

TFT Tools Inc

Toolmaker's Microscope

PREFACE

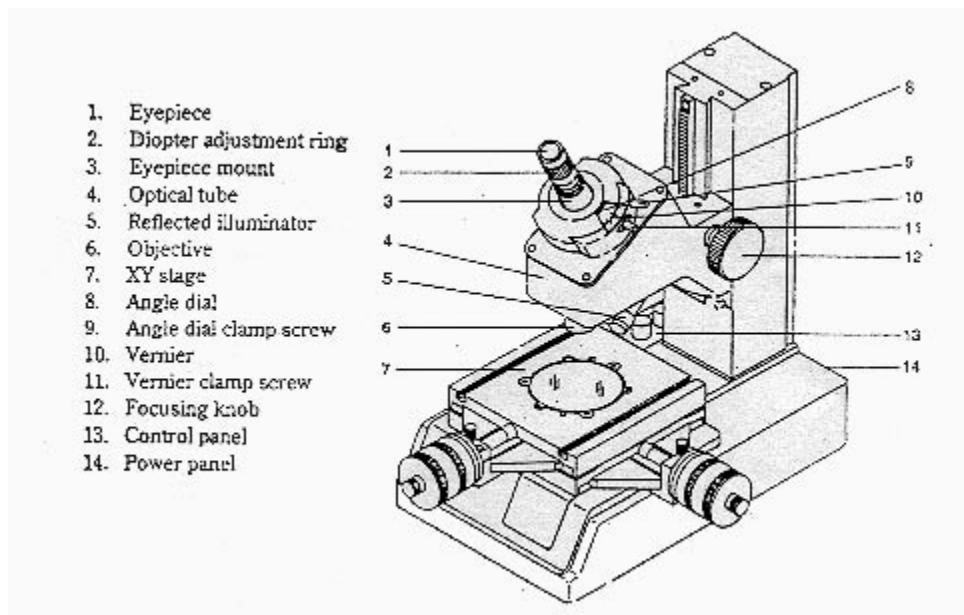
This User's Manual explains the hardware operation of the instrument and the precautions to be observed during operation. To obtain the best possible performance and longest service life from your Industrial Microscope.

1. Outline

1.1 Description

The Industrial Microscope supports a wide range of application from shop-floor inspection, measurement of tools and machined parts to precision measurement of test tools in a measuring room. It is designed with angle dial, also can measure angle

The Industrial Microscope is easy-to-use and compactly laid out. It consists of objective, eyepiece, XY stage, angle dial, reflected illuminator, transmitted illuminator power and so on.



1.2 Specification

(1) Graduation: Micrometer head: 0.0001" . Angle dial: 10 Vernier: 6"

(2) XY Stage feeding range: 1"x1" without gage block and 2x2" with gage block

(3) Eyepiece: Magnification: 15X Field number: 13

(4) Objective: Magnification: 2X Working distance: 2.64" (67mm)

2. Installation and Setup

2.1 Package Contents *Contents may vary. Please refer to User's Manual in each package.*

Description	Quantity
Objective 2X	1
Eyepiece 15X	1
Cross-hair reticule	1
Reflected illuminator	1
Micrometer Head	2
Reticule setting screw	1
Spare bulb (24V)	1
Spare Fuse (0.5A)	1
Power Cord	1
Grounding wire	1
User's Manual	1

2.2 Installation Site

Avoid using this Industrial Microscope from the place where vibration and dust exist.

2.3 Setting-up

1. Install the micrometer head on the XY stage.

Loosen the hex-socket head screw on the bracket. If using micrometer head with a fitting hole in the stem, insert the stem so that the hole is aligned with the clamp screw. If this puts the scale on the micrometer head in a poor position for viewing the zero graduation adjust the scale position by turning the micrometer head sleeve. Then, tighten the hex-socket head screw with the stem in place.

2. Connect the reflected illuminator cable to the connector on the power panel which is at the back side of the microscope.

3. How to set the voltage selector to the right voltage level? Turn the fuse holder to remove the fuse. Pull out the selector plug, insert the selector plug so that the supply voltage can be seen through the notch. Put the fuse back into the holder and attach the holder to the voltage selector plug.

4. Turn off the illuminator switch knob and connect the power cord to the power panel.

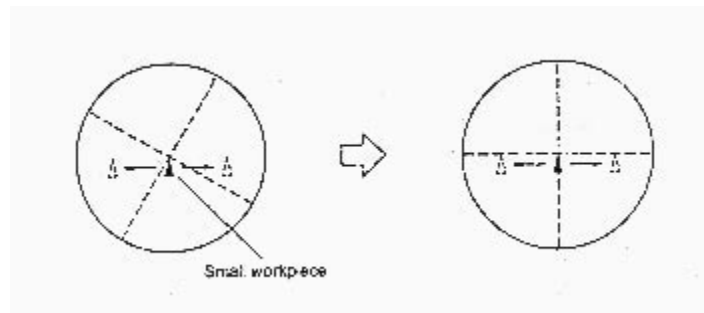
2.4 Check and Adjustment

2.4.1 Check the reticle position against XY stage movement direction

1. Place a small work piece on the stage glass and bring it into focus.

2. Turn the micrometer head to align an edge of the work piece with the center of the cross-hair.

3. While turning the micrometer head to move the work piece left and right, turn the angle dial so that the horizontal cross-hair is oriented to coincide with the direction of the stage movement.



4. Loosen the vernier clamp screw. Align the 0 Degree graduation on the angle dial with that of the vernier scale. Ensure the margin is sufficient for adjusting the vernier scale position. If space for adjusting the vernier scale position is limited, re-adjust the vernier scale position by referring to 2.4.3

2.4.2 Check the centering of the reticle

To perform dimensional measurement by turning the angle dial or after replacing the reticle align the cross-hair with the center of rotation of the angle dial as follows:

1. Place a small work piece on the stage glass and bring it into focus.

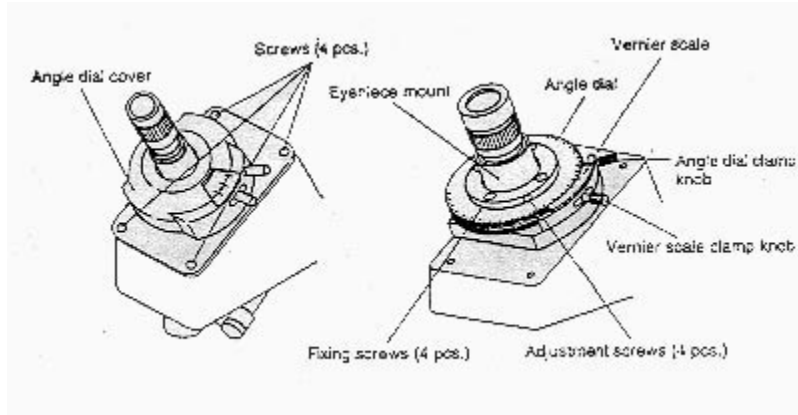
2. Turn the micrometer heads to align an edge of the workpiece with the center of the cross-hair.

3. Turn the angle dial 180 degree. Make sure the edge of the workpiece remains within 3 micrometers of the cross hair.

If it is not within 3 micrometers adjust the center of the reticle by referring to "2.4.3 (2) Centering the Reticle"

2.4.3 Adjusting Reticle

(1) Adjusting the reticle with the XY stage moving direction

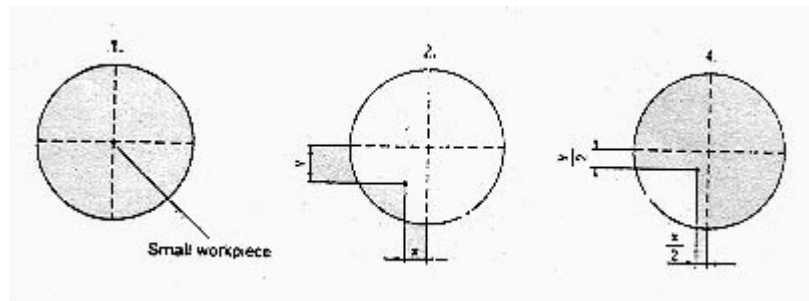


1. Remove the clamp knobs from the angle dial and vernier scale.
2. Remove the four screws from the angle dial cover and remove the cover
3. Screw-in the clamp knobs on the angle dial and vernier scale.
4. Approximately center the vernier scale in the adjustable range. Then secure it with the clamp knob.
5. Align the "0" graduation of the angle dial with that on the vernier scale. Then, secure the angle dial with the clamp knob.
6. Loosen both the adjustment screws and fixing screws (4 pieces/each) so that the eyepiece mount can be moved manually.
7. While looking into the eyepiece adjust the position of the eyepiece mount so that the horizontal cross-hair is oriented to coincide with the direction of the stage movement.
8. Temporarily secure the eyepiece mount by slightly tightening the fixing screws.
9. Remove the clamp knobs from the angle dial and vernier scale.
10. Remove the clamp knobs from the angle dial and vernier scale.

11. Replace the angle dial cover and secure it to the optical tube with the four screws.
12. Screw -in the clamp knobs on the angle dial and vernier scale.

(2) Centering Reticle

1. Place a small workpiece on the stage glass. turn the micrometer heads to align an edge of the workpiece with the center of the cross-hair.
2. Rotate the angle scale disc 180 degree and read the displacement between the edge of the workpiece and the center of the cross-hair.
3. Remove the four screws from the angle dial and dismount it. Slightly loosen the four fixing screws.
4. Adjust the eyepiece mount position with the four adjustment screws to minimize the displacement between the edge of the workpiece and the center of the cross-hair. Centering is easily performed by moving the eyepiece mount by half the displacement in both X and Y directions. Two pairs of adjustment screws are located at the opposite sides (for adjusting the X and Y displacements). Adjust the screws in pairs. Loosen one on one side and then tighten its counterpart on the other side to adjust the displacement.
5. Turn the micrometer heads to align an edge of the workpiece with the center of the cross-hair. Rotate the angle dial 180 degree and check the displacement.
6. Repeat steps 1, 2, 4, 5 until the displacement falls within 3 micrometers.
7. Confirm that four adjusting screws are fully tightened.
8. Tighten the four fixing screws and replace the angle dial cover.



3 Measurement

This chapter describes how to prepare for measuring and its procedure

3.1 Preparation for Measuring

3.11 Precautions for measurement

1. Installation site:

When selecting an installation site keep vibration, dust and humidity into consideration. Vibration can affect measuring accuracy. Dust and humidity can impair optical parts, such as objective and prism as well as the XY stage and moving parts.

2. Precaution

If focusing, making measurements or mounting workpieces always take the surrounding conditions into account. Be careful not to bump the objective, stage glass and etc.

3. Objective and Eyepiece

The supplied objective and eyepiece were finely adjusted before shipment. To maintain performance and accuracy handle them with care and do not disassemble. Do not allow the surface of the lens to be scratched or to be exposed to machine oil. If the lens is oiled clean it as described in "4.1.(3)".

4. Stage Glass

Since workpiece are mounted on it the stage glass is likely to be scratched or even severely damaged. Clean the dust of the workpiece before placing it on the stage glass. Exercise care so as not to bump the stage glass with the workpiece. Do not slide the workpiece on the glass stage

3.12 Illumination modes

This micrometer supports the following illumination modes. Select the appropriate illumination mode according to your application.

(1) Transmitted Illumination

The transmitted illumination generates a contour image of the workpiece and is suited for measuring and inspecting workpiece contour. The illuminator is equipped with a green filter.

(2) Reflected Illumination

Reflected illumination shows the surface of a workpiece and is used in observation and inspection of workpiece surface. Adjust the angle and orientation of this illuminator so the workpiece surface can be observed under optimum conditions.

The optional twin-bulb reflected illumination unit can be used if necessary.

(3) Simultaneous Use of Transmitted and Reflected Illumination

Both the contour and surface of the workpiece can be observed simultaneously. To switch these illumination modes use the illumination select switch

3.1.3 Adjusting the Diopter

While looking into the eyepiece turn the diopter adjustment ring until the reticle can be seen sharply.

3.1.4 Bringing the Measuring Surface into Focus

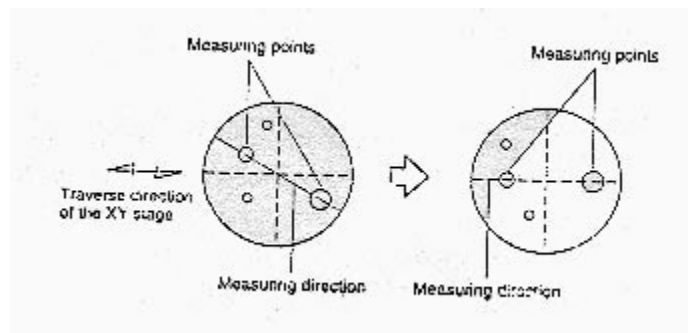
Bring the measuring surface into focus by moving the optical tube up and down with the focusing knob. Look into the eyepiece to make sure the cross-hairs are kept in ocular focus during focusing. If moving the optical tube be careful not to bump the workpiece, especially when the workpiece is stepped.

3.1.5 Positioning the Workpiece

Align the measuring direction of the workpiece with that of the stage traverse.

Follow the procedure in "2.3.3 (1) Adjusting the reticle with the XY stage moving direction."

After making the above adjustment, confirm that alignment is corrected by moving the XY stage as shown below.

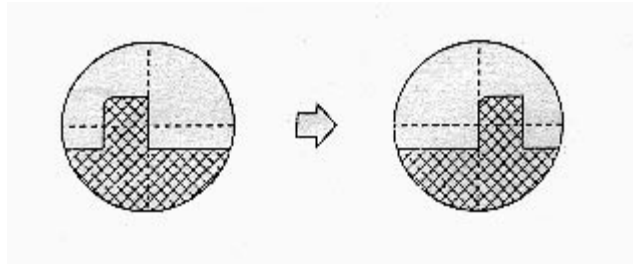


3.2 Measurement

3.2.1 Dimensional Measurement

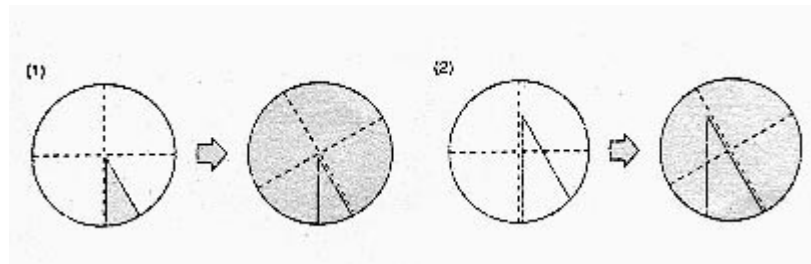
Align a measuring point on the workpiece with one of the cross-hairs and take the reading from the micrometer head. Then move the XY stage by turning the micrometer head and align another measuring point with the same cross-hair and take the reading at

this point. The difference between the two readings represents the dimension between the two measuring points.



3.2.2 Angle Measurement

Angles are measured with the angle dial using either of the following two procedures:



(1) Align an edge of the workpiece with cross-hair reticle and align the end edge with the center of the cross-hair. Turn the angle dial to align the cross-hair with the other edge of the workpiece. Take readings from the angle dial.

(2) Align two edges of the workpiece with the same cross-hair one after the other by turning the angle dial and moving XY stage. Take readings from the angle dial.

1. In both procedures measuring points on the workpiece are aligned with a cross-hair one after another. The angle is determined from the difference in reading.
2. The resolution of the angle dial is 1 degree with the main scale and 6" with the vernier scale.
3. The Zero position of the angle dial can be adjusted by turning the vernier scale. This allows the angle measurement origin to be set to 0. After turning the vernier scale check the reticle position. Refer to "2.4.3. (1) Adjusting the reticle against the XY stage moving direction" if necessary.

To maintain the performance of this microscope a daily and periodical inspection and maintenance is required.

4.1 Cleaning and Lubrication

(1) Main Unit

Periodical apply a thin layer of grease over the slide guide surfaces and rack of the optical tube using a brush.

(2) XY stage

Apply a thin layer of spindle oil to guide rails. In case the stage glass get dust wipe it gently with a soft cloth.

(3) Eyepiece and Objective

Always use an air blower or a feather to remove the dust on the lenses. If the lenses are contaminated by oil or fingerprints slightly wipe the lenses' surface by using a soft gauze or absorbent cotton soaked with high-grade alcohol in a circular motion.

4.2 Inspection

We recommend you often inspect the parts specified below:

(1) Connecting parts

Turn off the illuminator select switch knob and pull out the power cord from the AC outlet to prevent electric shock.

Check the power cord, AC inlet, voltage selector, GND terminal, reflected illuminator connector and other joints for looseness and poor connection.

(2) Illuminator select switch and light control knobs

1. Check that the illuminator select switch knob is correctly set
2. Check that the transmitted and reflected illuminators light by turning the select switch knob to each position.
3. Check that the light intensity of each illuminator changes by turning the light control knob.

(3) Focusing knob

Check this knob for any abnormal tightness, play, unevenness and noise.

(4) XY stage

1. Check the stage glass for scratches and contaminants.
2. Move the XY stage over the measuring range by hand to check for any abnormal tightness, play, unevenness and noise. (Perform the same check on the stage by turning the micrometer heads.)

(5) Angle Dial

Loosen the angle dial clamp knob and turn the dial to check for any abnormal tightness, play, evenness and noise.

(6) Field of View

Look into the eyepiece under transmitted illumination and check the entire field of view for shading and uneven illumination.

(7) XY Stage Feeding Accuracy

This inspection will be affected by the measuring environment, alignment error and other adverse conditions. Keeping these factors in mind and check the feeding accuracy by measuring a workpiece of a standard scale with an appropriate dimension of 5 mm.

1. Position a workpiece, for which accurate dimension is known on the stage glass and bring it into focus.
2. Align a measuring point on the workpiece with one of the cross-hairs according to the moving direction of the workpiece.
3. Obtain the dimension from the readings on the micrometer head. (Refer to 3.2.1 Dimensional Measurement)
4. Measure the X and Y-Axis dimensions of the workpiece. If the difference between the measured and nominal dimensions for any 5mm travel range is less than 5 micrometers the XY stage feeding accuracy is adequate.

(8) Resolution

Position a workpiece on the XY stage and bring it into focus. Check if any region of the image in the field of view has poor resolution.

4.3 Broken Parts Replacement

(1) Replacing the fuse

1. Turn the illuminator selector switch knob to OFF.
2. Pull out the power cord from the main unit.
3. Turn the fuse holder in the direction indicated by the arrow and remove it from the voltage selector. Remove the blown fuse from the holder.
4. Insert a new fuse into the holder and place the holder back into the voltage selector.

(2) Replacing the transmitted illumination bulb

The bulb remains hot after it has been turned off. Do not touch the bulb until it has become cool.

1. Turn the illuminator select switch knob to OFF.
2. Remove the stage glass.
3. Turn the green filter counterclockwise to remove it.

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