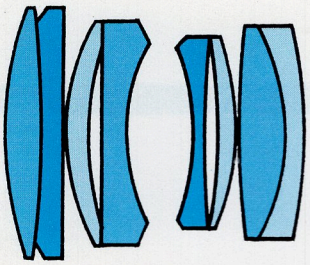


KODAK EKTAR LENSES

These data sheets describe some of Kodak's more recently designed high-acuity lenses for use in aerial photography, CRT recording, and microphotography.

The lenses are shown in specific mounts that can be modified to meet customer requirements. Lenses designed for use at finite conjugates can be optimized for performance at slightly different magnifications. In addition, the focal lengths of these lenses can be scaled up or down to meet changes in the angular-field requirement.

All of these lenses are special-order items.

Ordering Information

Orders for Kodak Ektar Lenses should be addressed as follows:

Eastman Kodak Company
Apparatus and Optical Division
Special Products Sales
Rochester, New York 14650

Telephone:
Area Code 716, 325-2000

"ERRATUM. Please note that the lens diagram on page 3 belongs on page 6 and, correspondingly, the diagram on page 6 belongs on page 3."

Special Products Sales • Apparatus and Optical Division
EASTMAN KODAK COMPANY • ROCHESTER, N. Y. 14650

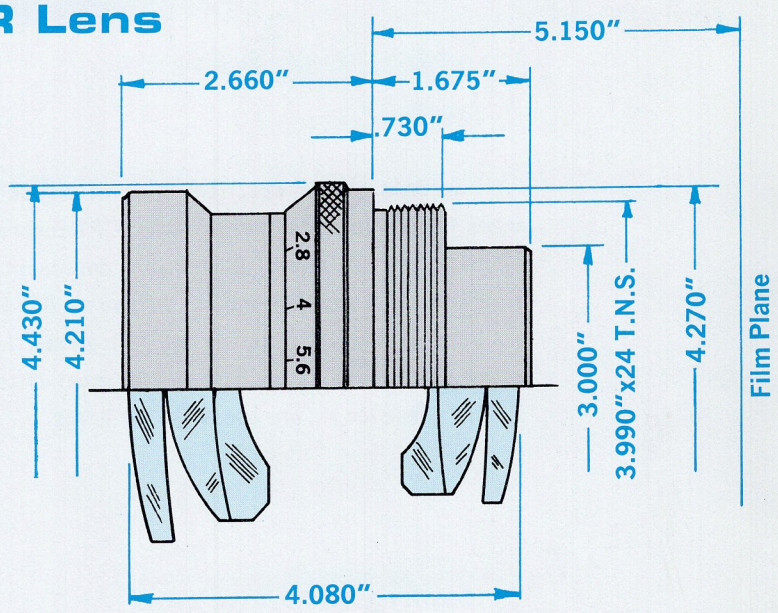
KODAK EKTAR LENSES

KODAK AERO EKTAR Lens

6-inch f2.8
Formula M-360

This lens is a six-element, Gauss-type objective. It is intended primarily for use in aerial cameras with a yellow filter (KODAK WRATTEN Filter, No. 12, Minus Blue). The optics are assembled in the lens mounts with rubber-type O rings to withstand shock conditions and high-frequency vibrations.

This lens is available in a wide variety of barrels and mounts for flange or screw-in mounting. It can be supplied with or without an adjustable iris diaphragm.



Characteristics

Part Number SK-9437-1
Equivalent Focus 150.92mm
Back Focus 92.51mm
Front Focus 61.85mm
Maximum Relative Aperture f2.8
Semifield . . . . . 14.7°
Usable Image Diameter . . . . . 3.180″
Nominal Format Size . . . . . 2.25″ square

Achromatism (for use with KODAK WRATTEN Filter, No. 12) . . 656-486mμ
Axial Transmission at f2.8 . . . . . 85%
Relative Field Illumination at f2.8 . . . . 64% at 14.7°

Resolution: The table shows the resolution in lines/mm obtained with a lens tested in accordance with Method 7 of MIL-STD-150. The tests were made at the apertures and on the photographic materials indicated, through a KODAK WRATTEN Filter, No. 12.

KODAK Emulsion Type	f-No.	Semifield Angles			
		0	5°	10°	15°
SUPER-XX Emulsion #8226	2.8	56	63	49	33
	8	80	63	49	37
PLUS-X Emulsion #SO-1159	2.8	45	45	39	33
	8	63	56	49	37
*Infrared Emulsion #5218	2.8	40	35	34	26
548 F Pan	2.8	280	200	109	75
	2.8*	280	250	194	75

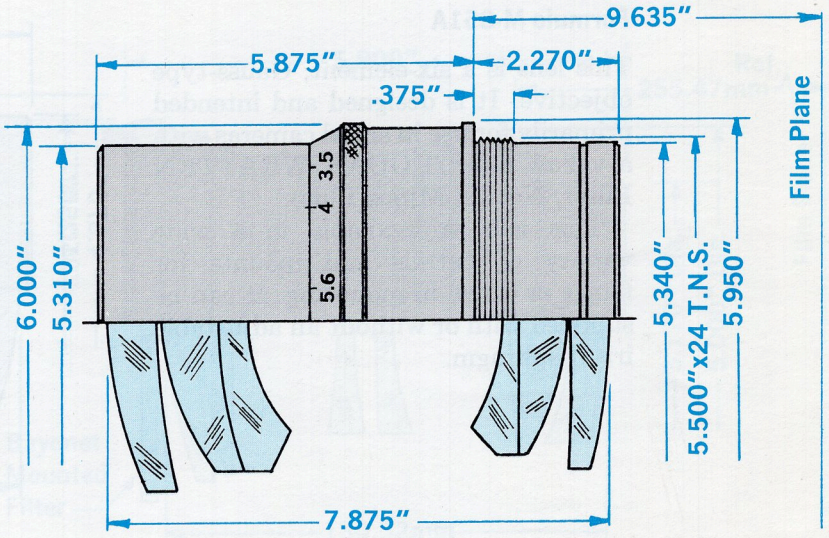
*With KODAK WRATTEN Filter, No. 25.

KODAK AERO EKTAR Lens

6-inch f3.5
Formula M-351A

This lens is a six-element, Gauss-type objective. It is intended primarily for use in aerial cameras with a yellow filter (KODAK WRATTEN Filter, No. 12, Minus Blue). The optics are assembled in the lens mounts with rubber-type O rings to withstand shock conditions and high-frequency vibrations.

This lens is available in a wide variety of barrels and mounts for flange or screw-in mounting. It can be supplied with or without an adjustable iris diaphragm.



Characteristics

Part Number SK-8661-1B
Equivalent Focus 152.58mm
Back Focus 93.43mm
Front Focus 69.13mm
Maximum Relative Aperture f3.5
Semifield . . . . . 14.7°
Usable Image Diameter . . . . . 3.180″
Nominal Format Size . . . . . 2.25″ square

Achromatism (for use with KODAK WRATTEN Filter, No. 12) . . 656-486mμ
Axial Transmission at f3.5 . . . . . 89%
Relative Field Illumination at f3.5 . . . . 60% at 14.7°

Resolution: The table shows the minimum resolution in lines/mm obtained with a lens tested in accordance with Method 7 of MIL-STD-150. The tests were made at f3.5 on KODAK SUPER-XX and 548 F Pan-type emulsions. The white light source was filtered through a KODAK WRATTEN Filter, No. 12.

KODAK Emulsion Type	Semifield Angles						
	0°	2½°	5°	7½°	10°	12½°	15°
SUPER-XX	50	—	50	—	44	—	37
548 F Pan	225	280	250	178	123	78	97

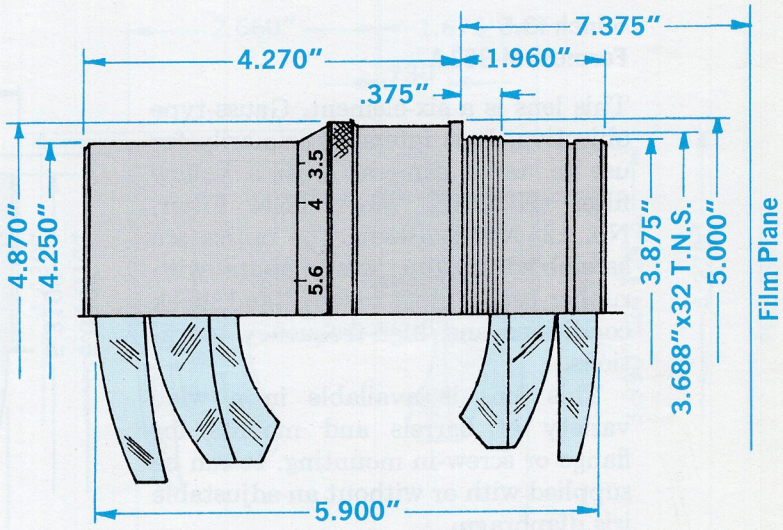
KODAK EKTAR LENSES

KODAK AERO EKTAR Lens

9-inch f3.3
Formula M-351A

This lens is a six-element, Gauss-type objective. It is designed and intended primarily for use in aerial cameras with a yellow filter (KODAK WRATTEN Filter, No. 12, Minus Blue).

This lens is available in a wide variety of barrels and mounts for flange or screw-in mounting. It can be supplied with or without an adjustable iris diaphragm.



Characteristics

Part Number SK-9362-1
Equivalent Focus 229.93mm
Back Focus 143.80mm
Front Focus 110.14mm
Maximum Relative Aperture f3.3
Semifield . . . . . 10° 2¼″ Square format
15° 2¼″ x 4½″ format
Usable Image Diameter 127.75mm
Nominal Format Size . . . . . 2.25″ square

Achromatism (for use with KODAK WRATTEN Filter, No. 12) . . 486-656mμ
Axial Transmission at f3.3 . . . . . 85%
Relative Field Illumination at f3.3 . . . . . 87% at 10°
46% at 15°

Resolution: The table shows the minimum resolution in lines/mm obtained with a lens tested in accordance with Method 7 of MIL-STD-150. The tests were made at the maximum aperture and on the photographic materials indicated, through a KODAK WRATTEN Filter, No. 12.

KODAK Emulsion Type	Semifield Angles						
	0°	2½°	5°	7½°	10°	12½°	15°
PLUS-X AERECON	47	42	37	46	41	32	22
SUPER-XX AERO	42	42	37	37	32	28	23
TRI-X AERO	30	30	26	29	25	28	22
Infrared*	30	30	30	26	29	22	22

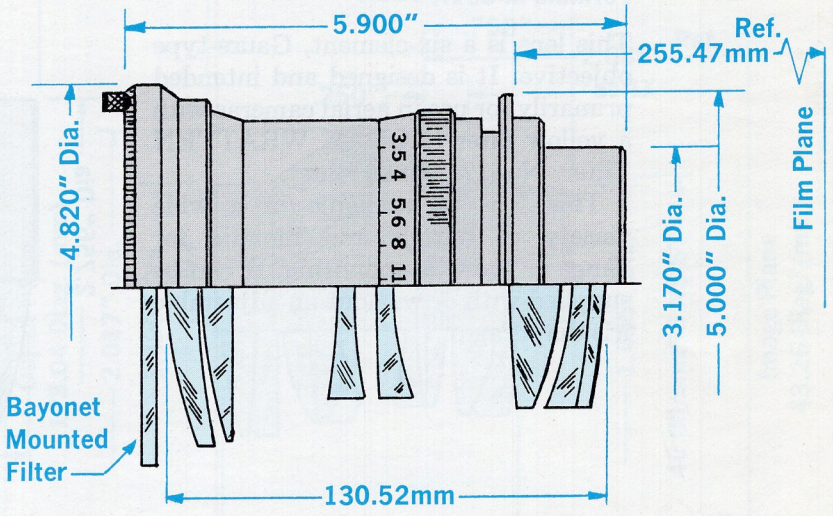
*With KODAK WRATTEN Filter, No. 25.

KODAK AERO EKTAR Lens

12-inch f3.5
Formula J-240-1

This lens is a seven-element objective. It is intended primarily for use in aerial cameras using 70mm film and with a yellow filter (KODAK WRATTEN Filter, No. 3, Aero No. 1). The optics are assembled in the lens mounts with rubber-type O rings to withstand shock conditions and high-frequency vibrations.

This lens is available in a wide variety of barrels and mounts for flange or screw-in mounting. It can be supplied with or without an adjustable iris diaphragm.



Characteristics

Part Number OSS-00050
Equivalent Focus 304.04mm
Back Focus 226.89mm
Front Focus 222.69mm
Maximum Relative Aperture f3.5
Semifield . . . . . 7.5°
Usable Image Diameter . . . . . 3.180″
Nominal Format Size . . . . . 2.25″ square

Achromatism (for use with KODAK WRATTEN Filter, No. 12) . . 520-656mμ
Axial Transmission at f3.5 . . . . . 75%
Relative Field Illumination at f3.5 . . . . 76% at 7.5°

Resolution: The table shows resolution in lines/mm obtained with a lens tested across the worst diagonal in accordance with Method 11 of MIL-STD-150A. Tests were made at the apertures and on the photographic materials indicated, through a KODAK WRATTEN Filter, No. 12.

Emulsion Type	f-No.	Semifield					
		0°	2½°	5°	7½°*	10°	12½°
RECORDAK MICRO-FILE	3.5	162	162	97	89	55	6
	5.6	181	203	114	112	63	7
KODAK Special Pan-X SO-121	3.5	91	81	57	56	40	10

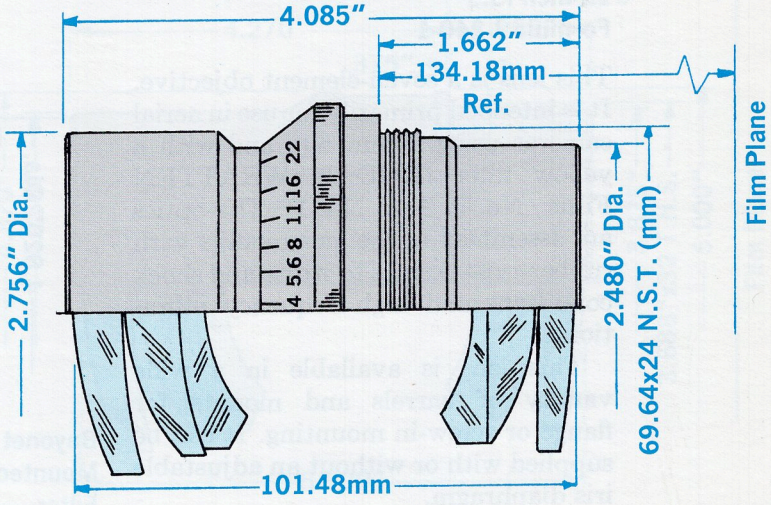
*Maximum semifield for 2.25" square format.

KODAK AERO EKTAR Lens

12-inch f3.5
Formula M-351A

This lens is a six-element, Gauss-type objective. It is designed and intended primarily for use in aerial cameras with a yellow filter (KODAK WRATTEN Filter, No. 12, Minus Blue).

This lens is available in a wide variety of barrels and mounts for flange or screw-in mounting. It can be supplied with or without an adjustable iris diaphragm.



Characteristics

Part Number SK-10214-1A
Equivalent Focus 310.64mm
Back Focus 189.28mm
Front Focus 138.44mm
Maximum Relative Aperture f3.5
Semifield . . . . . 14.7°
Usable Image Diameter 161.50mm
Nominal Format Size . . . . . 4.500″ square

Achromatism (for use with KODAK WRATTEN Filter, No. 12) . . 656-486mμ
Axial Transmission at f3.5 . . . . . 80%
Relative Field Illumination at f3.5 . . . . 63% at 14.7°

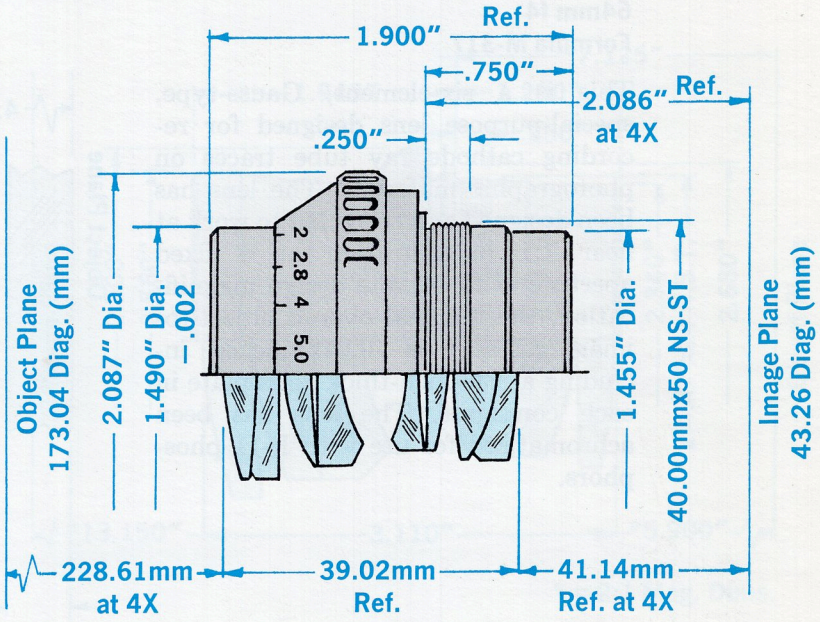
Resolution: The table shows the minimum resolution in lines/mm obtained with a lens tested in accordance with Method 7 of MIL-STD-150. The tests were made at the maximum aperture and on the photographic materials indicated, through a KODAK WRATTEN Filter, No. 12.

Emulsion Type	Semifield Angles					
	0°	2½°	5°	7½°	10°	12½°
RECORDAK MICRO-FILE	162	128	102	80	45	54
KODAK PLUS-X	64	64	51	45	39	35

KODAK Cathode Ray Tube EKTAR Lens

50mm f2.0
Formula M-236

This is a special-purpose lens designed for recording cathode ray tube traces on photographic materials. It is an eight-element, Gauss-type, recording objective. This lens has been designed and corrected to work at near 1:4 magnification. It has been achromatized for use with P-11 and P-16 phosphors. It performs very satisfactorily at maximum aperture for most applications.



Characteristics

Part Number . . . . . SK-9893-1A—OSS-00279
Equivalent Focus 50.01mm
Back Focus 28.64mm
Front Focus 28.57mm
Maximum Relative Aperture f2.0
Minimum Relative Aperture f16
Semifield at .25× Magnification . . . . . 19°
Nominal Image Diameter at .25× Magnification 43.26mm

Achromatism (for P-11 and P-16 phosphors) 436-365mμ
Axial Transmission (P-16 source at 370mμ peak) . . 47%
Relative Field Illumination at f2.0 at 19° 35%
f4.0 at 19° 79%

Resolution: The table shows the resolution in lines/mm obtained with a lens tested on RECORDAK MICRO-FILE Film with a P-16 source at 4:1 reduction.

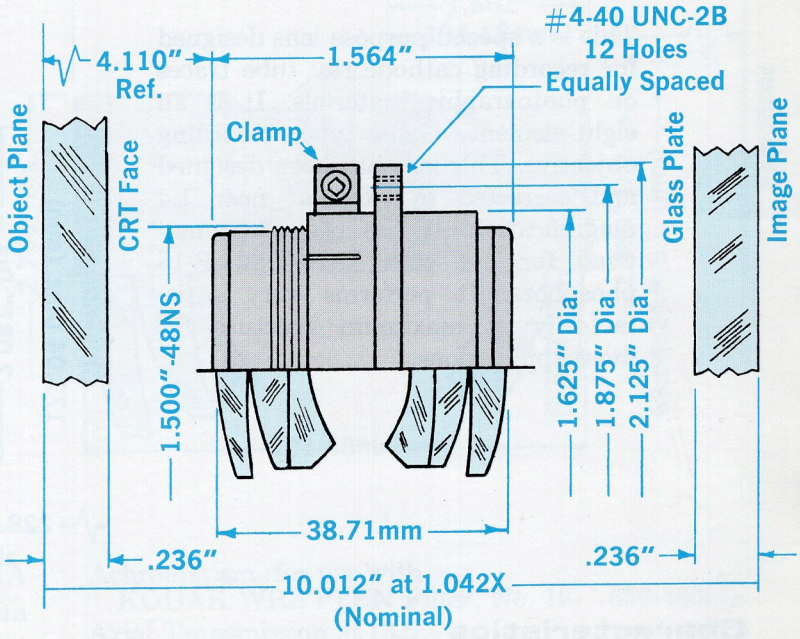
f-No.	Semifield Angles		
	0°	13° 30′	19°
2.0	128	64	48
4.0	200	80	48

KODAK EKTAR LENSES

KODAK Cathode Ray Tube EKTAR Lens

64mm f4
Formula M-317

This is a six-element, Gauss-type, special-purpose lens designed for recording cathode ray tube traces on photographic materials. The lens has been designed and corrected to work at near 1:1 magnification at a fixed aperture of f4. At the design magnification, the nominal overall object-to-image distance is 10.012 inches, including a .236-inch-thick glass plate in each conjugate. The lens has been achromatized for use with P-11 phosphors.



Characteristics

Part Number SK-10044-1A
Equivalent Focus 64.06mm
Back Focus 41.68mm
Front Focus 41.68mm
Maximum Relative Aperture ..... f4 (fixed)
Semifield ..... 17.6°
Nominal Object and Image Diameters 81.25mm

Achromatism (for P-11 phosphors) 486-434mμ
Axial Transmission (white light) ..... ——
(450mμ) 79%
Relative Field Illumination at f4 at 17.6° 72%

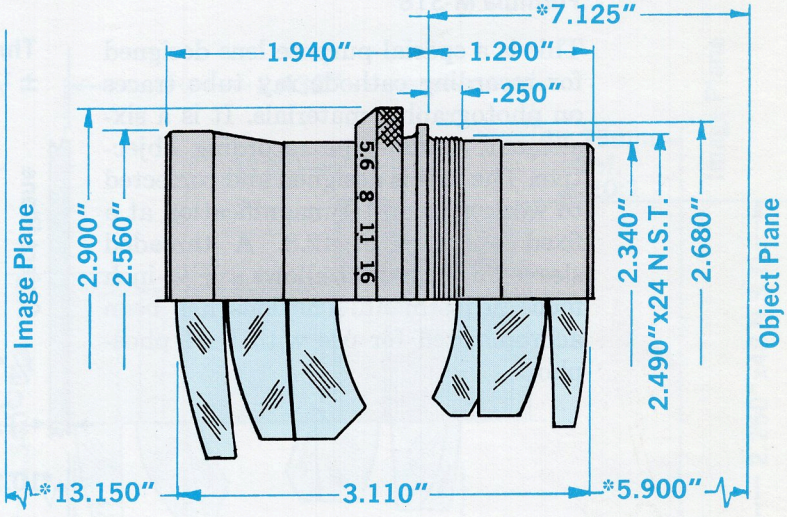
Resolution: The table shows the resolution in lines/mm obtained with a lens tested on SO264 film with a KODAK WRATTEN Filter, No. 47B.

Semifield Angles				
0°	7°	11°	15°	17.5°
80	80	57	64	51

KODAK Cathode Ray Tube EKTAR Lens

5-inch f2.5
Formula M-342

This is a special-purpose lens designed for recording cathode ray tube traces on photographic materials. It is a six-element, Gauss-type recording objective. The lens is designed and corrected to work at 2:1 magnification. The mount incorporates an iris diaphragm adjustable from f2.5 to f16. The lens has been achromatized for use with P-11 phosphors. It performs very satisfactorily at maximum aperture for most applications.



* = 2:1 Mag. Dims.

Characteristics

Part Number OSS-00236
Equivalent Focus ..... 5.000″
Back Focus ..... 3.390″
Front Focus ..... 3.140″
Maximum Relative Aperture f2.5
Minimum Relative Aperture f16
Semifield at 2× Magnification ..... 16.7°
Maximum Object Diameter at 2× Magnification ..... 4.500″
Nominal Image Diameter at 2× Magnification ..... 9.000″
Achromatism (for P-11 phosphors) 486-434mμ
Axial Transmission (P-11 source) 85%
Relative Field Illumination at f2.5 and 16.7° 51%

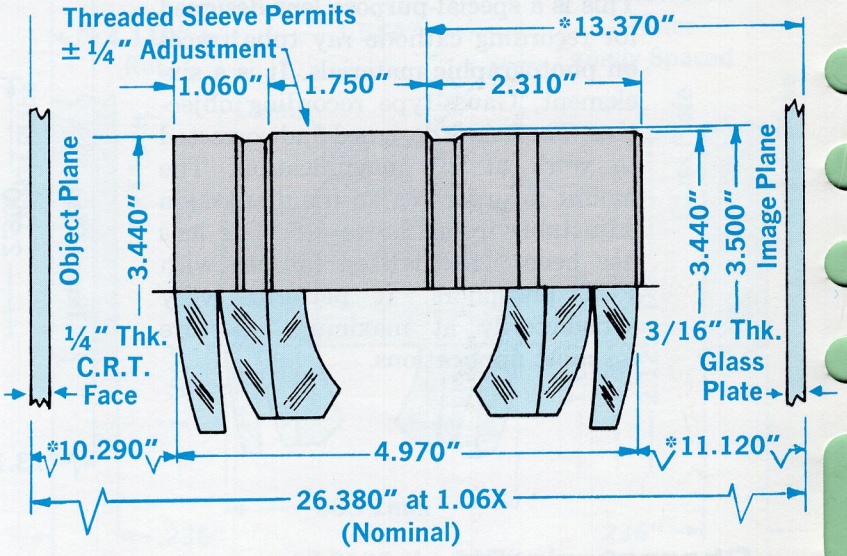
Resolution: The table shows resolution in lines/mm obtained in the short conjugate with a lens tested with KODABROMIDE Paper, (F-4) and a P-11 source at a magnification of 2×.

Semifield Angles						
f-No.	0°	3° 50′	7° 40′	11° 20′	15°	16° 40′
2.5	80	64	50	40	50	40

KODAK Cathode Ray Tube EKTAR Lens

7-inch f2.8
Formula M-318

This is a special-purpose lens designed for recording cathode ray tube traces on photographic materials. It is a six-element, Gauss-type recording objective. The lens is designed and corrected to work at near 1:1 magnification at a fixed aperture of f2.8. A threaded sleeve on the mount allows a ±¼-inch focus adjustment. The lens has been achromatized for use with P-11 phosphors.



*1.06:1 Mag. Dims.

Characteristics

Part Number SK-9935-1
Equivalent Focus 178.48mm
Back Focus 91.24mm
Front Focus 91.24mm
Maximum Relative Aperture . . . . . f2.8 (fixed)
Semifield . . . . . 9.5°
Image Size at 1.02:1 (1.02× Magnification) . 118.00mm
Achromatism (for P-11 phosphors) 434-486mμ
Axial Transmission (P-11 source) 70%
Relative Field Illumination at 9° . . . . . Over 90%

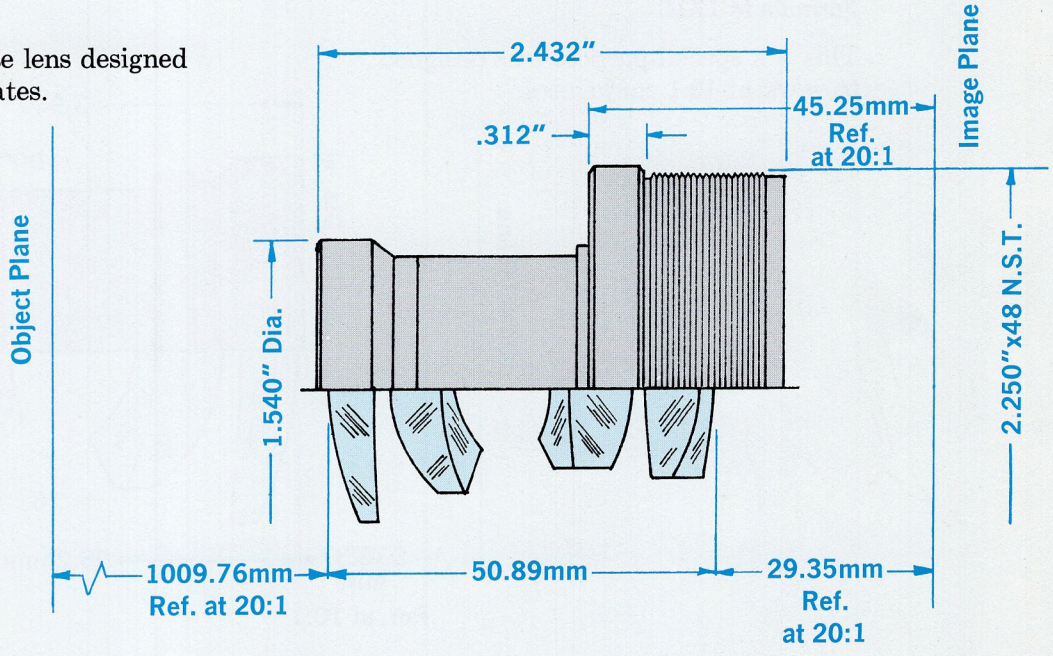
Resolution: The table shows the resolution in lines/mm obtained with a lens tested in accordance with Method 8 of MIL-STD-150. The tests were made at f2.8 on SO1264 emulsion. The test object was trans-illuminated with white light filtered through a KODAK WRATTEN Filter, No. 47B. Glass plates ¼" and 3/16-inch were used in the object and image planes, respectively, to simulate an actual system.

Magnification	Semifield Angles				
	0°	2° 45′	5° 20′	7° 35′	9°
1.07:1	66	59	52	47	38
.823:1	62	56	40	40	34

High Resolution EKTAR Lens for Microphotography

50mm, f2.8
Formula M-171

This is a special-purpose lens designed to work at 20:1 conjugates.



Characteristics

Part Number SK-9182-17
Equivalent Focus 50.24mm
Back Focus 26.84mm
Front Focus 2.80mm
Maximum Relative Aperture f2.8
Semifield at 20:1 . . . . . 10.6°
Nominal Image Diameter at 20:1 . . . . . 19.75mm
Achromatism 436-405mμ

Axial Transmission at f2.8 (white light) 81%
(450mμ) 76%
Relative Field Illumination at f2.8 and 10.6° . . . 84%

Resolution: The table shows the resolution in lines/mm obtained with a lens tested across the best diagonal plane with 649GH film. The test object was illuminated by tungsten light filtered with a dydimium filter.

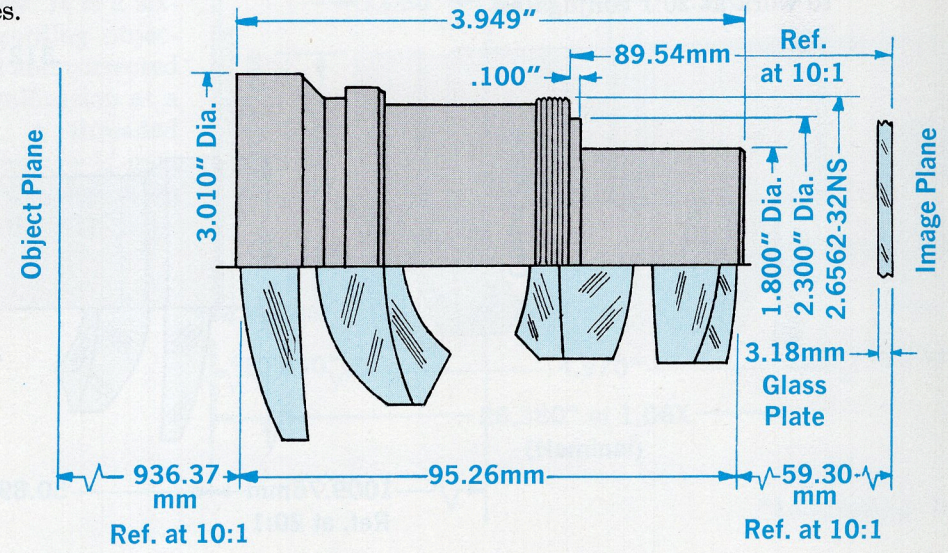
Semifield Angles			
0°	2° 44′	5° 26′	9° 12′
560	500	500	360

KODAK EKTAR LENSES

High Resolution EKTAR Lens for Microphotography

93mm, f2.0
Formula M-171C

This is a special-purpose lens designed to work at 10:1 conjugates.



Characteristics

Part Number	SK-10209-1
Equivalent Focus	93.35mm
Back Focus	49.06mm
Front Focus	2.80mm
Maximum Relative Aperture	f2.0
Relative Aperture (Fixed)	f3.5
Semifield	9.15°
Nominal Image Diameter at 10:1	33.00mm
Achromatism	436-405mμ
Axial Transmission at f3.5 (white light)	72%
(450mμ)	64%
Relative Field Illumination at f3.5 and 9.15°	81%

Resolution: The table shows the minimum resolution in lines/mm obtained with a lens tested at f3.5 with a RECORDAK MICRO-FILE type of emulsion and the KODAK WRATTEN Filters, No. 47B and No. 61.

Filter	0°	Semifield Angles			
		3°	6°	9°	10.5°
No. 47B	220	100	50	32.5	27.5
No. 61	350	280	220	170	120

KODAK Data Sheet U-27

Special Products Sales
Apparatus and Optical Division

EASTMAN KODAK COMPANY, ROCHESTER, N. Y. 14650

KODAK EKTAR Lenses
KODAK Sales Service Pamphlet U-10

1-65 New Pamphlet
AX-GLP-L