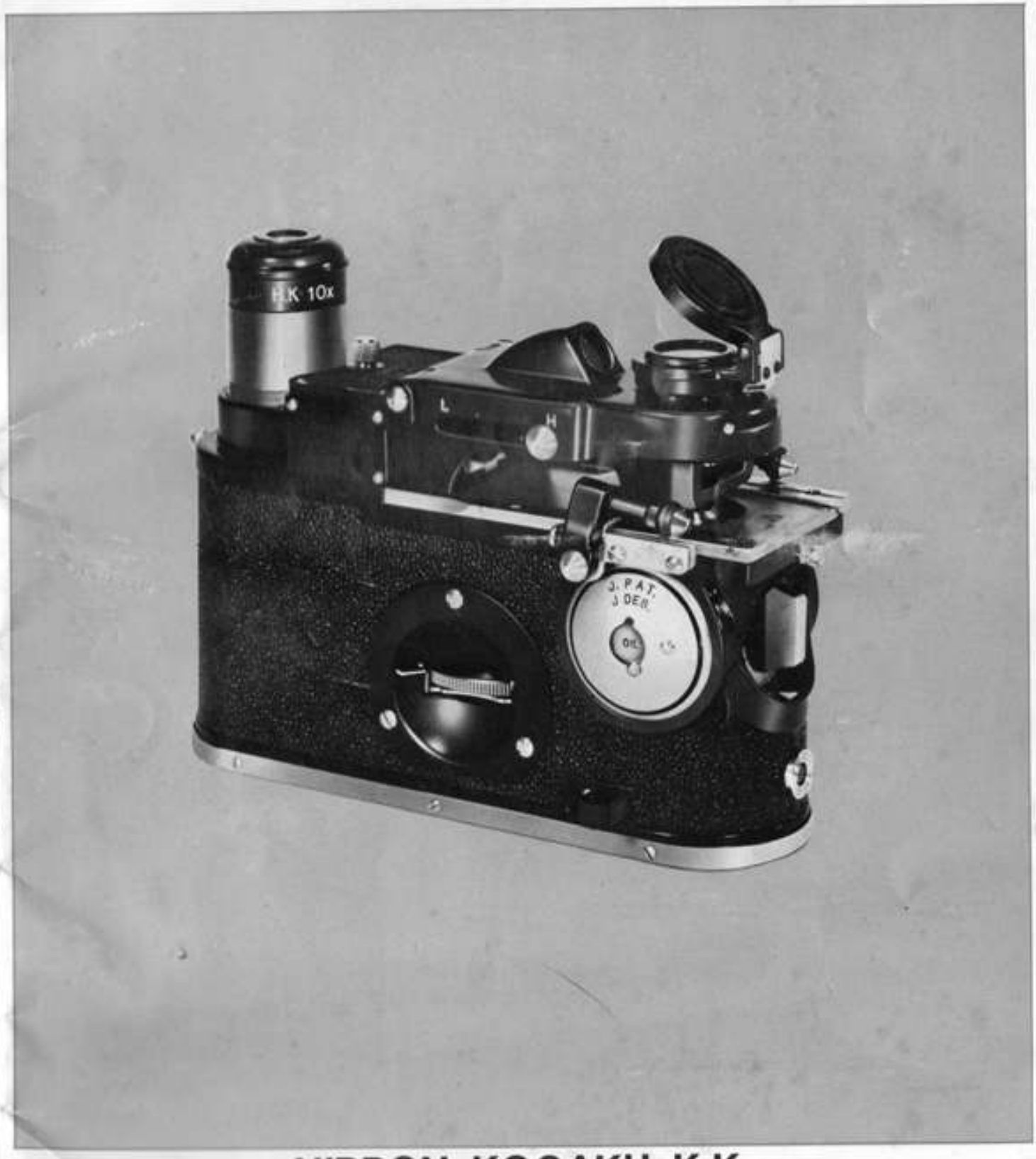
Nikon

MICROSCOPE MODEL H AND H3

INSTRUCTIONS



NIPPON KOGAKU K.K.

1. NOMENCLATURE AND ACCESSORIES

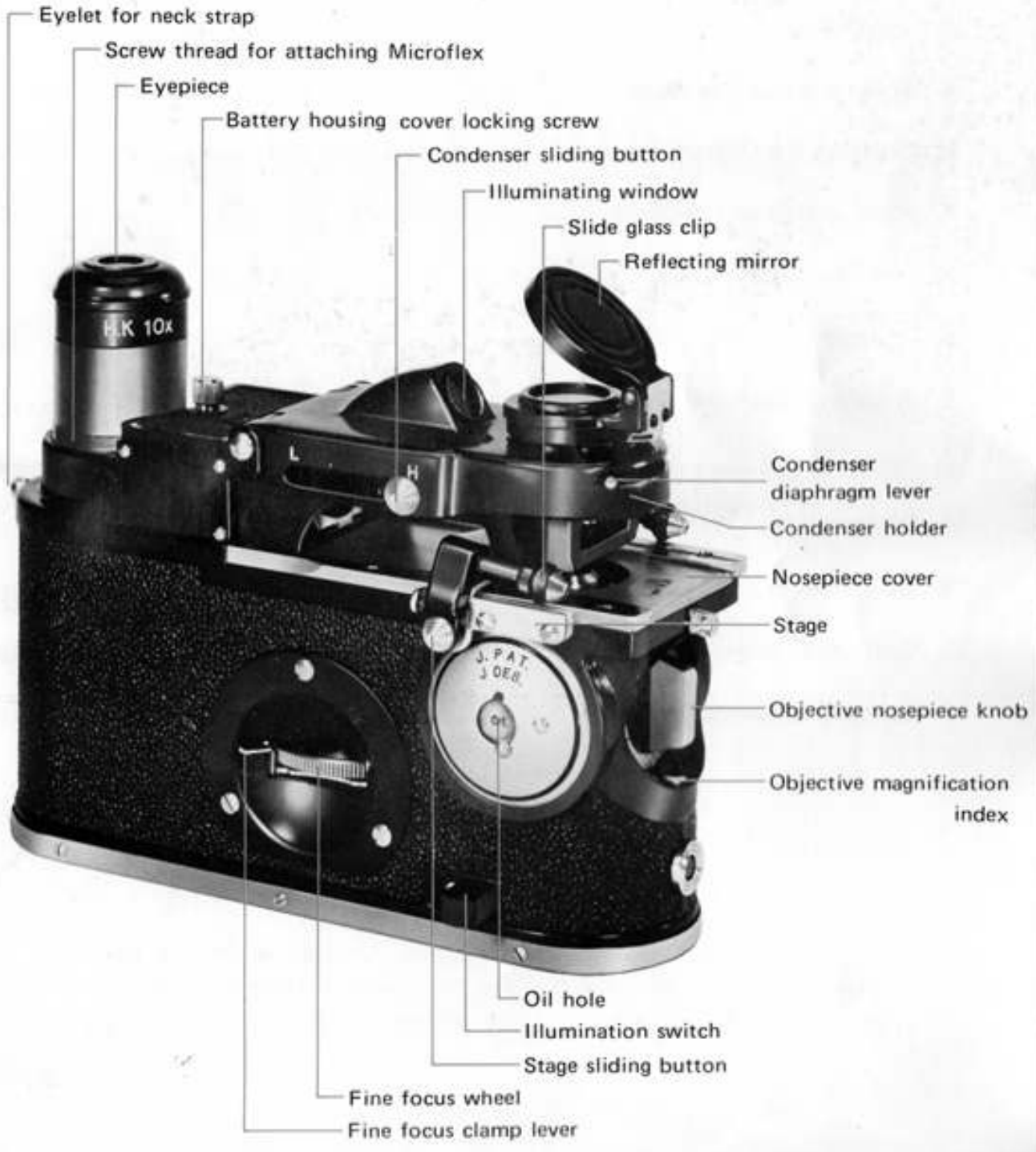


Fig. 1

Fig. 2

Fig. 3

Two models H (for general use) and H3 (for phase-contrast observation) are available, which differ from each other only in their objectives to be used and in the condenser substage.

2. HOLDING THE MICROSCOPE

Fig. 4

Draw away to the left the objective dust cover and fine focus clamp lever. Hold the microscope with both hands, your left hand forefinger or middle finger tip being placed on the fine focus wheel, and your right hand on the lower part of the microscope (to avoid the area around the nosepiece knob), with the thumb and forefinger tips on the stage sliding knob. (Fig. 4) Look in the eyepiece with your left eye. If desired, however, you can exchange the position of the left and right hands or also support the microscope with one hand. The microscope may be held somewhat inclined for the convenience of the viewer, except when examining a fluid preparation in which case the instrument should be kept horizontal.

In field work as a safety measure, secure the microscope by suspending it by the neck strap furnished. A camera tripod may also be used, for which purpose a standard screw thread socket is provided on the bottom.

3. ILLUMINATION

(1) Daylight illumination

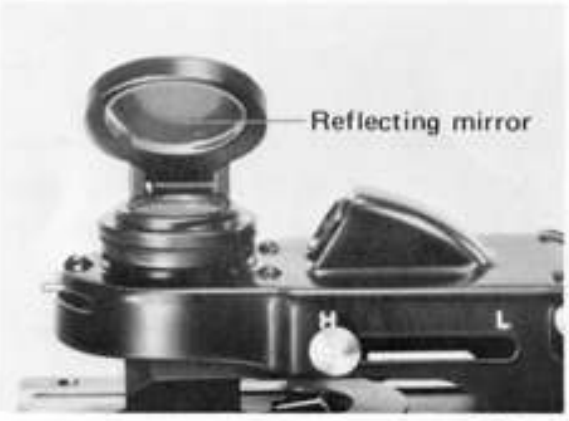


Fig. 5

If possible, use daylight illumination to avoid battery consumption as much as possible. Daylight illumination is also preferable because of its lesser reddish tinge as compared with artificial light. Lift up the reflecting mirror and turn it horizontally. Adjust its inclination and direction so as to attain the brightest field of view while looking in the eyepiece. (Fig. 5)

(2) Battery illumination

Fig. 6

This type of illumination is necessary when the microscope is used without the benefit of sunlight or strong natural light or when it is passed from hand to hand for demonstration. As a power source two penlight 1.5 V batteries are used which are inserted in series (their ends opposite to each other, after opening the battery housing cover by releasing the cover locking screw. (Fig. 6)

To attach 2.2 V electric bulb (having a lenticular head), swing up the condenser mount. Adjust the bulb by adjusting the socket plate so that the light is directed to the center of the illuminating window. It may sometimes be necessary to replace the bulb with another one, if vignetting cannot be avoided with a particular bulb.(Fig.7)

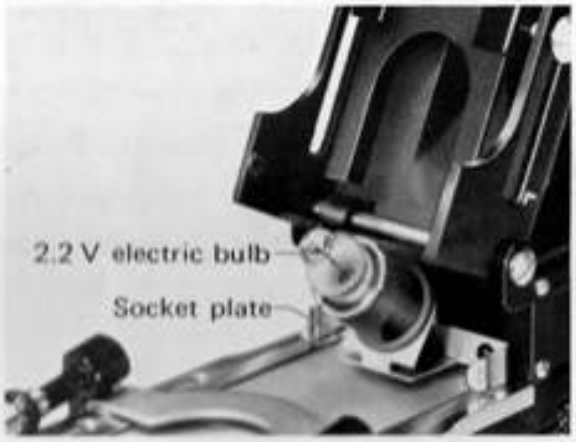


Fig. 7

The lamp bulb is turned on when the switch near the bottom is turned to the red mark. Turn the reflecting mirror horizontally until it clickstops so that the mirror faces the illuminating window. Adjust the inclination of the mirror so as to obtain the brightest illumination.

Turn off the lamp as soon as the observation is finished, because the life of the batteries is only about two hours.

4. OBJECTIVES AND EYEPIECES

For the model H and H3, the same eyepiece but different type objectives are used. The objectives for both models are of super-miniature type but with an inside optical system of the same features as of high-class microscopes, thus providing excellent image quality.

(1) Objectives for model H

The microscope model H incorporates 10× objective and, in addition, 4×, 20×, 40× or oil immersion 100× objective can be interchangeably fitted and used. All the objectives are parfocal, that is, when one is focused all are in focus, as they are rotated into position, manipulation of the fine focus wheel only being required.

When using 100× objective, apply immersion oil (refractive index: 1.515) between the objective front and the specimen cover glass. NC40× objective (No-cover-glass objective) is available on order.

(2) Objectives for model H3

The H3 objectives are designed for phase-contrast observation. The microscope model H3 incorporates DLL10×, and in addition, DLL20×, DLL40× or oil immersion DLL100× objective can be interchangeably fitted and used. When using DLL100× objective, apply immersion oil between the objective front and the specimen cover glass. All the objectives are also parfocal.

Numerical Aperture of Objective

Magnification	4×	10×	20×	40×	100× (oil immersion)
Numerical aperture	0.1	0.25	0.40	0.65	1.25
Magnification		DLL10×	DLL20×	DLL40×	DLL100× (oil immersion)
Numerical aperture		0.30	0.40	0.65	1.25

(3) Eyepieces

The eyepiece is used commonly for H and H3.

As a safety measure, the eyepiece is securely screwed into the eyepiece tube. The 10× eyepiece supplied with the microscope, being of wide field type and providing a view field nearly as large as that of an ordinary 5× eyepiece, meets most requirements. However, if necessary, any standard eyepiece may also be used. Take care, in this case, not to tilt the microscope too much to prevent the eyepiece from dropping out.

5. CHANGING THE OBJECTIVE

The built-in nosepiece incorporates 3 objectives and has an outside knob, the turning to the left or right of which brings each objective into play respectively. This can be manipulated easier by holding the knob with your right hand and turning the microscope with your left hand. The magnification being used is shown by an index beneath the knob. It can also be known by feeling the position of the knob without looking at the magnification figure. (Fig. 8)

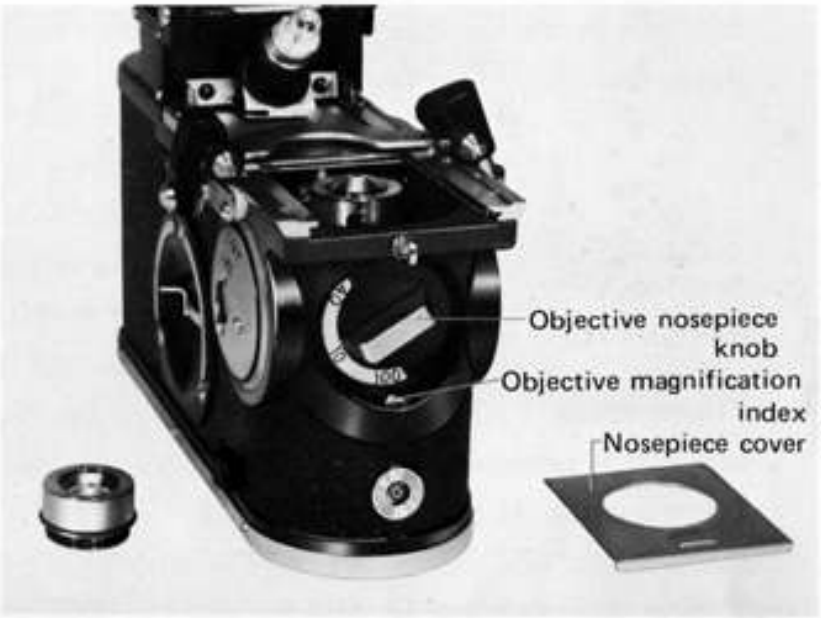


Fig. 8

In the model H, the 4× objective is to be attached to the nosepiece in such a position that the figure 4 on the nosepiece knob comes to the top (to the opposite side of the index), and to be used with that figure turned to the index.

To change the 4× objective for the 100× or vice versa, pull the objective nosepiece knob and turn it to the right (100×→4×) or to the left (4×→100×), until 100 or 4 figure appears opposite the index respectively. (Fig. 9 and 10)

Fig. 9

Fig. 10

To use the 20X objective, change it for the 100X or 40X objective. In the model H3, change the DLL20X objective for the DLL100X or vice versa. The 10X objective in the model H and the DLL10X in H3 are assembled as parts of the nosepieces and cannot be removed.

6. MANIPULATION OF CONDENSER

The condenser, of the same type for H and H3, is provided with a condenser diaphragm for H but a phase-contrast turret for H3.

The condenser, being an ABBE type, consists of a semi-spherical and a convex lens.

When the sliding knobs, found on either side of the condenser assembly are moved and positioned at H (Fig. 11), the semi-spherical front lens is brought into position which is suited for higher magnifications with 10X –100X or DLL10X – DLL100X objectives of larger numerical aperture.

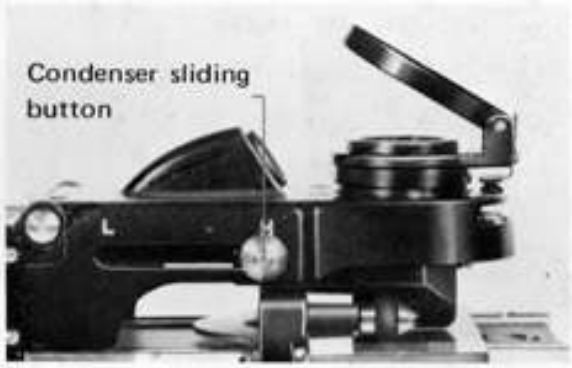


Fig. 11

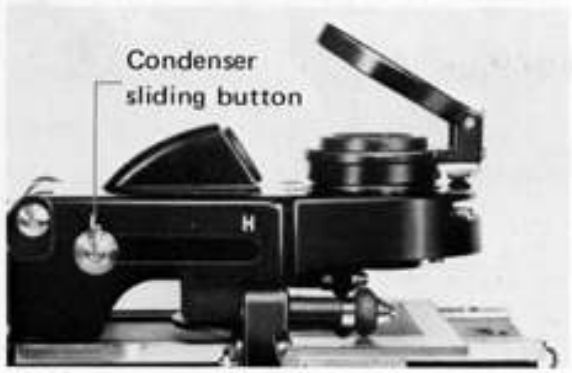


Fig. 12

When the sliding knob is positioned at L (Fig. 12), the front lens of the condenser is moved aside, which is suitable for lower magnification with the 4X or 10X objective and also for manipulation of the specimen (See 12, p. 15).

7. CONDENSER DIAPHRAGM

Generally speaking, if the numerical aperture of the condenser is stopped down to 60–70% of that of the objective, the best image will be obtained. For this reason, when using the oil immersion 100× objective with the numerical aperture 1.25, there will be no need for applying oil between the condenser and specimen since the numerical aperture is reduced to about 0.8 in this case.

Fig. 13

The condenser is provided with a diaphragm to adjust the aperture of condenser according to that of the objective being used. Move the diaphragm lever found on the right end of the condenser mount (Fig. 13) towards you, until the diaphragm is fully opened.

Next, slowly close the diaphragm, by pushing the lever, until the best image can be obtained. For lower magnification, a smaller diaphragm aperture will usually be better. By closing the diaphragm a transparent specimen may be seen clearer because of increased contrast. However, when higher resolution is more important than contrast, a larger diaphragm aperture is recommended.

8. PHASE-CONTRAST MICROSCOPY (model H3)

(1) Setting the phase-contrast ring diaphragm

Bring the condenser sliding knob to H position. The phase-contrast turret at the condenser being provided only with two ring diaphragms for 40× and 100×, when using the 10× and 20× objectives, they should be replaced for those for 40× and 100×. (Fig. 14)

To exchange the ring diaphragms, first expose them out of the case at the condenser holder (Fig. 15), and, after

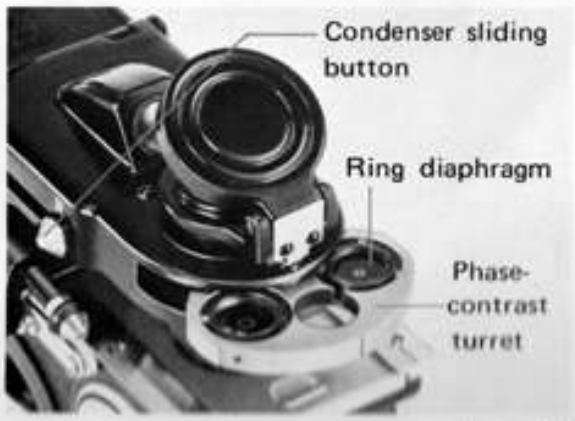


Fig. 14

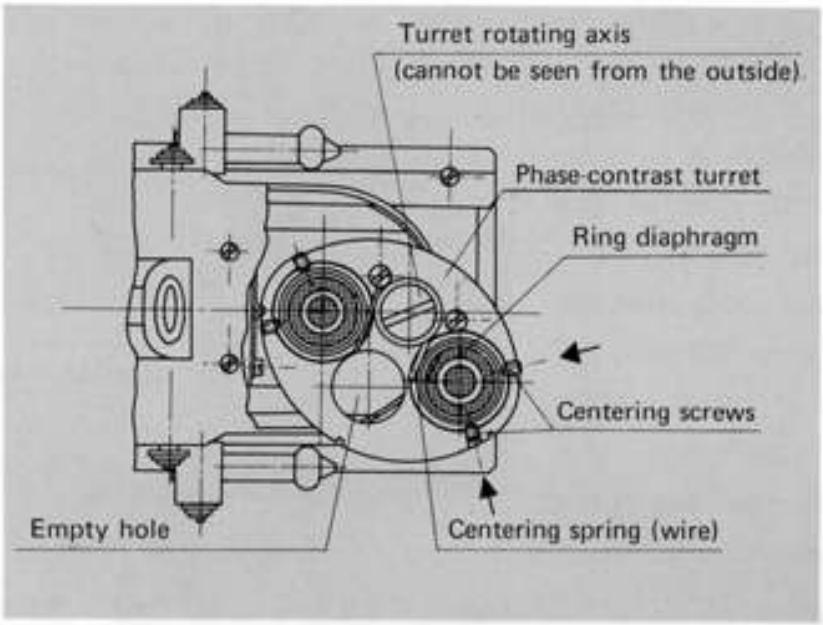


Fig. 15

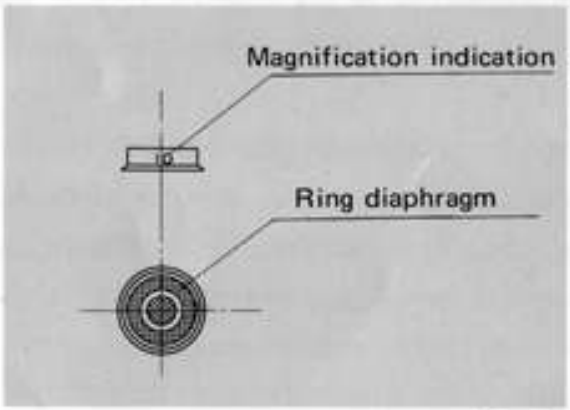


Fig. 16

releasing the two centering screws, remove the diaphragms, each engraved with a magnification number, for replacement. (Fig. 16) At this time, make sure that the wire springs actuate positively to allow the diaphragms to be centered by means of the two screws. (Fig. 15) After the ring diaphragms have been replaced, turn the phase-contrast turret to bring the diaphragms into the optical path one after the other, and the magnification of each diaphragm into coincidence with that of the objective being used. Light the lamp by switching on the illumination switch.

(2) Centering

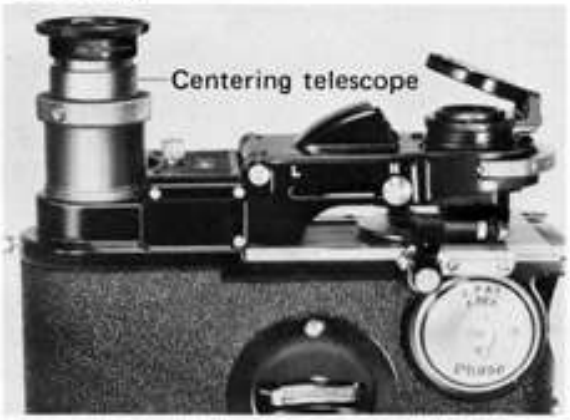


Fig. 17

By means of the fine focus wheel, bring the specimen approximately into focus (refer to p.14. 10. FOCUSING). Releasing the 10X eyepiece clamp screw, remove it for replacement by the centering telescope. (Fig. 17) Rotating its head while viewing through the telescope, bring into focus the phase-contrast ring in the objective and the image of the ring diaphragm at the condenser.

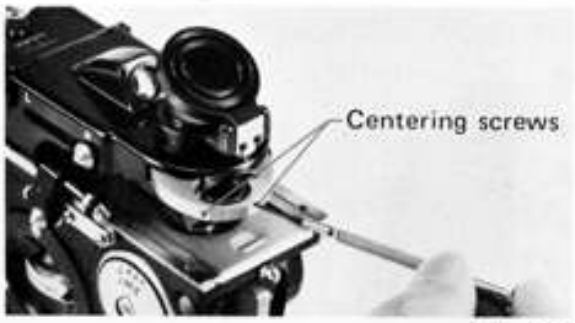


Fig. 18

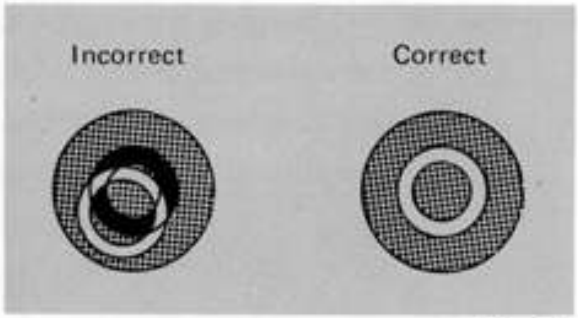


Fig. 19

If a bright ring image appears to extend from the phase-contrast ring, expose the ring diaphragm by turning the turret, and using the two centering screws, adjust the position of the diaphragm properly. (Fig. 18) Then, return the diaphragm into the optical path to check for the correct coincidence of the ring image with the phase-contrast ring at the center of the viewfield, as shown in Fig. 19. If not, repeat this procedure, until they are exactly coincided with each other. After the correct centering has been accomplished, draw out the telescope and replace the eyepiece for observation.

9. MOUNTING SPECIMEN

(1) Position of specimen

Since an inverted optical system is used in this microscope, the specimen should be mounted upside down, that is, the slide should be slipped onto the stage with the cover glass attached on the underside.

A slide glass of 25mm × 76mm size and a cover glass of 18mm × 18mm size and 0.17mm thick are recommended. In case of examining a fluid preparation, use of a slide glass with a hole or of a large size cover glass is recommended.

(2) Inserting specimen

Insert the slide under the clips on the stage, using the right-hand thumb and forefinger. Movement of the slide is performed by moving the sliding button. (Fig. 20) The clips are provided with rubber rollers so as to give proper friction against the slide.

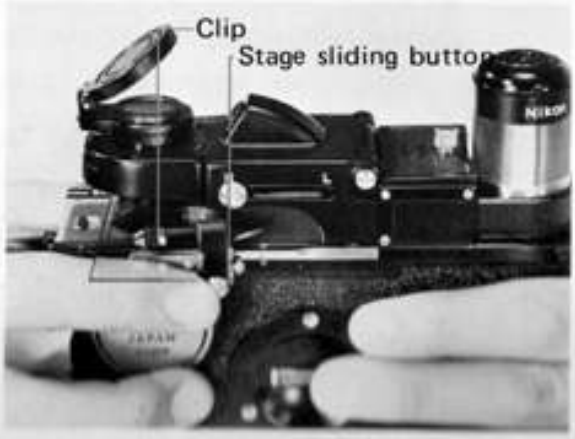


Fig. 20

(3) Finding and marking specimen

Lift up the condenser mount, and you can see the top lens of the objective through the slide glass. Place the specimen in position above the objective. The subject can then be very easily brought into the field of view.

Fig. 21

If necessary, the position of the subject can be marked with ink on the upper side of the slide glass without removing it from the microscope so that the subject may be easily found again. (Fig. 21)

10. FOCUSING

Fig. 22

Focusing is done by turning the fine focus wheel with the left hand middle or forefinger. (Fig. 22) The focusing range is about 0.5 mm. When the 100X objective is raised to the limit, it will touch the specimen. However, there is no danger of damaging the specimen or objective, as the slide will spring up at that instant. Perfect parfocality is maintained for all the objectives because of the inverted optical system used in the microscope. The thickness of the slide glass has no connection with the focusing. Therefore once sharp focus is obtained, it can be retained by only a slight turning of the fine focus wheel, no matter how many times the magnification or slide is changed. But when the 4X objective is exchanged for a high power objective, further turning of the fine focus wheel may sometimes be necessary due to its deeper depth. This is also the case when using a haematocytometer slide or observing a drop preparation.

In case a sharp image cannot be obtained by only turning the fine focus wheel, check whether the specimen has been correctly mounted (the slide should be placed with the cover glass attached on the underside) or whether the objective

nosepiece has not been rotated excessively, which causes an improper positioning of the objective.

11. OIL IMMERSION

When using the 100x objective, apply a small drop of immersion oil to the top of the objective by means of the oiler furnished with the microscope. For this purpose first open the oil hole and rotate the objective up to the hole, while keeping the microscope flat as shown in Fig. 23. Then, holding the nosepiece knob, turn the microscope upward until the oiled objective comes just under the specimen, so that the oil does not flow from the front lens. Then turn the fine focus wheel until a sharp image is obtained. Do not apply too much oil, otherwise it may flow over the top of the objective. If the image is not clear after turning the fine focus wheel, examine the specimen from above with the condenser mount swung aside and see whether the quantity of the oil is too little or whether the oil contains air bubbles. If the former, add oil, and if the latter, remove the bubbles by gently moving the objective to and fro by means of the nosepiece knob.

Fig. 23

It is necessary that the top of the lens be cleaned with a well-washed soft cotton cloth, moistened with a little quantity of tylol.

12. MANIPULATION OF SPECIMEN AND HAEMATOCYTOMETRY

Use of a slide glass with a hole of about 15mm in dia., whose bottom is sealed with a cover glass cemented by balsam or the like, or of a large size (25 × 76mm) cover glass will facilitate manipulation of an exposed specimen or application of chemicals or staining reagents from above. In either case, move the condenser sliding button to the L position and increase the clear-

Fig. 24

ance of the condenser to about 10mm. (Fig. 24) When using a large size cover glass, a slightly blurred image under a high power objective is unavoidable due to slight bending.

In haematocytometry, move also the condenser sliding button to the position L. In this case, the special slide glass (available on order) should be used.

13. COMBINATION WITH THE NIKON MICROFLEX

For this purpose, first unscrew the HK10x eyepiece. Fit the eyepiece adapter around the eyepiece sleeve, and using the clamp screw fasten it at such a position that the top of the eyepiece sleeve is about 1.5mm lower than the circumference top surface of the adapter. (Fig. 25)

Fig. 25

Fig. 26

Thereupon, insert carefully and securely the adapter connecting ring on the shutter housing of the Microflex. (Fig. 26) For handling each type of the Microflex, refer to its Instructions. Although one can hold the above photomicrographic combination with his hands during exposure, it is recommended to mount the whole equipment on a camera tripod, making use of the tripod socket on the bottom of the microscope H and H3, for avoiding vibration.

14. CARE AND MAINTENANCE

- **In observation**

  Place the slide glass on the stage in an inverted position, so that the cover glass attached comes underneath. In case of examining a fluid preparation, use of a slide glass with a hole or of a large size cover glass is recommended.

- **Batteries**

  Use two penlight batteries for illumination. When not in use for any length of time, they should be removed from the microscope.

- **Neck Strap**

  Avoid any swift motion while suspending the microscope by the neck strap to prevent possible damage.

- **In transportation**

  Set the nosepiece at 10×. Lock the fine focus wheel by pushing the clamp lever to the right. Slide the dust cover over the objective nosepiece to protect the inside.

- **Storing**

  Keep the microscope in a place free from dust and moisture.

- **Cleaning**

  Wipe only the outside of the lenses using a clean, soft cloth. The inside cleaning should be made only by authorized repair shops.

  Dust the surface of lens by means of a clean brush. To remove oil, grease, etc., use a soft cotton cloth moistened with a little quantity of xylol (not alcohol or ether). The microscope body is to be cleaned only by dusting. It is not necessary to use any oil.

- **Dismantling**

  Do not attempt to dismantle the microscope, especially the objectives in any case. If repair or adjustment is necessary, contact your dealer or the manufacturer.

LP-1EPK = 13M

HP-1EPK = 3M

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