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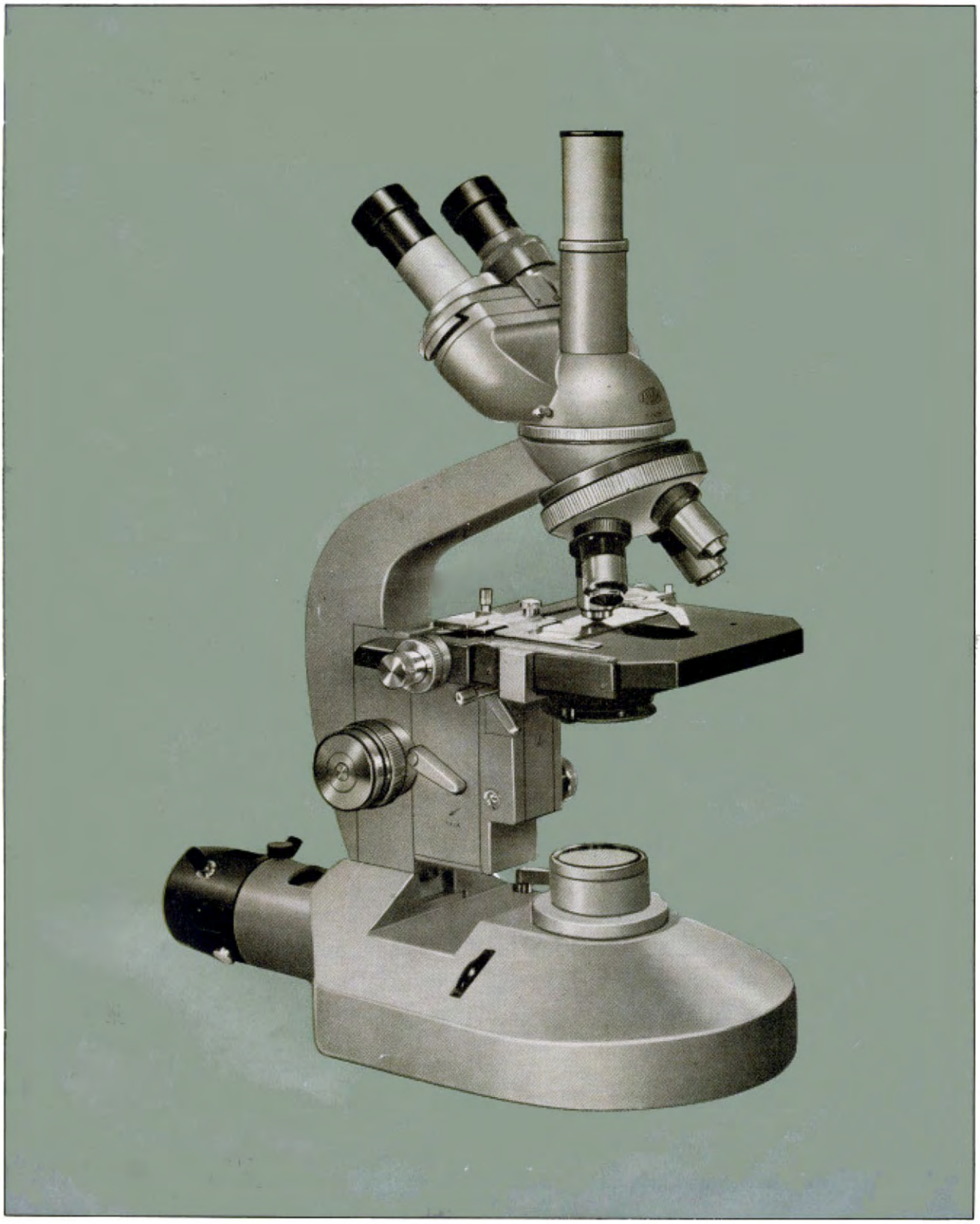
olympus microscope
instructions

Olympus-Tokyo

FH



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OLYMPUS MICROSCOPE MODEL FH

The new Olympus FH Microscope was made in response to a wide demand for a microscope with perfect illuminator. This Microscope, then, is an improvement on the highly popular F Microscope, whose fine adjustment is 0.0005 mm, and whose heads, stages, and lenses are interchangeable.

The Olympus FH Microscope, therefore, is a microscope we can recommend to the public with pride and confidence. The Olympus Optical Co., Ltd,. we might add, was established in 1919, and since has been turning out optical products exclusively.

OUTSTANDING FEATURES OF OLYMPUS FH MICROSCOPE

1. Perfect Built-in Illuminator.
   Centering need only be done once regardless of changes in magnification.

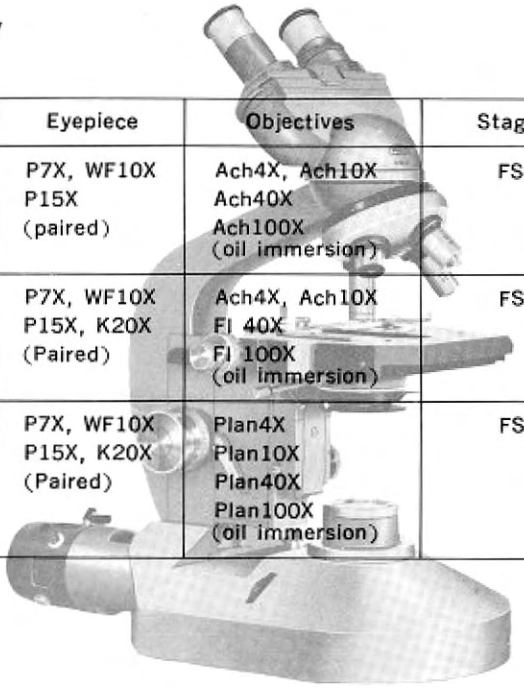
2. 0.0005 mm Fine Adjustment.
   This microscope boasts an ultra-sensitive fine adjustment system, which is the first of its kind in the world.
   Focusing is easy, and, what is more, the thickness of the specimen can be measured by the sensitivity scale.

3. Interchangeability of Head and Stage.
   This microscope is available in any desired head-stage combination.
   Furthermore, the head and stage can be changed easily and speedily.

4. Plan Achromatic Objectives.
   The plan achromatic objectives have been so designed that there is no spherical aberration. Furthermore, the field of photomicrographic work can be widened by using low magnification plan achromatic objectives.

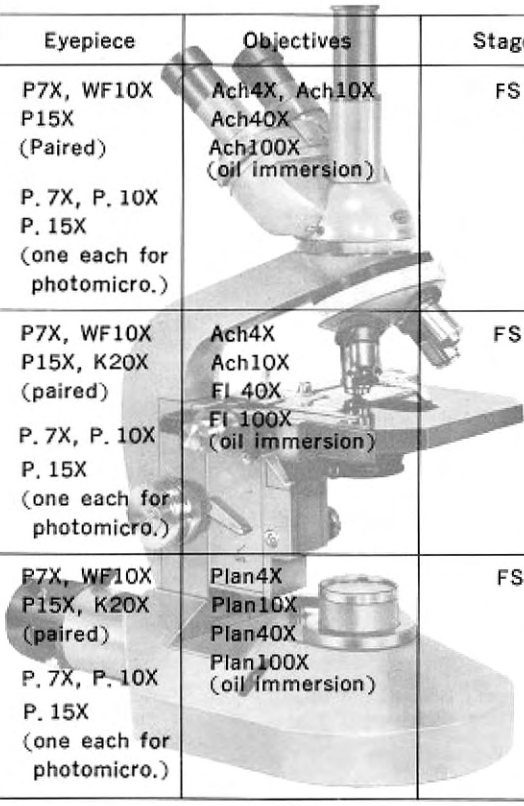
STANDARD COMBINATIONS OF FH MICROSCOPE

1. Binocular Body



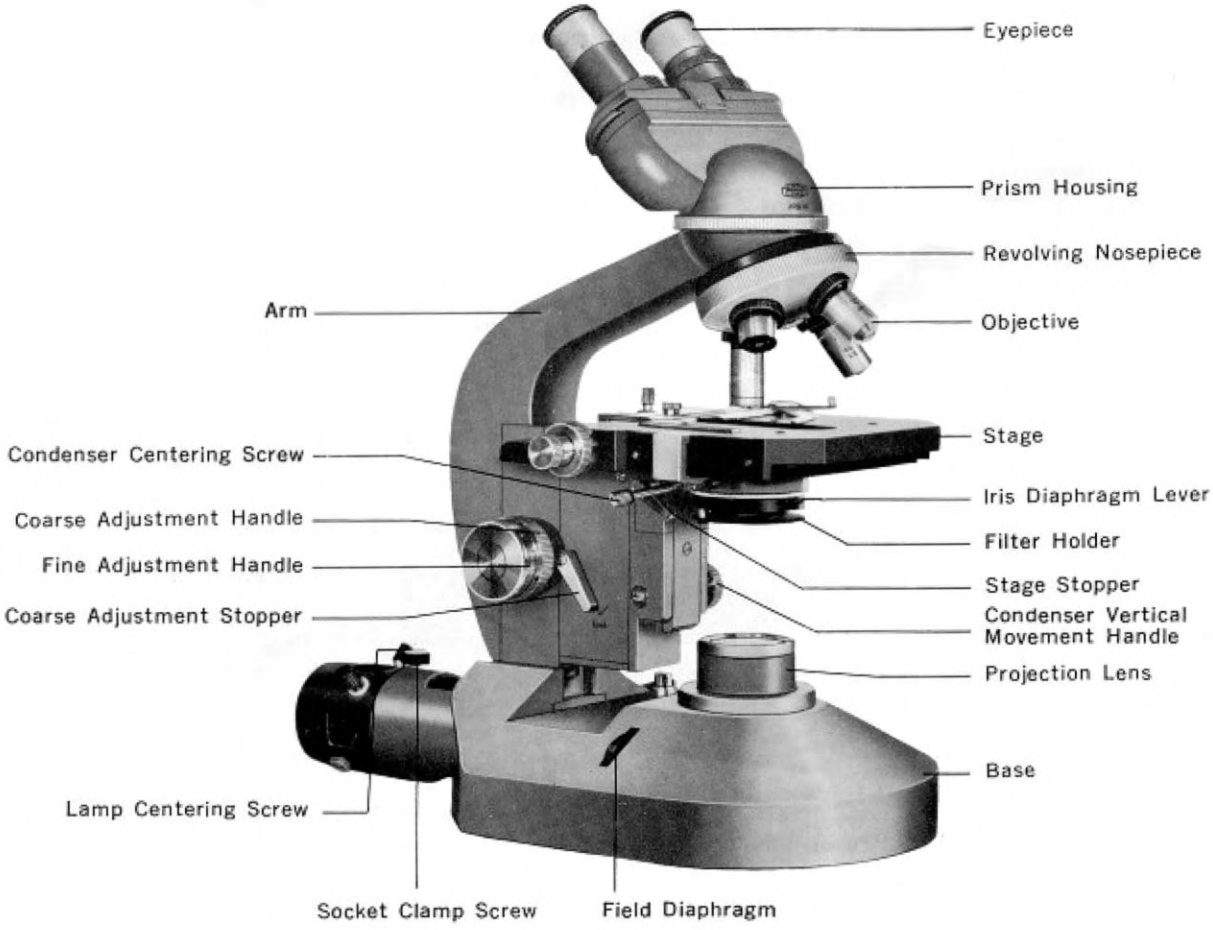
Type	Eyepiece	Objectives	Stage	Condenser	Magnifications
FHF - Bi - I	P7X, WF10X P15X (paired)	Ach4X, Ach10X Ach40X Ach100X (oil immersion)	FS	N. A. 1. 25	28X - 1500X
FHF - Bi - II	P7X, WF10X P15X, K20X (Paired)	Ach4X, Ach10X Fl 40X Fl 100X (oil immersion)	FS	N. A. 1. 25	28X - 2000X
FHF - Bi - III	P7X, WF10X P15X, K20X (Paired)	Plan4X Plan10X Plan40X Plan100X (oil immersion)	FS	N. A. 1. 25	28X - 2000X

2. Trinocular Body



Type	Eyepiece	Objectives	Stage	Condenser	Magnifications
FHF - Tr - I	P7X, WF10X P15X (Paired) P. 7X, P. 10X P. 15X (one each for photomicro.)	Ach4X, Ach10X Ach40X Ach100X (oil immersion)	FS	N. A. 1. 25	28X - 1500X
FHF - Tr - II	P7X, WF10X P15X, K20X (paired) P. 7X, P. 10X P. 15X (one each for photomicro.)	Ach4X Ach10X Fl 40X Fl 100X (oil immersion)	FS	N. A. 1. 25	28X - 2000X
FHF - Tr - III	P7X, WF10X P15X, K20X (paired) P. 7X, P. 10X P. 15X (one each for photomicro.)	Plan4X Plan10X Plan40X Plan100X (oil immersion)	FS	N. A. 1. 25	28X - 2000X

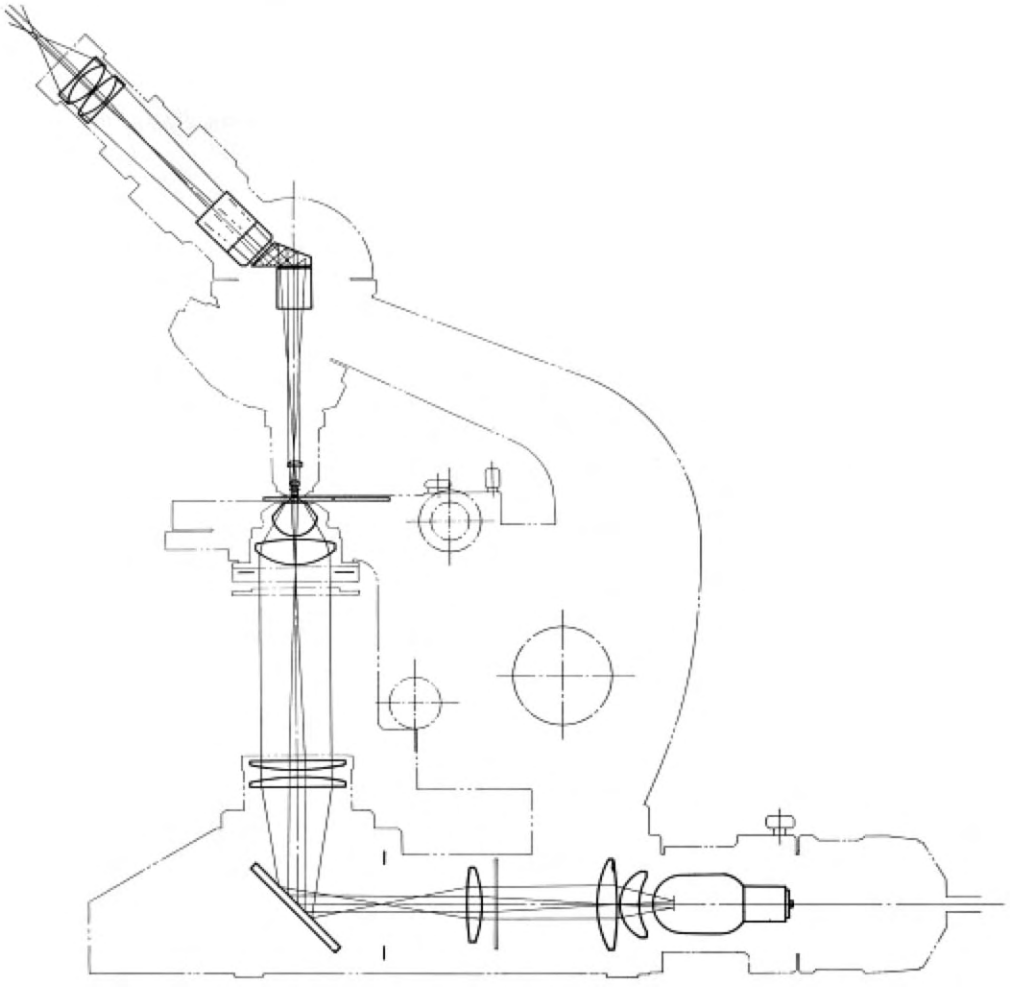
NAME OF PARTS



SPECIFICATIONS

Body Tube :	Binocular Head ····· 45° inclination, rotatable through 360° horizontally.
	Trinocular Head ····· Binocular part 45° inclination, rotatable through 360° horizontally.
Revolving Nosepiece :	Quadruple (ball bearing system) indicator for objectives' position.
Bulb :	6V 5A TB-1 (clear)
Transformer :	TC. 100V, 110V, 220V, 240V available.
Filter :	32.5 ϕ mm (blue)
Light Source :	Bulb centering adjustment type; compensation lens shifting system (for low, medium and high light value).
Focusing :	Vertical movement stage; co-axial coarse and fine adjustment handles.
Coarse Adjustment :	Rack-and-pinion with stopper; range of operation : 32.5mm

OPTICAL PATH



Fine Adjustment : Balanced spring-tension system ; range of vertical movement : 1.2mm ; scale : calibrated in unit of 0.001mm.

Condenser Focusing System : Rack-and-pinion type ; range of vertical movement : 23.5mm ; centering device.

Condenser : N.A. 1.25 condenser with external diameter of 36.8mm and featuring variable iris-diaphragm and filter holder.

Stage : Square Coaxial Mechanical Stage (double-handle) FS ····· easy to detach and replace the stages, as it is dovetailed to the body.

Special Attachments : The Round Revolving Stage Model RS.
The Square Coaxial Mechanical Stage (single-handle) Model CS.
The Square Revolving Coaxial Mechanical stage (single-handle) model CrS.

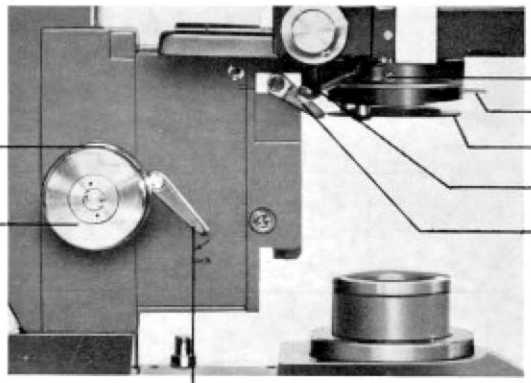
STRUCTURE OF PARTS

A. MICROSCOPE BODY

Arm, Focusing Mechanism and Condenser :

The arm is secured firmly to the base by means of a support, and, in turn, it supports such parts as the focusing mechanism, stage, condenser, revolving nosepiece and the head. Furthermore, it is shaped uo facilitate carrying around.

The focusing mechanism has such built-in units as the coarse adjustment and fine adjustment units and the coarse adjustment stopper. The coarse adjustment handle and the fine adjustment handle are coaxial. In other words, the large handle is used for coarse adjustment and the small handle for fine adjustment. The stage will move no higher than the height obtained by manipul ating the coarse adjustment handle, provided that the coarse adjustment stopper is tightened. In othe words, when the stage is lowered and again brought up toward the objective, it will go no higher than the stop position. This not only prevents contact of the specimen and the objective but also facilitates focusing. The condenser mount, which is of the rack-and-pinion type, has a receiver with a dovetail groove. The condenser mount screw is used for adjusting the optical axis.



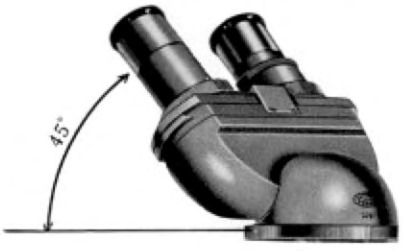
B. MICROSCOPE HEAD

The microscope head of Model EH microscope is inclined 45 degrees from the horizontal plane so as to enable microscopic examination in the most natural posture and with a minimum of fatigue.

As mentioned previously, the standard height of this instrument is 380mm from the desktop. This is exactly the height required for the average person to conduct microscopic examination in the most natural sitting posture. Thus, a special desk is absolutely unnecessary when this Model EH microscope is used.

The following four types of microscope head are available :

1. Binocular head (Bi)
2. Trinocular head (Tr)
3. Upright head for photomicrography
4. Monocular head



Microscope head fixing ring

To mount the microscope head, turn the knurled ring of the microscope fixing screw. This will fix the head properly to the arm and ; at the same time, secure precise optical alignment.

Microscope head fixing guide

Range of adjustment of direction of micro scope head

The above heads, with the exception of the upright head for photomicrography, which remains in a fixed position, can be rotated through 360° horizontally.

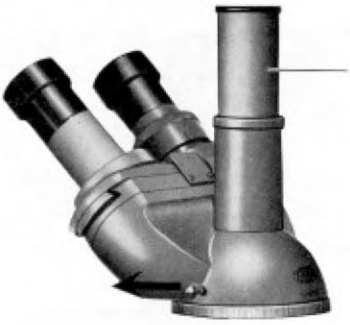
B-1 Binocular Head

The light from the objective reaches the eyepieces after being split into two by the semi-transmissive prism. This head was designed taking into consideration the characteristic function of the human eyes.

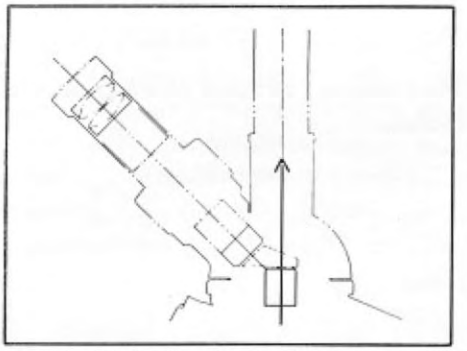
That is to say, the right and left optical axis are slanted slightly toward the center. Furthermore, the eyepieces can be adjusted according to the user's inter-pupillary distance. This is done by slipping out the dovetailed eyepieces. The inter-pupillary distance is shown on the scale between the two eyepieces. This operation is called eye-width adjustment. The scale readings are based on BiWF10X eyepieces. Since one eye is often weaker than the other, this tube is equipped with a diopter adjustment ring on the left eyepiece. When the dioptric adjustment ring is set at zero, and the inter-pupillary distance scale reads 62, the mechanical tube measures about 160mm long.

B-2 Trinocular Body

The trinocular head consists of binocular head and upright head for photomicrography. The photographer can actually see what he is photographing since it incorporates a mechanism to switch the light patch alternately for direct observation and photomicrographic work. The binocular head is equipped with a dioptric adjustment ring and an inter-pupillary distance scale.



prism shifting knob

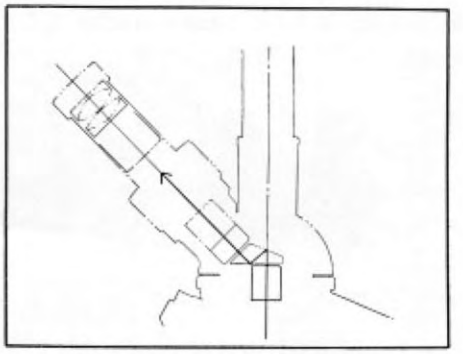


① Path of rays at the time of photomicrography

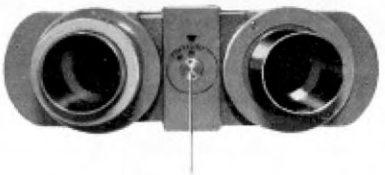
When the prism shifting knob is pulled outward as shown in the above photo, the prism locks into position (① diagram) and the path of rays is directed to the upright head for photomicrographic work.

A push in of the knob almost instantly returns the prism to its original position (② diagram).

This unique mechanism (one-knob operation) permits direct observation and photomicrographic work alternately with a minimum loss of time.



② Path of rays at the time of direct observation



Inter-pupillary distance scale

B-3

Upright head for photomicrography

In case of microscopes featuring monocular inclined head or binocular head, the standard microscope head must be interchanged with an upright head when conducting photomicrographic work. The photomicrographic apparatus must be mounted on this upright head.

B-4 Monocular Head

C. STAGE

There are four types of stages available for Model FH :

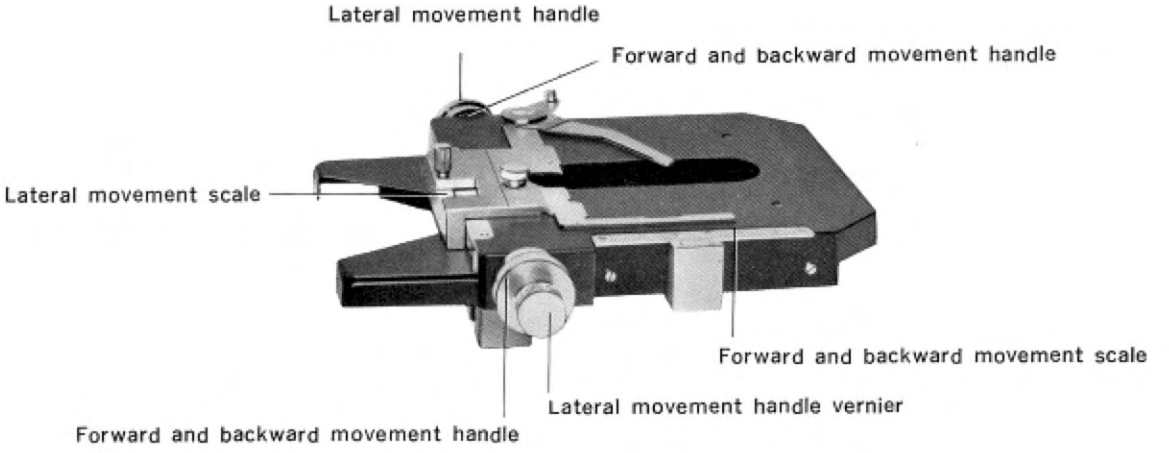
- ○ Square coaxial mechanical stage (double handle) FS :
- ○ Square revolving coaxial mechanical stage (single handle) CrS
- ○ Square coaxial mechanical stage (single handle) CS
- ○ Round revolving stage RS

The square coaxial mechanical stage FS is standard equipment of the FH Microscope.

C-1 Square Coaxial Mechanical Stage FS

This square stage can be detached at will since it is dovetailed to the main body. The specimen can be moved by means of handles found on both sides of the stage. For forward and backward movement of the specimen, a large handle (rack-and-pinion) is used, and a small handle (lead screw) is used for lateral movement. The surface of the stage can be made level by removing the clip.

Two slide glasses can be placed on the specimens side by side. This is extremely convenient when comparing two specimens at the same time.



MODEL **FH**

VARIED COMBINATION OF PARTS

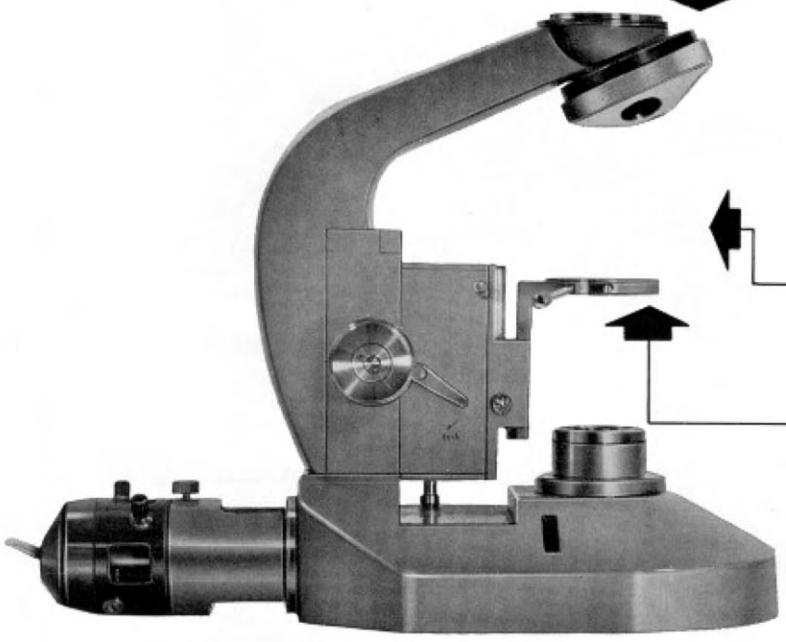


Photo lenses

P. 15X

P. 10X

Eyepieces

Monocular inclined head

Binocular head

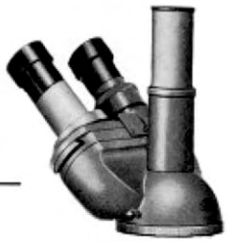
Objectives

Round stage RS

Abbe condensers

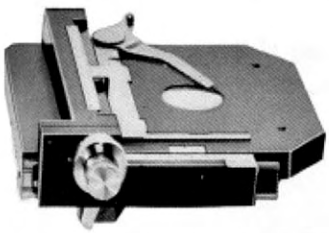
N. A. 1.25

P. 7X

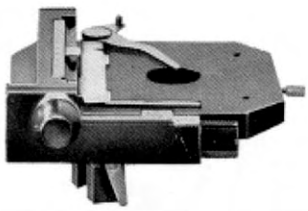


Trinocular head

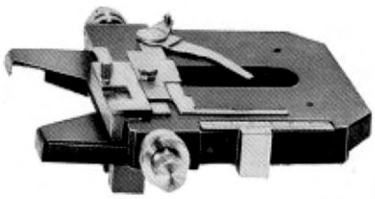
Ugright head



Square mechanical stage
(single handle) CS



Square revolving mechanical stage
(single handle) CrS



Square mechanical stage
(double handle) FS

N. A. 1.40

Swing-out N. A. 0.25-0.9

C-2 Square Revolving Coaxial Mechanical Stage (single handle) CrS

This stage is fixed firmly to the body of the microscope, and on its surface, there is a cross movement clip. The specimen is shifted by means of a coaxial type forward and backward movement handle and lateral movement handle on the right side of the stage. The former is operated by means of a rack-and-pinion, whereas the latter is manipulated by means of a lead screw.

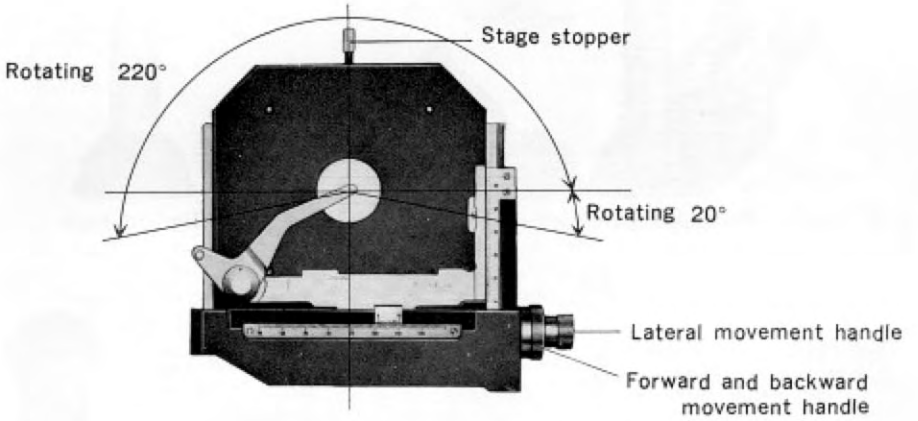
The working range of the handles are:

Forward and backward 27mm

Lateral 70mm

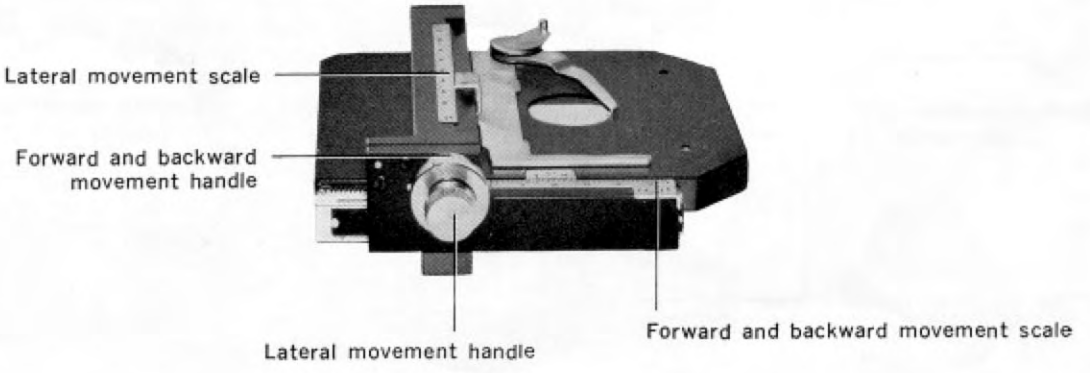
Each handle has a scale (0→30, 40-110) and a vernier.

Rotation: After setting the slide glass in position, the center of the slide glass is brought into line with the optical axis. Then the stage is rotated horizontally. The stage rotates about 220° to clockwise, and about 20° to counter-clockwise. Rotation can be stopped by means of the stage stopper.



C-3 Square Coaxial Mechanical Stage (single handle) CS

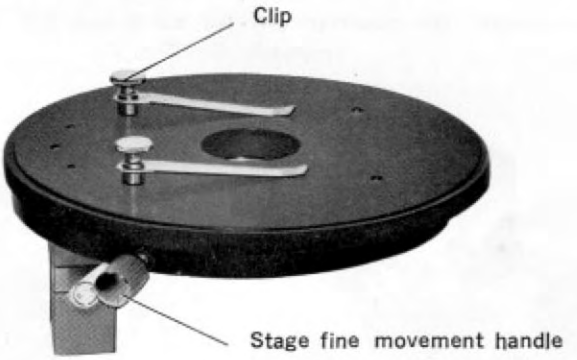
This mechanical stage can be operated by a single handle which consists of a rack-and-pinion for forward and backward movement. and a lead screw for lateral movement



C-4 Round Revolving Stage RS

The round revolving stage consists of two stages. The lower stage is fixed to the stage mount on the main body. The upper stage slides over the lower stage horizontally.

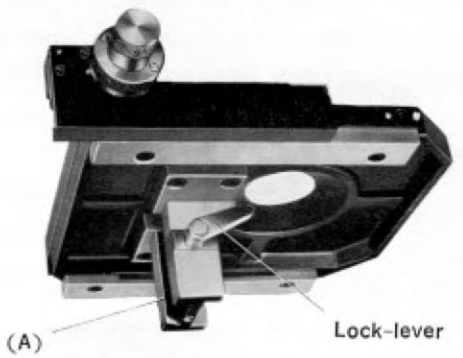
Sliding is done by operating the left- and right- side fine adjustment handles by turns. Furthermore, the upper stage can be rotated through 360° horizontally by pressing the knurl part on the rim of the stage.

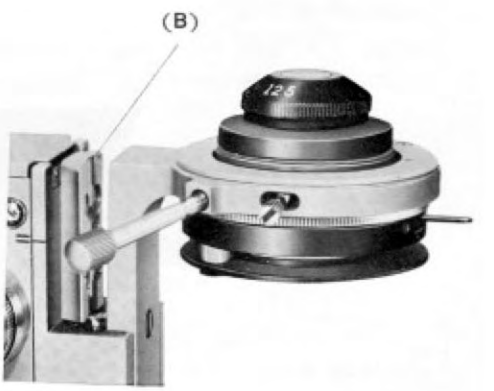


How to Fix Stage to the Body

The Olympus FH stages have been so made that they can be easily fixed to the main body. The four stages ..... FS, CrS, CS and RS, each of which is used for a specific purpose ..... are interchangeable.

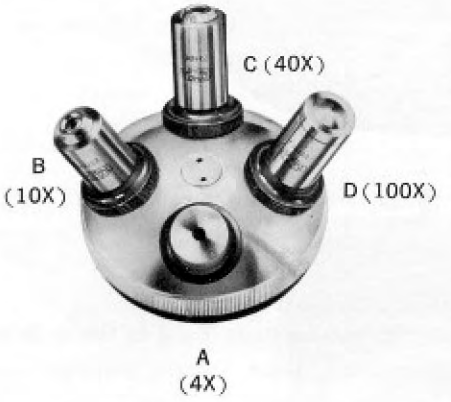
1. First of all, the condenser is lowered as far as possible by means of the condenser handle.
2. The stage mount is also lowered as far as possible by turning the coarse adjustment handle.
3. In the case of FS, CrS and CS stages, the clip is moved forward as far as possible by manipulating the forward and backward movement handle.
4. Next, the stage guide (A) is slowly inserted into that of the main body (B) with the lock-lever up. The stage must be so inserted that it is parallel with the main body. Care must be taken not to crash the top lens of the condenser with the stage during this operation.
5. Finally, the stage firmly fixed to the main body by means of the lock-lever.

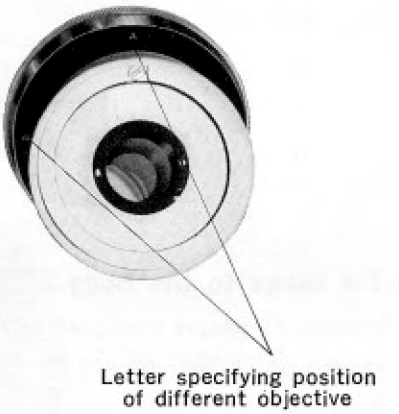




D. REVOLVING NOSEPIECE

The revolving nosepiece of Model FH features a ball-and-socket revolving system with four objective mounts. A knurled ring is provided for slip-free and smooth manipulation of the nosepiece. By means of the large built-in spring and groove, the objective sets into position accurately, maintaining proper optical alignment. The upper surface of the revolver is marked with the letters A, B, C, D in order to show where the objectives should be fixed. 'A' is for 4X, 'B' for 10X, 'C' for 40X, and 'D' for 100X. In this way, the position of the objectives do not change. Furthermore, the observer can tell which objective is being used while conducting observation.



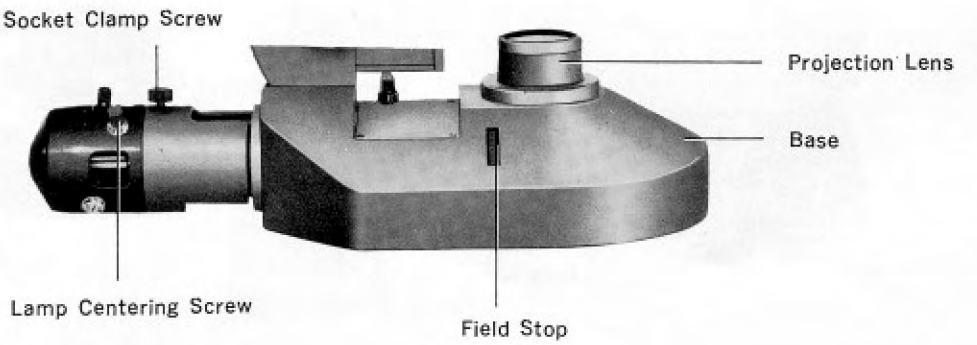


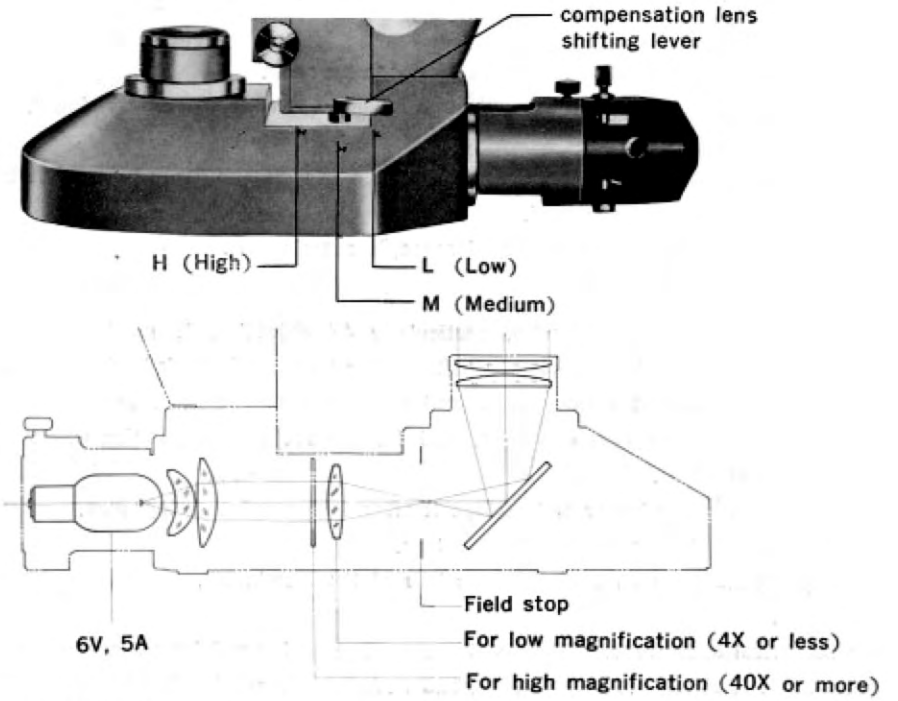
E. BASE AND ILLUMINATOR

The base not only supports the microscope but also has built-in illuminator. The light source unit is fixed to the base by means of fitting screws. Switch over the first compensation lens according to the magnification of the objective being used.

The compensation lens shifting lever is used for the following purposes.

L (Low) ..... objective 4X or less
M (Medium) ..... objective 10X and 20X
H (High) ..... objective 40X or more





EFFECTIVE ILLUMINATION

Prior to conducting microscopy, it is of very importance to check whether appropriate and effective lighting is directed to the specimen. That is to say, the observer should see if the ray of light emitted from the illuminator or mirror follows a central path leading to the objective and eyepieces. This can be done by looking into the eyepiece tube after roughly focusing a 40X objective or 10X objective and removing the eyepiece. If the light from the light source unit illuminates throughout the lens surface evenly without any eccentricity, it means that proper, effective lighting is being rendered. Even if the light is not eccentric, only the center of the lens is often illuminated brightly. This means that the condenser is not in the proper position. This can be corrected by adjusting the position of the condenser by moving it up and down. However, it should be noted that inaccurate focusing produces the same phenomenon.

Even the slightest mistake can throw the optic path off-center. To illustrate, the observer should not even touch the mirror since it results in poor illumination. Furthermore, when the image appears to move off the center while manipulating the fine adjustment handle in the course of securing focus, it means that the path of rays is not aligned properly. In this case, lighting must be readjusted in accordance with the foregoing procedures.

CENTERING OF LIGHT

Centering of light from the light source is essential to ordinary microscopy and microphotography. The following procedures permit to obtain good centering of light.

1. Focus the specimen with 10X objective.
2. Close both iris diaphragm of the condenser and field stop of the illuminator. Bring field stop (a small circle of stop-light) into focus by moving the condenser up and down.

3. Set field stop (stop-light) at the center of the field by manipulating two condenser centering screws.
4. Open field stop slowly so that an entire field can be seen.
5. Remove the eyepiece from the eyepiece tube, and open iris diaphragm slowly, while looking into the eyepiece tube, so that an entire field can be lighted.
6. By adjusting the lamp centering screws (2 screws) of the lamp house, set the image of filament at the center of the field.
7. Replace the eyepiece, and start your microscopic examination.

NOTES :

(1) When low magnification objective, particularly 4X objective, is used, the field is often illuminated unevenly. In this case, adjust lighting by one of the following manners.
   (a) Loosen the socket clamp screw and move the socket back and forth slowly, while looking into the eyepiece tube, and fix the socket at a position where an even light can be obtained.
   (b) Remove the condenser and replace it after taking off the top lens. In other words, use the condenser without the top lens.
   (c) Put ground glass on the projection lens of the illuminator.

(2) Condenser.
   The numerical aperture of condenser is 1.25 when oil is used for oil immersion microscopy, otherwise it is about N. A. I. O ..... 0.9, and N. A. 0.5 without the top lens.

PROCEDURE FOR ADJUSTING THE COARSE ADJUSTMENT HANDLE

Generally speaking, the coarse adjustment handles are tight. This, of course, means that movement is heavy. However, this can be remedied easily by gripping the right-and left-side handles as illustrated and turning them in the opposite direction simultaneously. In most cases, the coarse adjustment handles should be more or less tight rather than loose.

WORKING DISTANCE AND PAR-FOCAL

The revolving nosepiece to which the objectives are attached, has been so designed that as long as one objective has been focused properly the others can be focused by means of the fine adjustment handle. The distance from the tip of low magnification objective to the specimen is considerably longer than that from high magnification objective. The distance is shortest in the case of oil immersion objective. When the revolving nosepiece is rotated, after focus is secured with one of the objectives, to switch the magnification from one to the other, for instance, to the oil immersion objective, there is no danger of the tip of the lens touching the specimen. In other words, microscopic examination can be conducted immediately after manipulating the fine adjustment handle.

Focus at first by utilizing 10X objective. The distance between the objective and the microspecimen in this case will be approximately 5.6mm. Even when 100X objective is set to viewing position, it will not collide with the microspecimen. The distance will then be about 0.14mm.

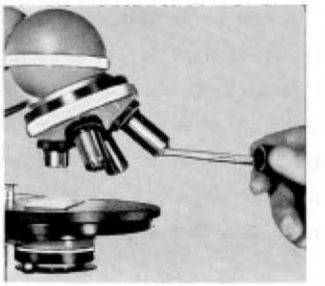
INSTRUCTION FOR USING OIL IMMERSION OBJECTIVE

Before using oil immersion objective, secure focus by using low magnification objective. Apply a drop of cargille oil or anisole to the surface of the specimen. Also apply cargille oil to the oil immersion objective. As we have already mentioned, the oil immersion objective will not touch the specimen when the revolving nosepiece brings it into position over the specimen. After focusing the lens by means of the fine adjustment handle, microscopic examination can be carried out without any loss of time.

After examination, cargille oil left on the oil-immersion objective must be thoroughly wiped off with gauze dipped in xylene. Otherwise, the lens will soon become useless. Clean gauze is sufficient to wipe off anisole.

Place a drop of cargille oil or anisole on the microspecimen

Apply cargille oil to the tip of the oil-immerson objctive



CAUTION

Microscopes are extremely allergic to moisture and dust. Since both moisture and dust are found in most laboratories, microscopes should be kept in containers immediately after use. If this is not possible, they should be covered with the enclosed vinyl dust cover.

As for objectives and eyepieces, it is best to keep them in desiccators. Failing this, they should be kept in cases containing such desiccants as silica gel.

After the eyepiece has been removed, the eyepiece tube should be covered with the enclosed cap. By no means should a microscope be taken apart for repairs. This should be left to experts. And, of course, microscopes must always be kept clean. Fine dust on parts that cannot be reached by the hand should be blown or wiped off by means of air blower or clean feather.

ACCESSORIES

Small Photomicrographic Apparatus, PM-6

The PM-6 is a photomicrographic unit designed exclusively for taking full-size photographs on a 35mm film. Fits all types of biological and metallurgical microscopes of all makes.

- ○ Shutter speed: B, 1-1/50 sec.
- ○ Size of image: 24mm×36mm
- ○ Specimen can be observed while photographing
- ○ Has insertion opening for photo cell of photomicrographic exposure meter.
- ○ Available for all eyepieces except 5X power.
- ○ Shock-proof shutter prevents shutter vibration and insures no blurred pictures.
- ○ Magnification on the film plane: about 1/3X of total magnifications of microscope.

Phase Contrast Equipment, PA · PB

The bright field observation method of microscopic examination can not be used for examining colorless, transparent specimens since such specimens lack contrast. The phase contrast equipment, therefore, was designed to provide such specimens with contrast and thus make examination of living bacteria, cells and tissue possible.

Two kinds of light pass through specimen ..... namely, undeviated light and deviated light. Deviated light is ¼ wave length slower than undeviated light. Contrast can be strengthened through light interference by making undeviated light ¼ wave length faster or slower. This method is highly convenient for observation of the ecology of the specimen since it eliminates such troublesome procedures as dyeing the specimen. The Olympus phase contrast equipment is highly prized today since it has widened the scope of biological microscopic examination. What is more, it is easy to handle.

Contents of Phase Contrast Equipment Set.

model PA

Phase Contrast Objectives for 4 different contrasts each with 4 different magnifications (total of 16 objectives):

- PL 10X, 20X, 40X, 100X (oil immerson)
- PLL 10X, 20X, 40X, 100X (oil immerson)
- NH 10X, 20X, 40X, 100X (oil immerson)
- NM 10X, 20X, 40X, 100X (oil immerson)

Phase contrast turret condenser,
Centering Telescope (CT),
Green filter (outer diameter 32.5mm)

model PB

One set of Phase Contrast Objectives of the above mentioned 4 contrasts (PL, PLL, NH, NM).

Also contains Phase contrast turret condenser, centering telescope (CT), and green filter (outer diameter 32.5mm).

Note: Contrast: PL ..... Positive Low
PLL ..... Positive Low Low
NH ..... Negative High
NM ..... Negative Medium

Lens Container

This is a container specially made for microscope lenses. With a desiccant (silica gel) at the bottom of the container, lenses can be kept completely free of moisture and dust. The plastic top permits to check the lenses from outside without removing the top, and it is very convenient to keep the lenses in order.

Capacity: 7 lenses (up to 57mm high)
3 filters (up to 33mm in dia. and 3.5mm thick)

Plan Achromatic Objectives

New and originally designed Plan Achromatic Objectives, completely free of spherical aberration, are included as the standard set in the Olympus Microscope FH-III. Furthermore, use of the low magnification Plan Achromatic Objectives will help broaden the field of photomicrographic work.

- ○ Plan Achromatic Objectives: 1.3X, 2X, 4X, 10X, 20X, 40X, 100X
- ○ Condenser exclusively for low magnification (1.3X and 2X objectives) microscopy.

Dark field condenser DC

Brownian movement of celloid, etc. is hardly visible in bright field, but with aid of the dark field condenser, all mic roscopes permit examination of such movement in a dark field. (Use 100X oil-immersion objective with iris diaphragm with dark field condenser.)

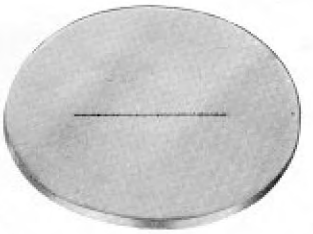
Filar micrometer eyepiece OSM

Accurate measurement of a minimum of 0.0001mm is feasible by inserting this eyepiece into the tube of the microcope. When mounting it on monocular inclined head, binocular head or trinocular head, first remove the auxiliary lens on the bottom section, and insert the eye- piece into the eyepiece sleeve.

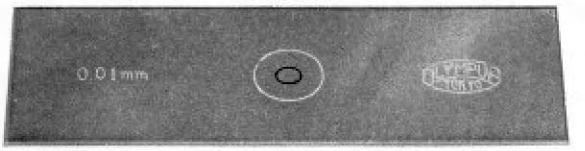
Eyepiece Micrometer and Objective Micrometer

These are used to measure the size of specimens.

(1) Eyepiece Micrometer : A round glass plate, 10mm/100, 19mm in diameter.

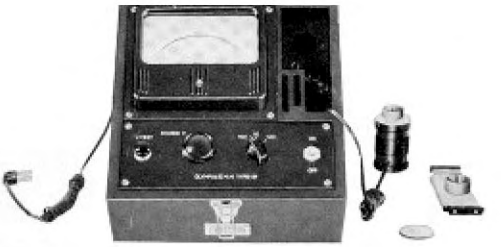


(2) Objective Micrometer : A slide glass — 1mm/100, 26×76mm.



Photomicrographic Exposuremeter, EMM-IV (equipped with CTR)

This equipment is used for photomicrography in which proper exposure is hard to determine. Exposure failures are especially frequent in color film photomicrography; so use EMM - IV.



Polarizing Attachment, POL

This is a simplified polarizing apparatus equipped with a polarizing condenser including a polarizer, and a polarizing eyepiece including an analyzer. This can be attached to any microscope equipped with a condenser with an outer diameter of 36.8mm.