

Nikon

**STEREOSCOPIC MICROSCOPE
SMZ-10**

Instructions

NIKON CORPORATION

CAUTIONS

- 1 Handling**
Handle the microscope gently, taking care to avoid sharp knocks.
- 2 Environment**
Avoid the use of the microscope in a dusty place, where it is subject to vibrations or exposed to high temperatures, moisture or direct sunlight.
- 3 Lamp housing**
Take care not to touch the lamp housing being lighted, and don't bring inflammable substances such as gasoline, thinner, and alcohol near to the lamp housing, as some parts of the lamp housing may take a high temperature while the lamp is being lighted.
- 4 Lamp bulb or fuse exchange**
Before replacing the lamp bulb or fuse, turn OFF the power switch and disconnect the plug of the power source cord. In such cases as of replacement, do not touch the lamp bulb with bare hands, immediately after putting out the lamp.
- 5 Cleanliness of lenses**
Do not leave dust, dirt or finger marks, on the lens surfaces. They will prevent you from clear observation of the specimen image.
- 6 Coarse focus clamp**
For clamping the coarse focus movement, fasten the focusing mount clamp knob tightly.

CARE AND MAINTENANCE

- 1 Lens cleaning**
To clean the lens surfaces, remove dust using a soft brush or gauze. Only for removing finger marks or grease, should soft cotton cloth, lens tissue or gauze lightly moistened with absolute alcohol (ethyl alcohol or methyl alcohol) be used. Observe sufficient caution in handling alcohol and xylene.
- 2 Other cleaning**
Avoid the use of any organic solvent (for example: thinner, xylene, ether, alcohol etc.) for cleaning the painted surfaces and plastic parts of the instrument.
- 3 Dismantling**
Never attempt to dismantle the instrument, so as to avoid the possibility of impairing the operational efficiency and accuracy.
- 4 Storage**
When not in use, cover the microscope with the accessory vinyl cover, and store it in a place free from moisture and fungus.
- 5 Periodical check**
To maintain the performance of the instrument, we recommend to check the instrument periodically. (For details of this check, contact our agency.)

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I. COMBINATIONS AND ASSEMBLY CHART

Systematic figures below show the assembling of type SMZ-10TP. For assembling the equipments for other types, or optional accessories, refer to the pages 5 ~ 6 .

④ Eyepiece (10X)

Inserted in the observation tubes.

③ Trinocular eyepiece tube

Fitting the attachment groove to the attachment pin on the zooming body, tilt the eyepiece tube slightly for easy fit. Thrusting the eyepiece tube against the circular dovetail, seat it in a horizontal position. Fasten the tube with the eyepiece tube clamp screw. When coaxial episcopic illuminator or drawing tube is mounted on the zooming body, the eyepiece tube can be attached in the same way as above.

Attachment groove for zooming body

Attachment pin for eyepiece tube

Eyepiece tube clamp screw

② Zooming body

Inserted to the focusing mount and fastened with the zooming body clamp screw.

Zooming body clamp screw

Focusing mount clamp knob

① Focusing mount

Attached to the pillar and fastened with the focusing mount clamp knob.

Plain stand

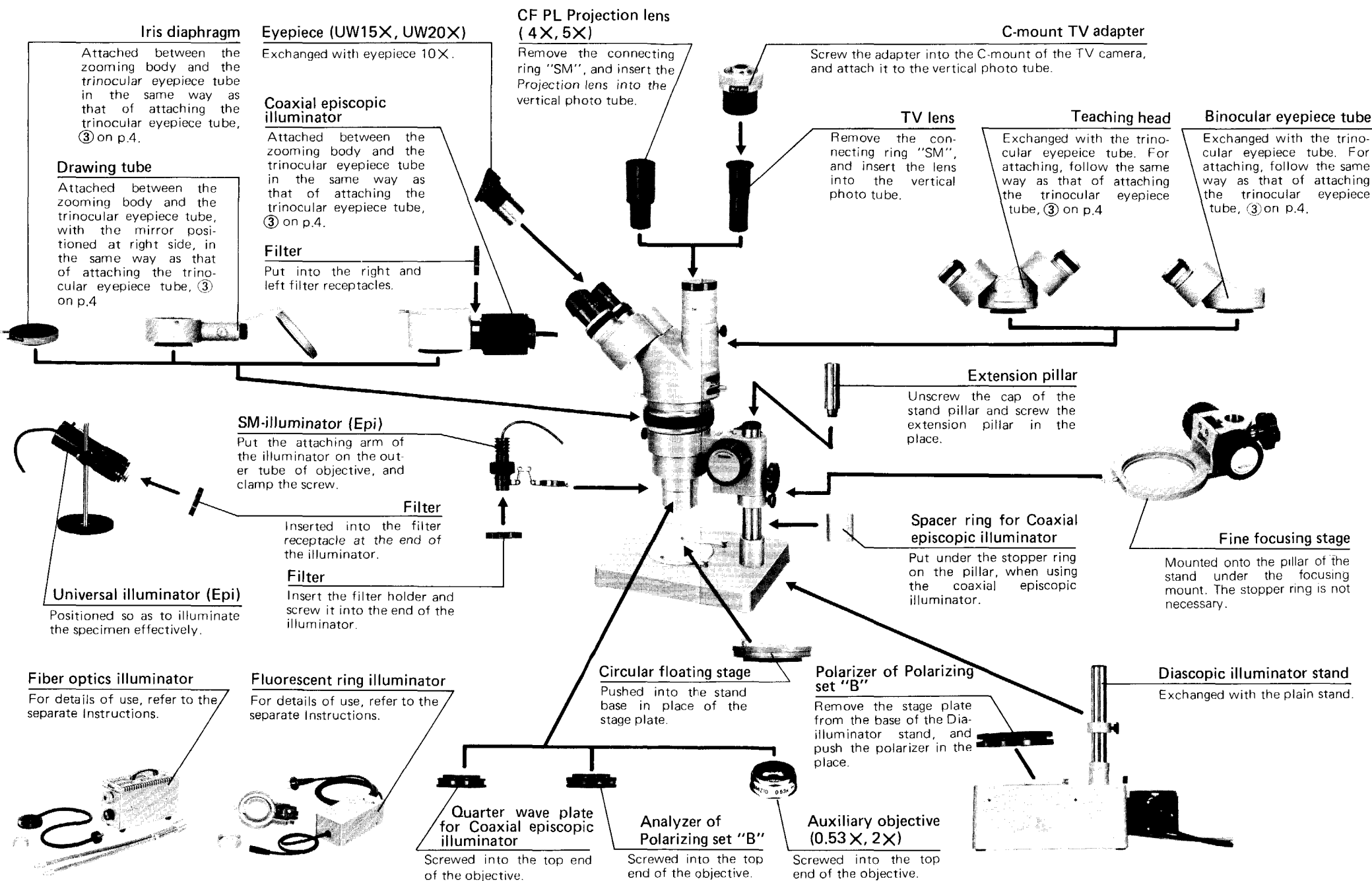
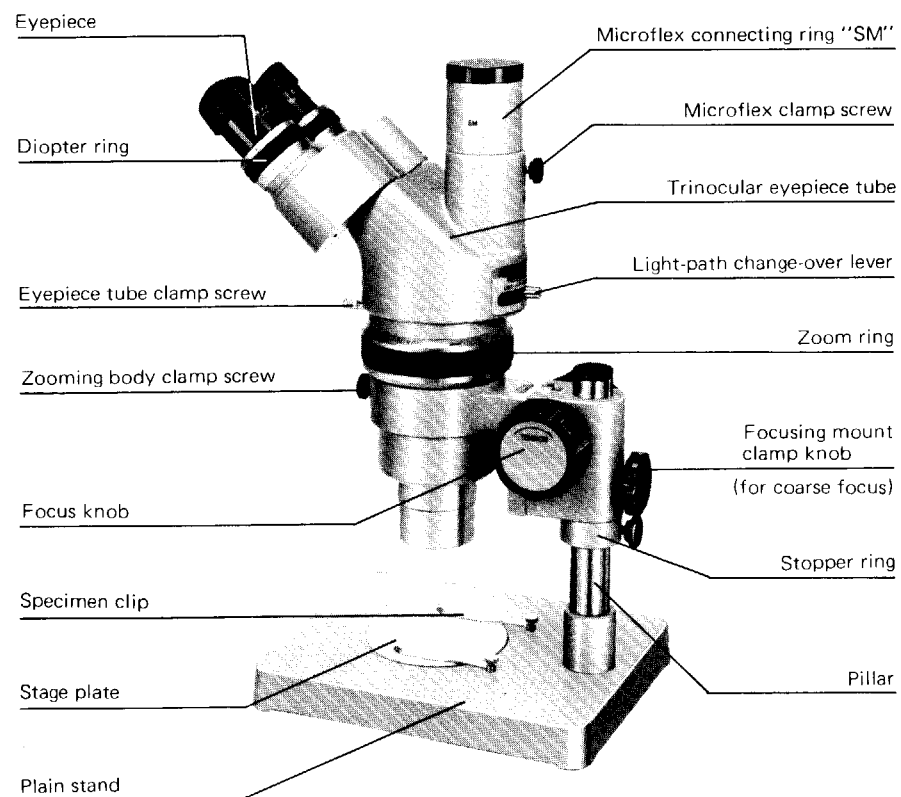


Fig. 1

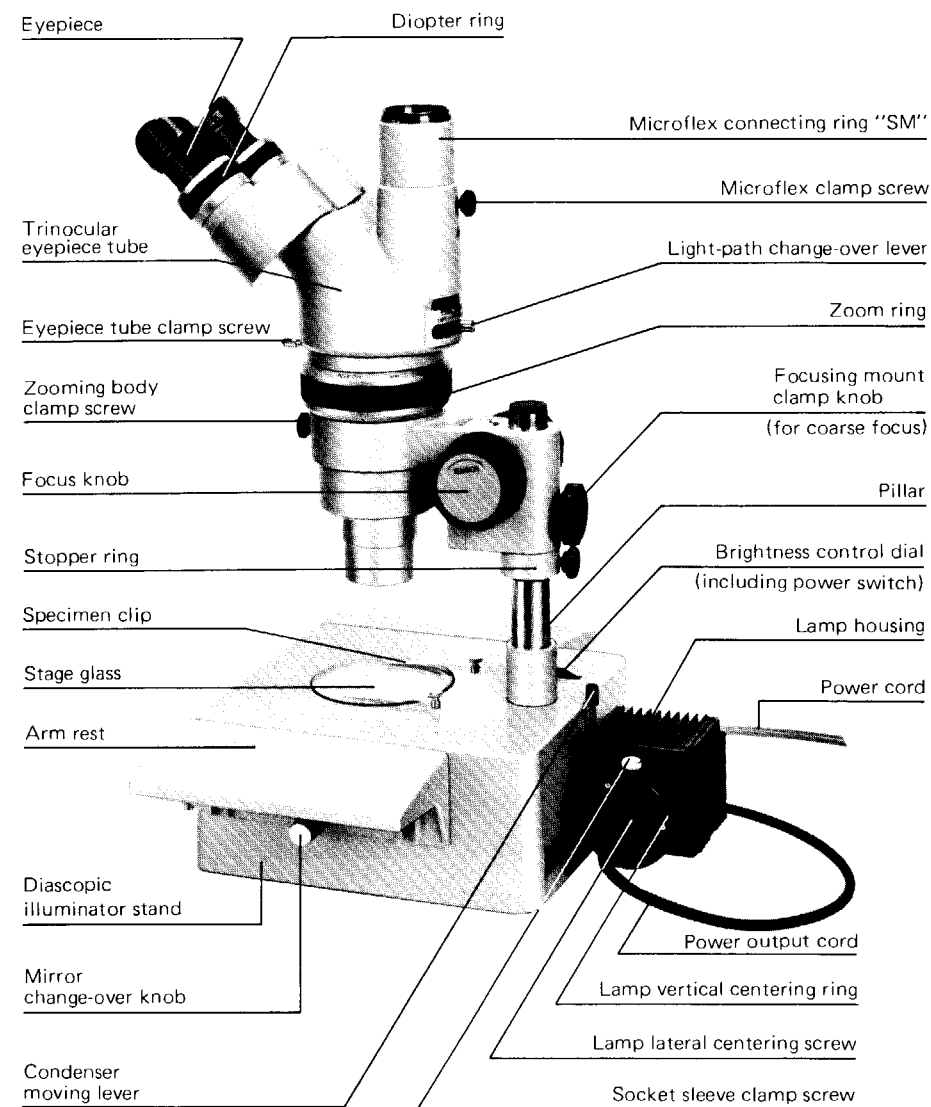
II. STANDARD USE

1. Nomenclature



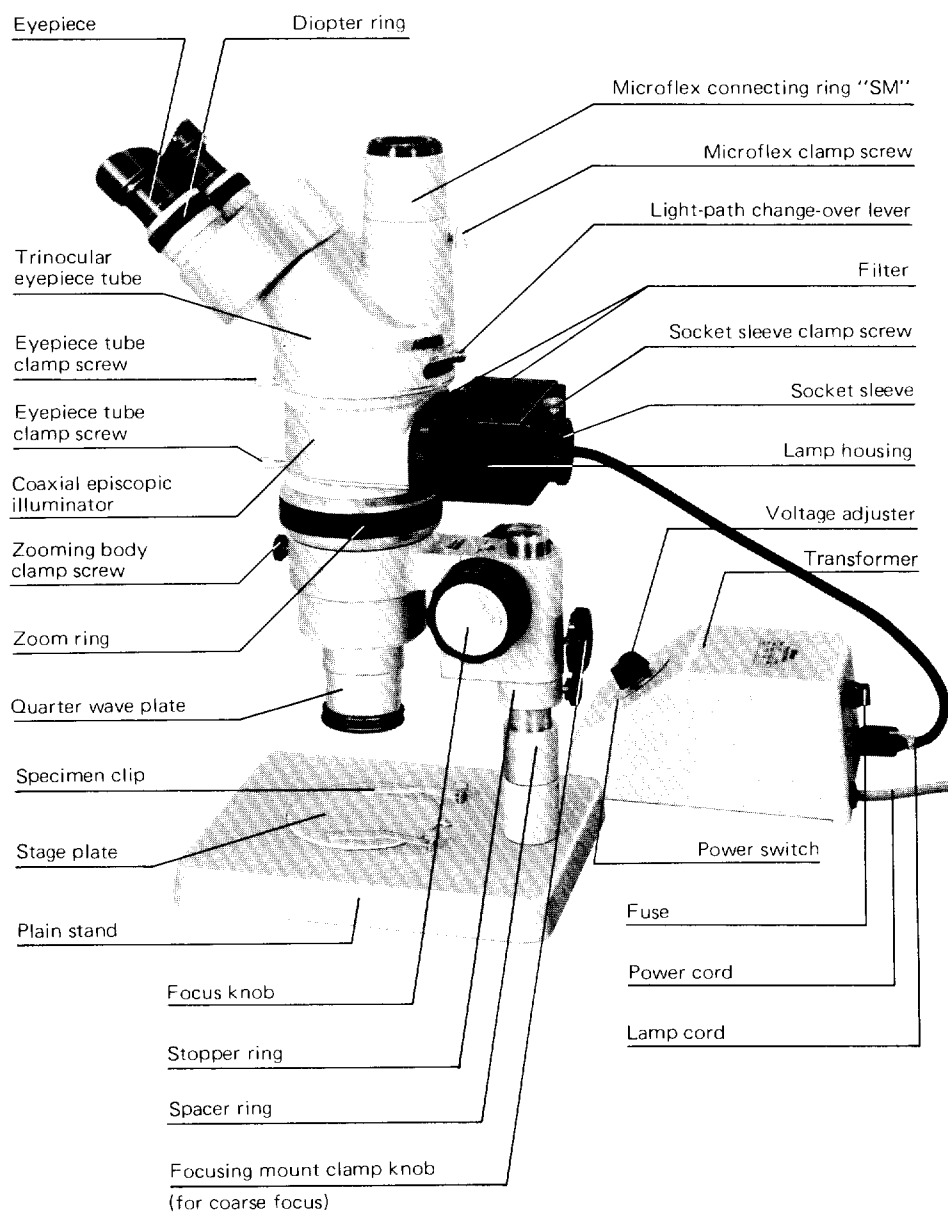
SMZ-10TP

Fig. 2



SMZ-10TD

Fig. 3



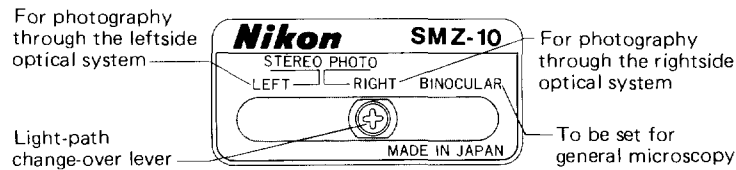
SMZ-10TC

Fig. 4

2. Operating procedure

- ① Place a specimen on the stage plate (glass).
- ② Set the light-path change-over lever to "BINOCULAR" position.
(Refer to the illustration below)

● Use of light-path change-over lever



- ③ Release the focusing mount clamp knob. Move the mount up or down to set the distance from specimen to the lens front at 70~80mm. In this position, tighten the focusing mount clamp knob.
- ④ Make all the necessary dispositions for using the illuminator.
(Refer to p.11 ~13)
- ⑤ Set the scales of the diopter rings on the observation tubes to 0.
- ⑥ Looking into the eyepieces in the observation tubes, move the right and left prism housings with both hands to set the interpupillary distance to a position where both the right and left viewfields become one.
- ⑦ Turn the zoom ring up to the highest magnification (4×).
- ⑧ Manipulate the focus knob to bring the specimen image into sharp focus.

This microscope is engineered to minimize eyestrain by employing parallel optical axes for the two eyepieces. Thus you can always view the specimen with both eyes in the relaxed position.

- (1) Place your eyes approximately 16mm above the eyepiece.
- (2) Relax your eyes as if you were looking at a distant object through a window.
- (3) Bring the specimen into focus.
- (4) Should the right and left images not coincide, rack the microscope down about 5mm and, keeping your eyes relaxed, slowly bring the specimen back into focus.
- (5) If the right and left images still remain separate, take a pencil (any object with a sharp point will do) and hold its point slightly above the specimen. Then slowly move it down until it touches the specimen.

- ⑨ Turn the zoom ring to set the lowest magnification (0.66×).
- ⑩ At this time, if the image is out of focus, rotate the diopter rings on the right and left observation tubes for sharp focus.
Do not manipulate the focus knob.

It is recommended that the scale readings on the right and left diopter rings be noted for future use, to speed up focusing over the entire zoom range.

- ⑪ Reset the zoom ring to its highest magnification, 4×, to see that exact focus is still maintained. If not, repeat the above procedures ⑦, ⑧, ⑨ and ⑩.

3. Illumination

1) Episcopic illumination

Attach the SM-illuminator (Epi) to the mounting ring of the zooming body. Move the socket to adjust the direction of the lamp housing, until uniform illumination is obtained on the specimen. Since the mounting ring can hold two illuminators simultaneously, it enables choosing oblique illumination using one illuminator or balanced illumination using two, depending upon the specimen. (Fig. 5)

When specimen does not have sufficient reflection to obtain enough brightness by SM-illuminator, the use of a Universal Illuminator (Epi) is recommended. (In this case, it will be necessary to employ the transformer for the Universal Illuminator.) (Fig. 6)

Note: Take care not to touch the lamp housing being lighted as some parts of the housing may take a high temperature.

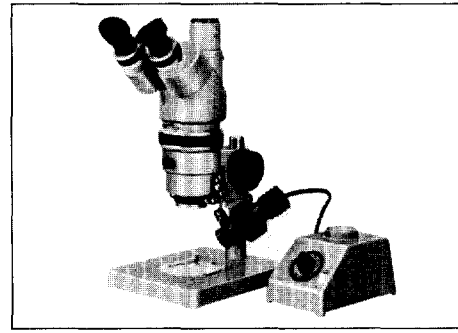


Fig. 5

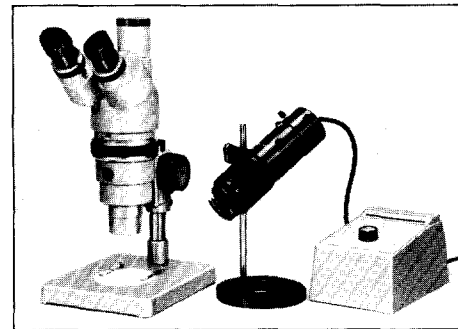


Fig. 6

2) Diascopic illumination

- ① Turn the brightness control dial (including power switch) on the diascopic illuminator stand to switch on the lamp.
- ② Viewing the matte glass surface through the stage glass, rotate the lamp lateral centering screw to center the illuminating light to the matte glass frame. For vertical centering, after releasing the socket sleeve clamp screw, rotate the lamp vertical centering ring. Rotation of the condenser moving lever will change the illuminated area. (Refer to Fig. 7 & 8)
- ③ Rotating the mirror change-over knob, select the concave or plane surface: the concave side for lower magnifications or photomicrography, and the plane for higher magnifications requiring more brightness.

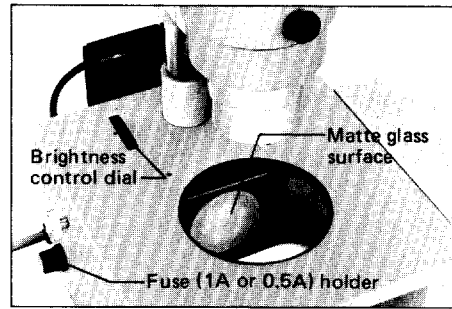


Fig. 7

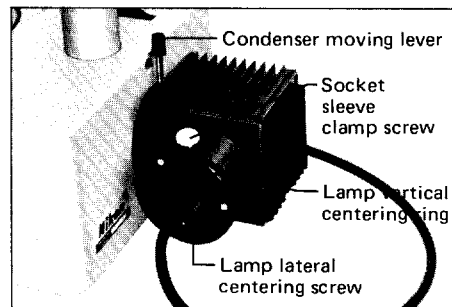


Fig. 8

★ Exchanging the lamp bulb (Fig. 9)

Turn OFF the brightness control dial and disconnect the plug from the power source. After removing the socket sleeve clamp screw, pull out the socket and exchange the lamp bulb (6V-20W Halogen lamp). When inserting the lamp bulb into the socket, do not touch the lamp bulb directly with finger. Use a clean cloth or glove. Insert the lamp bulb sufficiently deep into the socket.

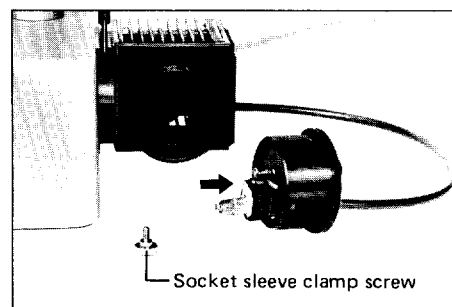


Fig. 9

★ Exchanging the fuse

Turn OFF the brightness control dial and disconnect the plug from the power source. Take off the fuse holder by turning it to the direction of the arrow and place the correct fuse.

3) Coaxial episcopic illumination

- ① Connect the lamp cord to the transformer, and turn ON the power switch.
- ② Screw the quarter wave plate into the top of the objective lens, and turn the milled ring until brightest illumination is obtained (the white dot on the ring comes to the front side).
- ③ Focus on the specimen.
- ④ Remove the eyepieces, and look into the sleeves to observe the illumination. After releasing the socket sleeve clamp screw, center the lamp bulb by sliding in or out, and turning the socket sleeve until a uniform illumination is obtained in both viewfields. (Fig. 10)
- ⑤ Brightness adjustment can be done by turning the voltage adjuster on the transformer or turning the quarter wave plate. In this case, when the white dot on the wave plate comes to the front side, brightest illumination is obtained.

Note 1: Set the specimen in such a position as its surface makes a right angle with the optical axis. If not, the right and left viewfields will not be illuminated uniformly or the seeing in each viewfield will differ, though the lamp bulb is centered.

Note 2: When observing the image by the regular reflection of the specimen, such as IC pattern or object with mirror-surface, observation illumination may be cut at the circumference of the viewfield, if the magnification of the zooming body is set at lower than 1X.

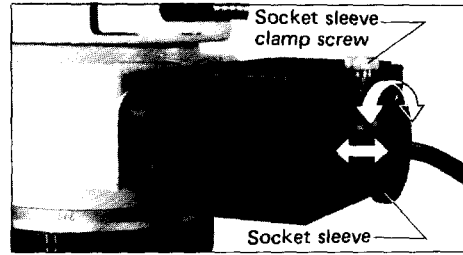


Fig. 10

★ Exchanging the lamp bulb

Turn OFF the power switch on the transformer and disconnect the plug from the power source. After releasing the socket sleeve clamp screw, pull out the socket sleeve and exchange the lamp bulb (6V-20W Halogen lamp). When inserting the lamp bulb into the socket, do not touch the lamp bulb directly with finger. Use a clean cloth or glove. Insert the lamp bulb sufficiently deep into the socket. (Fig. 11) When inserting the socket sleeve into the lamp housing, bring the white dot on the socket sleeve to the center of the two white dots on the lamp housing. (Fig. 12)

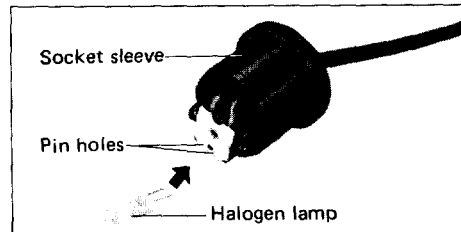


Fig. 11

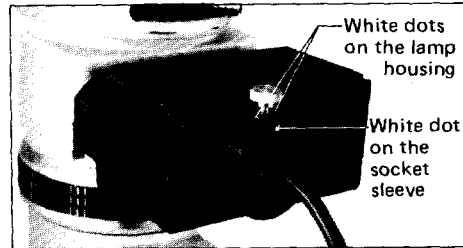


Fig. 12

★ Exchanging the fuse

Turn OFF the power switch on the transformer and disconnect the plug from the power source. Take off the fuse holder at the rear of the transformer by turning it to the direction of the arrow and place the correct fuse.

4. Photomicrography

As a photographic attachment, various types of Nikon Microflex are available. For details on the use of Nikon Microflexes, or for assembling of the Microflexes, refer to their respective instructions.

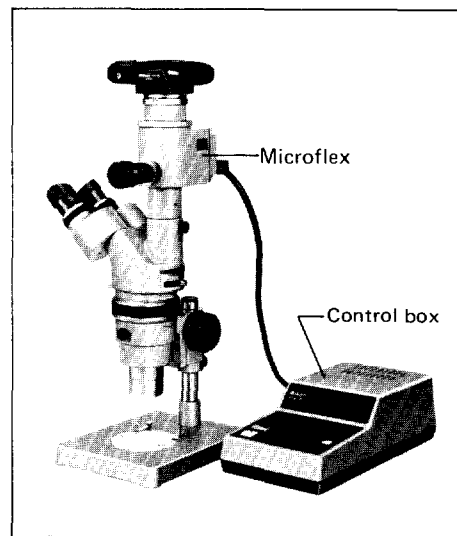


Fig. 13

1) Attaching the Microflex

- ① Remove the connecting ring "SM" from the photo tube of the trinocular tube and insert the CF PL Projection lens into the photo tube. (Fig. 14)
- ② Remove the connecting ring from the Microflex, and in its place attach the connecting ring "SM" removed from the photo tube. Attach the connecting ring "SM" screwed into the Microflex to the photo tube and lock it firmly in position. (Figs. 15 & 16)

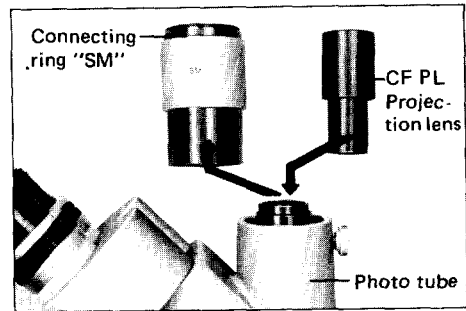


Fig. 14

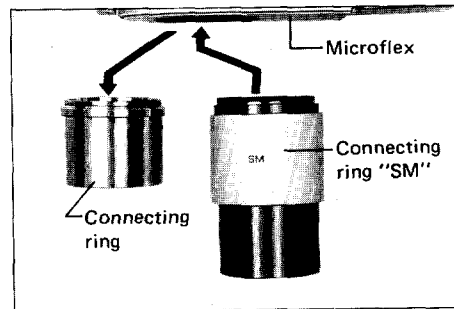


Fig. 15

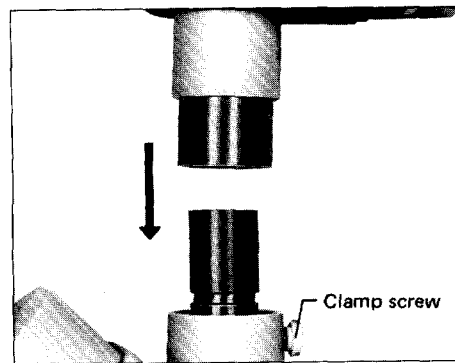


Fig. 16

2) Adjustment of the illumination

Uneven illumination will show up more conspicuously on a photograph than under visual observation. Adjust carefully to avoid such unevenness.

3) Use of filters

(1) In episcopic illumination

When using a color film of day-light type, set the voltage of the SM-illuminator (Epi) at 6V, and use a color balancing filter NCB 10 (33mm in dia.) in the filter holder. This is available as an accessory on order. Attach the holder to the end of the SM-illuminator (Epi). (Fig. 17)

When using a Universal illuminator (Epi), set the voltage at 7.5V. Use a color balancing filter CB14 (45mm in dia.) and color compensation filter CC10M in the filter holder on the Universal illuminator (Epi).

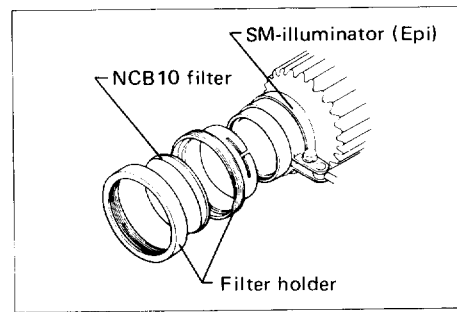


Fig. 17

(2) In diascope illumination

Remove the lamp housing from the diascope illuminator stand. Rotate the condenser moving lever to draw out the condenser, and the filter receptacle will be exposed. Place the color balancing filter NCB 6 (available as accessory). (Fig. 18)

Set the brightness control dial to 6.

When using the plane mirror surface for lower magnifications, if an uneven illumination would result, it is necessary to use the concave surface.

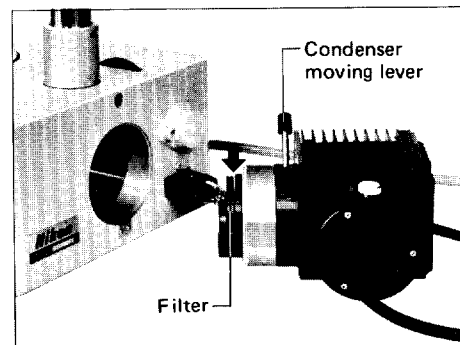


Fig. 18

(3) In coaxial episcopic illumination

Place the two color balancing filters in the right and left filter receptacles between the lamp housing and the illuminator main body, respectively. (Fig. 19)

Set the voltage at 6 on the transformer. Turn the milled ring of the quarter wave plate until brightest illumination is obtained (the white dot comes to the front side). If not, color rendition will differ in some degree.

Note: Depending upon the make of the film, the resultant color rendition will differ minutely. If necessary, a color compensation filter should be used in combination. When using black & white film, set the voltage at 6V. In this case, no color compensation filter is necessary. If a higher contrast is desired, use a color filter such as green in the filter holder.

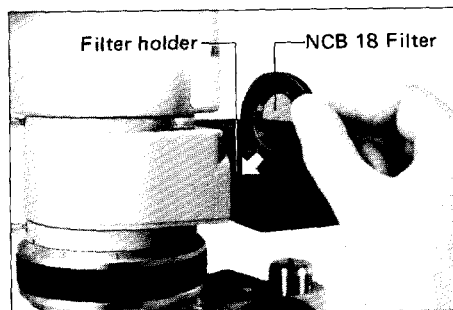


Fig. 19

4) Focusing

- ① Looking into the observation tubes, move the portion of specimen to be photographed to the center of the viewfield. Then, set the light-path change-over lever to "LEFT" or "RIGHT" of "STEREO PHOTO" position.
- ② After changing-over the light-path, fit the focusing magnifier to the finder of the Microflex, and proceed to focus. (Fig. 20)

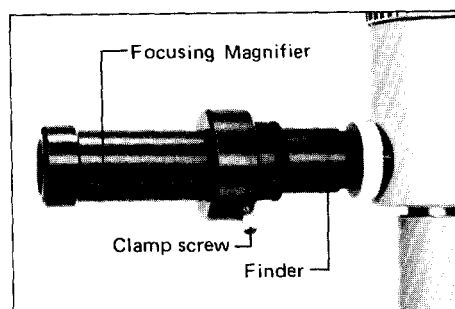


Fig. 20

Viewing through the attached focusing magnifier, move it back and forth until the double cross line is seen clear. Then focus the double cross line and the specimen image by rotating the fine focus knob as sharp as possible.

If two photographs of the same viewfield are taken, one with the "LEFT" and the other with the "RIGHT" position of the lever, and examined under a stereoscope, a stereo image will be attained.

5. Specifications

1) Zooming body

Magnification: 0.66 ~ 4X

Zooming ratio: 6

2) Trinocular eyepiece tube

Interpupillary distance adjusting range: 50 ~ 74mm

Diopter adjusting range: +6 ~ -8 Dptr

Inclination angle: 45°

Photomicrography. Nikon Microflex can be attached onto the photo tube.

Stereoscopic photomicrography can be done by changing over the light-path change-over lever.

Total magnification of photomicrography:

(In case of using Microflex UFX-IIA, HFX-IIA, AFX-IIA or PFX)

Magnification of CF PL Projection lens* × Zooming magnification × Magnification factor of Microflex × (Magnification of auxiliary objective) × 0.6

* CF PL Projection lens 2.5X is not usable.

(In case of using Microflex HFM, AFM or PFM)

Magnification of CF Photo eyepiece* × Zooming magnification × Magnification factor of Microflex × (Magnification of auxiliary objective) × 0.6

* CF Photo eyepiece 5X is not usable.

3) Eyepiece

10X: Field number 21

UW 15X (available on order): Field number 17

UW 20X (available on order): Field number 15

4) Focusing device

Center distance of pillar and zooming body: 101 mm

Fine focus range: 40 mm

Coarse focus range: 60 mm

5) Stand

Plain stand: Size 220 × 180mm

Diascopic illuminator stand: Size of the stage glass ϕ 90mm (Effective diameter ϕ 86mm)

Distance between the bottom and the specimen surface
96mm

Size (W) (L) (H)

200 × 310 × 280mm (Without arm rests)

350 × 310 × 280mm (With arm rests)

Weight about 4kg

Input voltage 120V or 220/240V (with input voltage change-over switch on the bottom of the base)

Lamp bulb 6V-20W Halogen lamp (PHILIPS 7388)

Fuse 1A/250V or 0.5A/250V

Filter ϕ 45mm green filter and Color balancing filter

NCB6

6) Coaxial episcopic illuminator (available on order)

Magnification: 1.5X
 Working distance: 71mm
 Lamp bulb: 6V-20W Halogen lamp (PHILIPS 7388)
 Size: (W) 100 × (L) 172 × (H) 50mm
 Weight: About 0.8kg
 With a transformer, a quarter wave plate and a spacer ring

7) Other accessories (available on order)

SM-illuminator(Epi), Universal illuminator(Epi), Fiber optics illuminator, Fluorescent ring illuminator, Binocular eyepiece tube, Drawing tube, Teaching head, Polarizing set "B", Fine focusing stage, Auxiliary objectives 0.53 × and 2 ×, Iris diaphragm, TV adapter.

8) Magnification table (For the type with Epi-illuminator (Epi), Universal illuminator (Epi) or Diascopic illuminator)

Objective lens (Zoom)	Auxiliary objective	Working distance (mm)	Eyepiece					
			10 ×		15 ×		20 ×	
			Total mgf. (×)	Real field (mm)	Total mgf. (×)	Real field (mm)	Total mgf. (×)	Real field (mm)
0.66 ×	—	87	6.6	31.5	10	25.5	13.3	22.5
	0.53 ×	132	3.5	63	5.3	51	7	45
	2 ×	26	13.3	15.7	20	12.7	26.6	11.2
1 ×	—	87	10	21	15	17	20	15
	0.53 ×	132	5.3	42	8	34	10.6	30
	2 ×	26	20	10.5	30	8.5	40	7.5
1.5 ×	—	87	15	14	22.5	11.3	30	10
	0.53 ×	132	8	28	11.9	22.6	15.9	20
	2 ×	26	30	7	45	5.6	60	5
2 ×	—	87	20	10.5	30	8.5	40	7.5
	0.53 ×	132	10.6	21	15.9	17	21.2	15
	2 ×	26	40	5.2	60	4.2	80	3.7
3 ×	—	87	30	7	45	5.6	60	5
	0.53 ×	132	15.9	14	23.9	11.3	31.8	10
	2 ×	26	60	3.5	90	28	120	2.5
4 ×	—	87	40	5.2	60	4.2	80	3.7
	0.53 ×	132	21.2	10.2	31.8	8.5	42.4	7.5
	2 ×	26	80	2.6	120	2.1	160	1.9

Magnification table (For the type with Coaxial episcopic illuminator)

Objective lens (Zoom)	Working distance (mm)	Eyepiece					
		10×		15×		20×	
		Total mgf. (×)	Real field (mm)	Total mgf. (×)	Real field (mm)	Total mgf. (×)	Real field (mm)
* 0.66×	71	10	21	15	17	20	15
1×		15	14	22.5	11.3	30	10
1.5×		22.5	9.3	33.7	7.5	45	6.6
2×		30	7	45	5.6	60	5
3×		45	4.6	67.5	3.7	90	3.3
4×		60	3.5	90	2.8	120	2.5

(Magnification of illuminator: 1.5×)

* When observing the specimen with mirror-surface, observation illumination may be cut at the circumference of the viewfield.

III. OTHER ACCESSORIES

1. Binocular eyepiece tube (Fig. 21)

Follow the same procedure as for the trinocular eyepiece tube. (Refer to p. 10, 2. Operating procedure)

Interpupillary distance

adjusting range: 50 ~ 74mm

Diopter adjusting range: +6 ~ -8 Dptr

Inclination angle: 45°

Weight: 1 kg

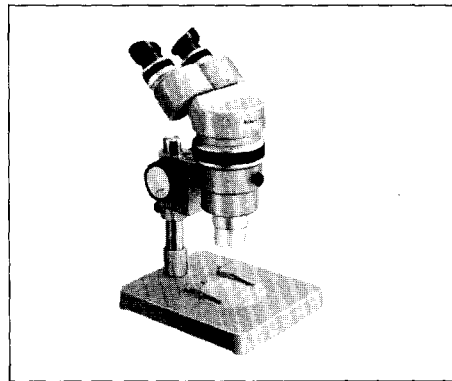


Fig. 21

2. Drawing tube (Fig. 22)

- ① Place a sheet of drawing paper (size: up to A4 or so) under the mirror.
- ② Pull the light path cutting knob toward the operator.
- ③ Looking into the observation tubes, bring the specimen image into focus.
- ④ Put a pencil on the paper. Rotating the focus ring, focus to the image of the pencil. Covering the objective with the hand will facilitate focusing in this case.
- ⑤ Now, the images of the pencil and specimen will be seen superimposed on the paper, permitting tracing the specimen image with the pencil.

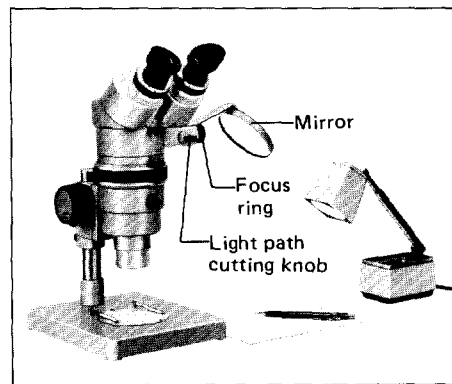


Fig. 22

Note:

- If the brightness on the drawing paper is not sufficient or the illumination of the specimen is too bright, the image on the paper may be difficult to see. In such a case, illuminate the paper directly with a fluorescence lamp or the like.
- While drawing, if only the specimen is to be seen, push in the light path cutting knob.
- For observation, use the binocular eyepiece tube in combination.

- If the drawing at the left side is desired, remove the attachment pin for eyepiece tube on the drawing tube, and attach the pin in the tapped hole opposite, beforehand.

Size of drawing paper	With the plain stand	With the diascope illuminator stand:
	using 10× eyepiece: 166mm in dia.	using 10× eyepiece: 193mm in dia.
	using 15× eyepiece: 134mm in dia.	using 15× eyepiece: 156mm in dia.
	using 20× eyepiece: 119mm in dia.	using 20× eyepiece: 138mm in dia.

3. Teaching head (Fig.23)

The student sees the same, but vertically inverted image, when the two persons face each other. (Refer to the arrow mark in the Figure)

Weight: 1.9kg

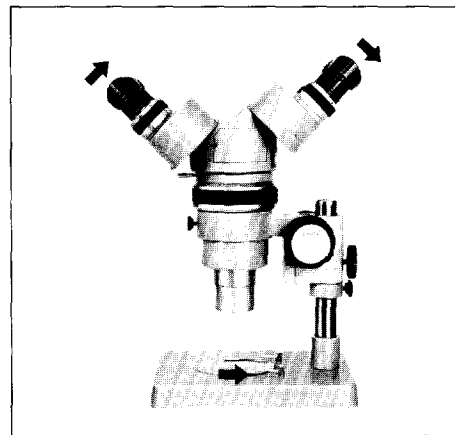


Fig. 23

4. Polarizing set "B" (Fig. 24)

This is used in combination with the type with diascopic illuminator stand. Polarization observation will be possible by turning the analyzer rotation ring so that the viewfield becomes dark.

The analyzer, rotatable about 360° , permits the adjustment according to which type of observation is to be made and what type of specimen, observed.

By turning the milled ring of the polarizer, only the specimen can be rotated in the position of Crossed Nicols.

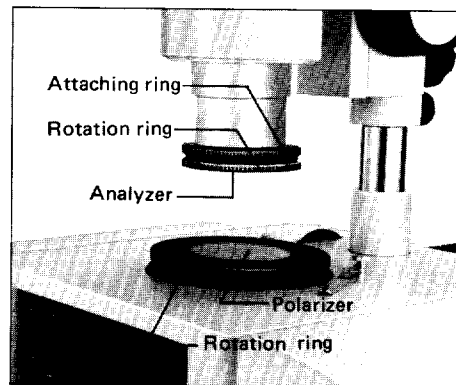


Fig. 24

5. Auxiliary objectives (Fig. 25)

Two types, $0.53\times$ and $2\times$, are available. For the total magnifications obtained by these objectives in combination with the eyepieces and zooming system, see the Magnification table, p. 20. In case of using $0.53\times$, it is necessary to screw in the extension pillar (available on order) to the top of the pillar of the stand.

Note: These auxiliary objectives are to be used combined with the microscope zooming body with the mark "F.F." on its front side.

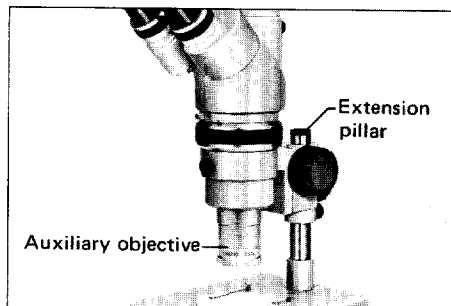


Fig. 25

6. Iris diaphragm (Fig. 26)

The iris diaphragm is used for increasing the depth of focus in photomicrography.

The size of the diaphragm is adjusted $\phi 16 \sim \phi 6.5$ mm by turning the diaphragm control lever according to the specimen. Diaphragm indication figures, "5 ~ 1", are graduated, and when the lever is positioned at "5", the diaphragm is fully open. As the lever is turned to the smaller figure, the diaphragm is more stopped down. It is convenient for the later photographing to remember the indication figure.

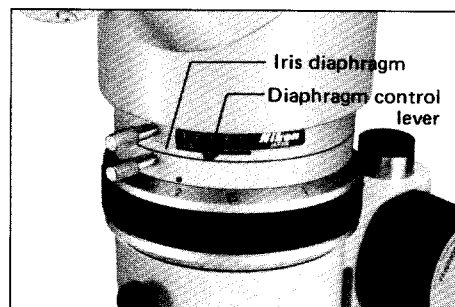


Fig. 26

7. C-mount TV adapter (Fig. 27)

For attaching the TV camera (2/3 type Vidicon) with C-mount to the trinocular eyepiece tube.

Remove the connecting ring "SM" from the trinocular eyepiece tube, and insert the TV lens to the vertical photo tube.

Screw the TV attaching adapter into the C-mount of TV camera and attach it to the trinocular eyepiece tube.

Use it in the procedures below.

- ① Set the optical-path change-over lever to "BINOCULAR" position.
- ② Make focusing with the high magnification.
- ③ Set the optical-path change-over lever to "STEREO-PHOTO" or "LEFT"
- ④ Turn the zoom ring to the low magnification.
- ⑤ Watching the TV monitor, make focusing by turning the focus ring of the TV attaching adapter.

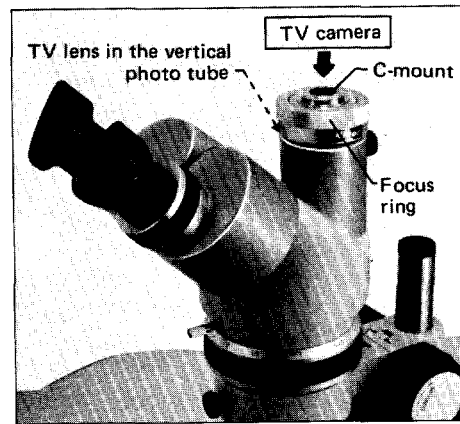


Fig. 27

ELECTRIC SPECIFICATIONS

	Episcopic illumination (Transformer)		Diascopic illumination (built-in the base)	Coaxial episcopic illumination (Transformer)
	Epi-illuminator (Epi)	Universal illuminator (Epi)		
Power source	120V or 220/240V		50/60 Hz	
Secondary voltage	3-4-5-6-7-8V	0 ~ 12V	1 ~ 6 (Brightness control dial)	3-4-5-6-7-8-V
Lamp bulb	6V – 15W Tungsten (type G)	6V – 30W Tungsten (type T)	6V – 20W Halogen (PHILIPS 7388)	
Fuse	1A/250V for 120V or 0.5A/250V for 220/240V			

Nikon reserves the right to make such alterations in design as may be considered necessary in the light of experience. For this reason, particulars and illustrations in this handbook may not conform in every detail to models in current production.