing 80%, camera 20% Observing 100%, or camera 100%
Eyepieces:	Wide field eyepiece WF10X/22mm Wide field eyepiece WF15X/16mm Wide field eyepiece WF20X/12mm 10X with micrometer
Nosepiece:	Quintuple nosepiece
Objective:	Infinity long working distance plan objectives (BF & DF) 5X, 10X, 20X, 50X, 100X
Focus:	Coaxial coarse and fine focus adjustment, division of fine focus adjustment; 0.002mm Moving range: upward 1 mm, downward 7 mm
Stage (movement):	226 x 178 mm (40 x 40 mm)
Illumination:	12V50W halogen lamp with brightness and centering adjustment.
Dimensions (WxHxD):	Approx. 13 x 18 x 18 inches (330 x 450 x 450)



1.2 Features and Benefits

The **IM-5000** metallurgical microscope provides brightfield (BF), darkfield (DF), polarized light and differential interference contrast (DIC) illuminations. The IM-5000 metallographic microscope is a powerful optical tool for the metallographer and metallurgist.

2.0 Unpacking, Shipping and Installation

2.1 Unpacking

Unit is delivered in a box. Unpack and check for completeness of parts.

Measures WxHxD: 28 x 13 x 21 inches (box).

Weight: Varies, depending upon model
(approximately 35 lbs.)

2.2 Shipping

When moving box, lift from bottom.



! **Caution:** Very sensitive optical instrumentation. Take care to avoid bodily injury and damage to the unit.



2.3 Installation



Install unit carefully! Improper installation voids warranty.

The **IM-5000 metallographic microscope** should be placed on a flat stable surface.
Requires electrical connection.

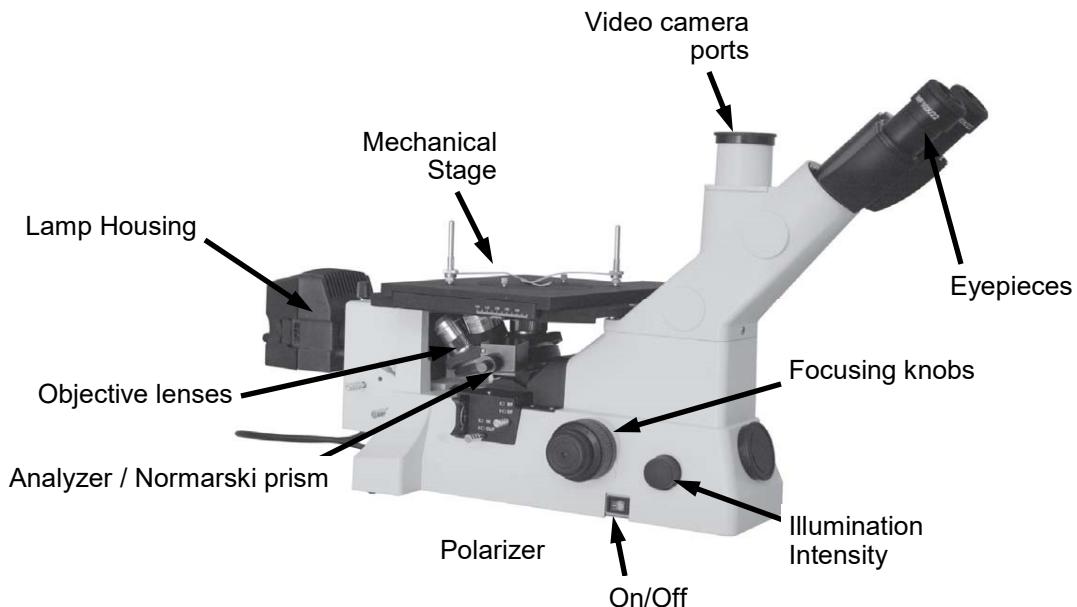


Figure 1. Overview of IM-5000 metallurgical microscope

2.3.1 Sequence for Assembly

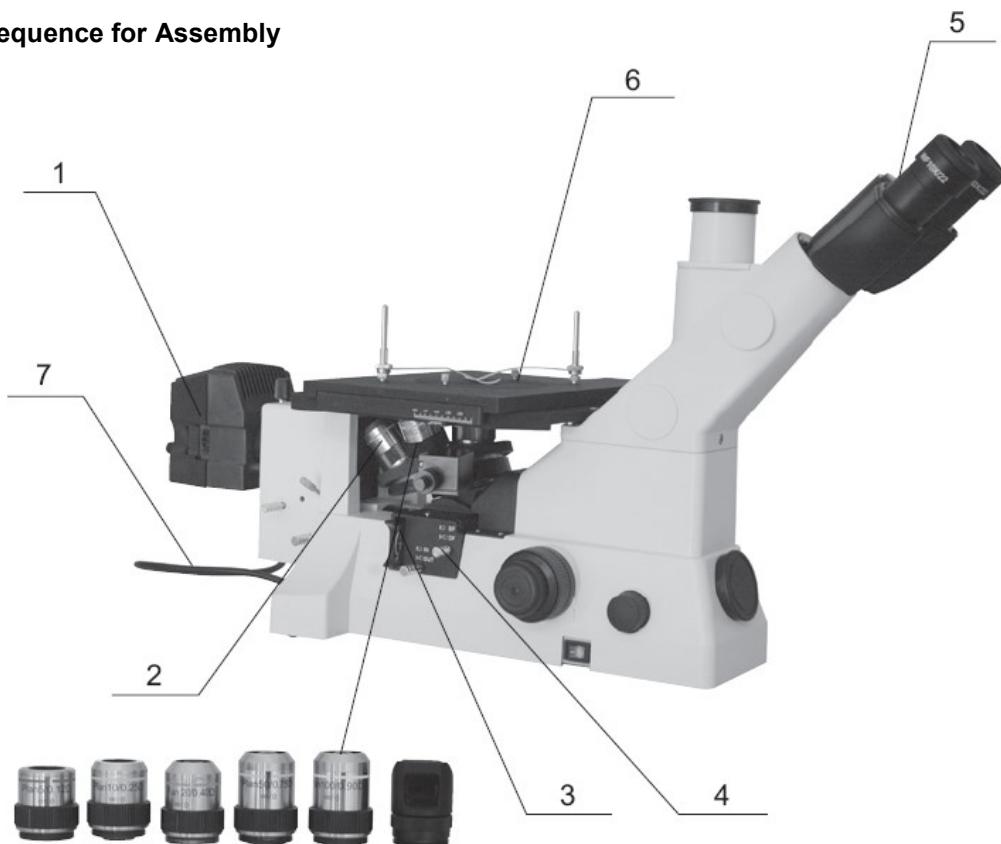


Figure 2. Assembly order

Initial Prep: Before assembly ensure that all parts are free of dust and damage

- Step 1: Install lamp house and bulb (2.3.1.1)
- Step 2: Install Objectives (2.3.1.2)
- Step 3: Insert polarizer (2.3.1.3)
- Step 4: Insert DIC / analyzer (2.3.1.4)
- Step 5: Install eyepieces (2.3.1.5)
- Step 6: Install mounting stage (2.3.1.6)
- Step 7: Connect power (2.3.1.7)



2.3 Installation (continued)

2.3.1.1 Installing and Replacing Bulb

Requires Halogen Lamp (12V50W)

! Caution: Bulb and lamp housing can get very hot. Turn off power and let cool before removing or replacing.

1. Let bulb and housing cool before removing
2. Remove hex bolt on the light cover (Figure 3).
3. Push clip to remove old bulb and replace with new blub (Fibure 4)



Figure 3. Housing Assembly

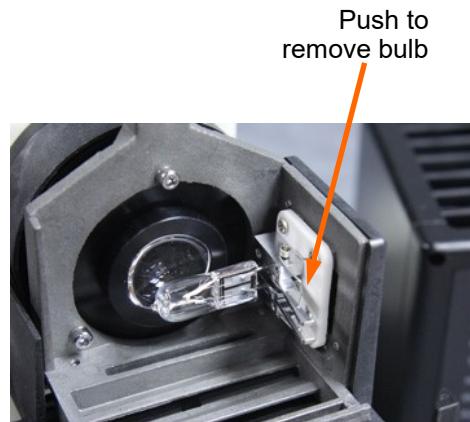


Figure 43. Bulb replacement

! Caution: Use cotton gloves when handling light bulb. Do not touch with fingers as oil from fingers can significantly reduce the life of the bulb.



2.3 Installation (continued)

2.3.1.2 Installing Objective Lenses

Unlock turret: For shipping the turret is locked to prevent it from moving up and down during transport. To unlock turret loosen the collar (2) on the right side of the microscope located in front of the focusing knobs next to the microscope base.

Adjust tension so that the turret can move up and down freely but is not too loose so that it moves under its own weight.



Figure 5. Tension adjustment for turret nose-piece

Install Objectives: Be sure to clean any dust and debris off the objective lenses and the turret nosepiece before installing objectives.

Install 5X objective and then rotate counter-clockwise sequentially adding higher magnification lenses.



Figure 6. Installing Objective Lenses



2.3 Installation (continued)

2.3.1.3 Installing Polarizer



Figure 7. Installing Polarizer

Install polarizer: Slide polarizer into slot as shown (Figure 7).

2.3.1.4 DIC assembly



Figure 8a. DIC Assembly



Figure 8b. DIC Assembly location

Install DIC assembly: Slide DIC assembly into Dove-tail slot by turret on the left side of the microscope (Figure 8).



2.3 Installation (continued)

2.3.1.5 Eyepiece assembly

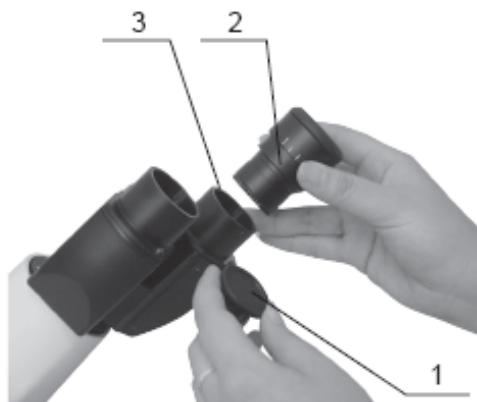


Figure 9. Eyepiece assembly

1. Remove protective cap
2. Insert eyepiece into tube
3. Adjust eyepiece to set focus on eyepiece scale, focus on sample and adjust other eyepiece so both eyepieces are in the same focus.



2.3 Installation (continued)

2.3.1.6 Auxiliary stage assembly

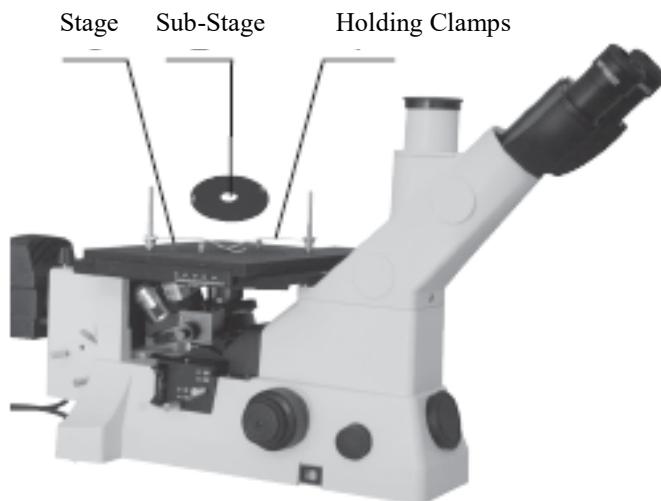


Figure 10. Stage plate assembly

Three different stage plates are supplied with the IM-5000 metallographic microscope. Insert into ring on top of primary stage.

The auxiliary stages can be rotated to square up the specimen.

2.3.1.7 Power connections

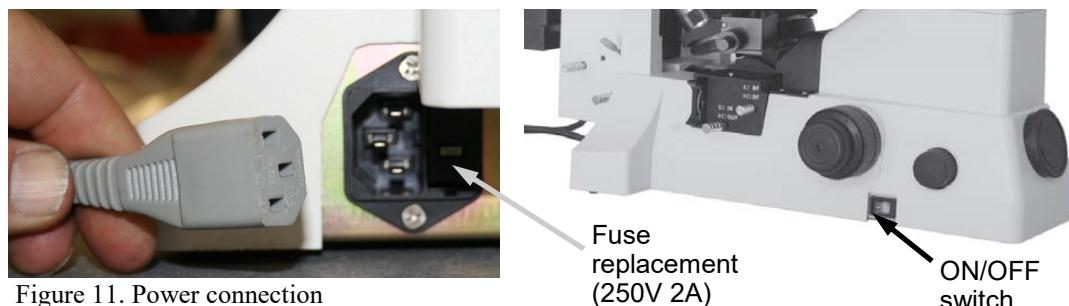


Figure 11. Power connection

Use a three prong grounded plug. Input power can range from 110V to 220V.

3.0 Adjustments

3.0.1 Field diaphragm alignment

1. The field diaphragm allows the amount of light entering the sample to be controlled. This allows for the wavelength of light to be constant.

In comparison, adjusting the intensity of the light source alters the wavelength of the light and can degrade the image quality.

2. Reduce the field diaphragm by pulling out field diaphragm knob.
3. Center field diaphragm by rotating alignment knob.
4. Open field diaphragm (pushing in knob) so that it is just outside the field of view.

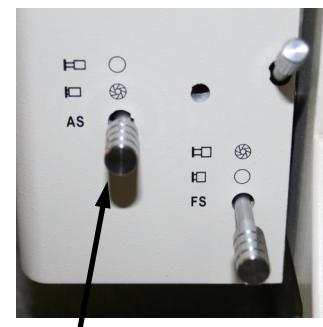
Field diaphragm alignment



Field diaphragm adjustment

3.0.2 Aperture or Condenser diaphragm adjustment

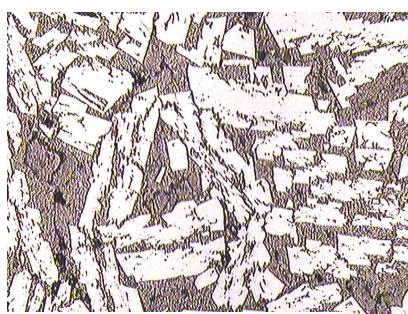
1. The aperture or condenser diaphragm alters the sample contrast, which in turn changes the microscopes numerical aperture. The result is an effective change in the depth of field of the image (may be very considerable at higher magnifications).
2. Push or pull to adjust aperture diaphragm.



Aperture diaphragm adjustment



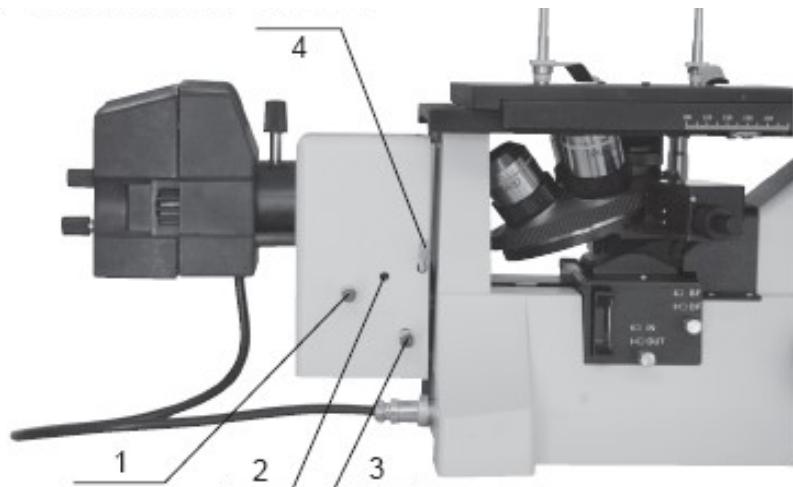
Aperture diaphragm OUT



Aperture diaphragm IN

3.0.3 Aperture or Condenser diaphragm alignment

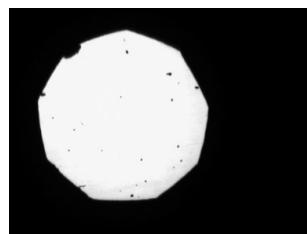
The aperture or condenser diaphragm has been aligned at the factory, however, it may shift during transportation.



1. Remove eyepiece and set objective lens to 50X
2. Push or pull to adjust aperture diaphragm (no.1) (observe the aperture movement, the light should remain in the center)
3. If the light is not in the center, adjust the set screw (no. 2) with the allen hex wrench (note there is a second set screw on the other side of the microscope). Adjust so that the light is in the center.

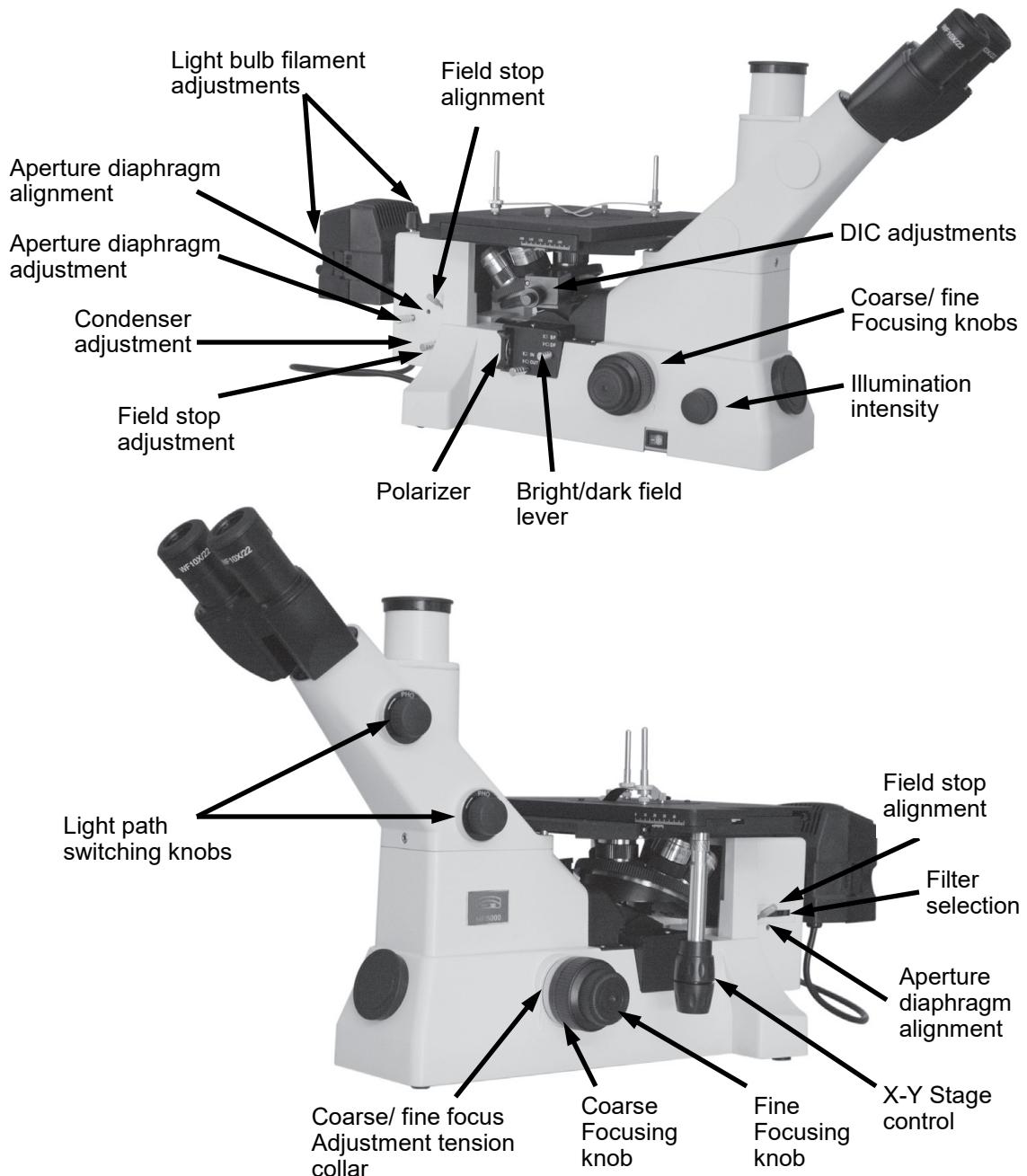
3.0.4 Field Stop diaphragm alignment

1. Close down the field diaphragm (no. 3) as shown.
2. Center with adjusting knobs (no. 4) (note there is a second knob on the other side of the microscope). Adjust so that the diaphragm is in the center.



Field diaphragm
should be centered
in the field of view

4.0 Operating Parts



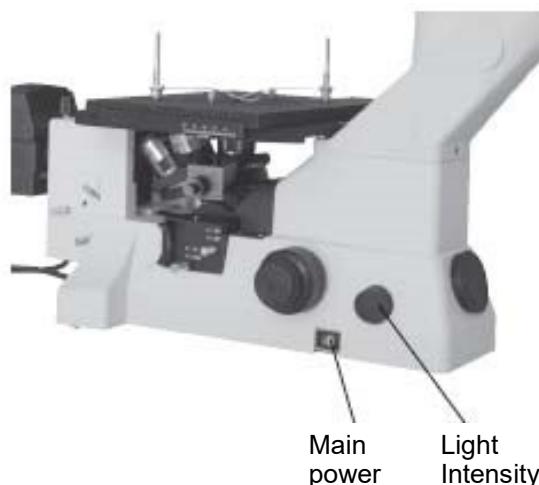


5.0 Operation

5.1 Lamp operation

1. Turn on main switch.
2. Rotate knob to adjust intensity of light

NOTE: Reducing the intensity of the bulb will prolong the life of the bulb. Also when using the microscope turn down the intensity but do not turn off when on stand-by (this keeps the bulb warm and does not shock it by constantly turning it on and off)

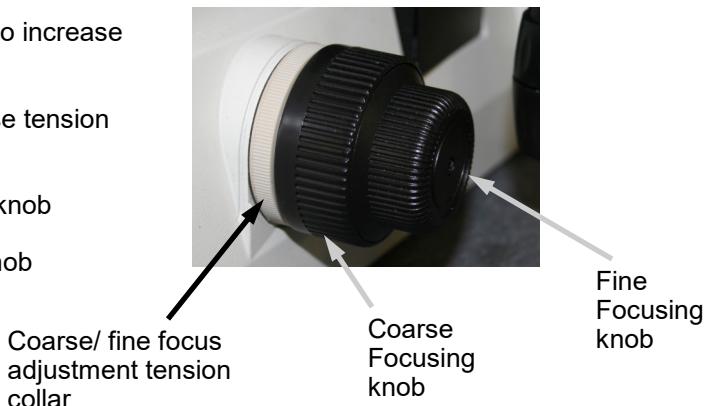


5.2 Focusing

1. Adjust the tension for the focusing knob with the collar next to the microscope base

Turn counter clockwise (CCW) to increase tension

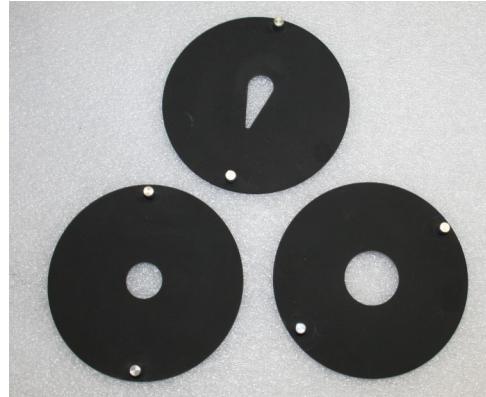
Turn clockwise (CW) to decrease tension
2. Adjust coarse focus with larger knob
3. Adjust fine focus with outside knob



5.3 Mechanical Stage

1. Place sample on sub-stage (interchangeable)

2. Using the dual stage control knobs the stage can be moved in either the X-axis or Y-axis direction (40 mm x 40 mm) (1.5 x 1.5-inch)
Note stage has a scale to monitor movement (0.1 mm accuracy)



Microscope sub-stages



X-Y stage controls



Microscope X-Y stage



Calibrated stage movement



5.4 Binocular viewing head

5.4.1 Eyepiece focus adjustment

1. The eyepieces can be focused independently of each other by adjusting the focus for each eyepiece.
2. Place a sample on the stage and focus by viewing with only one eyepiece.
3. Adjust the second eyepiece to match the focus of the first by rotating the top of the eyepiece while holding the base.



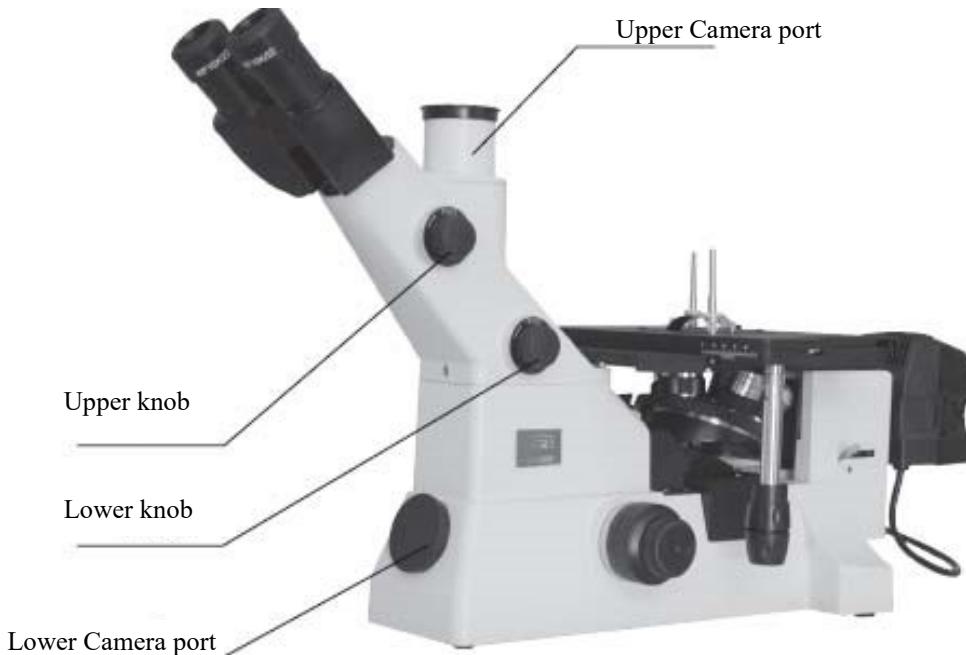
Eyepiece adjustment

5.4.2 Adjusting Interpupillary Distance

- 1 The interpupillary vision or distance between the center of the pupils of the two eyes is different for each persons. By adjusting the interpupillary distance of the eyepieces the eyes will only see one image when viewed through the microscope.
- 2 To adjust hold one side of the eyepiece prism and rotate with the other side to change the viewing width.



Range of interpupillary distance 55-75 mm

**5.5 Light path control knobs**

1. Lower knob controls the light path to the camera ports or to the eyepieces. In the PHO position, the light is directed to the lower camera port. In the neutral position the light path is to the eyepieces/upper camera port.
2. Upper knob controls the light path between the eyepieces and the upper camera port. In the PHO position, 20% of the light goes to the camera port and 80% for binocular viewing

In the neutral position, 100% of the light is directed to the eyepieces.

**5.6 Filters**

Green filter Monochrome contrast filter.

Ground glass: Diffuses filament image to produce more uniform lighting.

Blue: Used for lower light setting to compensate for the lower temperature of the light (reduces the yellow-orange color for daylight photographic film).

Yellow: Monochrome contrast filter.

Gray: Monochrome contrast filter.

Rotate filter on back right side of microscope.

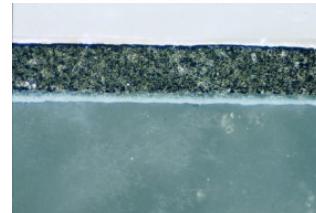


5.7 Illumination Techniques

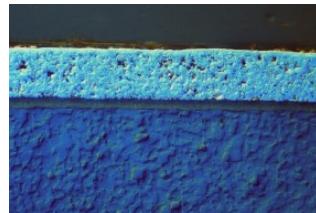
BRIGHTFIELD: Brightfield (B.F.) illumination is the most common illumination technique for metallographic analysis. The light path for B.F. illumination is from the source, through the objective, reflected off the surface, returning through the objective, and back to the eyepiece or camera. This type of illumination produces a bright background for flat surfaces, with the non-flat features (pores, edges, etched grain boundaries) being darker as light is reflected back at a different angle.

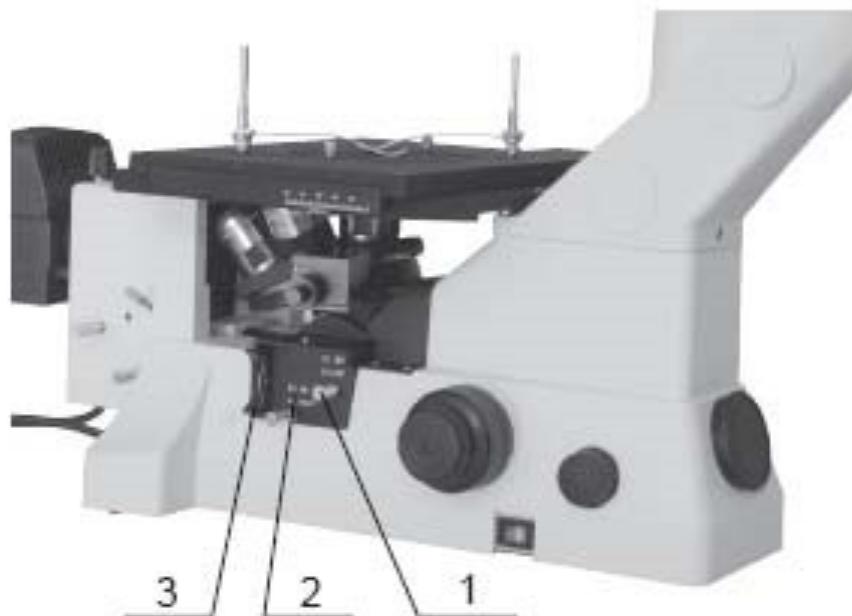


DARKFIELD: Darkfield (D.F.) illumination is a lesser known but powerful illumination technique. The light path for D.F. illumination is from the source, down the outside of the objective, reflected off the surface, returned through the objective and back to the eyepiece or camera. This type of illumination produces a dark background for flat surfaces, with the non-flat features (pores, edges, etched grain boundaries) being brighter as light is reflected at an angle back into the objective.



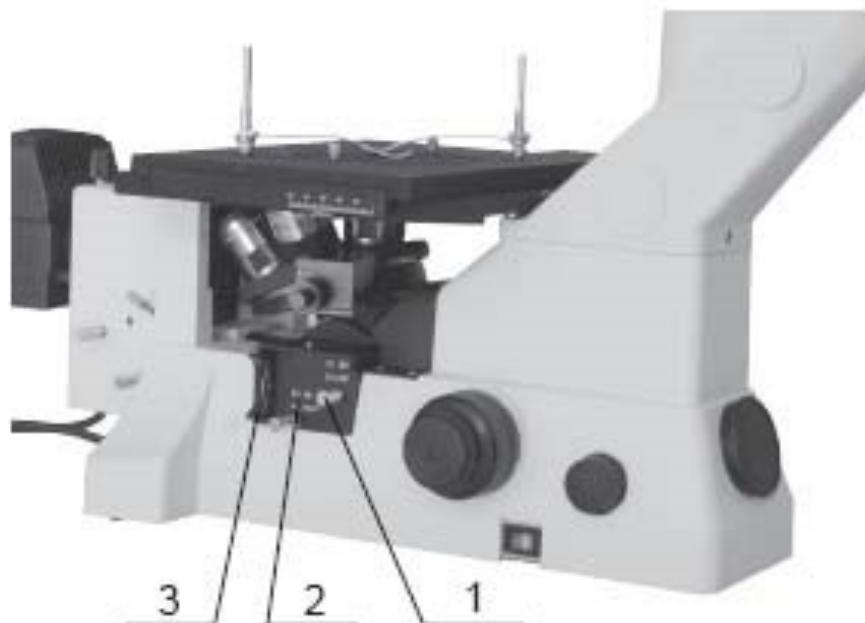
DIC: Differential Interference Contrast (DIC) is a very useful illumination technique for providing enhanced specimen features. DIC uses a Normarski prism along with a polarizer in the 90° crossed positions. Essentially, two light beams are made to coincide at the focal plane of the objective, thus rendering height differences more visible as variations in color.



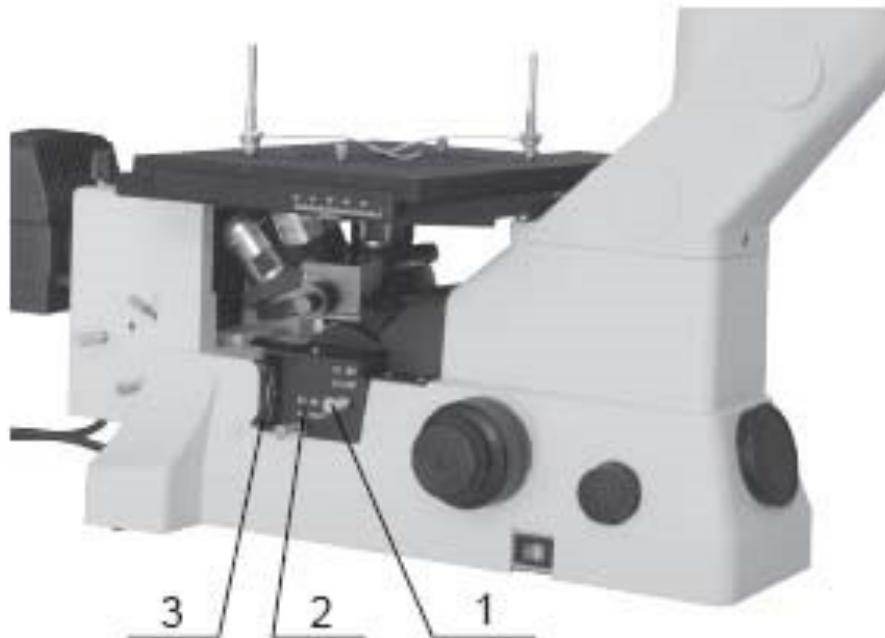
**5.7.1 Brightfield Illumination**

Brightfield;

- Lever (2) should be pulled OUT
- Lever (1) should be in BF position (IN)
- Polarizer (3) removed

3601 E. 34th St. Tucson, AZ 85713 USA Tel. +1-520-882-6598 Fax +1-520-882-6599 email: pace@metallographic.com Web: <https://www.metallographic.com>**5.7.2 Darkfield Illumination****Darkfield:**

- Open aperture diaphragm to maximum position
- Open field diaphragm to maximum position
- Lever (2) should be OUT
- Lever (1) should be in DF position (OUT)
- Polarizer (3) removed

**5.7.3 Polarized Light Illumination**

Polarized Light:

- Lever (2) should be pushed IN
- Lever (1) should be in BF position (IN)
- Polarizer (3) pushed IN (rotate for polarization)



5.7.4 Differential Interference Contrast (DIC)



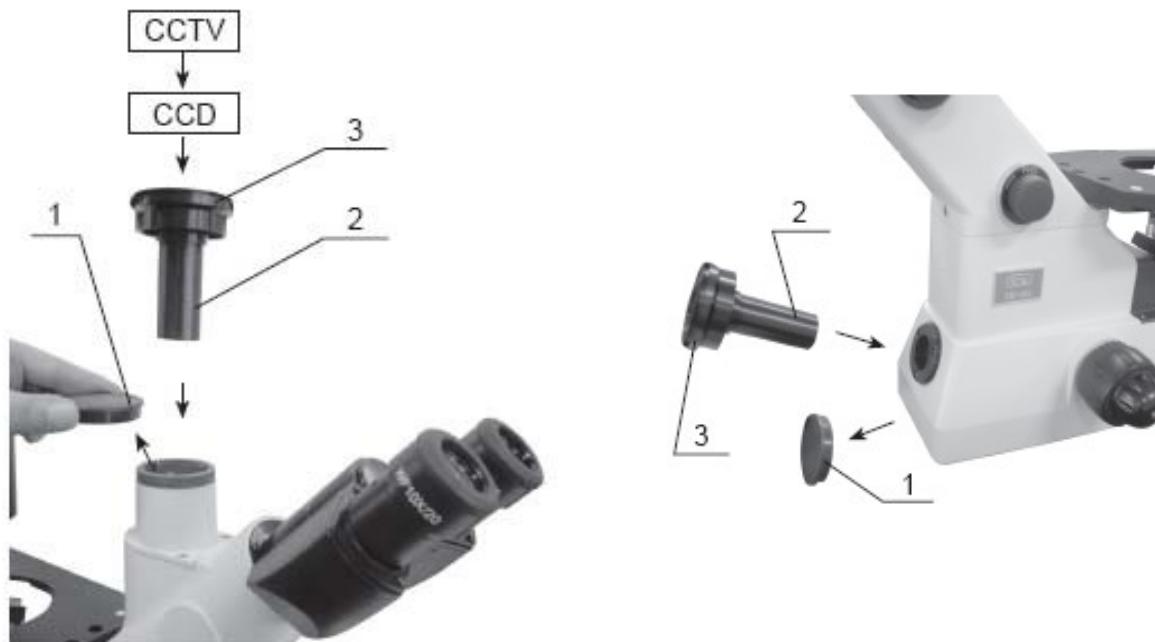
- DIC;
- Lever (2) should be pushed IN
 - Lever (1) should be in BF position (IN)
 - Polarizer (3) pushed IN (rotate polarizer to extinction or black)
 - Use correct prism for the magnification to be viewed in the DIC assembly
 - Insert DIC assembly into dove-tail slot
 - Rotate larger knob (1) to observe variations in color
 - Rotate smaller knob (2) to equalize the color in the field of view.

Dove-tail slot
for DIC assembly



5.8 Camera set-up

- Attach camera to adapter
- Attach C-mount camera adapter to microscope port on microscope
- Set light path to PHO to direct light rays to camera



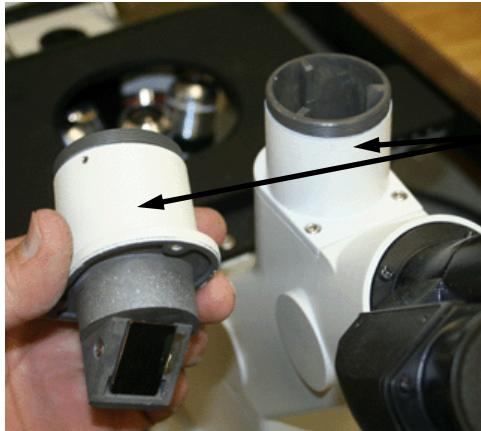
**5.8.1 Camera adapters**

- There are two camera adapter options. The 1X adapter is used for obtaining an image closest to what is seen through the eyepieces. The disadvantage of the 1X adapter is that a round image is projected onto a square chip in the camera and thus can result in edges with a slightly darker appearance. This is typically not too much of an issue for taking pictures, however, for image analysis, which is based on light intensity, can create some artificial artifacts.
- For image analysis software a 0.5X produces a more uniform light intensity for better image analysis results.



5.8.2 Camera installation

For 0.5X camera adapter you may need to use an additional spacer for the camera and eyepieces to be in focus.



Camera adapter assembly



Camera adapter assembly on the microscope.

**5.8.3 Focusing eyepieces to camera**

- Insure that the light bulb is centered and the illumination is correctly set
- Adjust the focus so that the image on the computer screen is in focus
- Adjust the focus on the eyepieces so that the image is in focus.



Rotate this part
of the eyepiece
to focus the
eyepiece

Hold this section
of the eyepiece
in place



6.0 Safety Guidelines

6.1 Warning Sign

- ! This sign points to special safety features on the instrument.

6.2 Safety Precautions

- ! Careful attention to this instruction manual and the recommended safety guidelines is essential for the safe operation of the IM-5000 **metallographic microscope**.
- ! Proper operator training is required for operation of the IM-5000 **metallographic microscope**. Any unauthorized mechanical and electrical change, as well as improper operation, voids all warranty claims. All service issues need to be reported to the manufacturer / supplier.
- ! Operate unit as specified in this manual.
- ! Disconnect power before opening unit.
- ! Let lamp and lamp house cool before changing bulb.
- ! When unit is not in use turn light bulb power down slowly to cool before turning off power.

6.3 Emergency Statement

The IM-5000 **metallographic microscope** has been designed for analyzing metallographic specimens. Always follow proper operational guidelines and avoid contact with moving lubricants and abrasives. .



7.0 Maintenance

7.1 Introduction

The IM-5000 **metallographic microscope** requires very minimal maintenance. To keep the unit clean cover with microscope cover after use.

7.2 Cleaning lenses

Use only an alcohol such as IPA for cleaning the objectives and eyepieces.

7.3 Replacing light bulb

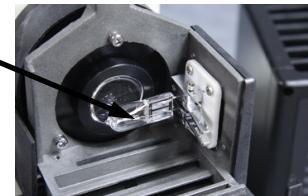
Do not touch the light bulb with fingers directly, the oil on the skin will significantly reduce the life of the light bulb. Use cotton gloves.

- Remove light bulb casing
- Remove old light bulb. Be careful if the bulb recently burned out as it may still be hot.
- Install new bulb, make sure it is pushed all the way down, otherwise it may not be possible to focus the light (see page 11).



Remove housing cover by pulling off the top part

Insert new bulb and make sure it is completely pushed all the way in





8.0 Trouble Shooting (Optical Path)

More extensive trouble shooting, repair guides, video's, and parts lists are provided online at www.metallographic.com or

<http://www.metallographic.com/PACE-service/IM-5000-service.html>

Problem	Cause	Solution
Bulb lights but the field is dark	<ul style="list-style-type: none"> a. The aperture or field diaphragm is closed. b. Analyzer and polarizer are engaged in light path. c. Light path selector knob for trinocular tube is not positioned properly d. Mirror selector lever is in an intermediate position 	<ul style="list-style-type: none"> a. Open the aperture and field iris diaphragms. b. Disengage them from light path. c. Fully pull out the light path selector knob. d. Set the knob correctly
Field of view is obscured or not evenly illuminated	<ul style="list-style-type: none"> a. Light path selector knob of trinocular tube is not fully turned. b. Mirror selector lever is in an intermediate position. c. Revolving nosepieces is not in clicked position. d. Field iris diaphragm is not centered. e. ND filter is not in position f. Lamp bulb is not installed properly. g. Analyzer and/or polarizer are not installed correctly 	<ul style="list-style-type: none"> a. Set the light path selector knob to the correct position. Set the knob correctly. b. Lock in the position. c. Center the field iris diaphragm correctly and open fully. d. Set into correct position. e. Push halogen bulb terminals all the way into the holder f. Engage analyzer and polarizer into light path.
Dirt or dust in field of view	<ul style="list-style-type: none"> A. Dirt / dust on eyepiece B. Dirt/ dust on specimen 	Clean thoroughly.
Image defocused / low resolution	<ul style="list-style-type: none"> A. Revolving nosepiece is not in correct position B. The surface of the objective is contaminated. C. Dirt / dust on specimen 	Clean thoroughly.
One side of image is blurred.	A. Objective is not engaged properly.	Turn revolving nosepiece so that it engages properly



8.1 Trouble Shooting (Mechanical)

Problem	Cause	Solution
Coarse focus knob is hard to turn	Tension adjustment collar is too tight.	Loosen to proper tension.
Stage drifts down by itself or focus is lost during observation.	Tension adjustment collar is too tight.	Tighten collar to proper tension.
Cannot focus on specimen.	Stage height adjustment is to low.	Raise stage holder height.
Image shifts when stage is moved or touched.	Stage not properly mounted.	Clamp stage.
Field of view of one eye does not match that of the other eye.	Interpupillary distance is incorrect.	Adjust interpupillary distance.
Eye fatigue.	A. Incorrect eyepiece focus. B. Brightness too high.	A. Adjust eyepiece focus. B. Adjust bulb voltage.

8.2 Trouble Shooting (Electrical)

Problem	Cause	Solution
Lamp does not turn on	A. No power supply. B. Bulb installed incorrectly C. Bulb burned out. D. Connection of lamp housing power plug is incorrect. E. Power not turned on.	A. Check power cord B. Install bulb correctly C. Change the bulb D. Disconnect and reconnect E. Turn on power
Bulb burns out easily	A. Incorrect lamp. B. Oil from touching bulb.	A. Use recommend light and use lower voltage illumination. B. Use cotton gloves when installing new bulbs.

9.0 Spare / Replacement Parts

PACE PART No.	PACE DESCRIPTION (IM-5000)	
Base components		
431-415	IM-5000 Mechanical Stage	
431-415-010	Teardrop stage plate	
431-415-020	20 mm stage plate	
431-415-030	30 mm stage plate	
418-010	0.1 mm calibration slide	
418-001	0.01 mm calibrations slide	

PAGE PART No.	PAGE DESCRIPTION (IM-5000)	
IM-5000-DUST	IM-5000 dust cover	
	Optical Components	
431*615	IM-5000 Objective (PL-5X/0.12BD)	A black and silver microscope objective lens with red markings.
431*625	IM-5000 Objective (PL-10X/0.25BD)	A black and silver microscope objective lens with yellow markings.
431*635	IM-5000 Objective (PL-20X/0.4ND)	A black and silver microscope objective lens with green markings.
431*655	IM-5000 Objective (PL-50X/0.70BD)	A black and silver microscope objective lens with blue markings.
431*695	IM-5000 Objective (PL-100X/0.90BD)	A black and silver microscope objective lens with grey markings.

PAGE PART No.	PAGE DESCRIPTION (IM-5000)	
431-855	IM-5000 DIC components	
431-865	IM-5000 Normarski 5x prisms	
431-875	IM-5000 Normarski 10x prisms	
431-885	IM-5000 Normarski 20x, 50x, 100X prisms	
431-845	IM-5000 Polarizer	
431-515	IM-5000 Eyepiece (WF10X/22)	
431-525	IM-5000 Eyepiece (WF15/16)	

PACE PART No.	PACE DESCRIPTION (IM-5000)	
431-535	IM-5000 Eyepiece (WF20/20)	WF20X/20
431*515	IM-5000 Division Eyepiece (WF10X/22)	WF10X/22
Camera components		
431-715	IM5000 0.5X CS-camera adapter	IM5000 0.5X CS-camera adapter
431-725	IM5000 1X CS-camera adapter	IM5000 1X CS-camera adapter
IM-5000-CP	IM-5000 camera prism	IM-5000 camera prism



IM-5000 Metallurgical Microscope

INSTRUCTION MANUAL

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PACE PART No.	PACE DESCRIPTION (IM-5000)	
CS-CA	CS camera adapter	
	Electrical components	
431-835	IM-5000 Lamp House	
431-000	Halogen lamp for IM-5000 microscope	
IM-5000-Trans	IM-5000 power transformer	
CORD-110V	110V power cord	
CORD-220R	220V round time power cord	
CORD-220F	220V three prop flat connector	