CONTENT

Volume 2

Lenses for Photography and Lenses for Enlarging please refer to Volume 1

CINE-ZOOM-NIKKOR 1:2.2 f = 17 ~ 70mm / CINE-ZOOM-NIKKOR 1:2.2 f = 17 ~ 70mm with Reflex Finder

Lens design	xx lens elements in x groups	**Angle of view**	40° - 12°30‘
Aperture scale	f / 2.2 to f / 22	**Minimum range**	4.5 feet (1.4m)
Diameter x length	Diameter 54mm x 105mm length	**Weight**	430 g
Filter mount / Lens hood	Filter mount 52mm		

Type 1 Black barrel. Within front ring engraved „CINE-ZOOM-NIKKOR“, „1:2.2“, „f = 17 ~ 70mm“, „Nippon Kogaku Japan“ and serial number „No.“. Broad milled distance ring „m“ upon „feet“ scale in counter-clockwise direction. Small casting portion with white index line. Zoom scale and milled ring for zoom with 3 holes to attach a zoom stick. Partly milled chrome-plated aperture ring and on small casting portion, red index dot. Smaller black casting portion with chrome-plated rear portion and C-mount connection.
Manufactured from 1963 to about 1970.
‹ # 181015 › # 181565

Type 1 Arri As Type 1, but with an Arriflex mount and different serial number batch.
Manufactured from 1963 to about 1970.
‹ # 181511 › # not known

Type 1 RF As Type 1, but with fixed reflex finder. Main portion of this lens is identical to type 1, but beneath aperture ring, broader casting portion with white dot as index. Broad milled chrome-plated ring to unscrew reflex finder. Two black step rings, one with C-mount connection. On side of the second step ring, black (crinkle) portion with a thicker ring and a chrome-plated knob to fix the rotating of the finder. On front of the 90° fixed tube, anodized „CINE ZOOM NIKKOR“. Long black (crinkle) tube with milled portion to turn the finder screen from landscape to portrait position. On rear, eyepiece with milled ring to close the eyepiece.
Manufactured from about 1963 to about 1965.
The only known serial number: # 181261

ZOOM-NIKKOR 1:2.5 f = 17 ~ 85mm

Lens design	15 lens elements in 10 groups	**Angle of view**	40°40‘ - 8°30‘
Aperture scale	f / 2.5 to f / 22	**Minimum range**	5 feet (1.5m)
Diameter x length	Diameter 58mm x 115mm length	**Weight**	450 g
Filter mount / Lens hood	Filter mount 52mm		

Type 1 Black casting. On side of front ring engraved „ZOOM-NIKKOR“, „1:2.5“, „f = 17 ~ 85mm“, „Nippon Kogaku Japan“ and serial number „No.“. Small milled distance ring „m“ upon „feet“ scale in counter-clockwise direction and engraved „LENS MADE IN JAPAN“. Small casing portion with white index line. Small milled ring for zoom with 3 holes to attach a zoom stick, zoom scale. Chrome -plated and milled black aperture ring. Smaller but long black casting black / chrome-plated portion and C-mount connection.
Manufactured from 1966 to about 1971.
‹ # 351069 › # (not known)
‹ # 850122 › # (not known)

Cine-NIKKOR 20 ~ 80mm 1:2.5

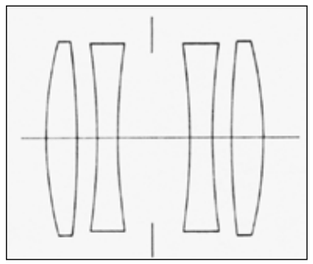
Lens design	not known	**Angle of view**	not known
Aperture scale	f / 2.5 to f / 22	**Minimum range**	4.5 feet (1.4m)
Diameter x length	Diameter 56mm x 110mm length	**Weight**	445 g
Filter mount / Lens hood	Filter mount 52mm		

Type 1 Black barrel. Within front ring engraved „CINE-ZOOM-NIKKOR“, „1:2.5“, „f = 20 ~ 80mm“, 77„Nippon Kogaku Japan“ and serial number „No.“. Broad milled distance ring „m“ upon „feet“ scale in counter-clockwise direction. Small casting portion with white index line. Zoom scale and milled ring for zoom with 3 holes to attach a zoom stick. Partly milled chrome-plated aperture ring and on small casting portion, red index dot. Smaller black casting portion with chrome-plated rear portion and C-mount connection.
Manufactured from in about 1965
‹ # 425294 › # (not known)

Arriflex 16 ST camera with 120m cassette and Cine-NIKKOR 6.5mm f/1.8.


APO-NIKKOR OBJEKTIVE

Apo-NIKKOR brochure in English language from 1968 only with symmetrical lenses.



Lens section of a symmetrical Apo-NIKKOR lens.

An 1965 brochure states as follwing: „Each APO-NIKKOR of symmetrical type, consisting of a symmetrically arranged optical system comprising 4 groups and 4 elements of lenses, has the following features:

1. The lenses will give a wide effective picture angle (about 46 °) for their long focal length. Therefore, the image area being assumed the same, a camera of shorter length can be used.

2. Since the lens system is symmetrical in respect to the iris diaphragm, the optical performance remains the same, regardless of the direction in which the lens is used. No need to reverse the lens for magnification. This greatly facilitates the use of the lenses mounted on the camera with automatic focusing device.

3. The lenses are also suitable for work, where no distortion is permissible at a reproduction ratio close to full size. On the other hand, since the lenses give an excellent image, for a wide picture angle at infinite distance as well as in enlarging work, they can also be utilized for a large size camera or on an enlarger.

In an 1967 publication I found the following information: „Special lenses are needed in photoengraving work because of the corrections required for the relatively close subject distance ranging around reproduction ratios of unity.

The Apo-NIKKOR lenses are of symmetrical design comprimising four elements arranged in four groups and for their focal lengths give a wide effective picture angle of about 46°. Theses lenses may also be used for general work with view cameras and on an enlarger.

The brochure from the year 1969 stated very detailed the following: „Apo-NIKKOR lenses are designed especially for use in photoengraving work. Apo-NIKKOR lenses are apochromatic lenses in which chromatic aberrations are strictly corrected. This means that there is no displacement of image plane and no difference in image size in color separation process. In addition, these lenses incorporate other numerous design features to meet the

Apo-NIKKOR 180mm f/9 lenses, left, Type 1 and right, Type 3, both with hinged caps.

Three Type 1 Apo-NIKKOR lenses 240mm f/9.

special needs of photoengraving. Together with the wide range of focal lengths available, the Apo-NIKKOR lenses are the most suitable for photoengraving work.

1. The Apo-NIKKOR corrects chromatic aberration for three colors, red, green and blue, thus covering at least the whole range of visible light, unlike the ordinary achromatic lens where the correction is accomplished for only two colors, red and blue. Also, the image size difference according to colors is negligibly small. Therefore, in color separation work, where photographs of more than three colors are taken with color filters, the same size of image can be attained on each plate with perfect coincidence of the images.

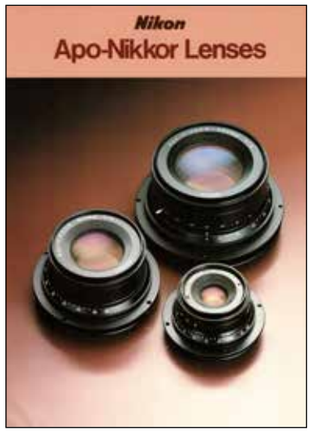
2. Apo-NIKKOR lenses have sufficiently high resolving power to distinctly reproduce complicated type faces, such as Chinese characters, for instance (Photomechanical technique).

3. In photoengraving work, the subject is usually taken at close distance, corresponding to a reproduction ratio of about 1:1. The Apo-NIKKOR are corrected for the highest performance at the reproduction ratio of 1: 1, which is adopted as the standard magnification.

4. Apo-NIKKOR lenses ensure uniform quality throughout the entire image area, resulting in faithful reproduction of the original.

5. Because the photographic plate differs from the human eye in sensitivity to colors, the chromatic aberrations of all Apo-NIKKOR lenses have been

Two different Apo-NIKKOR 360mm f/9 lenses, left, Type 3 and right, Type 1 lens with built-in variable waterhouse stops.



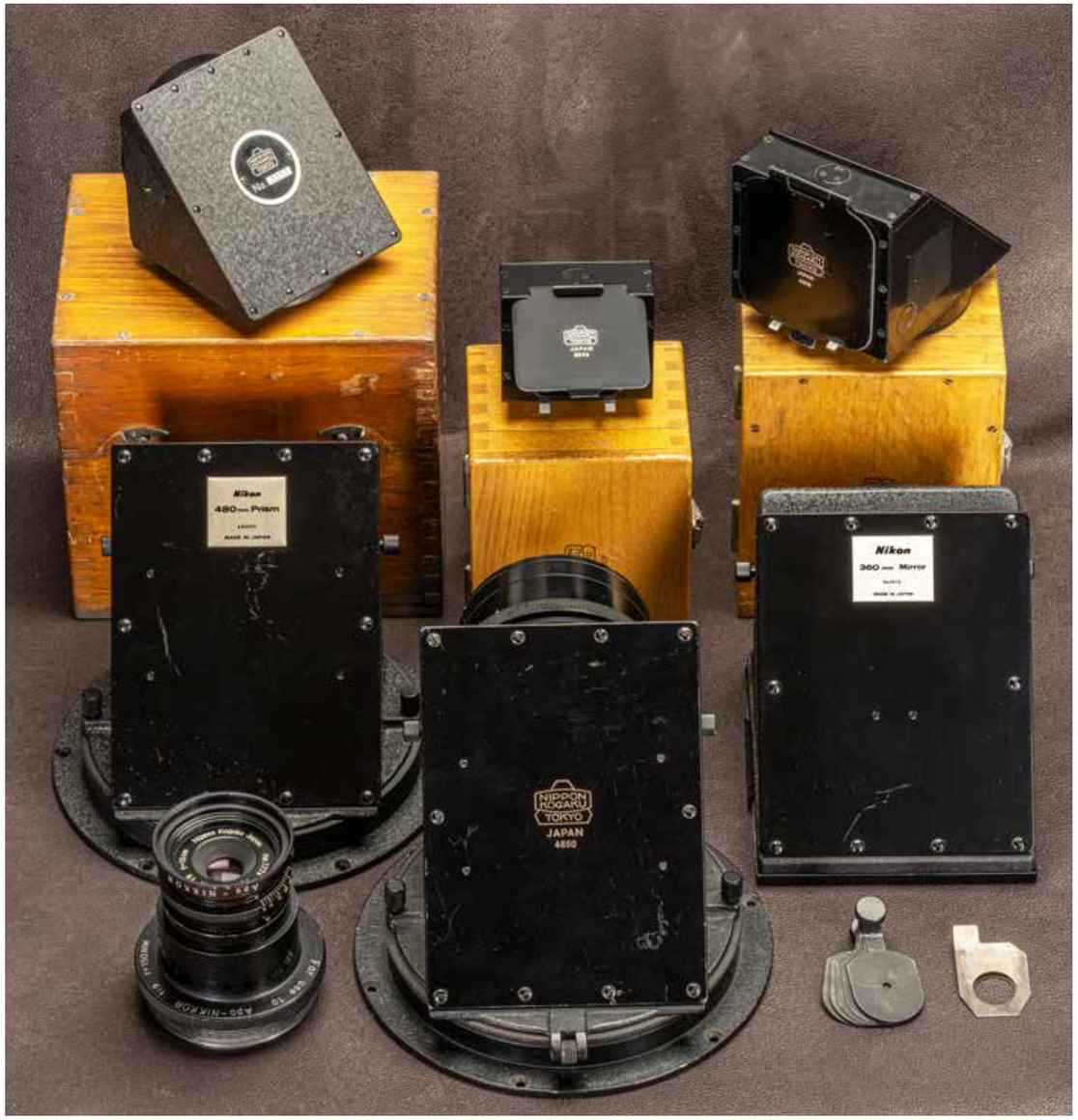
Apo-NIKKOR brochure in English language from February 1986.

Apo-NIKKOR 305mm f/9, Type 3.

W.A. Apo-NIKKOR Type 2 lenses, 150mm f/8 (left) and 210mm f/8 (right).

W.A. Apo-NIKKOR Type 2 lenses, 300mm f/9 (left) and 360mm f/9 (right).

Reproduction
Accessories for Apo-NIKKOR Lenses



Accessories for Apo-NIKKOR lenses: Prisms, roof prisms, mirror, Apo-NIKKOR lens with lens hood, waterhouse stop blades and filter holder.

be used at f/7. Since this lens probably came on the market only in 1968, it must have been made for a special application, i.e. for a very specific copy machine. Furthermore, this lens has a much smaller angle of view, with 56° 30‘. It also lacks the built-in shutter.

Fax-NIKKOR 300mm f/ 7

The 300mm f/7 also has an angle of view of only 52° and is also believed to have been manufactured in the mid-1960s. This lens does not have a built-in diaphragm, but does have a slit for slip-in aperture control plate, as well as a simple shutter to prevent light from entering. This is opened and closed via the long tube on the side.

Fax-NIKKOR 300mm f/7 with „opened“ rubber grip ring with quater curves graduation to slide in a filter.

The 300mm lens exceptional. The first type of this lens has the engraving of the lens data only on the back of the lens, which means that if the lens is mounted in the device, you cannot see it. The second type of lens has an additional engraving on the front side. This is very unusual, I don‘t know of any other lens with engraving on front and back.

This Fax-NIKKOR was obviously produced until about the end of the 1970s, as a version with engraved „Nikon“ instead of „Nippon Kogaku Japan“ also exists.

The graduation from „0°“ to „90°“ is not engraved with straight lines but with quarter curves. In the US price list from September 1966 the price was USD 603 and in a price list of Rank-Pullin (1969), this lens is listed with GBP 222.

Fax-NIKKOR 300mm f/7 with the unusual engraving on front and rear (identical engraving including the serial number).

Fax-NIKKOR 1:5.6 f = 160mm

Lens design	6 lens elements in 4 groups	**Angle of view**	72°
Aperture scale	f / 5.6 to f / 22	**Working dist.**	64cm
Diameter x length	Diameter 70mm x 53mm length	**Weight**	340 g (no plate)
Filter mount	Screw-in filter (58mm)		

Type 1 Black barrel, front ring with filter thread. Outside the ring engraved „Fax-NIKKOR“, „1:5.6“ f=160mm“, serial number „No.“ and white dot as index for aperture scale. Beveled aperture ring with scale (increasing clockwise), tick marks at each 1/3 f/stop and milled grip ring for aperture setting. Longer black ring with fixed shutter knob on side and beveled portion of aperture ring. Screw mount 62mm for device and additional 4-hole mounting plate (77.5mm diameter).
Manufactured from about 1962 to about 1971.
‹ # 1781 › # 4427

Type 2 As Type 2, but with engraved „Nikon“ instead of Nippon Kogaku Japan and serial number without „No.“.
Manufactured from about 1972 to about 1978.
(no serial number known)

Fax-NIKKOR 1:5.6 f = 18cm

Lens design	not known	**Angle of view**	not known
Aperture scale	No diaphragm	**Working dist.**	not known
Diameter x length	Diameter 75mm x 57mm length	**Weight**	215 g
Filter mount	Screw-in filter (57mm)		

Type 1 Black barrel, front ring with filter thread. Within front ring engraved „Fax-NIKKOR“, „1:5.6“ f=18cm“, „Nippon Kogaku Japan“ and serial number „No.“. Next to front ring, lager ring with 6 holes to mount the lens. Long black barrel. On rear, screw mount 57mm.
Manufactured from about 1959 to about 1962.
‹ # 5622 › # 5662

Fax-NIKKOR 1:5.6 f = 210mm

Lens design	6 lens elements in 4 groups	**Angle of view**	70°
Aperture scale	f / 5.6 to f / 22	**Working dist.**	84cm
Diameter x length	Diameter 88mm x 66mm length	**Weight**	660 g (no plate)
Filter mount	Screw-in filter (68mm)		

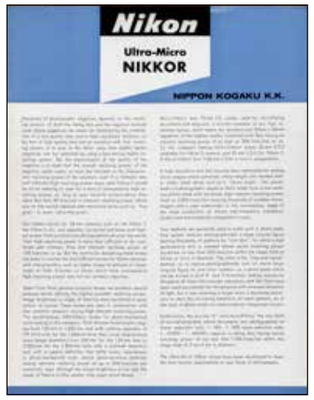
Type 1 Black barrel, front ring with filter thread. Outside the ring engraved „Fax-NIKKOR“ (narrow letter spacing), „1:5.6“, „f=210mm“, serial number „No.“ and white dot as index for aperture scale. Beveled aperture ring with scale (increasing clockwise), tick marks at each 1/3 f/stop and milled grip ring for aperture setting. Engraving „LENS MADE IN JAPAN“ („M“ with slanting sides), next to it longer black ring with fixed shutter knob on side. Beveled portion of aperture ring. Screw mount 72mm for device and additional 6-hole mounting plate (98mm diameter).
Manufactured from 1959 to about 1964.
‹ # 4380 › # (not known)

Type 2 As Type 1, but with engraving „LENS MADE IN JAPAN“ („M“ with straight sides).
Manufactured from 19655 to about 1968.
‹ # 4427 › # (not known)

Type 3 As Type 2, but with wide letter spacing of the engraving „Fax-NIKKOR“ and other designation. No built-in shutter. Shorter portion of aperture ring.
Manufactured from about 1968 to about 1974.
‹ # 21257 › # 21559

Two views of the Ultra-Micro-NIKKOR 28mm f/1.7.

Serial number of the Ultra-Micro-NIKKOR 28mm f/1.7.



English language brochure from October 1965.

Apart from these general purpose lenses, we produce special purpose lenses offering the highest possible resolving power. Image brightness or angle of field has been sacrificed to some extent, of course. These lenses are used in combination with low sensitive emulsion having high inherent resolving power. The world famous Apo-NIKKOR lenses for photomechanical work belong in this category. With thirteen focal lengths ranging from 150mm to 1,800mm and with relative aperture of f/9 (f/14 only for the 1,800mm lens), they cover large picture area (image diameters from 250mm for the 150mm lens to 2,300mm for the 1,800mm lens) with a minimum distortion and with a superb definition that fulfils every requirement in photomechanical work, where photosensitive materials having inherent resolving power af up to 200 lines/mm are commonly used, although the image brightness is low and the angle of field is a litlle smaller than usual photo lenses.

Micro-NIKKOR lens 70mm f/5, widely used for microfilming documents and diagrams, is another example of our high resolution lenses, which makes the standard size (32mm X 45mm) negatives of the highest quality combined with films having an inherent resolving power of as high as 300 lines/mm or so. To this category belong Micro-NIKKOR lenses 50mm f/3.5 available for Nikon S camera, and 55mm f/3.5 for Nikon F. A Micro-NIKKOR lens (150mm f/5.6) is now in preparation.

A high resolution lens has recently been demanded for making micro images where extremely sharp images are needed within rather small areas, such as in „photo masks“. The photo mask is a photographic negative plate mode from a low sensitive photo plate with extremely high inherent resolving power (such as 2,000 lines/mm) bearing thousands of complex micro images, and is used extensively in the intermediate stage of the mass production of minute high frequency transistors, diodes and semiconductor integrated circuits.

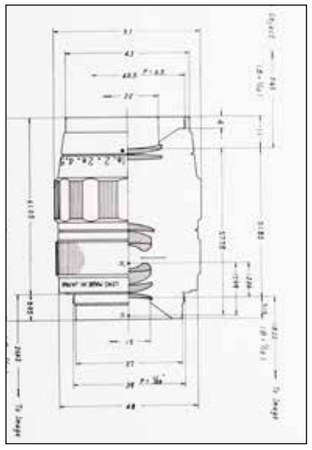
Two methods are generally used to make such a photo mask. One system reduces photographically a large original figure bearing thousands of patterns by „one shot“, for which a high performance lens is needed whose aerial resolving power should be no less than 400 lines/mm within the image field of 25mm or more in diameter. The other is the „step and repeat“

Side view of two Ultra-NIKKOR 28mm f/1.8 lenses, left, „e-line“ and right, „h-line“.

method, i.e. to reduce photographically one (or more large original figure is one after another on a photo plate which can be moved in both X and Y directions, making exposures thousands of times. Microscope objectives with flat field have been used successfully for this purpose with reversed direction of light, but a lens covering a larger area is becoming neccessary to meet the increasing dimension of each pattern, as in the case of photo masks for semiconductor integrated circuits.

Furthermore, the process of „ultra-microfilming“ the new field of microphotography where documents are photographed at linear reduction ratio 1:100 - 1:200 (area reduction ratio 1:10,000 - 1:40,000), requires a taking lens having aerial resolving power of not less than 1,200 lines/mm within the image field of 2mm to 3mm in diameter.

The Ultra-Micro-NIKKOR lenses have been developed to meet the most severe requirements in new fields of photography.



Lens section of the Ultra-Micro-NIKKOR 28mm f/1.8.

Ultra-Micro-NIKKOR Series

A great difficulty encountered in designing ultra high resolution lenses is due to the fact that the conventional technique in optical design „to pursue

Two Ultra-NIKKOR 28mm f/1.8 lenses, left, „e-line“, right, „h-line“ and top, a lens for both „h-line“ and „g-line“.