



# Lab Manual

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## UVSCOPE

(uvscope)

### 1.0 **Title**

UVSCOPE Operation

### 2.0 **Purpose**

This manual describes the general operation of UVSCOPE and its interface with XCAP™ Interactive Image Analysis Software.

### 3.0 **Scope**

This manual includes the procedures for Bright Field, Dark Field, Interference contrast, and UV sub-micron operations. It also includes the procedures of grasping the microscopic images using XCAP™ Interactive Image Analysis Software and transferring the images to the user's computer workstation.

For lamp replacement, refer to Section 4.1. For details of XCAP™ Interactive Image Analysis V2.0/2.1, refer to Section 4.2.

### 4.0 **Applicable Documents**

#### [Revision History](#)

- 4.1 Leica INM100 Universal Inspection Microscope Operation Manual (Available at the UVSCOPE and in the office)
- 4.2 XCAP™ Interactive Image Analysis V2.0/2.1 Reference Manual (Available online and in the office)

### 5.0 **Definitions & Process Terminology**

- 5.1 **Ergotube** - A combination of binocular tube and video tube. It can be adjusted for loss less beam splitting into 100% eyepieces (position I), 50% eyepieces-50% video (position II), or 100% video (position III).
- 5.2 **Bright Field Image** – Microscopic image of reflected light.
- 5.3 **Dark Field Image** – Microscopic image of scattered light.
- 5.4 **Differential Interference Contrast Image** – Special application for inspection of surface topographies.
- 5.5 **UV Image** – Microscopic image of reflected Ultra Violet Light (365nm) for inspection of sub-micron features.

### 6.0 **Safety**

- 6.1 All general Microlab safety guidelines apply when operate UVSCOPE.
- 6.2 HOT SURFACE HAZARD: Lamp house surface is hot and may cause burn.
- 6.3 EXPLOSION HAZARD: Hg and Xe Lamp may explode and can cause severe injury if not secured in explosion shielded housings

### 7.0 **Statistical/Process Data**

N/A

## 8.0 Available Processes, Gases, Process Notes

N/A

## 9.0 Equipment Operation

### 9.1 General UVSCOPE Operation – Bright Field Operation

- 9.1.1 Enable UVSCOPE on the Wand. Turn on the microscope and the bright light power by press the main switch (on the lower right side of the microscope) to “on” position. If you are going to use the UV light, turn on the UV light power supply unit (ebq 100, Netz Power). It needs 20 minutes to warm up.
- 9.1.2 Lower the stage with the coarse focus knob. Move the stage to the right and toward you by moving with the two knurled knobs under the stage on the right hand side. Put your wafer on the center of the stage. The stage can be rotated 360 degree if needed. Move the stage back to the position where you can examine your wafer. Do not try to put your wafer directly in between the objective lens and the stage. You may scratch or damage the objective lens and your wafer.
- 9.1.3 Check microscope set up.
- 9.1.3.1 Check the position of the Ergotube (on the center right side). If it is pull out at position “III”, push it in to the position “II” or “I”.
- 9.1.3.2 Check the Contrast turret (on the right center side of the microscope) is set at BF. If not, turn it until BF is locked at the position.
- 9.1.3.3 Check the Interference prism turret (on the front side of the microscope) is set at “H”. If not, turn it until “H” is locked at the position.
- 9.1.3.4 Check the UV light shutter (between the microscope and the UV light housing) is at the bright light position.
- 9.1.3.5 Check the Bright light shutter handle (on the left back side of the microscope) is to the “in” position.
- 9.1.3.6 Check the incident light aperture. The “man. AD” button (on the lower left side) should be red. If it is white, push it once to change it to red.
- 9.1.4 Select the suitable objective lenses using the “+” and “-” buttons located on the lower left hand side of the microscope. Push the “+” button for higher magnification lens and “-” for lower. Do not turn the objective turret manually. It is easier to focus starting with lower power objective lens.

There are six lenses on the UVSCOPE:

HC PL FLUOTAR	5X	Red ring
HC PL FLUOTAR	10X	Yellow ring
HC PL FLUOTAR	20X	Green ring
HC PL FLUOTAR	50X	Blue ring
PL APO	150X	White ring
UV 365nm	150X	White ring (smaller size)

- 9.1.5 Adjust the lamp brightness using the thumb wheel located in the lower front of the microscope.
- 9.1.6 Choose the lowest magnification lens. Raise the stage while focusing. Focus on your wafer using the coarse focus drive and turn slowly while looking through the eyepieces. With the coarse focus drive (outer knob), the stage can be fast positioned in height. The fine focus (inner knob) has two different gears. When it is pushed to the left side, one rotation equals 0.1mm. When it is pushed to the right, one rotation equals 0.02mm. This is extremely useful for high power objective lens.

- 9.1.7 Perform stage stop position set up.
- 9.1.7.1 This is needed to prevent damage to the sample due to the stage position being too high; the upper stage stop position can be set with the limiting wheel (black ring around the coarse focus knob).
  - 9.1.7.2 Disengage the upper limit stop by rotating the limiting wheel counterclockwise a quarter turn. If you do not want to set the upper limit stop, proceed to 9.1.8.
  - 9.1.7.3 Set correct focus using 50X objective.
  - 9.1.7.4 Engage the upper limiting stop by rotating the limiting wheel clockwise until it is fixed.
  - 9.1.7.5 This procedure must be repeated whenever the sample thickness is changed.
- 9.1.8 Adjust eyepiece distance and correct focus for un-even eyesight if desired.

## 9.2 Dark Field Operation

- 9.2.1 Follow Procedure 9.1 to obtain the Bright field image first.
- 9.2.2 Turn the Contrast turret (located on the center right side of the microscope) to "DF" position. Adjust the lamp brightness and focus if needed.
- 9.2.3 To return to the Bright Field image, turn the Contrast turret to "BF" position.

## 9.3 Interference Contrast Operation

- 9.3.1 Follow Procedure 9.1 to obtain the Bright field image first.
- 9.3.2 Turn the Contrast turret (on the center right side of the microscope) to "DIC" position.
- 9.3.3 Turn the Interference prism turret (on the front side) to the appropriate position:
- |            |                                     |
|------------|-------------------------------------|
| Position 1 | HC PL FLUOTAR objectives (5 to 50X) |
| Position 2 | same as position 1                  |
| Position 3 | PL APO objectives (150X)            |
- 9.3.4 Adjust the small knurled knob (on the right side of the Interference turret) to obtain optimal interference contrast.
- 9.3.5 To return to the Bright field image, turn the Interference prism turret to "H" position first. Then turn the Contrast turret to "BF".

## 9.4 Viewing the image using the SONY monitor

- 9.4.1 Check the position of the Ergotube (on the center right side). If it is pushed in at the position "I", pull it out to the position "II" or "III".
- 9.4.2 Set the A/B switch box to "A" for Bright Field, Dark Field, and Interference Contrast Images. (Switch to "B" for UV image.)
- 9.4.3 Turn on the SONY monitor. Select Channel (line) A. The settings (brightness, contrast, and etc.) are preset. To turn off the pre-settings for manual adjusting, press "manual" button and follow the instruction on the screen.
- 9.4.4 You may need to adjust the microscope lamp brightness and/or focus to obtain satisfactory images.

## 9.5 UV image Operation (can only be displayed on the SONY and PC monitors)

- 9.5.1 Follow Procedure 9.1 to obtain the Bright Field image of the area of interest. Switch the objective to UV 365nm (150X).

- 9.5.2 Change the UV light shutter position (between the microscope and the UV light housing) to UV position.
- 9.5.3 Pull out the Bright light shutter handle (on the left back side of the microscope).
- 9.5.4 Check the position of the Ergotube (on the center right side). If it is pushed in at the position "I", pull it out to the position "II" or "III".
- 9.5.5 Set the A/B switch box to "B" for UV image.
- 9.5.6 Turn on the SONY monitor. Select Channel A. The settings (brightness, contrast, and etc.) are preset. To turn off the pre-settings for manual adjusting, press "manual" button and follow the instruction on the screen.
- 9.5.7 You may need to adjust the UV Video Camera Shutter setting (black push button device sits on top of the microscope) and/or microscope focus to obtain satisfactory images.
- 9.5.8 To return to the Bright Field image, follow Procedure 9.1.3 and set the A/B switch box to "A".

## **9.6 XCAP and FTP Graphic File Transfer**

- 9.6.1 Check the position of the Ergotube (on the center right side of the microscope). If it is pushed in at the position "I", pull it out to the position "II" or "III".
- 9.6.2 Turn on the UVSCOPE PC Workstation next to the microscope. It is running Window NT™ OS. The login is "leica" and the password is "LEICA" too (case sensitive).
- 9.6.3 Double-Click the "XCAP for Windows" icon to start the program.
- 9.6.4 Select the drop down menu "PIXCI®"; select "PIXCI® open/close". In the pop-out window, click "open" button. A window with previous grasped image will pup-out. If no image (dark screen), then refer to troubleshooting guidelines Section 10.
- 9.6.5 Select the proper camera connection in the setup window. Top connection is for Bright Light images and bottom for the UV. Click "snap" or the "camera" icon to grasp new images.
- 9.6.6 You can save the grasped images in several graphic formats on a floppy diskette or the hard drive temporarily. If you save the images on the hard drive, please use SSH Secure Shell to transfer the files to your own workstation account. The users' files will be purged to protect the hard drive.
- 9.6.7 To use the SSH Secure Shell program, click the "start" button on the bottom menu bar. Click the "programs", choose the "SSH Secure Shell", then the "Seccure File Transfer Client" option. Click the "Quick Connect" icon. Select your host computer and account. Enter your password for the account. Drag the graphic files to your host computer directory.

## **9.7 Fluorescence Operation (FL) – Not Available**

## **9.8 Shutdown Procedures when you are done.**

- 9.8.1 Return the microscope to Bright Field state by following Procedure 9.1.3.
- 9.8.2 Turn down the lamp brightness to minimum.
- 9.8.3 Turn off the microscope main switch and the UV light power supply (ebq100).
- 9.8.4 Turn off the SONY monitor and the PC workstation monitor. Leave the PC workstation on.
- 9.8.5 Log off UVSCOPE on the wand.

## **10.0 Troubleshooting Guidelines**

### **10.0 The wafer stage does not move up for focusing.**

Check the stage upper limiting stop is not engaged (Procedure 9.1.7).

### **10.1 No Bright Field, Dark Field, or Interference Contrast Image**

10.1.1 Check there is light coming out of bright light lamp housing (left rear side of the microscope). If there is no light coming out, the lamp needs to be changed. Report fault on the Wand.

10.1.2 Double check the microscope setup by following Procedure 9.1.3.

### **10.2 No UV Image**

10.2.1 Check there is light coming out of UV lamp housing (rear side of the microscope). If there is no light coming out, the lamp needs to be changed. Report fault on the Wand.

10.2.2 Double check the UV image operation Procedure 9.1.3.

### **10.3 No image on the “SONY” monitor and/or XCAP™**

10.3.1 Check there is power to the monitor.

10.3.2 Double check Procedure 9.4 for the “SONY” monitor, Procedure 9.6 for XCAP™.

10.3.3 The light from the microscope may be too low for the video camera. Manually adjust the incident light aperture (see instruction in the appendix).

## **11.0 Figures & Schematics**

Refer to Leica INM100 Universal Inspection Microscope Operation Manual

## **12.0 Appendix**

### ***Adjusting the Incident Light Aperture***

The incident light aperture can affect the resolution and contrast of the microscopic image. The UVSCOPE is equipped with a variable iris aperture diaphragm which is factory aligned for the best performance. In some cases, the application requires an overwriting of the factory setting.

To adjust the aperture diaphragm manually, push the red [Man. AD] button (on the left side of the microscope) once. It will turn white/pink. Then adjust the aperture diaphragm using the [AD] rotary wheel under the [Man. AD] button. Pushing the [Man AD] button again, it will turn red and the diaphragm return to the automatic mode.

In the automatic mode, the diaphragm will be adjusted to the preset positions. When changing from Bright Field to Dark Field, the diaphragm will open automatically. Changing from Dark Field to Bright Field, the diaphragm will return to its previous position.