



This manual is for reference and historical purposes, all rights reserved.

This creation is copyright© by M. Butkus, NJ, U.S.A.

These creations may not be sold or distributed without the expressed permission of the producer

I have no connection with any camera company

On-line camera manual library

If you find this manual useful, how about a donation of \$2 to:

M. Butkus, 29 Lake Ave., High Bridge, NJ 08829-1701

and send your e-mail address so I can thank you.

Most other places would charge you \$7.50 for a electronic copy or

\$18.00 for a hard to read Xerox copy.

This will allow me to continue this site, buy new manuals and pay their shipping costs.

It'll make you feel better, won't it?

If you use Pay Pal, go to my web site

www.orphancameras.com and choose the secure PayPal donation icon.

Nikon

BELLOWS FOCUSING ATTACHMENT PB-4



INSTRUCTIONS

CONTENTS

| | |
|---------------------------------|----|
| Features..... | 1 |
| 1. Specifications | 1 |
| 2. Nomenclature | 2 |
| 3. Manipulation | 3 |
| 4. Taking Picture | 4 |
| 5. Reproduction Ratio | 8 |
| 6. Exposure Determination | 12 |
| 7. Accessories | 13 |



Photo 1

Nikon Bellows Focusing

Attachment PB-4

Features

- The sliding support equipped at the bottom permits moving the bellows as a whole for convenience in finer focusing.
- The camera can be attached to or detached from the bellows, or turned vertically or horizontally at any position on the rail.
- The provision for lateral shift and swing of the lens enables increasing depth of field and correction of converged lines in the picture.
- The bellows facilitates slide copying using the Slide-copying Adapter Model PS-4 or PS-5.
- The bellows, provided with holes in the bottom of its tripod head, can be firmly attached to the Repro-copy Outfit Model PF with its pins.

1. Specifications

| | |
|---|--|
| Camera to be used: | Nikon F, Nikon F Photomic, Photomic-T, TN, FTN Nikkormat FT, FTN and FS |
| Lens to be used: | NIKKOR lenses 24mm f/2.8 through 300mm f/4.5, and Zoom NIKKOR Auto 43-86mm f/3.5 |
| Extension: | 43mm—185mm |
| Reproduction ratios: | With 50mm f/2 normal lens (The focusing ring of the lens is set at ∞ in both cases) 1/1.2 \times —3.6 \times (attached in normal position) 1/1.6 \times —4.4 \times (attached in reverse position) |
| Moving range of sliding support: | 152mm |
| Shift: | lateral 10mm (only the lens carrier) |
| Swing: | lateral 25° (only the lens carrier) |
| Dimensions: | 109 \times 160 \times 211mm (W) (H) (L) |
| Weight: | 1.25 kg |

2. Nomenclature

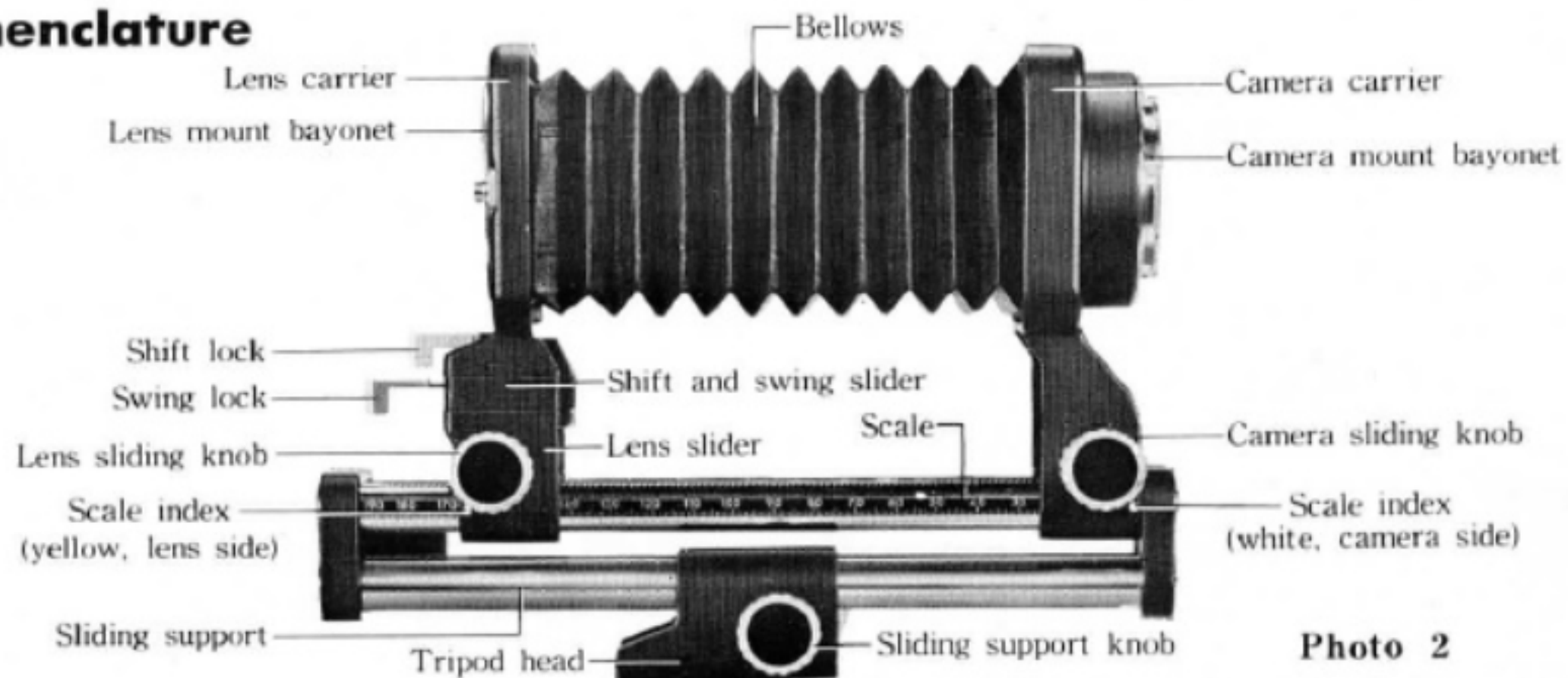


Photo 2

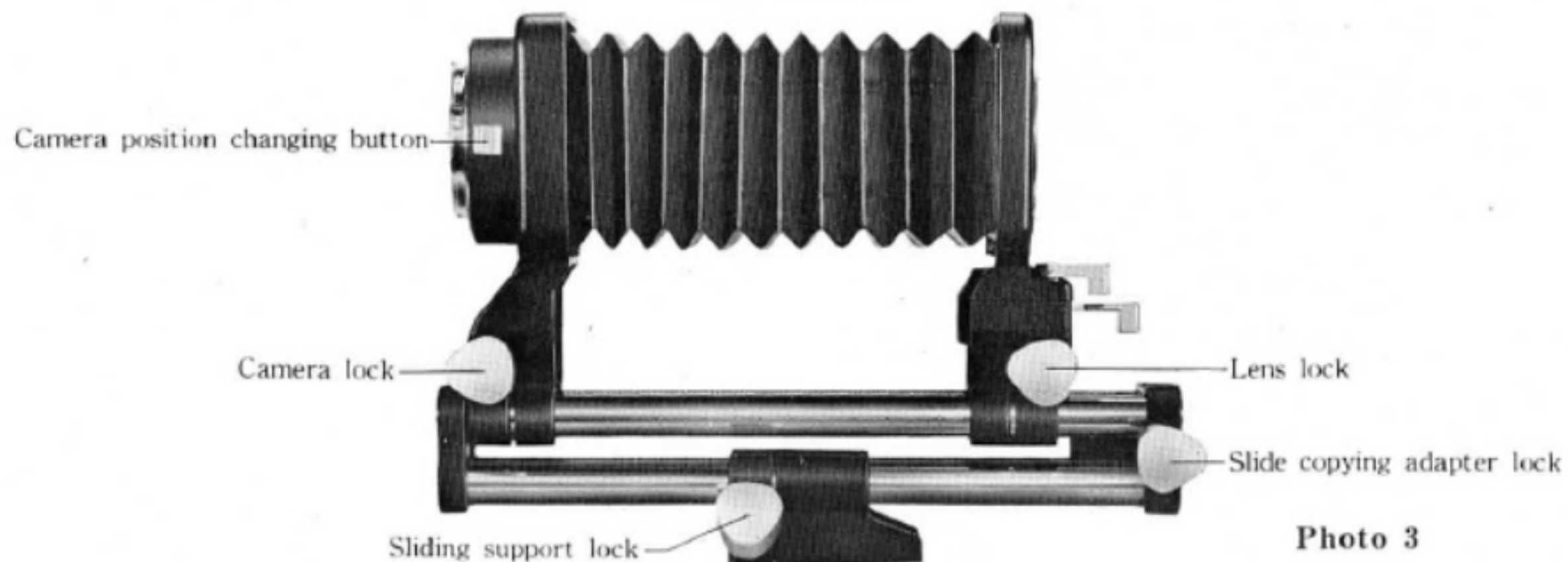


Photo 3

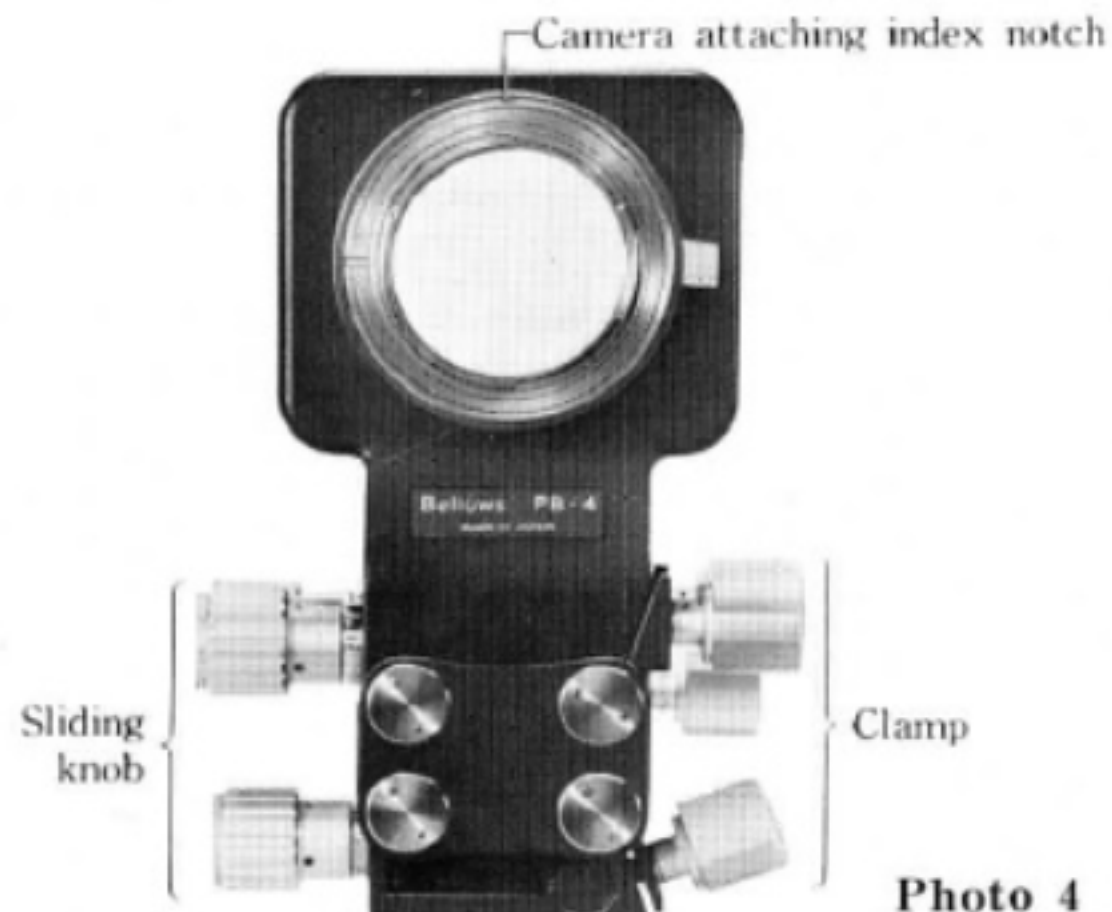


Photo 4

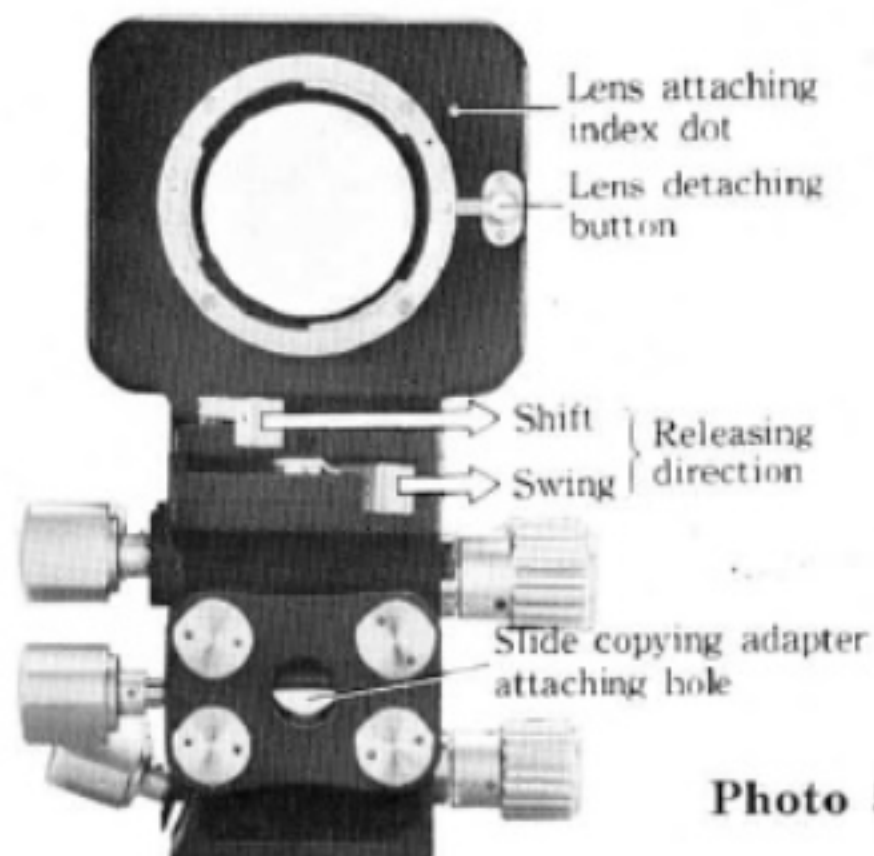


Photo 5

3. Manipulation

- To attach the lens onto the front lens slider of the bellows by bayonet fashion, line up the dot on the lens with the white dot on the carrier and turn the lens counterclockwise. To detach the lens from the slider, pushing the button toward the bellows, turn the lens clockwise.
- To attach the camera onto the rear camera slider bayonet, line up the dot on the camera with the **red** index line on the slider and turn the camera counterclockwise. To detach the camera, turn the camera clockwise while depressing the lens lock release button on the camera.
The camera is to be attached and detached in the vertical position unless the slider is located at the rear end of the rails. To turn the camera 90°, pull the button toward the bellows. (**Photo 6**)
- The lens, camera and sliding support are moved by means of the respective knobs, all located on the left side of the bellows, viewed from the camera. They will be fixed in position by fastening the right side knobs respectively. (**Photo 4**)
- To swing the lens laterally release the front bottom lever. For shifting the lens with the lens slider laterally, release the front top lever. (**Photo 5**)



Photo 6

4. Taking Picture

● Choosing of the Lens

The reproduction ratios which will be obtained by the use of NIKKOR lenses are given on **Table 1.** (P. 6) However, since each lens has its peculiar characters and features, it is recommended to choose the most suitable one depending upon your picture taking purpose, subject distance, illuminating conditions, etc., referring to the remarks given in the Table.

In general, for the same reproduction ratio, telephoto lenses afford a longer subject distance than wide-angle lenses.



Photo 7

● Normal and Reverse Position of Lens

At a magnification higher than $1\times$, the picture quality is improved, when the position of the lens is reversed, for which, however, the insertion of BR2 Ring is necessary. (**Photo 7**)

As the Table indicates, with a wide-angle or standard lens used on the bellows for close-ups, a higher magnification will be obtained when the lens is attached in reverse position than in normal position. In using telephoto lenses, however, the magnification will be lower when the lens is attached in reverse position.

● Focusing

The bellows inserted between the lens and the camera prevents the use of the automatic aperture diaphragm. In performing focusing, therefore, it will be necessary to fully open the lens aperture diaphragm by turning the aperture ring to make the image in the viewfinder bright and clear, and then to stop it down to the desired f-number manually.

Focusing is performed by expanding or contracting the bellows by means of the lens and camera sliding knobs. For fine focusing, turn the sliding support knob. This sliding support allows the camera-and-lens unit to move as a single unit without changing lens-to-film distance.

The central portion of the focusing screens type A, J and the Nikkormat's is blacked out when

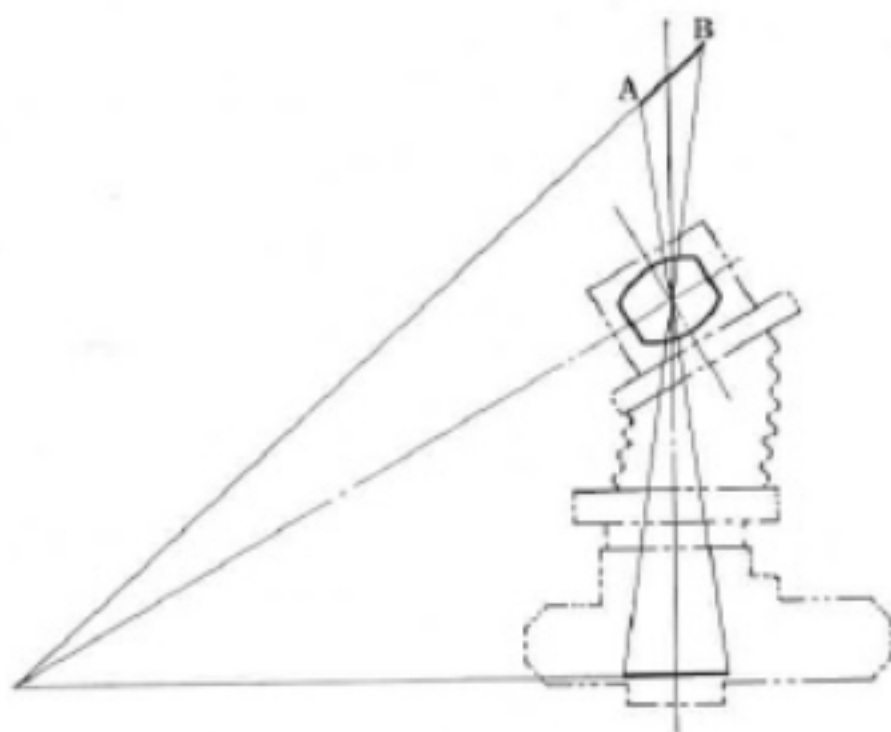


Fig. 1

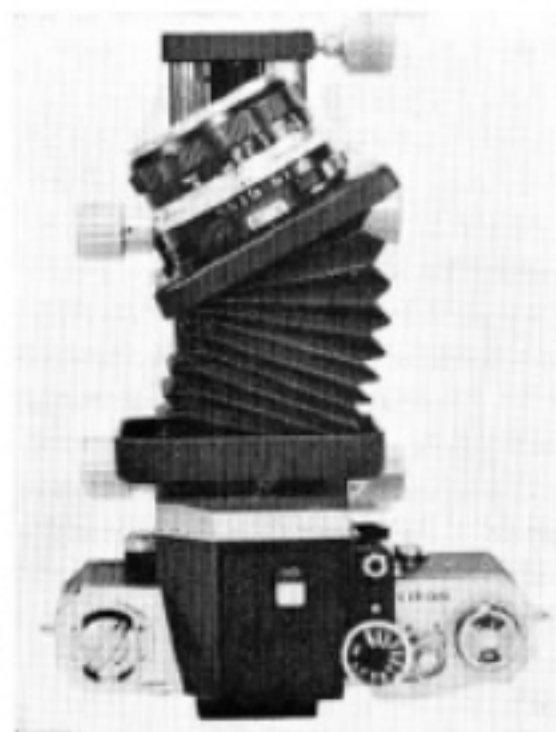


Photo 8

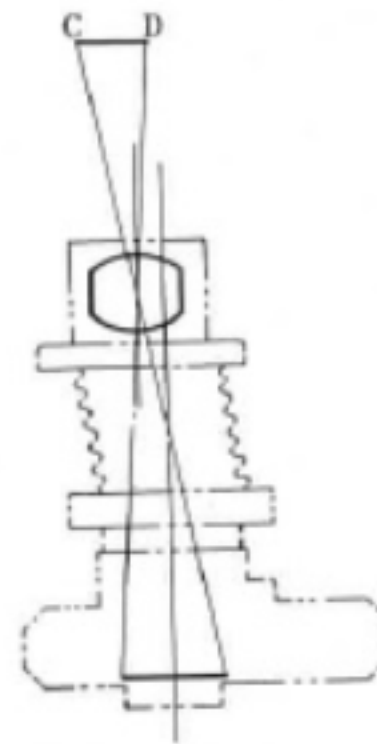


Fig. 2



Photo 9

focusing with the bellows in place. Use the matte Fresnel surrounding the central portion of the above screens.

Vignetting may take place in the upper part of the finder viewfield, but it will give no influence on the picture registered on the film.

● Shift and Swing

The focused planes will be changed by shifting or swinging the lens (**Photo 8**) as shown by the straight line AB in **Fig. 1**, giving the same effect as increasing the depth of field without adjusting the camera angle. By shifting the lens (**Photo 9**) the coverage will be changed as shown by the straight line CD in **Fig. 2**. This provides great convenience in slide copying.

● Aperture

The optimum f-number to be used for each lens is shown in **Table 1**. On the other hand, the f-number is also to be determined depending upon the desired depth of field.

● Caution

Avoid camera jar as far as possible because of resulting in more blurred pictures in close-ups and macrophotography. Use a rugged tripod and a cable release. (**Photo 10**)



Photo 10

Table 1-(1) Reproduction Ratio Range

Figures on both ends of each line indicate "working distance" from the subject plane focused to the front edge of the lens barrel in cm.

| Lens | | Reproduction Ratio Range | | | | | | | | | | | | Remarks |
|------------|---------------------------------|--------------------------|-----|-----|----|-----|----|-----|-----|-----|----|-----|-----------|---|
| Type | Position | 11× | 10× | 9× | 8× | 7× | 6× | 5× | 4× | 3× | 2× | 1× | 1/2× 1/∞× | |
| Wide-angle | NIKKOR Auto 24mm f/2.8 | Reverse | 3.7 | | | | | | 4.0 | | | | | Image is at its best at f/8 and degenerates as lens is stopped down further. |
| | NIKKOR Auto 28mm f/3.5 | Normal | | | | | | | | 0 | | 0.9 | | The more the lens is stopped down, the better the image is. Unsuitable for copying. |
| | | Reverse | | 3.8 | | | | | 4.2 | | | | | Image is at its best at f/8 and degenerates as lens is stopped down further. |
| | NIKKOR Auto 35mm f/2 | Normal | | | | | | | 0 | | | 2.2 | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | 4.2 | | | | 4.9 | | | | Image is at its best at f/8 and degenerates as lens is stopped down further. |
| | NIKKOR Auto 35mm f/2.8 | Normal | | | | | | 0 | | | | 2.3 | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | 4.0 | | | | 4.7 | | | | Image is at its best at f/8 and degenerates as lens is stopped down further. |
| | PC-NIKKOR 35mm f/2.8 | Normal | | | | | | 0.2 | | | | 2.5 | | The corner-image degenerates at low magnification. Unsuitable for copying. |
| | | Reverse | | | | 4.8 | | | | 5.5 | | | | Image is best at f/8 and degenerates as lens is stopped down further. |
| Standard | GN Auto NIKKOR 45mm f/2.8 | Normal | | | | | | | 3.9 | | | 7.7 | | Image is best at f/8-f/11 and degenerates as lens is stopped down further than f/11. |
| | | Reverse | | | | | | 4.6 | | | | 6.8 | | Image is best at f/8 and degenerates as lens is stopped down further. |
| | NIKKOR Auto 50mm f/1.4 | Normal | | | | | | | 1.0 | | | 5.7 | | The more the lens is stopped down, the better the image is. Unsuitable for copying. |
| | | Reverse | | | | | | 5.0 | | | | 6.5 | | The corner-image somewhat degenerates at low magnifications. |
| | NIKKOR Auto 50mm f/2 | Normal | | | | | | | 2.5 | | | 7.2 | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | | | 4.8 | | | | 6.8 | | At high magnifications, the corner-image somewhat degenerates when the lens is stopped down further than f/8. |

Table 1-(2)

| Lens | | Reproduction Ratio Range | | | | | | | | | | | | | Remarks |
|-----------|------------------------------------|--------------------------|----|----|----|-----|-----|-----|------|------|------|------|------|------|--|
| Type | Position | 7× | 6× | 5× | 4× | 3× | 2× | 1× | 1/2× | 1/3× | 1/4× | 1/5× | 1/6× | 1/∞× | |
| Standard | NIKKOR Auto 55mm f/1.2 | Normal | | | | 1.4 | | | 6.9 | | | | | | Suited for general close-up photography but not for copying. It is advisable to stop down the lens as far as possible to secure better image at the picture corners. |
| | | Reverse | | | | 5.1 | | | 7.0 | | | | | | The corner-image degenerates at low magnifications. |
| | Micro-NIKKOR Auto 55mm f/3.5 | Normal | | | | 1.8 | | | 7.2 | | | | | | Image is at its best at f/8 and degenerates as the lens is stopped down further. |
| | | Reverse | | | | 5.5 | | | 7.5 | | | | | | |
| Telephoto | NIKKOR Auto 85mm f/1.8 | Normal | | | | | 9.0 | | 22 | | | | | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | | 7.8 | | 21 | | | | | | The corner-image degenerates at low magnifications. |
| | NIKKOR Auto 105mm f/2.5 | Normal | | | | | 16 | | 36 | | | | | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | | 13 | | | | | | | | Image is good at high magnifications but the corner-image degenerates at infinity. |
| | NIKKOR Auto 135mm f/2.8 | Normal | | | | | 22 | | 55 | | | | | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | | | 23 | | | | | | | Image is good at high magnifications but the corner-image degenerates at infinity. |
| | NIKKOR Auto 135mm f/3.5 | Normal | | | | | 24 | | 57 | | | | | | The more the lens is stopped down, the better the image is. |
| | | Reverse | | | | | | 26 | | | | | | | Image is good at high magnifications but the corner-image degenerates at infinity. |
| | NIKKOR for Bellows 105mm f/4 | Normal | | | | | 15 | | | | | | | | The more the lens is stopped down, the better the image is. |
| | NIKKOR Auto 200mm f/4 | Normal | | | | | 54 | | 127 | | | | | | The more the lens is stopped down, the better the image is. |
| | NIKKOR Auto 300mm f/4.5 | Normal | | | | | | 103 | | | | | 264 | | The more the lens is stopped down, the better the image is. |

(Note : Lens being set at ∞)

5. Reproduction Ratio

To determine the reproduction ratio, the following methods will be used:

● Reading the Scale on the Bellows Rails

Read out the scales on the rail using the indices, yellow and white, on the lens and camera slider, respectively. The difference between the read-

out results will give the reproduction ratio, using **Table 2** according to the type of lens. For example, as shown in **Photo 11**, the yellow side is read as 140, the white side as 44. Then, $140 - 44 = 96$. Therefore, the ratio obtained when NIKKOR 50mm f/2 is used in reversed position will be about $2.5\times$.

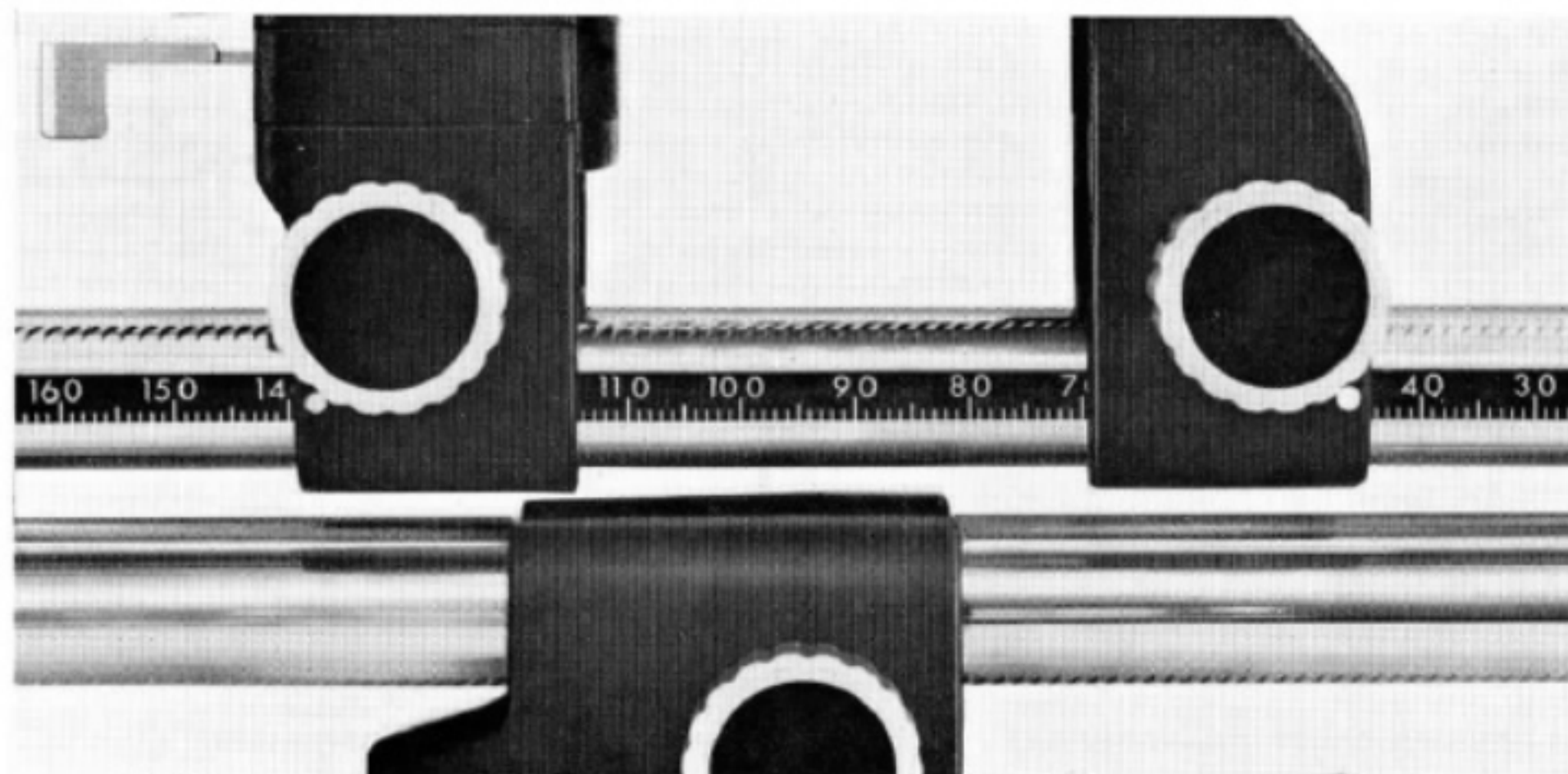


Table 11

● Reading a Scale in the Camera Viewfinder

Bring the left end (zero point) of the image of a scale (**Fig. 3**) up to the left edge of the finder viewfield and read out the full length just visible along the lengthwise side of the viewfield in mm. The reproduction ratio will be found by dividing 36 by the reading.

That is:

$$\text{Reproduction Ratio} = \frac{36\text{mm}}{\text{Reading of scale}}$$

Use of the table below will also enable finding the reproduction ratio from the scale reading. (This measurement is applied to any focal length of lens.)

● Caution

In the Nikkormat camera, however, owing to its smaller viewfield size, the reproduction ratio thus obtained should be reduced to a value multiplied by 0.9.

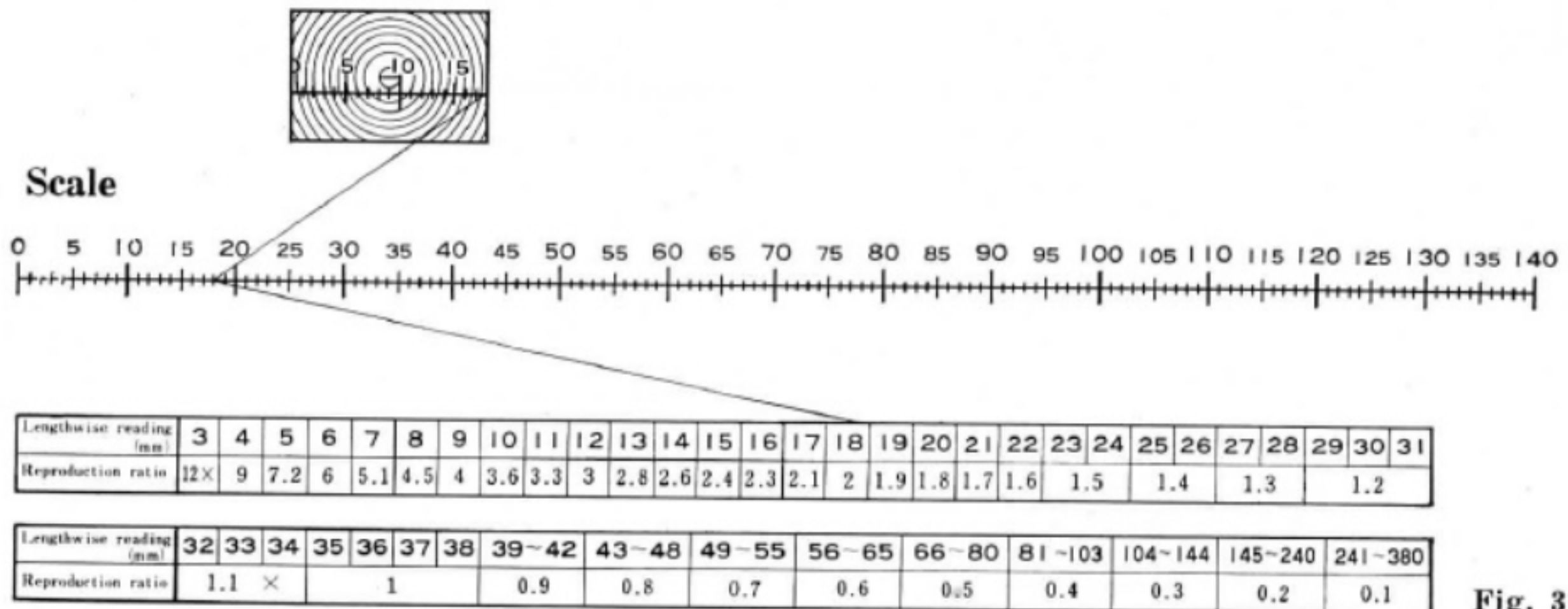


Fig. 3

Figures in the parentheses indicate "working distance" from the subject plane focused to the front edge of the lens barrel in cm.
For the lenses marked * they will be approximate distances.

Table 2-(1) Reproduction Ratios

| Lens | | Read-out Values on Scale | | | | | | | | | | | | | | | | |
|----------------------------------|----------|--------------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|---------|-----------|---------|-----|-----|----------|--|--|
| Type | Position | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | | |
| NIKKOR Auto 24 mm f/2.8 | Reverse | 4.5×(4) | 5×(3.9) | | 6×(3.8) | | | 7×(3.8) | | 8×(3.7) | | | 9×(3.7) | | | 10×(3.7) | | |
| NIKKOR Auto 28 mm f/3.5 | Normal | 1.5×(0.9) | 2×(0.4) | 2.5×(0.1) | 2.9×(0) | | | | | | | | | | | | | |
| | Reverse | 3.6×(4.2) | 4×(4.2) | 4.5×(4.1) | 5×(4) | 5.5×(4) | 6×(3.9) | 6.5×(3.9) | 7×(3.9) | 7.5×(3.8) | 8×(3.8) | 8.5×(3.8) | | | | | | |
| NIKKOR Auto 35 mm f/2 | Normal | 1.2×(2.2) | 1.5×(1.6) | 2×(1) | 2.5×(0.6) | 3×(0.4) | 3.5×(0.2) | 4×(0.1) | 4.5×(0) | | | | | | | | | |
| NIKKOR Auto 35 mm f/2.8 | Reverse | 3×(4.9) | 3.5×(4.7) | 4×(4.6) | 4.5×(4.5) | 5×(4.4) | 5.5×(4.4) | 6×(4.3) | 6.5×(4.3) | | | | | | | | | |
| PC-NIKKOR 35 mm f/2.8 | | | | | | | | | | | | | | | | | | |
| GN Auto NIKKOR 45 mm f/2.8 | Normal | 1×(7.4) | | 1.5×(5.9) | | 2×(5.1) | | 2.5×(4.6) | | 3×(4.3) | | 3.5×(4.1) | | | | | | |
| | Reverse | 1.5×(6.7) | | 2×(5.9) | | 2.5×(5.4) | | 3×(5.1) | | 3.5×(4.9) | | 4×(4.7) | | | | | | |
| NIKKOR Auto 50 mm f/1.4 | Normal | 1×(4.6) | | 1.5×(2.9) | | 2×(2) | | 2.5×(1.5) | | 3×(1.2) | | 3.5×(0.9) | | | | | | |
| | Reverse | 2×(6.3) | | 2.5×(5.8) | | 3×(5.4) | | 3.5×(5.2) | | 4×(5) | | 4.5×(4.8) | | | | | | |
| NIKKOR Auto 50 mm f/2 | Normal | 1×(6.4) | | 1.5×(4.7) | | 2×(3.8) | | 2.5×(3.3) | | 3×(3) | | 3.5×(2.7) | | | | | | |
| | Reverse | 1.6×(6.9) | 2×(6.3) | | 2.5×(5.8) | | 3×(5.4) | | 3.5×(5.2) | | 4×(5.1) | 4.3×(4.9) | | | | | | |

Table 2-(2)

| Lens | | Read-out Values on Scale | | | | | | | | | | | | | | | |
|------------------------------------|----------|--------------------------|-----------|----------|----------|-----------|----------|----------|-----------|----------|----------|-----------|----------|-----------|----------|-----------|--|
| Type | Position | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 | 170 | 180 | 190 | |
| NIKOR Auto 55mm f/1.2 | Normal | | 1×(5.1) | | | 1.5×(3.2) | | | 2×(2.3) | | | 2.5×(1.8) | | | 3×(1.4) | 3.3×(1.2) | |
| | Reverse | | 2×(6.4) | | | 2.5×(5.8) | | | 3×(5.5) | | | 3.5×(5.3) | | | 4×(5) | | |
| NIKOR Auto 85mm f/1.8 | Normal | 0.6×(18) | | 0.8×(16) | | 1×(14) | | 1.2×(12) | | 1.4×(11) | | 1.6×(10) | | 1.8×(9.8) | | 2×(9.3) | |
| | Reverse | 0.6×(16) | | 0.8×(14) | | 1×(12) | | 1.2×(11) | | 1.4×(10) | | 1.6×(9.2) | | 1.8×(8.6) | | 2×(8.1) | |
| NIKOR Auto 105mm f/2.5 | Normal | 0.4×(36) | | 0.6×(28) | | 0.8×(24) | | 1×(21) | | 1.2×(19) | | 1.4×(18) | | | 1.6×(17) | | |
| | Reverse | ∞ | | | 0.2×(57) | | 0.4×(31) | | 0.6×(22) | | 0.8×(18) | | 1×(15) | | | 1.2×(14) | |
| NIKOR Auto 135mm f/2.8 | Normal | 0.4×(46) | | | 0.6×(35) | | | 0.8×(29) | | | 1×(26) | | | 1.2×(24) | | 1.3×(23) | |
| | Reverse | | | ∞ | | | 0.2×(74) | | | 0.4×(41) | | 0.6×(29) | | | | 0.8×(24) | |
| NIKOR for Bellows 105 mm f/4 | Normal | ∞ | | 0.2×(60) | | 0.4×(33) | | 0.6×(25) | | 0.8×(20) | | | 1×(18) | | 1.2×(16) | 1.3×(15) | |
| NIKOR Auto 200mm f/4 | Normal | | 0.3×(101) | | 0.4×(84) | | 0.5×(74) | | 0.6×(68) | | 0.7×(63) | | 0.8×(60) | | | 0.9×(57) | |
| NIKOR Auto 300mm f/4.5 | Normal | 0.15×(254) | 0.2×(204) | | | 0.3×(154) | | | 0.4×(129) | | | 0.5×(114) | | | | 0.6×(104) | |

6. Exposure Determination

● When using Nikon F Photomic T, T_N, FT_N, or Nikkormat FT, FT_N

In this case, since the meter incorporated in these finders measures the light actually passing through the taking lens, it is not necessary to consider the exposure factor such as depending upon the magnification increase caused by inserting the bellows, extension ring, etc. In the same way, no adjustment is required even when any filter is used.

However, the bellows being inserted between the lens and the camera, the operation of the coupling prong and of the automatic aperture diaphragm on the lens cannot be utilized. Therefore, determine the exposure with the lens manually stopped down to the taking aperture—the stop-down method.

Caution

1. Exposure measurement should be made after the lens has been focused.
2. As any strong light coming into the eyepiece of the finder may be responsible for an error in measurement, the use of the rubber eyecup, in looking into the finder, is recommended. When measurement is made by the pointer needle in the outside window on the camera, it is advisable to cover the eyepiece with hand.

● When using Nikon F Photomic, Nikon Exposure Meter or Other Individual Meters

Here, according to the magnification, the exposure factor must be considered which is given by the following formula:

$$\text{Exposure factor} = (1 + \text{Repro. ratio})^2$$

In using the Micro-NIKKOR Auto 55mm f/3.5 or Bellows-NIKKOR 105mm f/4, the above formula can be applied directly.

When the lens is of retrofocus or telephoto type, however, such as encountered in most of wide-angle or longfocus lenses, respectively, an optical coefficient (ϕ)—the ratio of the diameter of entrance to that of exit pupil—is to be taken into account for the exposure factor, as below:

$$\text{Exposure factor} = \left(1 + \frac{\text{Repro. ratio}}{\phi} \right)^2$$

when the lens is used in normal position

$$\text{Exposure factor} = \frac{1}{\phi^2} (1 + \phi \times \text{Repro. ratio})^2$$

when the lens is used in reverse position

The accompanied graphs will be useful for finding the exposure factor and corresponding aperture increase or decrease (–) according to the reproduction ratio for such type lenses.

7. Accessories for Close-ups and Reproduction Works

● Slid Copying Adapter PS-4 and PS-5 (Photo 12 and 13)

For convenient copying of your color slides and black-and-white transparencies, use the Slide Copying Adapter PS-4 or PS-5.

● Repro-copy Outfit Model PF

A convenient and versatile outfit to be used with the camera for copying flat objects such as manuscripts, maps, reference materials and pictures or for photographing small objects and specimens.

● E₂ Ring and K Ring Set (Photo 14 and 15)

Enable elongation of the lens-to-film distance more than the maximum length of the bellows. E₂ Ring with its aperture opening button permits convenient focusing.



Photo 12



Photo 13

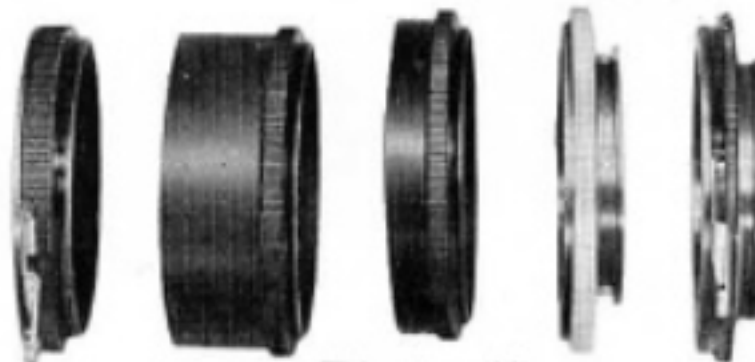


Photo 15



Photo 14



Photo 16



Photo 17

● Waist-level and Angle Finder

Waist-level finder is extremely convenient in low- or high-level shots. The built-in magnifier makes for pinpoint focusing. The Nikkormat camera accepts Angle finder instead.

● Focusing Screens (Photo 16)

In close-ups the split-image portion of the type A screen will be darkened. It is recommended to use the type B (matte) or E (checker) focusing screen.

● Cable Release (Photo 17)

Necessary for preventing camera jar



NIPPON KOGAKU K. K.

Nishikawa Bldg., 1-7, Nihonbashi-dori, Chuo-ku, Tokyo, 103 Japan

NIPPON KOGAKU (U.S.A.) INC.

623 Stewart Avenue, Garden City, N.Y. 11530, U.S.A.

NIKON EUROPE N. V.

Entrepotgebouw Schiphol-Centrum, Amsterdam, The Netherlands

NIKON A. G.

Kirchenweg 5, 8008 Zurich, Switzerland