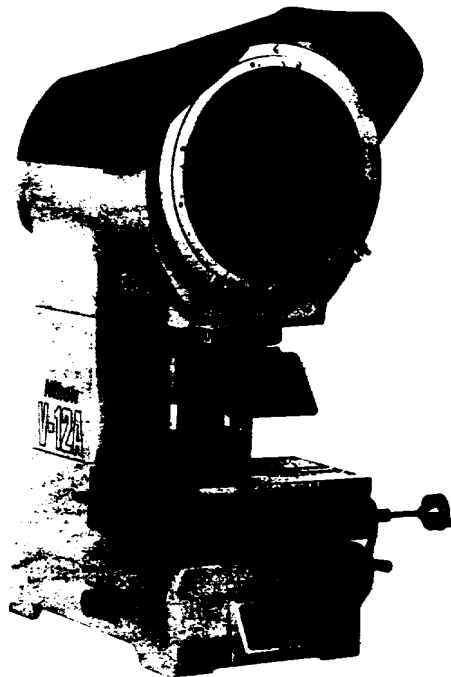


Nikon

Profile Projector V-12A

INSTRUCTIONS



NIKON CORPORATION

Introduction

Thank you for purchasing the Nikon Profile Projector V-12A.

Since the Profile Projector V-12A is a precision optical instrument, please read this Instruction Manual carefully before using the instrument, and handle it correctly to make full use of its capabilities under your complete comprehension.

Cautions

1. Take care of the following points when installing the instrument:
 - Avoid installing the instrument in such bright areas as beside the windows or just under the illumination lamp.
 - Install the instrument in a low humidity environment free from dust, particles, and vibration. When not in use, cover the instrument with the vinyl cover provided.
 - Install the instrument on a level surface.
 - Do not hold the projector head when moving or installing the instrument.
2. Keep the view screen and projection lenses clean to ensure bright and sharp images at all times.
3. Never attempt to dismantle the instrument as this may impair the efficiency and accuracy of the instrument.
4. When replacing the fuse or lamp bulb, be sure to turn OFF (O) the power switch and disconnect the plug from the power supply.

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I. ASSEMBLY

Assembly should be done in the following order.

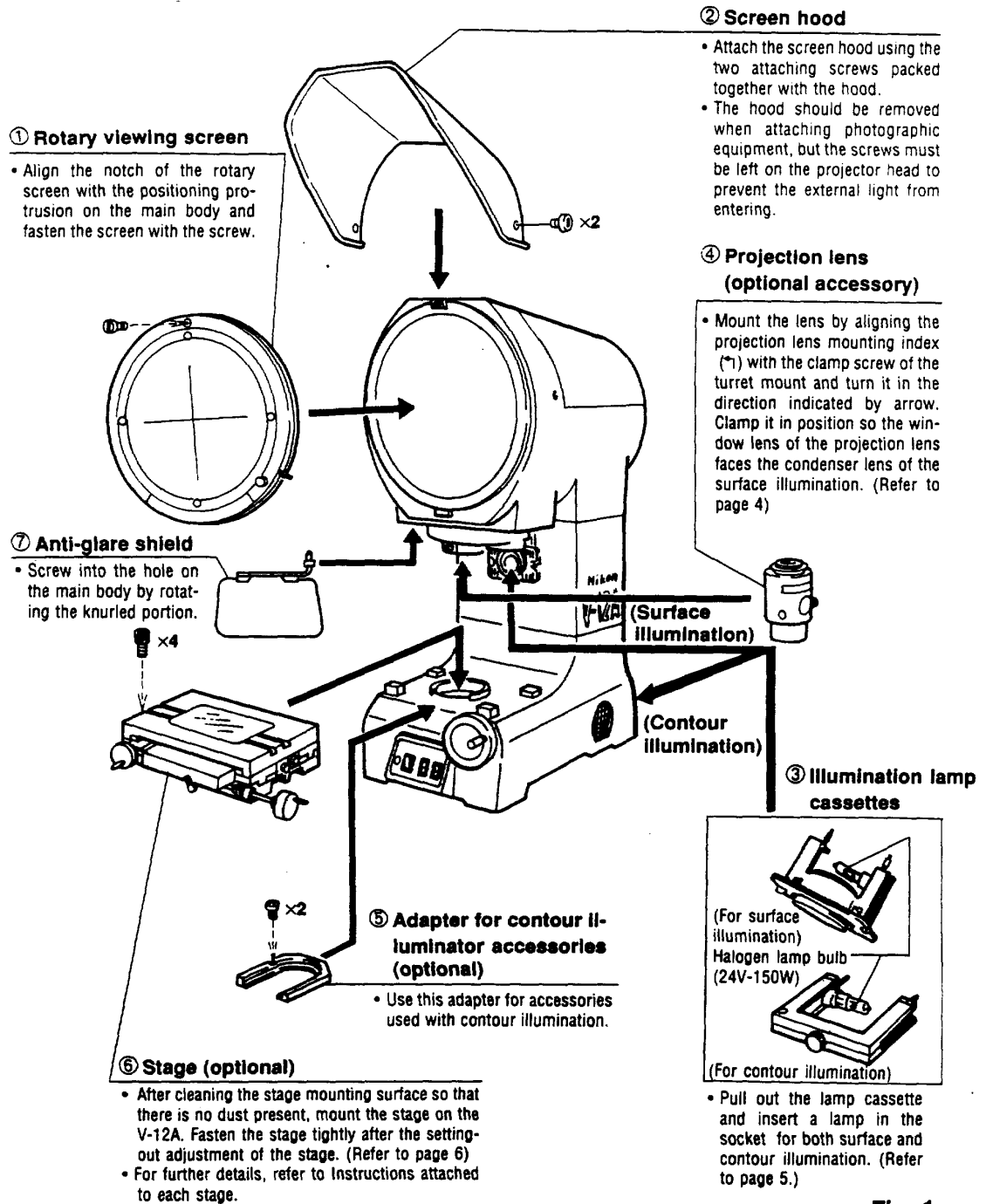


Fig. 1

II. NOMENCLATURE AND FUNCTION OF EACH PART

Screen hood

- Preventing extraneous light from above.

Projector head

- Bring the specimen into focus by moving it vertically by 75mm together with the projection lenses.
- Note:** Do not apply strong stress to the head or measuring accuracy may be damaged.

Hole for chart clip

Protractor

- Convenient for measuring the angle of the specimen by rotating the screen.

Vernier

Projection lens clamp screw

Counter (optional)

Stage (optional)

- 03L, 03, A4, 6VL stages are available.

Pilot lamp

- Neon lamp indicating whether the power is ON or OFF.
(When the power is ON: It lights up.)
(When the power is OFF: It goes out.)

Power switch

- Switch to turn the power ON or OFF.
(1: ON. 0: OFF)

Surface illumination switch (☀)

- Turn on the switch, and the surface of specimen will be illuminated and its image projected.
- Turning the switch upwards (H) increases the image brightness, and turning it downwards (L) decreases image brightness, but prolongs the life of the lamp bulb.

Rotary screen

- Reading scale, chart holder (optional) can be mounted on the metal frame.
- Replaceable with photographic equipment (optional).

Screen fine motion knob

- Use this knob to rotate the screen in a fine motion after releasing the rotation clamp knob.

Rotation clamp knob

- Turn the knob clockwise to clamp the screen rotation. This will make the screen fine motion knob idle at the same time.

Note:

- Turn the rotation clamp knob to the limit.
- Always clamp the screen rotation except when using the screen fine motion knob.

Turret mount

- Hold the turret mount when revolving the turret.

- Note:** Do not revolve the turret holding projection lens itself or measuring accuracy may be damaged.

Projection lenses (optional)

- Eight projection lenses (5x, 10x, 20x, 25x, 50x, 100x, 200x and 500x) are available.

Half-reflecting mirror change-over knob

- For surface illumination, bring the half-reflecting mirror into the optical path by turning the knob counter-clockwise.
- The built-in half-reflecting mirror of the 5x lens is fixed.

Focusing wheel

- Used for focusing the specimen by moving the stage up or down.
- Turning the wheel clockwise moves the head up by 1.5mm.

Contour illumination switch (☀)

- For projecting the contour of the specimen.
- Turning the switch upwards (H) increases the image brightness, and turning it downwards (L) decreases image brightness, but prolongs the life of the lamp bulb.

Fig. 2-1

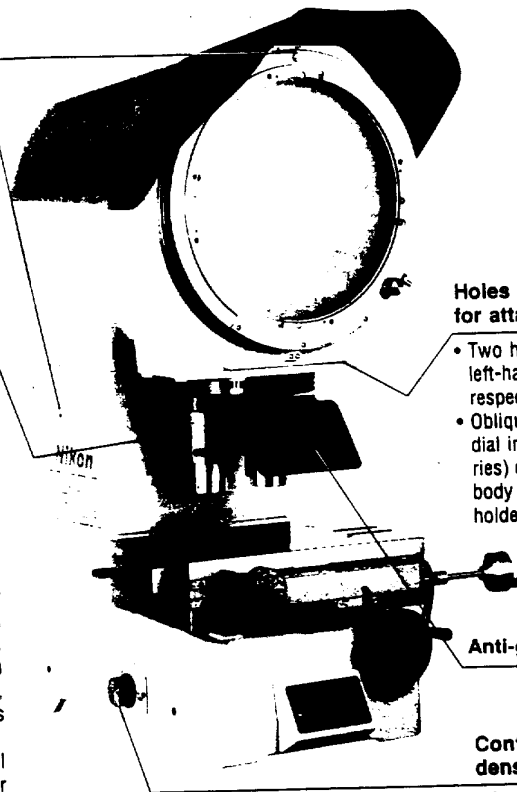
Screen clamp screw

Focusing cover

- Moves up or down together with the projector head.
- The bottom line of the cover is about the same height as the focusing position. This can be conveniently used for rough focusing.

Lamp cassette for surface illuminator

- Accepting one halogen lamp (24V-150W).
- Illuminates the specimen through the half-reflecting mirror built in the projection lens.
- Condensed illumination is available if you pull out the condenser lens by revolving it counter-clockwise.
- Filter (ø52mm screw-in type) for Nikon cameras can be mounted on the tip of the condenser lens.
- When using surface illumination with a 500× projection lens, screw in a special condenser lens for 500×.
- When replacing lamp bulbs, pull out the whole lamp cassette for the surface illuminator. (Refer to page 5)



Holes for attaching accessories

- Two holes are on the right- and left-hand of the turret mount, respectively.
- Oblique surface illuminator or dial indicator (optional accessories) can be attached to the main body by screwing its rod or holder into the hole.

Anti-glare shield

Contour illumination condenser switch-over knob

- Change the magnification figure on the knob between high (over 20×) and low magnifications according to the projection lens being used.

Fig. 2-2

(Rear side)

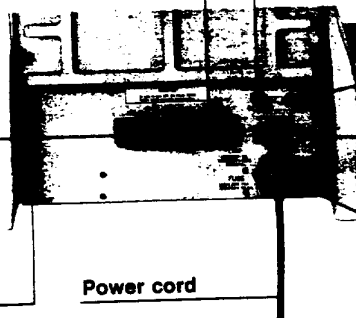
Lamp cassette for contour illuminator

- Accepting one halogen lamp (24V-150W).

Focusing direction adjustment knob

Product serial number

Power cord



Power connector for small counter

- Outputs power to the connected small counter.

CASE terminal

- Frame GND terminal

Voltage selector

- Selects voltage in accordance with input power supply.

Power source input receptacle with fuse holder

- Connected to AC power outlet with power cord. Turn the power OFF when plugging or unplugging power cord. (Refer to page 4)
- Fuse (5A or 2.5A according to the line voltage) included.

Fig. 2-3

III. PREPARATIONS

1. Connecting power cord

(3-pin plug with the GND is provided.)
Plug one end of the cord into the power input on the rear of the unit and plug the other end into the 2-pin power outlet with ground.

(Fig. 3-①)

Note:

If a grounded outlet is not available and a 3-pin plug cannot be used, attach the optional conversion adapter (3-pin to 2-pin) securely to the 3-pin plug and connect a ground line to the GND terminal or to a ground.

(Fig. 3-②)

Be sure not to reverse LIVE and NEUTRAL poles or the unit may be seriously damaged.

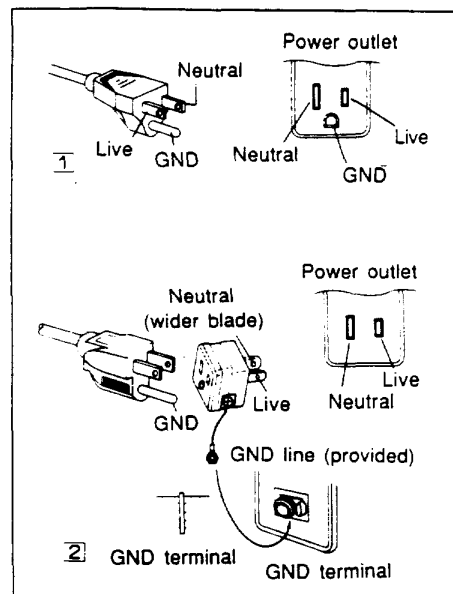


Fig. 3

2. Replacement of the projection lens

- ① Remove the dust cap attached to the turret mount.
- ② Mount the lens by aligning the projection lens mounting index (↖) with the clamp screw of the turret mount ①, and turn the lens in the direction indicated by arrow ②.
- ③ Clamp the lens in position where the window lens of the projection lens faces toward the condenser lens of the surface illuminator ③.
- ④ To remove the projection lens, support the lens with your hand and release the clamp. Turn the lens in the reverse direction you did for mounting, and remove the lens.

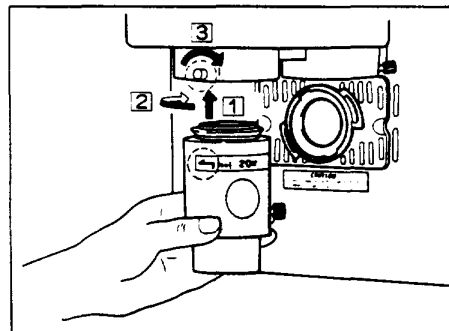


Fig. 4

Note:

In case the external light coming into the screen disturbs you when using photography equipment, attach the lens cap to the vacant lens mount.

3. Replacement of the lamp bulb

Note:

- Before replacing the lamp bulb, turn OFF the power switch and unplug.
- Don't touch the bulb surface with bare hands, use gloves, etc. Dirt or finger marks on the bulb surface should be removed using a cloth lightly moistened with alcohol.
- Take care not to touch the lamp bulb as it is hot when lit.
- Color of the lamp cassette may fade due to heat of the lamp, but it will not affect the performance of the unit.
- Lamp cassette for surface illumination cannot be removed when three projection lenses are mounted on the turret mount.
- Lamp cassette for surface illumination cannot be attached upside down. Attach the lamp cassette so that "Nikon" brand name can be read normally.

Lamp bulb for surface illumination

- ① Remove the projection lens from the turret mount.
- ② Pull out the lamp cassette for surface illumination. (Fig. 5-1)
- ③ Remove the halogen lamp from the lamp socket and replace it. (Fig. 5-2)
- ④ Insert the lamp cassette to its position, taking care not to confuse the direction of the lamp cassette. ("Nikon" brand name should not be reversed.)

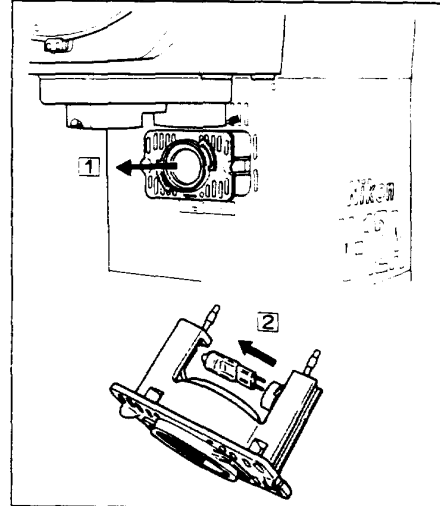


Fig. 5

Lamp bulb for contour illumination

- ① Pull out the lamp cassette for contour illumination from the rear of the unit. (Fig. 6-1)
- ② Remove the halogen lamp from the lamp socket and replace it. (Fig. 6-2)
- ③ Insert the lamp cassette to its position.

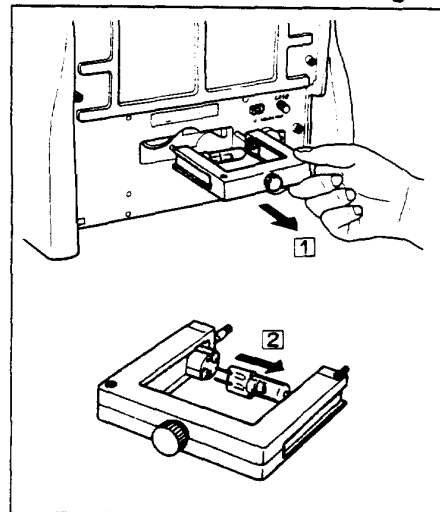


Fig. 6

4. Detection of the lamp bulb position

After inserting the lamp bulb in the lamp cassette for the contour illumination, proceed to the detection of the bulb position as follows:

Note:

The detection of the bulb position is to be done immediately after lighting the bulb as the lamp cassette will heat up.

- ① Place the detection lens on the turret mount.
- ② Using the contour illuminator, adjust the lamp position so that the filament image comes into focus on the center of the screen.
(Fig. 7)
 - Rotate the knob on the cassette to adjust the focusing direction of the filament.
 - To center the filament image on the screen, adjust the inclination of the lamp attached to the lamp socket.

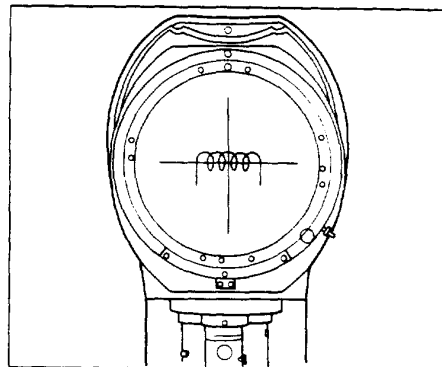


Fig. 7

5. Adjustment of the parallel positioning of the stage

- ① Rotate the screen to the angular position 0.
- ② Clean the mounting surface of the stage and mount it on the mounting portion. Fasten attaching screws lightly.
(Fig. 9-①)
- ③ Using a high-powered projection lens (ex. 50 $\times$), project the image of a positive point such as of an angle of specimen using contour or surface illumination, and coincide it with the cross line.
(Fig. 8-①)
- ④ Move the stage horizontally (in the direction of X-axis) and see if the positive point image moves away from the cross line.
(Fig. 8-②)
If the image moves away from the cross line, adjust the stage by shifting it around the attaching screw at the far left of the stage.
(Fig. 9-②)
- ⑤ After the above adjustment, fasten the attaching screw firmly.

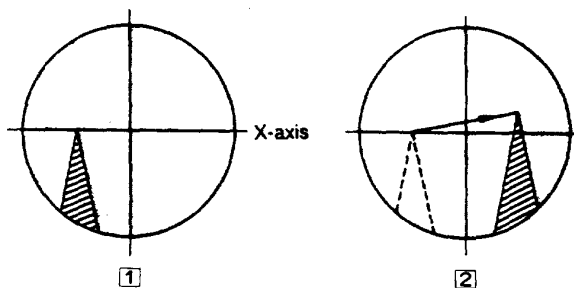


Fig. 8

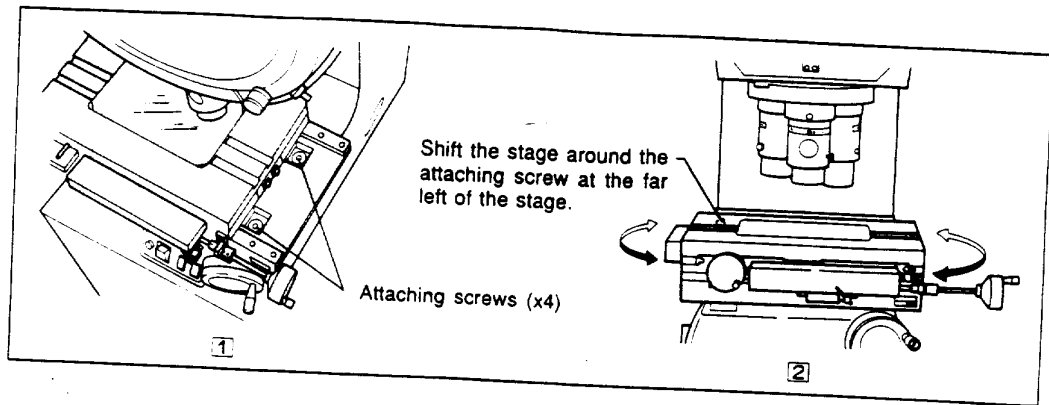


Fig. 9

6. Replacement of the fuse (when necessary)

- ① Turn the power switch OFF, and unplug the power cord.
- ② Remove the fuse holder. (Fig. 10- ①)
- ③ Replace the fuse. (Fig. 10- ②)

Be sure to use a properly rated fuse.
(100/120V T5A, 220/240V T2.5A)

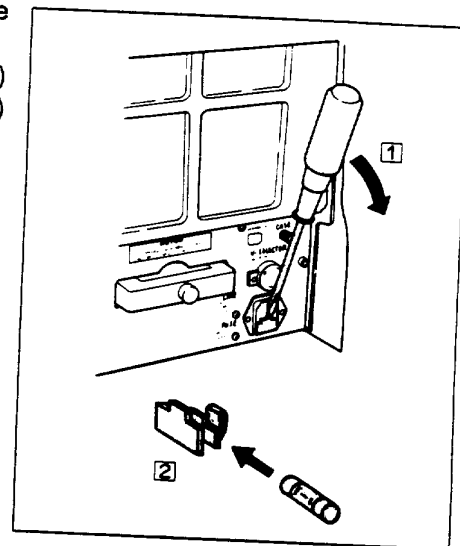


Fig. 10

IV. MEASUREMENT

1. Illumination

The V-12A Projector has three types of illumination so you can choose the most suitable type to suit your purpose.

- **Contour illumination:**

Used for projecting the contour of specimens using the contour illuminator.

- **Surface illumination:**

Used for projecting the surface of specimens using the surface illuminator.

Rotate the condenser lens counter-clockwise and pull it out for condensed illumination. Condensed illumination is convenient for observing uneven surfaces of specimens for their three-dimensional appearance. Use the optional oblique surface illuminator for more effective observation.

- **Simultaneous contour and surface illuminations:**

Used for projecting the contour and surface details of specimens at the same time.

Note:

Use the surface illumination for focusing.

2. Setting the specimen in position

Place the specimen on the stage in such a position that its contour (section) or surface plane is perpendicular to the optical axis of the projection lens. If this is not exactly attained, uniform focusing will not be obtained over the entire area of the screen.

Note:

If the top and bottom surfaces of the specimen are parallel or at right angles to each other, you can just place the specimen on the stage since the top surface of the stage is perpendicular to the optical axis.

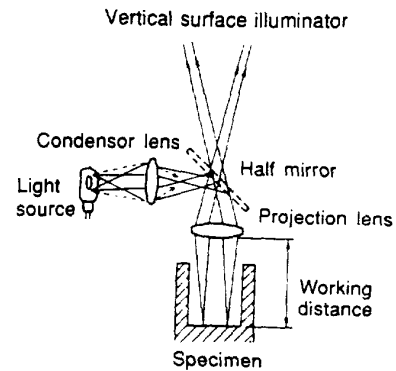


Fig. 11-1

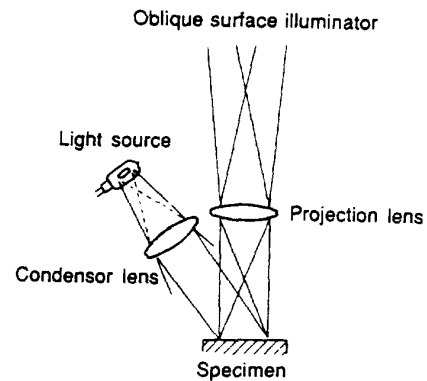


Fig. 11-2

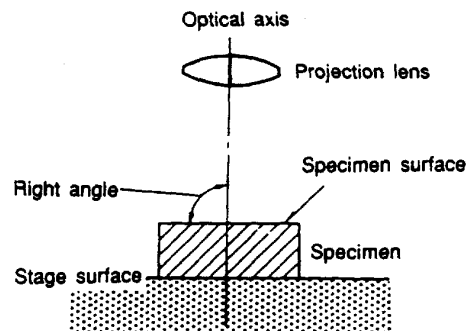


Fig. 12

3. Focusing

Do not turn the focusing wheel, watching only the viewing screen since there is a possibility of striking and damaging both the specimen and the projection lens. Proceed as follows:

- ① Observing the specimen, lower the Projector Head down to a point slightly below the focus plane.
- ② Observing the screen, raise the Projector Head till the image becomes sharp.

Note:

Turn the focus ring on the lens to focus precisely with 500× projection lens.

4. Some measuring methods

The Profile Projector is especially useful for the following:

- Measuring specimens so minute in size that they cannot be brought between two measuring end surfaces.
- Measuring specimens which may be deformed or damaged under any pressure.
- Measuring specimens of such an irregular shape or form that no other measuring instrument can be applied to them.

1) By placing a scale on the screen

Read out value divided by projection magnification will give measured value.

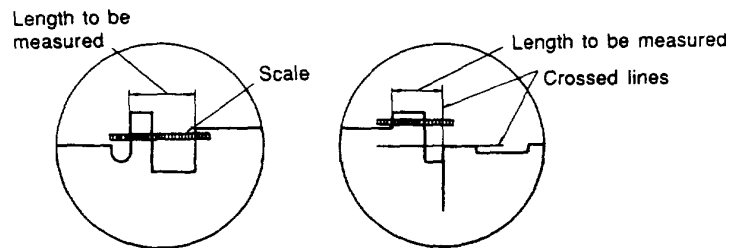


Fig. 13

Note:

- More accurate reading will be achieved by enlarging the image of the specimen and of the scale at the same time using a magnifying glass.
- The graduated line, if not in close contact with the projected image, may give rise to parallax error. It is recommended that you use the optical glass reading scale.

2) By measuring the difference from the standard

This method is convenient especially when repeating measurement of specimens of the same length, because the precise scale is not needed over the entire length. Read out value divided by projection magnification will give measured value.

Note:

- Refer to Note in 1).
- When a difference of length only is to be measured, use the stage to read out the actual (not enlarged) dimension.

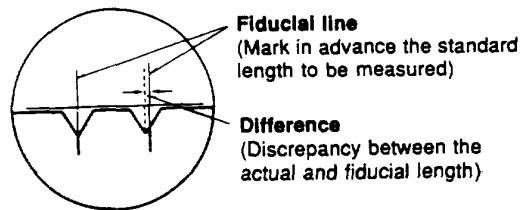


Fig. 14

3) By measuring the difference from the master chart

Enabling continuous measurement of a lot of specimens of complicated and irregular shapes to be efficiently performed.

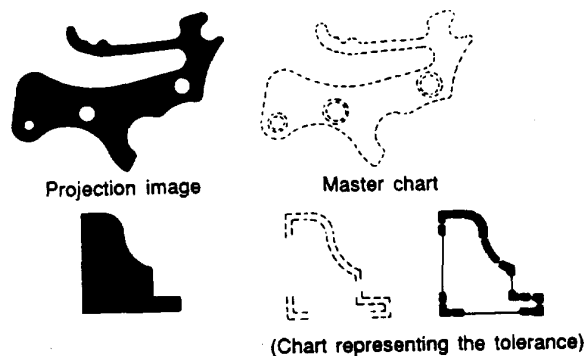


Fig. 15

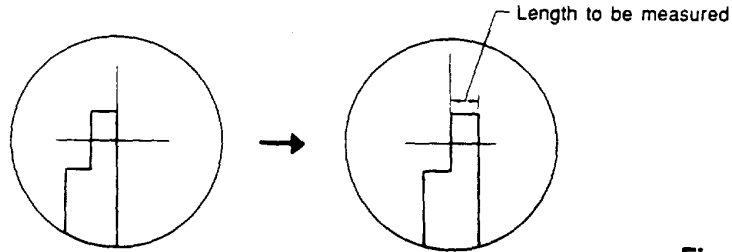
Note:

- As a material for the chart representing the standard, polyester film is advantageous owing to its small expansion factor.
- The chart figure should be brought into as close a contact as possible with the projected image to avoid parallax.
- A chart accompanied with the allowance or tolerance figure will promote measuring efficiency.

4) By using the micrometer stage (optional)

Using the crosswise traveling of the stage (optional), bring the projected image of the specimen into coincidence with one of the crossed lines and read the micrometer.

- ① Bring one side of the point to be measured into coincidence with one of the crossed lines, and read the micrometer.
- ② Then, bring the other side into coincidence with the same crossed line, and read the micrometer again.
- ③ Take the difference between the read out values in 1. and 2.



Note:
Refer to the instruction for the stage.

Fig. 16

5) By rotating the screen for angle measurement

Use the cross on the viewing screen and the protractor around the screen to read out the angle of the projected image.

- ① Bring one of the crossed lines into coincidence with one side of the angle to be measured of the projected image, and read the protractor scale.
- ② Then, bring the same crossed line into coincidence with the other side of the angle.
- ③ In this position, read out the protractor, and take the difference from the previously read out value.

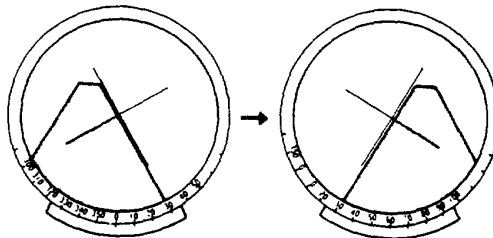


Fig. 17

Note:

- For measurement of a large angle, it will be more efficient to read out such a difference, taking the right angle of the crossed lines as the standard of 90° .
- By using the micrometer stage in this case a more rapid measurement is achieved, since it is not necessary to coincide the apex of the projected image angle with the center of the cross.
- For bringing the crossed line exactly into coincidence with the side of the projected image of angle, it is recommended that you make a narrow, parallel clearance between them.

V. CAUTION AND MAINTENANCE

The Nikon Profile Projector is a high precision instrument. Take special care in its handling to maintain the performance.

- **Dirt on the screen**

If grease, fingerprints, or dirt obscures a clear view of the screen, clean it carefully using a washed cotton cloth soaked with alcohol. Washing the screen with soap and tepid water will also give a good result, but remove the screen together with its metal frame from the instrument body beforehand.

It is recommended that you keep the screen surface covered with a film of transparent polyester at all times to protect it from dirt.

- **Projection lenses**

To avoid the decrease of magnification accuracy, and deterioration of image definition, never dismantle or roughly handle the instrument.

Dirt or scratches on the optical surfaces will cause a dark or insufficiently sharp image. Slight dust particles on the lens will not significantly affect the image quality.

- **Inside mirror**

To avoid scratching and lessening of accuracy, never touch the mirror surfaces. Unless the screen and the projection lenses are removed, there will be no problem with dust. If dirt or smears are found on the mirror surfaces, contact your nearest dealer or sales representative.

- **Dark Image**

Check the lamp bulb. If it is blackened, replace it with a new one. If the image is appreciably dark in contour illumination, further check the surface of lamp bulb, the stage glass and the filter being used. Darkness in surface illumination may be caused by dirt on the outside surfaces of the lamp bulb and of the condenser lenses.

- **Lamp doesn't light**

Check the lamp filament, the fuse and the contact of the lamp socket.

- **Oiling**

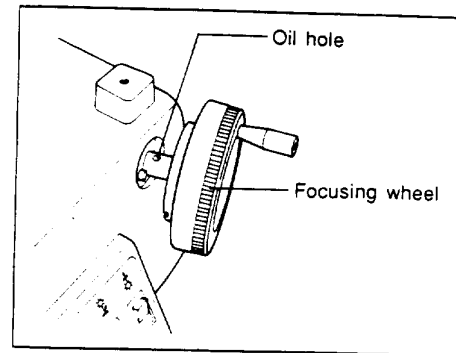


Fig. 18

Apply oil (Tona oil) to the focusing wheel bearing.
Oil once a month.

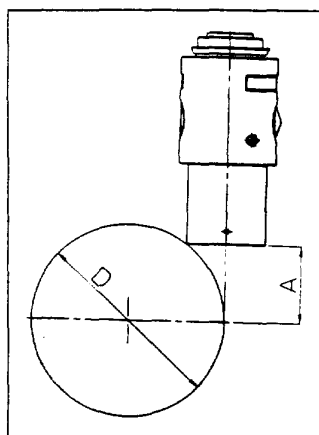
- **Any other trouble or malfunction**

For repair or troubleshooting, do not dismantle the instrument yourself. Contact your agent immediately.

VI. SPECIFICATIONS

Viewing screen — Effective diameter of screen 300mm (11.8 in.)
 With crosshair lines engraved on fine grain ground glass
 Rotation angle 360° Minimum reading 1' (by vernier scale). With
 screen fine motion knob and rotation clamp knob

Projection lenses (optional) — 5x, 10x, 20x, 25x, 50x, 100x, 200x, 500x
 All lenses are parfocal.
 Accuracy of magnification (except 500x) against Nominal magnification of each projection lens:
 Contour illumination : within $\pm 0.1\%$
 Surface illumination : within $\pm 0.15\%$



A : Working distance
 D : Maximum diameter of a
 specimen to be projected
 on the screen

Fig. 19

Magnification	Diameter of object field mm (in.)	Half-reflecting mirror	A mm	D mm
5x	60 (2.262)	Built-in	60	127
10x	30 (1.181)	Built-in	74	215
20x	15 (0.590)	Built-in	74	244
25x	12 (0.472)	Built-in	62	178
50x	6 (0.236)	Built-in	61	173
100x	3 (0.118)	Built-in	50	123
200x	1.5 (0.059)	Built-in	24	49
500x	0.6 (0.023)	Built-in	3.5	7

Turret mount ——— Three projection lenses can be attached.
Provided with three plastic dust covers.

Projector head vertical travel ——— Within a range of 75mm (2.95 in.)
(1.5mm/1 rotation of wheel)

Illumination system ———

- Contour illuminator : Telecentric system (2-step illumination flux switching over system, with a detection lens)
- Surface illuminator : Vertical surface illumination (Condensed illumination available.)
- Light source : Halogen lamp 24V-150W for both contour and surface illuminations
- Cooling fan : Built-in (x1 for each contour and surface illumination)

Power source ——— AC 100/120/220/240V $\pm$ 10%, 50/60Hz
Rating AC100/120V, ~5A, AC200/240V, ~2.5A
Power source for counter : Rating output 14V, 0.8A

Stage
(Optional)

Type	03L	03
Surface area mm (in.)	285 x 192 (11.22 x 7.56)	285 x 192 (11.22 x 7.56)
Stage glass dimensions mm (in.)	170 x 120 (6.69 x 4.72)	170 x 120 (6.69 x 4.72)
Crosswise travel range (X x Y) mm (in.)	100 x 50 (3.94 x 1.97)	100 x 50 (3.94 x 1.97) (with block gauge)
Minimum reading of micrometer mm	0.0005	0.001
Revolving angle	—	—
Grooves for fixtures	Dovetail grooves	Dovetail grooves
Loading capacity	5kg (11.02 lbs)	5kg (11.02 lbs)
Maximum height of specimen mm (in.)	0~75 (0~2.95)	0~75 (0~2.95)

Type	A4/A4-B	6VL
Surface area mm (in.)	170 dia. (6.7 in.)	350 x 232 (13.78 x 9.13)
Stage glass dimensions mm (in.)	107 dia. (4.2 in.)	200 x 120 (7.87 x 4.72)
Crosswise travel range (X x Y) mm (in.)	50 x 50 (1.97 x 1.97)	150 x 50 (5.91 x 1.97)
Minimum reading of micrometer mm	0.001	0.0005
Revolving angle	360° (without scale)	—
Grooves for fixtures	T-grooves	Dovetail grooves
Loading capacity	3kg (6.6 lbs)	5kg (11.02 lbs)
Maximum height of specimen mm (in.)	0~75 (0~2.95)	0~75 (0~2.95)

Dimensions and weight	— Refer to Fig. 20. Weight: Approx. 95kg (209.4 lbs)
Complete equipment	— Anti-glare sheet Halogen lamps (x2) Detection lens Fuse (with two spares) (100/120V 5A, 220/240V 2.5A) Power cord Vinyl cover
Optional accessories	● Auxiliary oblique halogen surface illuminator ● Dial indicator holder ● Photographic attachment - Size: 4" x 5", 8" x 10", cabinet. Permits Polaroid film photography ● Glass scale calibration set - Standard scale - Graduation range : 0~50mm 1 division : 1mm - Accuracy : $(3 + 7L/1000)\mu\text{m}$ - Glass reading scale - Graduation range : 0~300mm 1 division : 0.1mm - Accuracy : $(6 + L/50)\mu\text{m}$ - Supplied with 6x magnifier ● Glass reading scale - Graduation range: 0~200mm 1 division: 0.5mm - Accuracy: $(15 + L/20)\mu\text{m}$ ● Stand ● V-block fixture - Maximum diameter of specimen held: 25mmø - Maximum height of axis of specimen: 47mm (at 25mmø diameter) ● Tilting center fixture (for 03L, 03, A4/A4-B, 6VL) - Maximum diameter of specimen held: 70mmø - Maximum length of specimen held: 140mm - Center height: 45mm - Inclination angle: 10° (1°/division) ● Goniometer - Glass disc diameter: 107mm - Rotation angle: 360° (Reading to 2') - Surface diameter: 160mm ● Photoelectric digital micrometer model CM-6 - Measuring range: 50mm - Minimum reading of crosswise traveling: 0.001mm

- Digital printer Model CM-6P
- Projection lens
Refer to page 14.
- Stage
Refer to page 15.
- Adapter for contour illuminator
(used with following attachments)
- Booster lenses for 50x, 100x
- Booster lenses for 200x or more (condenser DIA)
- Booster lenses for 200x or more with photographic shutter
(photographic shutter C)
- Green filter (for contour illumination)
- Polarization equipment
(available with 10x to 100x lenses used.)

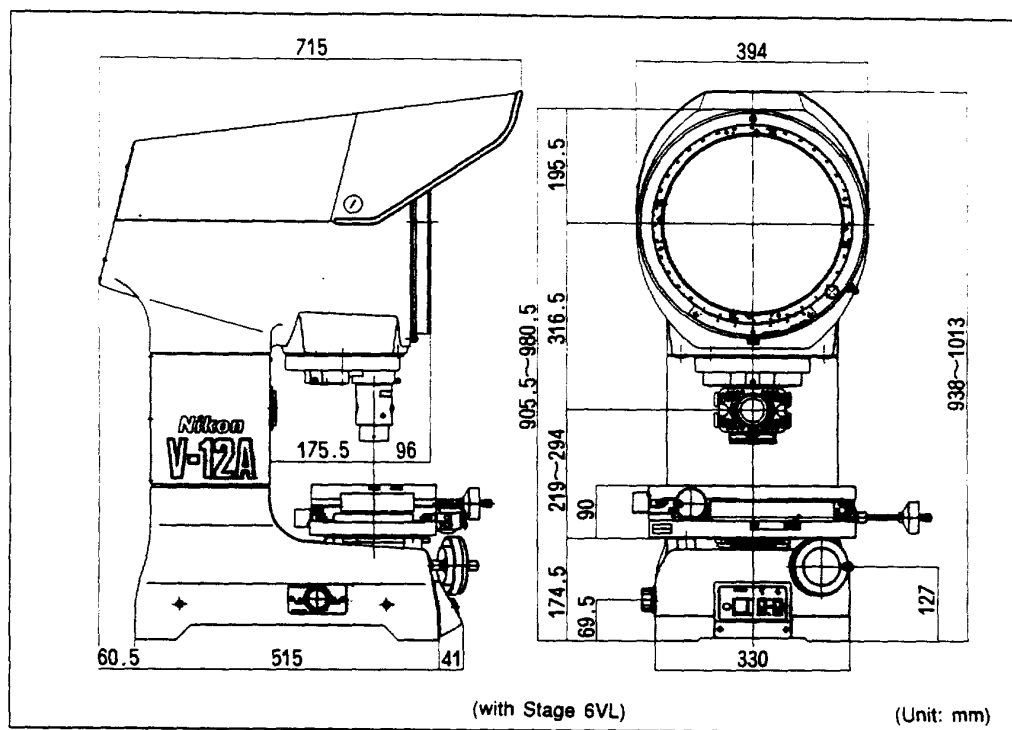


Fig. 20

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.

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