35¢

DATA BOOK ON KODAK LENSES RANGE FINDERS AND SHUTTERS

For Revising Kodak Reference Handbook

This Data Book Is a
Complete Unit on the Subject of Kodak

Lenses • Range Finders • Shutters

It is also punched for insertion in the Kodak Photographic Notebook or as a replacement section in the Kodak Reference Handbook.

KODAK LENSES, RANGE FINDERS, AND SHUTTERS presents information on lenses, supplementary lenses, range finders, and shutters, and their proper use. See the back cover of this book for new nomenclature now being introduced for Kodak lenses.

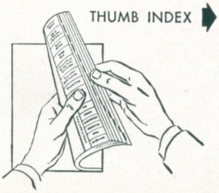
Special punching of the book makes it doubly useful: (1) It can be inserted in the *Kodak Photographic Notebook* with other Kodak Data Books or special photographic articles prepared by the Eastman Kodak Company, or (2) it provides the owner of the *Kodak Reference Handbook* with a replacement for a Lenses, Range Finders, and Shutters section bearing an earlier printing date. If used for replacement, the cover should be removed.

If you do not own a *Kodak Reference Handbook* or a *Kodak Photographic Notebook*, see your Kodak dealer. The *Handbook* is a comprehensive, metal-ring, reference book containing sections devoted to Lenses, Films, Filters, Color Films, Papers, Formulas and Processing, and Copying. The *Notebook*, designed to serve as a supplement to the *Handbook*, is a metal-ring binder containing five separators, a quantity of notebook paper, and a current list of free photographic articles.

KODAK LENSES
RANGE FINDERS AND SHUTTERS

Second 1946 Printing

THUMB INDEX ➧



KODAK LENSES

RANGE FINDERS AND SHUTTERS

PHOTOGRAPHY finds ever wider application in specialized and technical fields on the part of both the professional photographer and the serious hobbyist. This has led to greater emphasis on the correct and accurate use of the most important part of the camera—the lens. Higher standards in picture quality, the extended practice of color photography, the greater interest in picture taking at all times regardless of adverse light conditions, and increased activity in photographing small objects—all demand more attention to such matters as lens correction, lens definition, exact focus, effective lens aperture, depth of field, proper use of supplementary lenses, etc. The excellence of a lens or shutter alone will not necessarily assure precise results; their properties must be fully understood and correctly applied.

The information presented on the following pages is intended to afford a thorough understanding of lens and shutter operation. In addition, the characteristics of each Kodak Lens are described in detail in Specification pages. Optical formulas are included for the convenience of those faced with special problems.

"LUMENIZED"* LENSES

The most recent advance in Kodak lenses is the wide application of Lumenizing. Many Kodak lenses now bear a thin, hard coating of magnesium fluoride to reduce surface reflections and consequently flare light and spots. Picture quality is improved in shadow contrast and detail and in shadow color purity of color pictures. Because of the reduced tendency to veiling and spots, the camera has greater freedom of position with regard to the sun or bright lights.

Lumenizing slightly increases the speed of a lens having many glass-air surfaces. More light is transmitted to the highlights, less to the shadows. In color work the increase may amount to as much as a third of a lens opening setting; in black-and-white no allowance should be made.

*T. M. Reg. U.S. Pat. Off.

When all the elements including condensers of a projection system are Lumenized, screen brightness is increased—50% in the case of the Kodaslide Projector, Model 2A. The projected picture quality is also improved, mostly in the shadows.

Lumenized enlarger lenses tend to give improved highlight detail, especially from negatives of high contrast or large shadow areas.

Lumenized lenses, as currently made, bear a circled "L" engraved on the mount. Treated lenses can also be identified by the slight tint seen by reflected light. The lens is uncolored by transmitted light. Color rendering is not affected.

Dirt on Lumenized lenses tends to cancel the advantages of Lumenizing. Oil spots look like holes in the surface. Lumenized lenses can and should be cleaned in the usual way, as described elsewhere.

Recently designed Ektar lenses have mechanical improvements in the mount, also designed to reduce flare light.

Lens Properties

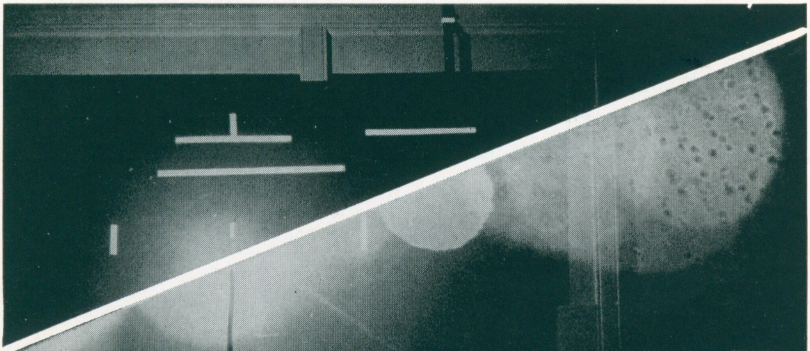
FOCAL LENGTH

A fundamental characteristic of any lens is the focal length. This controls the image distance and size, and ordinarily determines the usable negative size. The focal length is approximately the distance from the lens to the image of a distant object. Methods of finding focal length and the relation between it and subject and image distances are given on pages 31 and 32.

Photographic Perspective

Human eyes see in three dimensions, but a lens reproduces a view in two dimensions only. The missing dimension, depth, is suggested mainly by the relative size and position of the various objects in the picture. The relation of these objects, or perspective, and therefore the naturalness of the picture, is influenced by the position of the camera.

Laboratory test comparison of a Lumenized and an untreated lens. A bare lamp was photographed against a blackboard with—Upper—Lumenized lens—Lower—untreated but otherwise similar lens. Note the freedom from flare effects, and better contrast by the Lumenized lens.



A camera position too close to the subject results in an exaggeration of the parts nearest the lens.

Correct perspective in the final picture depends largely upon the distance at which it is viewed. Contact prints should be viewed at a distance equal to the focal length of the lens with which they were made. Enlargements require a viewing distance equal to the camera lens focal length times the number of diameters of enlargement. This usually results in a viewing distance more convenient to the eye than the one most desirable for contact prints, which is rarely practical, with the result that enlargements seem to convey an improvement in naturalness. For pictures projected on a screen, the correct viewing distance is equal to projector-screen distance multiplied by the ratio of the focal length of the taking lens to that of the projection lens. It is natural, however, to view any picture at a distance convenient to the eye when looking at it as a whole. Only if this results in a departure by more than a factor of 2 from the correct viewing distance is the rendering of perspective noticeably affected.

The best balance between normal perspective in the picture and compact still-camera design calls for a focal length slightly greater than the picture diagonal. Lenses with a focal length shorter than this are known as wide angle, while long-focus lenses, such as the telephoto type, exceed the diagonal considerably in focal length.

LENS DIAPHRAGM AND ITS MARKINGS

While slower lenses have a fixed opening or a series of apertures in a movable slide or disk, faster lenses have an adjustable opening to vary the amount of light passed. The size of this opening is indicated by a diaphragm scale, generally marked in *f*-numbers. Each *f*-number is the focal length divided by the effective diameter of the diaphragm. These numbers are related to light intensity at the image plane and permit common exposure recommendations for lenses of all focal lengths. The *f*-numbers 1.4, 2, 2.8, 4, 5.6, 8, 11, 16, 22, 32 indicate successive decreases of one half in light intensity. For an average lens at *f*/8, the illumination of the image in foot-candles is about 1/700 of the subject brightness in foot-lamberts.

Until recently the U. S. (Uniform System) markings in which the numbers are proportional to the exposure required were used on a number of lenses. The U.S. markings compare with the *f*-values as follows:

f	*f*/4	*f*/5.6	*f*/8	*f*/11	*f*/16	*f*/22	*f*/32	*f*/45
U.S.			4	8	16	32	64	128

Effective *f*-Number for Extreme Close-Ups: In making extreme close-ups, the image distance no longer approaches the focal length; hence the *effective* *f*-number will be higher than indicated. This is especially important in color photography and in copying. The formula for computing the effective *f*-number is given on page 32, or the exposure modification can be determined with the *Kodak Lens Guide*, sold by Kodak dealers.

CORRECTIONS IN PHOTOGRAPHIC LENSES

A single convergent lens can be used to form an image, which will, however, be found to suffer from serious defects due to lens aberrations, especially when used at full aperture. Kodak lens designers and lens makers use every means known to optical science to eliminate these aberrations entirely, or reduce them to a degree consistent with good performance. Some of the inherent shortcomings of lenses which are corrected in Kodak objectives, to make them meet the exacting demands of modern photography, are briefly listed. Those interested in further details should consult a good textbook on optics.

Spherical Aberration: In the case of a simple lens with spherical surfaces, the rays coming through the central portion of the lens and the rays coming through an outer zone do not converge at the same distance from the lens. As a result a point is imaged as a blur. The aberration is due to the fact that spherical surfaces are used on the lens, and is therefore called "spherical aberration." The effect of a small amount of this aberration on the image of an extended subject is to cover it with a haze of light. If present in large amounts, spherical aberration will spoil the sharpness and crispness of definition, approximately uniformly over the whole field. As the magnitude of this aberration usually rises rapidly with increased lens aperture, it becomes progressively more troublesome and harder to eliminate as the speed of a lens is increased. (See Figure 1.)

Coma: Coma is a kind of lateral spherical aberration. In spherical aberration itself, the various zones of a lens suffer from a longitudinal difference of focus for rays parallel to the lens axis. Coma affects the rays not parallel to the axis. When coma is present, these oblique rays passing through the various zones converge at different distances from the center of the image, so that a single point in the subject is imaged as an arrowhead pointing toward the center of the field.

Astigmatism: In this aberration, a single point in the subject is imaged not as a point but as two short, mutually perpendicular lines at different distances from the lens. The distance between the lines is a measure of the astigmatism present in the lens. Neither coma nor astigmatism exists at the center of the picture or, in other words, on the axis of the lens.

Curvature of Field: The field of a lens is the imaginary surface where the image of the subject is brought to focus. The field of a simple lens is not flat, but concave or saucer-shaped. As a result, a flat subject at right angles to the lens axis is brought to focus not in a plane as would be desirable for recording the image on a flat film, but on a concave spherical surface. Curvature of field is present in single-lens cameras, and, in order to provide a satisfactorily sharp image over the entire picture area, the film is placed at the distance for best average focus and a small relative aperture is used to increase definition and depth of focus. In some simple lens cameras, the film is held in a curved position, approximating the concavity of the lens field.

Distortion: In the case of distortion, the magnification varies from the center of the picture outward. This results in a distortion of the image

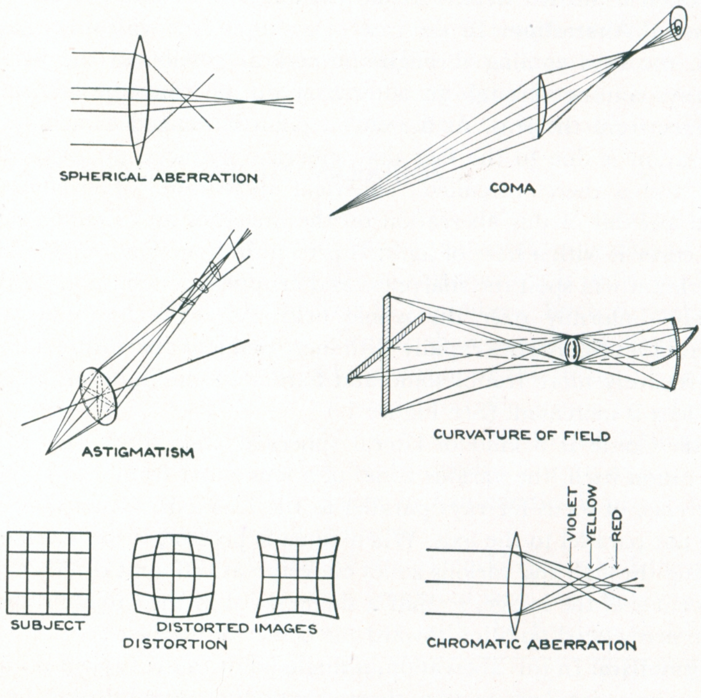


Figure 1—Lens Aberrations. The subject is to the left of the lens, image to the right. All aberrations are shown greatly exaggerated.

and causes a square object to be imaged as either a barrel-shaped or a cushion-shaped figure. When distortion is present, a straight line running across the center of the picture remains straight, but straight lines lying in the outer parts of the image field are bowed.

Chromatic Aberration: Because the degree of refraction or bending of a ray of light upon entering or leaving a polished glass surface varies with the color of the light, every property of a lens depends on color. Thus the position of the image itself changes slightly with the color or wave length of light (see Figure 1); this effect is known as axial or longitudinal chromatic aberration. Fortunately, it is possible to reduce this deficiency greatly by using the proper combination of two or more different kinds of glass in a lens.

Lateral Color: The varying degrees of refraction of different colors can result in another aberration known as "lateral color" or chromatic difference of magnification. This can occur in a compound lens even though the lens may be corrected for the chromatic aberration as described above. In the case of lateral color, while all the color images may be focused in the same plane, the effective focal length of the lens varies slightly from one color to another; this results in differences in magnification of the respective color images. If present, this aberration results in colored fringes surrounding the images in the outer parts of the field. In black-and-white photography, these colored fringes appear as a slight blur or fuzziness, but in color work, especially if the lens is used in an enlarger, colored fringes may show up very badly. This aberration is not reduced by stopping down the lens.

Correction of Aberrations: Corrections are achieved by the use of optical glasses differing in their light-bending and color-spreading powers, by the thickness and curvature of lens elements and the spacing between them. In general, the larger the aperture, the more elements are required for full correction. The task of designing lenses will be realized since various aberrations must be corrected simultaneously with a limited choice of glasses and number of elements.

Kodak Optical Glasses: These relatively new glasses are unusual in that they are not made from silica, but rather from compounds of rare elements such as tantalum, tungsten, and lanthanum. These new types have a high light-bending power (refractive index) combined with unusually low spreading of individual colors (dispersion). Such properties permit lens elements which are less steeply curved than those of the older glasses. This, in turn, simplifies and permits a higher degree of correction. These new glasses are now in widespread use and are represented in nearly every recent type of Kodak lens.

Lens Performance

DEFINITION AT VARIOUS APERTURES

The term "definition" refers to the ability of a lens to form a clear image of fine detail. Not even a theoretically perfect lens would be capable of imaging a point source of light as a geometrical point. All practical lenses image such a point as a small blur which changes in character with the change of lens aperture. In addition to reducing speed and increasing the depth of field, decreasing the lens aperture improves definition, as it removes the small amount of haze caused by residual aberrations. This also results in a slight increase in image contrast. As a general rule, the best compromise between maximum definition and speed is made by closing down the diaphragm from wide open about two stops for moderately fast lenses, such as *f*/4.5's, and about three stops for ultrafast lenses.

The wave nature of light sets a limit to the increase in definition as the aperture is closed down. A beam of light passing through an aperture does not continue unchanged, but spreads slightly at the aperture edge in a manner similar to the spreading of water waves after passing through a small opening in a breakwater. The smaller the opening, the greater the spreading. This diffraction may begin to influence definition unfavorably as the minimum aperture is approached. If maximum definition is desired, it may be advisable to use a diaphragm setting one to two stops away from the minimum.

Enlarger lenses used at their smaller lens apertures may limit print definition in extreme enlargements due to the diffraction effect mentioned. This limit is seldom reached in ordinary work.

Good lenses will perform satisfactorily at all stops provided. However, for extremely critical work, especially with ultrafast lenses and those of short focal length, it is well to take into consideration the above two factors influencing definition. In general photographic work, these small changes in performance with varying lens apertures are of little consequence.

DEFINITION AND CAMERA TECHNIQUE

Poor definition and lack of sharpness in negatives are more often due to faults in camera handling, in particular focusing errors and camera motion, than to lens quality.

Focusing for Visible Light: As the subject-to-lens distance is reduced the lens-to-image distance has to be increased. With lenses of comparatively short focal length and small aperture as used on Brownies and inexpensive Kodaks, the depth of field is sufficiently great to cover the range of distance normally used for picture taking. With faster lenses when used at their greater apertures the depth of field is more limited and focusing is necessary. With cameras provided with ground glass or coupled range finder focusing, this operation is simple and exact. Using cameras with scale-focusing requires an ability to estimate distances rather closely. For all close-up work and when working at maximum lens apertures with fast lenses, the distance cannot, as a rule, be estimated with sufficient accuracy, and should therefore be measured by a ruler or with the help of a range finder.

Focusing for Infrared Light: Focusing a lens by ground glass, range finder, or distance scale setting, produces sharp pictures only with visible light. Infrared light rays, due to their longer wave length, focus in a different plane from visible light rays. Some focusing scales provide a special focusing mark to be used when taking infrared pictures. For certain Kodak lenses, the correction is given in the specification sheet. These corrections are workable averages. As a general rule, better infrared pictures are obtained if the lens is extended by about ¼% of its focal length after it has been focused for visible light. To attain additional sharpness, the diaphragm should be closed down.

Camera Motion During Exposure: Small cameras are not held sufficiently steady by the average person for longer than 1/50 to 1/100 second, nor large hand cameras for longer than 1/25 second. At slower shutter speeds the use of a good tripod eliminates camera motion. A shutter speed of 1/50 second is recommended for large hand-held cameras, and 1/50 or preferably 1/100 second for small cameras, if light conditions permit. To release a shutter properly, a s-l-o-w, "trigger squeeze" finger movement should be used without moving the rest of the hand. Holding the breath at the instant of exposure often helps to avoid camera motion.

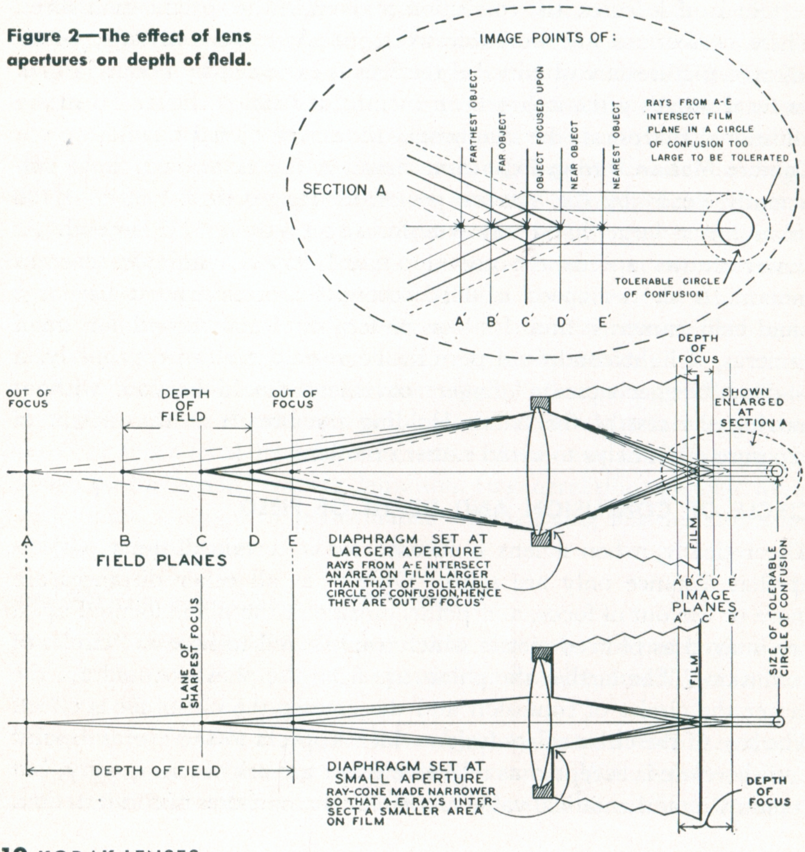
CIRCLE OF CONFUSION AND DEPTH OF FIELD

Theoretically, when a lens is focused for a certain distance, objects at that distance only are sharp. Objects at all other distances are more or less out of focus, and points outside of the plane focused upon are imaged as blurred circles which are referred to here as "circles of confusion." The farther the points are from the plane focused on, the larger the circles of confusion and the greater the out-of-focus effect. The size of the circle of confusion which appears to the eye as a point and therefore is accepted as tolerable is not a mark of lens quality, but is purely a mathematical value chosen for the purposes of computation.

For critical definition or sharpness, the circle of confusion *in the print* should not be larger than about 1/100 inch, if the print is to be viewed at the normal viewing distance of 10 inches. or, on an angular basis, the circle of confusion should not subtend more than two minutes of arc at the eye when the print is viewed for correct perspective (i.e., viewing distance equal to the focal length of the camera lens times the amount of enlargement, if any). When the circles of confusion exceed these limits, they appear to the eye as small blurs rather than points, and details within the image no longer appear sharp.

"Depth of field" of a lens refers here to the range of distances on the near and far sides of the plane focused upon, within which details are imaged with acceptable sharpness in the final print when observed from a normal viewing distance. Depth of field increases with increasing subject distance, decreases with increasing relative aperture, and increases with decreasing focal length, other things being equal.

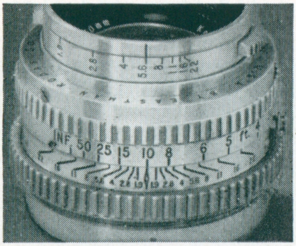
Figure 2—The effect of lens apertures on depth of field.



In addition to the factors mentioned above, the depth of field for any lens is dependent upon the size of the circle of confusion which is considered as acceptable. In computing the depth of field for Kodak lenses, a circle of confusion of 1/200 inch is used for folding Kodaks, 1/500 inch for miniature Kodaks, 1/1000 inch for 16-mm. Ciné-Kodaks, and 1/2000 inch for 8-mm. Ciné-Kodaks. For the Kodak lenses intended for commercial, press, portraiture, and studio work, a circle of confusion of 2 minutes of arc which is equal to approximately 1/1720 of the focal length is used in computing the depth of field. This is a smaller circle than is ordinarily used in computing depth of field tables for such lenses and is for critical definition when the print is viewed for normal perspective. At the limits of the range of sharpness, the circles of confusion are of the above dimensions, and between the limits, the circles of confusion are smaller. In the plane focused upon, these circles are a minimum.

Depth of field tables for a number of lenses are in the Lens Specifications. Formulas for computing depth of field are on page 34.

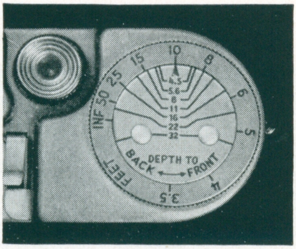
Depth of Field Indicators: Some cameras have depth of field indicators which show the approximate depth of field at various distances and lens apertures. The illustration on the left shows a depth of field indicator as part of the focusing scale. At the setting shown it indicates, for example, that at *f*/8, subjects from about 7 feet to 19 feet from the camera will be acceptably sharp. The right hand illustration shows an auxiliary type of depth of field indicator. The distance focused upon is brought opposite the index mark and the depth of field can be read off for the various lens openings. Controlled depth of field will help not only to emphasize or subdue fore- and background but also to avoid "wasting" depth of field. The following example will illustrate this: The subject is 50 feet away; exposure conditions call for *f*/11. If, instead of focusing at 50 feet, the indicator dial is turned until "infinity" comes to the *f*/11 line, the index mark is at 22 feet, and the gain in foreground sharpness is an additional 6 feet. The camera is, therefore, focused for 22, not 50 feet.



DEPTH OF FIELD INDICATORS:

← As part of the Focusing Scale.

Auxiliary Type of Indicator. →



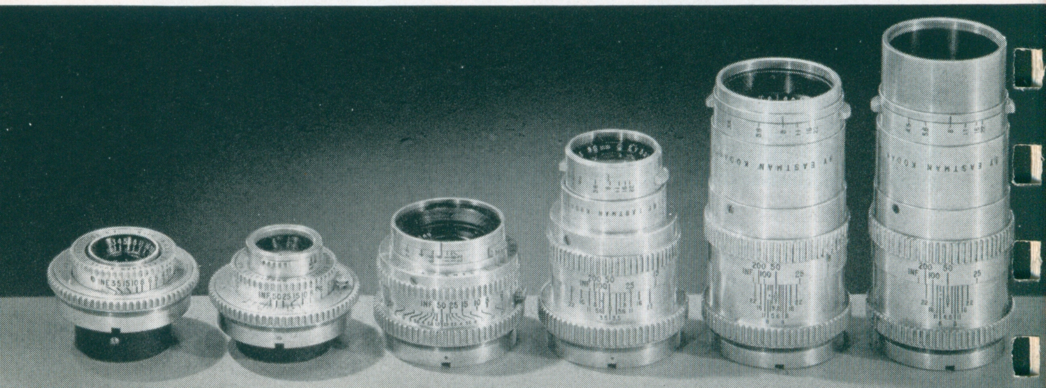
LENS PERFORMANCE IN COLOR PHOTOGRAPHY

The ever-increasing interest in color photography has brought more emphasis on the color corrections of photographic lenses. Insufficient lateral color correction, for example, causes color fringing in Kodachrome transparencies, or lack of register in color-separation negatives.

Kodak lenses of recent and present manufacture, according to their intended purposes, are adequately color corrected. The critical user can, however, test any lens for sufficient lateral color correction in the following manner: A test object of white threads should be arranged against a black velvet drop. These threads should be well illuminated, placed to fill the picture area, and critically focused on the camera ground glass. An image of a thread, close to one edge of the ground glass and parallel to that edge, should be examined carefully. If color fringing is apparent, the lens is not satisfactory for exacting color work. Kodachrome transparencies made only for ordinary viewing require less exacting lens performance.

If a lens is to be used for extremely critical work, a more rigorous test can be made photographically with the same subject, as follows: Three exposures should be made on panchromatic plates, such as Kodak Tri-X Panchromatic, Type B, Plates, with Wratten tricolor gelatin filters (cemented or glass filters should not be used for this test). These plates should be developed to low contrast, fixed, washed, and dried, as usual, and a contact positive on glass from one of them made on another plate; the positive also should be developed to a low contrast. This contact positive should be placed emulsion-to-emulsion with each of the other two negatives over an illuminator to see if the thread images coincide exactly. One of the test plates can be used to check the performance of the enlarger lens, if enlarged separation negatives are to be made, by focusing the enlarged image critically on the easel, then examining it for color fringing. If there is only a slight departure from register, definition may nevertheless be satisfactory for many types of work, and the lens can be tried on a typical subject.

Kodak Ektars—*Left to Right:* f/3.3, 35-mm.; f/3.5, 50-mm.; f/1.9, 50-mm.; f/3.5, 90-mm.; f/3.8, 135-mm.; and f/4.5, 153-mm.



KODAK LENSES

KODAK makes a complete line of lenses for still and amateur motion-picture cameras as well as for enlargers, projectors, and other photographic equipment. Here only still-camera and Ciné-Kodak lenses will be described in detail. Data for each lens are given in the Specifications starting on page 35. Summaries of lenses for enlarging and for home-movie and slide projection are shown on pages 51 and 60 respectively.

KODAK EKTARS

Of the millions of photographers, an increasing number carry out photographic work of a specialized nature. Industry and science are making ever greater use of photography. All this has created a demand for lenses that meet the most exacting requirements. In line with its policy to serve all photographic needs, the Eastman Kodak Company introduced in 1936 the first "Ektar" lens—the beginning of a series of highest quality lenses. Since then, other Ektar lenses have been added so that today there is available a balanced line of Ektar lenses serving practically all needs of the most exacting photographic worker. Kodak Ektars are not intended to replace, but rather to supplement, the long established line of Kodak Anastigmat Lenses, which are made to precise standards and give excellent results both in black-and-white and color.

In the Ektars, designers and lens makers have co-operated in making the best lenses that skill, care, and optical research can produce. For example, astigmatism, which is normally present in small amounts in all lenses, has been reduced in the Ektars to a new minimum. Air-glass surface treatment is applied to all Ektar lenses to reduce flare, and to improve the clarity and brilliance of the image in black-and-white negatives and color purity in Kodachrome transparencies. Color correction has been carried out to such a degree that color pictures made with Ektars not only satisfy the most exacting demands of the advanced color workers, but meet the far stricter requirements encountered when making photomechanical color reproductions.

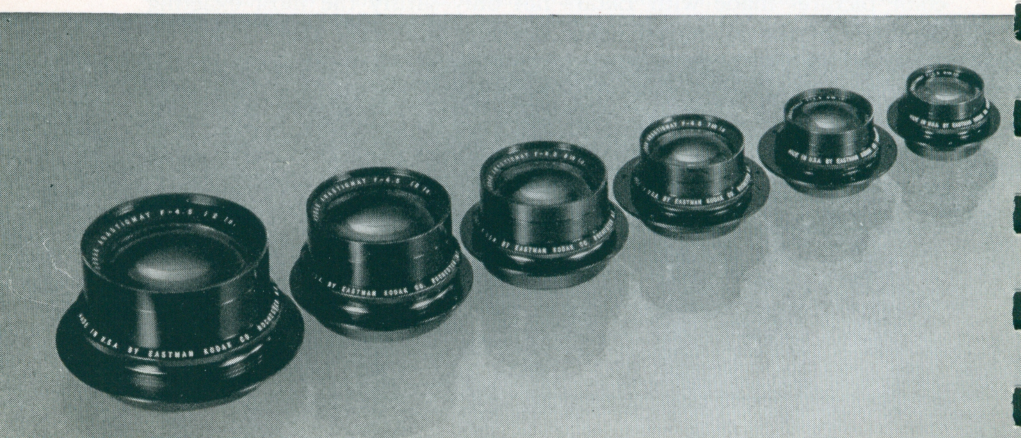
Kodak Ektars for Kodak Ektra and Bantam Cameras: Miniature photography with its specialized technique, its severe demands on the degree of enlargement of negatives, finds in the Kodak Ektar a lens which satisfies these requirements. All the corrections, notably those which make for greater definition, are carried out to an especially high degree. The numerous lens surfaces necessary for well-corrected high-aperture objectives permit the effective use of lens coating. Ektar lenses for the Kodak Ektra and Bantam Special have treated air-glass lens surfaces.

With interchangeable lenses, the change-over from one lens to another must not only be quick but, above all, precise and positive. To assure exact focus and positive coupling with the range finder, Kodak Ektars for the Ektra are held in precise position against a fixed lens seat by means of a threaded collar with a locking device. The 35- and 50-mm focal length lenses have a unique two-phase focusing scale which permits the minimum focusing limit to be extended from the customary 3½ feet to 1 foot.

Kodak Ektars for 2¼ x 3¼ and 3¼ x 4¼" Cameras: The *f*/3.7, 105-mm, *f*/4.5, 101-mm, and *f*/4.7, 127-mm Ektars are available in Flash Supermatic Shutters for cameras such as the Speed Graphic. The Kodak Medalist has an *f*/3.5, 100-mm Ektar. These lenses are of particular interest to the photographer using Kodachrome Professional Film, yet they are equally suitable for black-and-white photography, especially under adverse light conditions or when short exposures are necessary. In resolving power, definition, color correction, and other desirable lens qualities, they attain the very high standard established for all Ektar lenses. The air-glass surfaces of these lenses currently supplied are treated.

Eastman Ektars for 5 x 7 and 8 x 10" Cameras: These *f*/6.3 lenses, available in 14-inch, 12-inch, 10-inch, and 8½-inch focal lengths, and supplied in shutter or barrel, are especially designed for view and studio cameras, such as the Eastman Commercial View Camera Model B (All-Metal 8 x 10), and Eastman View Cameras 2D and 33A. They are corrected to a very high degree, especially for transverse chromatic aberrations or lateral color, and are, therefore,

Kodak Anastigmats *f*/4.5, supplied in a variety of focal lengths from 5½ to 12 inches for commercial, portrait, and press cameras.



ideally suited to Kodachrome and black-and-white photography. The treatment of the air-glass surfaces improves tone separation in shadows in both black-and-white and color pictures, and improves color saturation in color pictures. Each lens is tested for exact register of the images of the three primary colors.

KODAK ANASTIGMATS

Kodak Anastigmat *f*/4.5 Lenses for commercial, portrait, and press work are available in a variety of focal lengths from 5½ to 12 inches. They are supplied in barrels or shutters for use on appropriate cameras, such as the Speed Graphic and Graflex. They are highly corrected anastigmats, and their excellence is attested by the popularity they have long enjoyed among leading photographers.

Kodak Anastigmat Specials are made in a variety of focal lengths and in relative apertures of *f*/3.5 and *f*/4.5 and are supplied on various Kodaks. They are highly corrected and made according to the most reliable optical formulas and to very exact specifications, taking full advantage of recent progress in the optical field.

Kodak Anastigmats are well corrected anastigmats manufactured in a variety of focal lengths, and in relative apertures from *f*/3.5 to *f*/8.8. These lenses and the Kodak Anastigmat Specials permit the taking of pictures under unfavorable light conditions or at fast shutter speeds. Kodak Anastigmats, like other large-aperture lenses, require focusing.

KODAK ENLARGING LENSES

A lens which gives excellent results in a camera may not perform equally well as an enlarger lens, especially at low degrees of magnification. Good enlarging lenses are designed to meet the particular requirements of enlarging. They are especially corrected for short subject distances rather than for subjects at considerable distances from the lens. They have to work between flat fields, the flat surface of the paper and the flat negative. Since the usual way of focusing an enlarger lens is by visual inspection of the projected image, the longitudinal chromatic aberrations must be exceptionally well corrected. Enlarger lenses used for the making of color-separation negatives must also be well corrected for lateral color to insure precise register.

The lenses listed on page 51 are expressly designed to produce good enlargements. In Projection Ektars, lateral chromatic aberrations have been corrected to an exceptionally high degree. These lenses are therefore particularly suited for critical color work. They also have click stops which facilitate identifying diaphragm stops in the dark.

CINÉ-KODAK LENSES

The superb quality and precision of Kodak lenses are particularly evident when Ciné-Kodak and Kodascope lenses are considered. Due to the relatively small film-image size and the subsequent projection to a screen picture many hundred times enlarged, especially high demands are made on these lenses.

A noticeable difference between a Kodak and a Ciné-Kodak lens is the relatively longer focal length considered as normal for the latter. It is about double the diagonal of the exposed part of the picture frame: for 16-mm. film, 1 inch (25 mm.), and for 8-mm. film, ½ inch (13 mm.). This longer focal length of the lens narrows the angle of view down to about one-half that of a normal-focal-length lens of a still camera. For viewing home movies on a screen, this narrower angle approaches more closely normal vision for moving objects. Human vision has less tendency to scan when viewing moving objects and consequently has a smaller angle of view than when viewing a still picture.

The narrower angle of view of Ciné-Kodak lenses permits the making of faster lenses at lower cost and with fewer lens elements.

The depth of field for Ciné-Kodak lenses is calculated on the basis of a circle of confusion of 1/1000 inch for 16-mm. and 1/2000 inch for 8-mm. lenses. The fact that 8-mm. film is normally projected to a higher magnification than 16-mm. accounts for the difference.

Wide-angle and long-focus Ciné-Kodak lenses accomplish the same effects as such lenses on still cameras. The former lenses will be found useful in close quarters when it is desired to include a considerable portion of the subject, and the latter when a relatively large screen image of a distant object is wanted.

All Ciné-Kodak lenses are "Kodak Anastigmats," each one designed, corrected, and made to serve fully the task for which it is intended. All of them are color corrected and give excellent results with Kodachrome as well as black-and-white film.

All newer interchangeable lenses can be mounted quickly and securely by means of adapters. This permits the use of these lenses

Ciné-Kodak Lenses
Front row: **f/1.9, 25-mm. lens; lens adapter for Magazine Ciné-Kodak; and f/2.7, 15-mm. lens.**
Back row: **f/4.5, 76-mm.; f/1.6, 50-mm.; f/4.5, 114-mm.; f/2.7, 63-mm.; f/4.5, 152-mm.; and f/2.7, 102-mm. lenses.**

on various Ciné-Kodaks, and on new Ciné-Kodaks of the future. For close-ups with fixed-focus lenses, a Kodak Portrait Attachment is available. For titling, and small-object photography with lenses of normal focal length in focusing mount, Kodak Portra Lenses can be used.

Lenses of 38-mm. and longer focal length have unique two-phase focusing. This feature permits scale focusing for normal distances, and after lifting a plunger or removing a screw, the lens can be extended further for extreme close-ups. Using lens extension tubes gives an image on the film up to 8 times the subject size with 16-mm. and 14 times with 8-mm. Ciné-Kodaks. Making such extreme close-ups requires a camera with a reflex or an accessory focusing finder.

Details about the various Ciné-Kodak lenses, attachment sizes, depth of field, and sizes of field covered, are shown on pages 52 to 59.

KODAK SUPPLEMENTARY LENSES

Two series of Kodak supplementary lenses are available. They are the Kodak Portra Lenses, 1+, 2+, and 3+ diopters* and the Kodak Telek Lenses, 1−, 2−, 3−, and 4− diopters. These lenses are supplied as members of the Kodak Combination Lens Attachments, a series of combinable accessories which includes also filters, Pola-Screens, and Lens Hoods. In addition to these, the Kodak Portrait Attachment (¾ + diopter) is supplied. All these lenses are shaped for best lens correction, and are made and finished in the same manner as anastigmat lenses.

Kodak Portra Lenses are positive meniscus lenses and have three general uses.

1. When used with cameras which otherwise cannot focus for subjects closer than 3½ or 4 feet, the focusing range is brought to about 10 inches (with the 3+ lens) and the field size thereby reduced to about 5 x 7 inches. (See Figure 3.) This permits copying and small-object photography. Such photography otherwise demands a considerably extended bellows.

When the camera is focused, it must be fixed on a steady support. Unless the camera is equipped with a ground glass, focusing *must* be done by careful measurement, and the field covered, as given in the table, can be found roughly by disregarding the finder and sighting along the side of the camera. An alternative method of determining

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*The power of a lens is often expressed in "diopters." A diopter is by definition $\frac{1}{\textit{Focal length in meters}}$. Thus, a lens with a focal length of 1 meter (39.4 inches) has a dioptric power of 1. The + sign indicates a positive lens, the − sign indicates a negative lens.

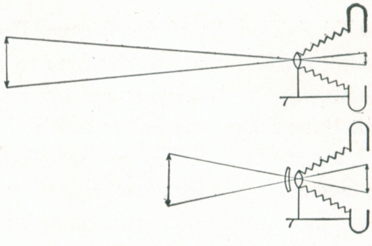


Figure 3. Portra Lens: for close-ups at normal lens-to-film distance.

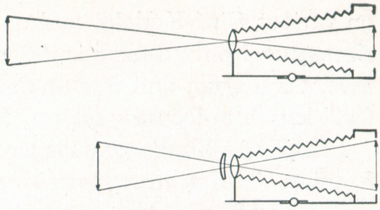


Figure 4. Portra Lens: for larger pictures of small objects at extended lens-to-film distance.

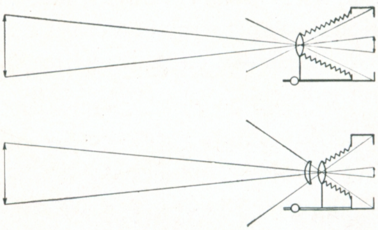


Figure 5. Portra Lens: for wide-angle work at shorter than normal lens-to-film distance.

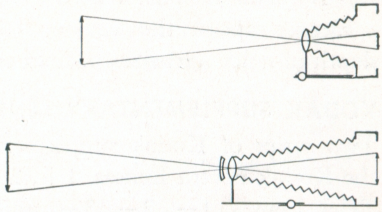


Figure 6. Telek Lens: for larger images of distant subjects at extended lens-to-film distance.

the field is to open the camera back *before loading*, place a sheet of ground glass—matte side toward the lens—in the plane normally occupied by the film, open the shutter, and observe the image.

2. The use of Portra lenses with cameras having double-extension bellows results in larger images of small objects. (See Figure 4.) The image in some cases may be considerably greater in size than the object. The use of the 3+ Portra provides the greatest magnification.

3. Portra Lenses can be used on most cameras of the film-pack type to secure wide-angle effects, since the focal length of the combined camera and Portra Lenses is shorter than that of the camera lens alone. (See Figure 5.) The camera must be focused by means of the ground glass; the camera lens will be back of its usual infinity position. The stronger the supplementary lens, the wider is the angle of view; thus, the 3+ lens gives the widest angle.

Kodak Portrait Attachments are low-power (3⁄4+) meniscus lenses, especially suitable for close-up pictures of people. They are available for most Kodaks and for Ciné-Kodaks with fixed-focus lenses.

Kodak Telek Lenses are negative meniscus lenses. They can be used only with cameras having double extension bellows or other means of extending the lens-to-film distance considerably, such as extension backs, extension tubes, etc., and focusing must be done on a ground glass. They make possible low-power telephoto effects and are useful for photographing distant objects and for the making of informal pictures of children, pets, birds, and other subjects when it is impossible or undesirable to take the camera close to the subject. (See Figure 6.) The 4− lens gives the greatest effect.

Setting the Camera Focusing Scale for Portra Lenses does not depend on camera lens focal length, but primarily on the subject distance and power of the supplementary lens. The focusing scale settings are given in the table on page 20. They can also be found by the formula on page 33.

Effective *f*-Number: The Portra Lens reduces the effective focal length of the camera lens. As long as the lens combination is used at the usual lens-to-film distances, the indicated *f*-number applies for all general work. When the Portra Lens is used for wide-angle effects, there is a considerable increase in effective lens aperture. However, when the Portra Lens is used for extreme close-ups with extension bellows or backs or when Telek Lenses are employed, there is a considerable decrease in effective lens aperture. In both cases this must be taken into consideration. This can be done conveniently with the *Kodak Lens Guide* or by the formula given on page 32.

Size of Field is primarily dependent on subject distance and camera angle of view. It is also affected slightly by the separation between camera and supplementary lens; the values given in the tables are, therefore, approximations. Exact field size should always be found by ground glass focusing methods.

Depth of Field when using supplementary lenses is very shallow, a matter of fractions of an inch in many cases. It is, therefore, necessary to measure lens-to-subject distance accurately, and to set the focusing scale correctly. To gain depth of field, the smallest practical aperture should be used. The depth of field at *f*/8 for minimum and maximum distance settings with Portra Lenses 1+, 2+, and 3+ on lenses of two different focal lengths is shown on the following page.

Supplementary Lenses and Definition: A supplementary lens introduces slight aberrations which increase with aperture and focal length of the camera lens and with the power of the supplementary lens. For practical purposes, definition is restored by using small apertures. A supplementary lens should be shielded from side light by a lens hood.

Subject Distances with Portra Lenses

Distance from Supplementary Lens to Subject in Inches for Kodaks and Ciné-Kodaks

Focusing Scale Set At Feet	Kodak Portrait Attachment	1 + Kodak Portra Lens	2 + Kodak Portra Lens	3 + Kodak Portra Lens
Inf.	52½	38¾	19½	13
50	48⅜	37	19⅛	12⅞
25	44¾	34¾	18½	12½
15	40⅝	32⅜	17¾	12¼
10	36½	29⅝	16⅞	11⅞
8	34	27⅞	16⅜	11½
6	30⅜	25½	15½	11⅛
5	28	23¾	14⅞	10¾
4	25⅛	21⅝	14	10⅜
3½	23⅜	20⅜	13⅜	10
3	—	18½	12⅝	9½
2	—	14⅜	10½	8¼

Optical Data for Kodak Portra Lenses

		Kodak Portra Lenses		
		1 +	2 +	3 +
24 x 36-mm. Camera with 50-mm. Lens				
DEPTH OF FIELD AT *f*/8 — Distance Scale set at	3½′	18¾″ — 22¼″	12⅝″ — 14¼″	9⅝″ — 10½″
	Inf.	32¼″ — 46½″	17⅞″ — 21⅜″	12¼″ — 13⅞″
APPROX. FIELD SIZE — Distance Scale set at	3½′	9¼″ x 14″	6⅛″ x 9¼″	4½″ x 6⅞″
	Inf.	18⅝″ x 28″	9⅜″ x 14″	6¼″ x 9⅜″
2¼ x 3¼-inch Camera with 100-mm. Lens				
DEPTH OF FIELD AT *f*/8 — Distance Scale set at	3½′	19⅜″ — 21⅜″	12⅞″ — 13⅞″	9¾″ — 10¼″
	Inf.	34⅞″ — 43½″	18⅜″ — 20¾″	12½″ — 13⅝″
APPROX. FIELD SIZE — Distance Scale set at	3½′	10½″ x 15¼″	6⅞″ x 10″	5¼″ x 7½″
	Inf.	22⅛″ x 32″	11⅛″ x 16⅛″	7½″ x 10¾″
16-mm. Ciné-Kodak with 25-mm. Lens				
DEPTH OF FIELD AT *f*/8 — Distance Scale set at	2′	12¾″ — 16⅜″	9⅝″ — 11⅝″	7¾″ — 9″
	Inf.	*	16⅞″ — 23½″	11¾″ — 14¾″
APPROX. FIELD SIZE — Distance Scale set at	2′	4⅛″ x 5½″	3″ x 4″	2⅜″ x 3¼″
	Inf.	*	5⅝″ x 7½″	3¾″ x 5″
8-mm. Ciné-Kodak with 13-mm. Lens				
DEPTH OF FIELD AT *f*/8 — Distance Scale set at	2′	11⅜″ — 19″	8¾″ — 12⅞″	7¼″ — 9¾″
	Inf.	*	14⅞″ — 28⅜″	10¾″ — 16⅝″
APPROX. FIELD SIZE — Distance Scale set at	2′	3⅞″ x 5⅛″	2¾″ x 3¾″	2¼″ x 3″
	Inf.	*	5″ x 6¾″	3⅜″ x 4½″

*There is no advantage in using a Portra Lens 1 + on any of the Ciné-Kodak Lenses when the lens is focused at a distance greater than 4 feet, because the same field size can be obtained by using the regular lens without the Portra Lens 1 +.

Diffusion Attachments

The Kodak Pictorial Diffusion Disk for cameras is a device which, by means of concentric circles and radial lines polished into its surface, produces a picture made up of a combination of sharp and soft images. The softness produced is desirable in many pictures, such as landscapes.

The Kodak Portrait Diffusion Disk is somewhat similar to the Kodak Pictorial Diffusion Disk in its diffusion effect. It has, in addition, the required optical power (¾+ diopter) to focus the camera for close-ups.

The Kodak Diffusing Disk is used over the enlarger lens; with it soft-focus prints can be made from sharp-focus negatives. These disks (in three grades for slight, medium, or strong diffusion) are made by polishing a pattern of crossed parallel lines in one face of flat optical glass.

CARE OF LENSES

For lenses to perform satisfactorily they must be properly aligned with the film, plate, etc. Rough handling or the application of undue force in the use of a camera may upset such alignment and should, therefore, be avoided. If a camera yields consistently imperfect results through no apparent fault of the user, it should be inspected by a reliable dealer and repaired if necessary.

All optical glass surfaces should be protected as much as possible from dust, dirt, and fingerprints. Keeping the camera closed when not in use, in the case of a folding model, or the use of a carrying case or lens cap affords some protection. Lenses should also be protected from jars and jolts, and from extreme and sudden temperature changes. They should not be stored in hot or humid places.

An occasional cleaning of all outer lens surfaces—the front as well as the rear—is not only recommended but is necessary for best optical results. Care should be used not to scratch these lens surfaces while cleaning. Any dust or grit should be removed first by gently brushing the surface with wadded Kodak Lens Cleaning Paper or a fine camel's-hair brush. If this brushing action fails to clean the lens, wipe it gently with a wad made from one or several sheets of Kodak Lens Cleaning Paper or a clean, soft, lint-free cloth, such as well-washed linen. Always wipe lightly and with a circular movement. In the case of fingerprints or scum formation, the use of a drop of Kodak Lens Cleaner on the cleaning paper or cloth or breathing on the lens is suggested. Do not use acid, alcohol, and other solvents or harsh, linty cloth. Avoid excessive cleaning and excessive pressure as this may do more harm than good. ***Important:*** No attempt should be made to take a lens apart. If the lens or mounting requires attention, it should be returned to the manufacturer.

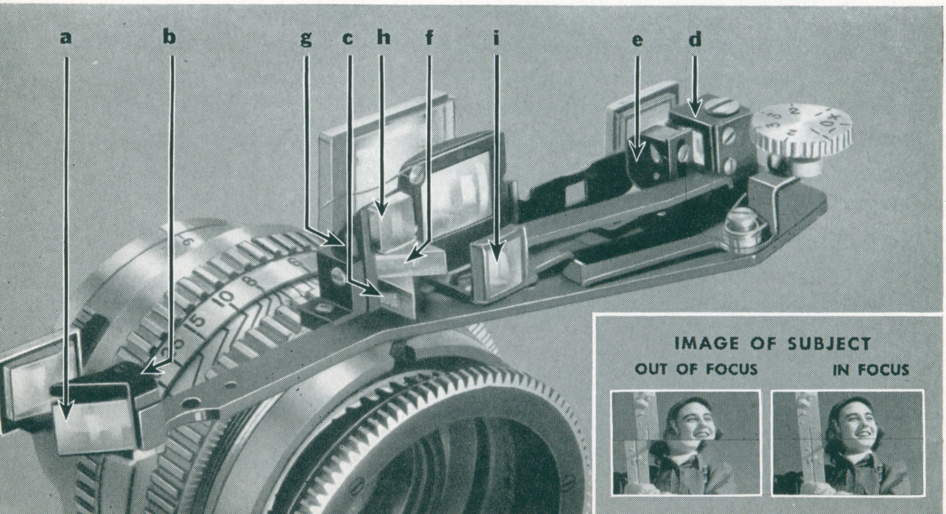
KODAK RANGE FINDERS

As an aid to accurate focusing, certain Kodaks, such as the Kodak Ektra, the Kodak Medalist, etc., have range finders coupled to the camera lens. For cameras not so equipped, the Kodak Service Range Finder is available. Basically, range finders measure the angle of convergence between two beams of light coming from the same subject point and separated at the camera by the distance between the two apertures of the range finder. The range finder operates by changing the direction of one beam to bring the two beams into alignment in the eyepiece. In coupled range finders, the movable prism or other means for deflecting the one beam of light is linked with the focusing mechanism in such a manner that the lens is focused, at all times, for the point of convergence of the two beams forming the aligned image. The Kodak Service Range Finder contains a scale which translates angle of convergence to linear distance directly. With subject distance thus determined, the camera can be set according to its focusing scale.

The longer the base of the range finder, the greater is its accuracy,

SPLIT-FIELD, MILITARY TYPE OF RANGE FINDER OF THE KODAK EKTRA

The image of the subject to be focused upon is reflected by fixed prism (a) through lens (b) lower coincidence prism (c) on to the latter's front part where it forms stationary half of the image. The second image of the same subject is reflected through movable prism (d), lens (e), upper coincidence prism (f) on to the latter's front part where it forms movable upper half of the image. The prism (g) erects the inverted image of both halves for normal viewing through collecting lens (h) and eye lens (i). The focusing mount of the camera lens is coupled with the movable prism (d). When both image halves are in alignment, the camera lens is focused on the subject seen aligned in the range finder.



other things being equal. In cameras for which a range finder of a long physical base is impractical, the effective base is, in some cases, lengthened optically. With lenses of moderate focal length, the depth of field is infinite beyond one hundred feet, and a range finder with a relatively short base has sufficient accuracy.

Ease and speed of aligning the two image halves in the range finder, especially under unfavorable light conditions, depend upon their size and clarity. For this reason, split-field range finders with two clear, brilliant fields showing magnified images of the subject focused on are used extensively by the Navy and Army. All Kodak range finders are of the split-field, military type.

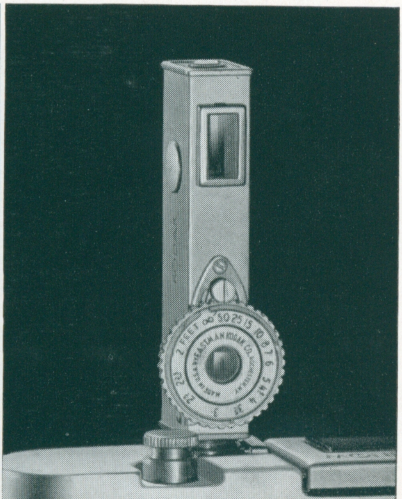
Range finders are an aid to more nearly accurate focusing, and consequently to sharper and crisper pictures. They are, however, especially useful when distances must be determined accurately, for example, in close-up work and when high-speed lenses are used at wide apertures.

In addition, photographic range finders are useful for measuring other distances when exactness contributes toward better pictures. For example, a range finder can be used in some cases to measure the lamp-to-subject distance in picture taking with artificial light. It can also be used to determine whether near and far objects in the picture are within the depth of field given by indicator or table for a given lens setting.

Good range finders are precision instruments and should be treated as such. All outside glass surfaces should be kept clean. A range finder should never be tampered with, and if it is in need of adjustment, only a competent repairman or the factory should be allowed to do this work.

Close Range and View Finder for Kodak Ektra.

Kodak Service Range Finder.



COUPLED, SPLIT-FIELD, MILITARY-TYPE KODAK RANGE FINDERS

On the Kodak Ektra: The base of the range finder is $4\frac{1}{8}''$, the magnification $2.2\times$, making it the longest effective range finder base on any 24 x 36 mm. camera. This base assures adequate focusing with telephoto lenses for this camera. Coupling of range finder to all the various lenses is automatic, accurate, and positive. An adjustable eyepiece permits accommodation for differences in eyesight.

On the Kodak Bantam Special: The base is $1\frac{13}{16}''$ and the magnification $3.1\times$, ample for the *f*/2, 45-mm. lens of this camera. The ocular can be adjusted for individual eyesight.

On the Kodak Medalist: The base is $2\frac{1}{2}''$—the magnification $1.5\times$. When sheet film or film packs are used, range finder and focusing scale are automatically adjusted to the different film plane.

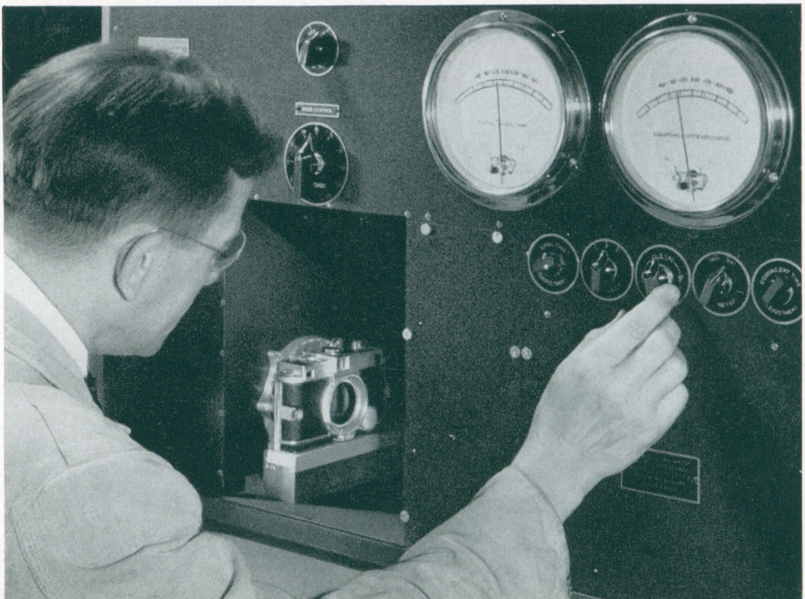
On the Kodak 35: The base of this range finder is $2\frac{5}{16}''$, unit magnification, sufficiently long for the *f*/3.5, 50-mm. lens.

AUXILIARY, SPLIT-FIELD, MILITARY-TYPE KODAK RANGE FINDERS

Kodak Service Range Finder: Inexpensive, small, and sturdy. It measures distance from "Inf." to 2 feet and can be attached to cameras having a suitable clip. Its base is $1\frac{21}{32}''$ without magnification.

Close Range and View Finder for the Kodak Ektra with *f*/1.9 lens: This range finder is especially designed for measuring distances from $3\frac{1}{2}$ feet to $10\frac{1}{2}$ inches. Its base of $1\frac{1}{2}''$ is, without magnification, sufficient for accurate measurements at this close range.

Kodak shutters are carefully checked for accuracy and efficiency on special electronic testing apparatus.



KODAK SHUTTERS

INCREASES in lens and emulsion speeds, the use of full-color films, and the greater exactness exercised by photographers have placed emphasis on faster and more accurate shutters.

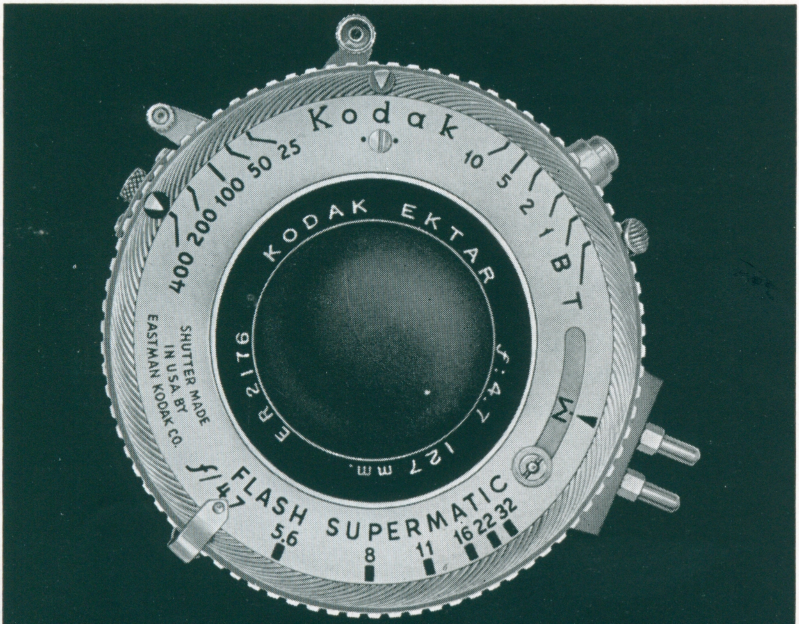
The scope of a shutter is not determined by the number and range of speeds alone. It is of equal importance that the exposure be sufficiently accurate and consistent at every speed indicated.

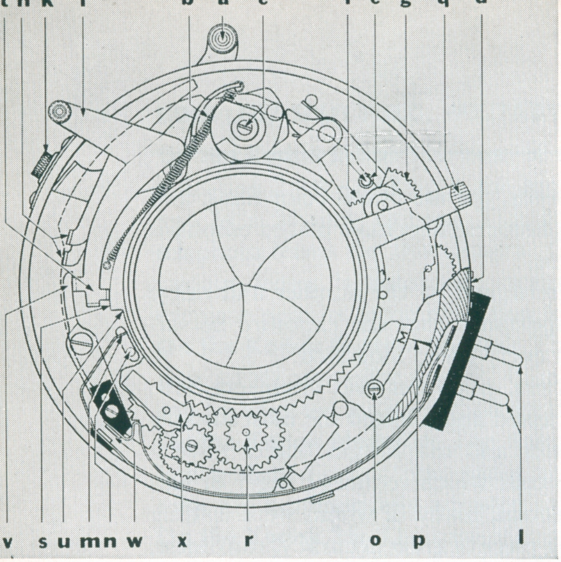
To achieve this in Kodak shutters, physicists and engineers have worked out designs, chemists have tested and selected the most suitable raw materials. For example, shutter and diaphragm blades have a wear-resisting matte black surface coat which reduces danger of lens flare even after years of use. Craftsmen, many of whom were leading watchmakers, have created a timing piece of great accuracy, sturdiness, and efficiency. As in fine watches, base plates are milled and drilled to close tolerances, and gears are cut and scratch-brushed.

Wholehearted co-operation between designer and craftsman, modern precision manufacturing methods, and more than fifty years' experience in making shutters have created a line of Kodak shutters, each one of which compares favorably with any shutter of similar type and price.

While various means, such as rotating disks, dropping slides, etc., can be used as shutters for still cameras, the most commonly encountered today are between-the-lens and focal-plane shutters.

Kodak Flash Supermatic Shutter with nine speeds ranging from 1 to 1/400 second, built-in synchronization for three flash settings, and blade arrester.





KODAK FLASH SUPERMATIC SHUTTER

Presetting the shutter by moving lever (a) to the right sets up tension in spring (b); at 1/400 second additional spring located under eccentric member (c) is brought into action. Shutter speeds are changed by turning speed selecting ring (d) which, by means of cams shown as dashed line, actuates controls. The step-shaped cam at (e) controls extent of engagement of gear sector (f) with one member of gear train retard mechanism (g) and a cam, not shown, controls position of an oscillating pallet relative to a ratchet wheel. "T" and "B" are determined by positions of levers (h), also controlled by a cam. The release lever is marked (i) and the socket for the cable release (k).

Flash discharges with no time lag are synchronized with shutter blade action by an electric circuit formed through prongs (l) and closing it at (m) through post (n) which moves upward as blades open.

Photoflash lamps with 5 milliseconds time lag are synchronized by sliding "F" on the limiting stop (o) opposite index (p). Clockwise movement of lever (q) sets up spring tension through gear train (r) and moves cam (s) upwards. Downward pressure on lever (i) now allows its extension (t) to move sideways to cam (u). Lever (v) follows and opposite end closes contacts (w). This releases gear train which, through downward movement of step between cams (s and u), actuates lever (t) and releases shutter so blades are fully opened about 5 milliseconds after electric circuit has been closed.

Synchronizing flash lamps with 20 milliseconds time lag is accomplished similarly. Limiting stop (o) at "M" permits extended movement of lever (q) which, in addition to the action described above, engages oscillating pallet (x). The pallet's action slows down counterclockwise travel of "step" and shutter is released so that "fully open" is reached about 20 milliseconds after contacts (w) have closed.

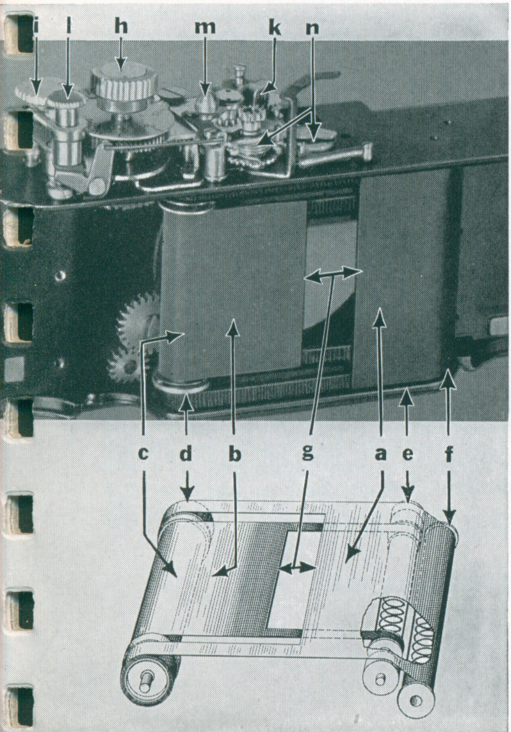
Between-the-Lens or Central Shutters open from the center and close toward the center. Exposure time depends upon the speed of opening and closing and the time the shutter remains open. There are two types—the self-setting or automatic, and the presetting shutter. In the former, pressing the release lever first sets up the spring tension and then trips the shutter. Such a design is generally employed on shutters with fewer and slower shutter speeds. In the presetting type of shutter, the necessary spring tension is produced by the separate action of setting or cocking before an exposure can be made. This construction permits not only a greater number, but also faster and more accurate shutter speeds. On most cameras the cocking of the presetting shutter has to be done manually; however, on some cameras, such as Kodak 35, Medalist, etc., advancing the film sets the shutter.

Focal-Plane Shutters are curtain types of shutters that operate near, and parallel to, the emulsion surface. The exposure time is regulated by varying the width of the slit, the time lag between the movement of two curtains, or in some cases, by varying the tension that pulls the curtain. For uniform exposure, it is important that the velocity of the curtains be uniform or that acceleration be compensated for by increasing the width of the slit as it moves across the focal plane.

Either type of shutter has advantages and shortcomings. The central shutter exposes the total film area at one time, whereas the focal-plane shutter, when using a slit, exposes one portion of the film after another. The latter results, in photographs of rapidly moving objects, in a slightly drawn out, contracted, or diagonally distorted image, depending upon the direction of the subject's movement. Central shutters permit synchronization at fast shutter speeds with high-peak, high-intensity flash lamps; whereas focal-plane shutters call for special flash lamps with a plateau type of light output curve.

Synchronization of Shutters with Flash Lamps: To assure good synchronization, the time lag of the flash lamp as well as the lag of the shutter has to be considered. In flash lamps, this lag represents the time between the instant the current is applied and the instant the peak or plateau of light intensity is approached. In central shutters, it is the time between the tripping of the shutter and the instant the

FOCAL-PLANE SHUTTER OF KODAK EKTRA



Operating the lever on the back of camera first brings edge of curtain (a) over edge of curtain (b), and then winds them together across film aperture onto rollers (c and d) setting up spring tension in rollers (e and f). Shutter speeds of 1/50 to 1/1000 sec. are determined by width of the curtain opening (g), regulated by knob (h) which turns roller (c) in relation to roller (d). Acceleration is compensated for by widening of slit as it travels across film plane due to difference in diameter of rollers (c and d). Speeds 1 to 1/25 sec. are selected with dial (i) and controlled by an escapement mechanism (k) which varies the delay of curtain (b) after curtain (a) has completed its run. At "B" setting curtain (a) moves across when the shutter release button (l) is pressed down and curtain (b) follows when button is released. Moving self-timer lever (m) in clockwise direction winds up a spring-actuated escapement mechanism (n) which delays automatic tripping of the shutter by 10 to 12 seconds.

shutter blades clear a given lens aperture. In Kodak central shutters of the presetting type, the average time lag is about 4 to 6 milliseconds, and in those of the self-setting type, 8 to 15 milliseconds. These figures include the time interval between pressing the shutter release to the instant the blades start to open, plus the blade opening time. In focal-plane shutters, the time lag important for correct synchronization represents the interval between tripping the shutter and the instant the curtain slit reaches the film area. In the focal-plane shutter of the Kodak Ektra, the average time lag is 15 to 20 milliseconds.

Flash Supermatic Shutters are equipped with a built-in mechanism which can be engaged to close an electrical circuit from 5 to 20 milliseconds before the shutter opens completely for precise synchronization of flash lamps. These shutters also have contacts for flashing Kodatron Speed Lamps electrically at the precise instant the shutter is fully opened.

Blade-Arrester: This feature on Kodak Flash Supermatic and Supermatic Shutters used for press- and view-type cameras permits the opening of the shutter blades for focusing purposes at any speed selected, without moving the speed selecting dial to "T" or "B".

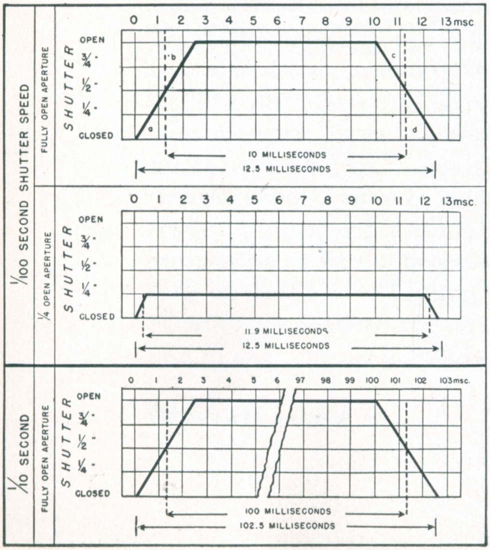
Delayed-Action Release: Some shutters are equipped with a device that delays the actual tripping of the shutter by about 10 to 12 seconds to allow the person actuating it to get into the picture.

EFFICIENCY OF A BETWEEN-THE-LENS SHUTTER AT VARIOUS SPEEDS AND LENS OPENINGS

The top figure shows that out of 12.5 milliseconds, about 2.5 are used for the blades to open fully. About the same time is needed for the blades to close. The shutter permits light to pass the moment the blades begin to open. Light begins to be cut off the moment the blades start to close. Taking a half-open position as a basis for measuring shutter efficiency compensates for this action, since area (a) is equal to area (b) and area (c) to (d). On this basis the efficiency of the hypothetical shutter illustrated is about 78%.

The middle figure demonstrates that shutter efficiency increases with smaller diaphragm openings. Shutter blades clear a small lens stop in less time than a fully opened one. The shutter efficiency in the case illustrated is about 93%.

The lower illustration shows that shutter efficiency is greater with slower shutter speeds since the time required to open and to close the blades to the half-open position is a smaller percentage of the total time than with faster shutter speeds. At 1/10 of a second and with fully open aperture the efficiency is about 97%.



Shutter Efficiency: With between-the-lens or central shutters, efficiency is expressed as a ratio between the actual amount of light permitted to pass and light that would pass if the shutter blades could open and close instantly. An efficiency of 100% is impossible to achieve, since moving blades have to overcome inertia and friction. Kodak shutters of the presetting type open to the maximum diaphragm setting within about two to three milliseconds from the time the blades permit the first ray of light to pass. They close in approximately the same time. Kodak shutters of the self-setting type are somewhat slower and require about six to nine milliseconds. These figures vary somewhat from shutter type to shutter type. They also depend upon the care the shutter has received.

The smaller the diaphragm, the shorter the time used by the shutter blades to clear the lens opening with the result that shutter efficiency increases markedly with smaller lens apertures. Shutter efficiency is greater with longer exposures, since the time for opening and closing represents a smaller percentage of the total shutter operating time.

Shutter efficiency with focal-plane shutters depends upon the distance between shutter curtain and film plane, the width of the slit, and the lens stop used.

Kodak shutters supplied today have been brought to such a degree of mechanical perfection that the unavoidable lowering of efficiency at highest speeds and maximum lens aperture is so small that it will not affect correct exposures even of film with short exposure latitude.

Shutter Testing: All Kodak shutters are carefully tested on special machines of the highest precision and must work within strictly held tolerances before they are permitted to leave the factory. While it may be possible to use uncalibrated testers such as rotating disks, etc., to check approximately the speeds on central shutters, such tests do not always give dependable results, especially at the higher speeds, since they do not take into consideration shutter efficiency.

The Use of Kodak Shutters: In Kodak central shutters, the speed is selected by moving a lever or by turning a collar on the periphery of the shutter housing. The speeds are varied by means of a step-shaped cam. This type of cam permits the repeating of the same exposure with greater certainty, since the exposure over the whole width of the step is the same. A continuous cam would vary the exposure at the slightest deviation from the exact setting. A step-shaped cam further permits a more accurate calibration of the individual shutter speeds. It does not, however, allow intermediate speeds by setting the index between speed markings.

Care of Shutters: Shutters of the presetting and the focal-plane type should not be put aside or stored for long time intervals in a set or cocked position, as this may weaken the spring tension. Avoid jarring or other rough handling, as shutters are fine timing instruments and should be treated as such. Like watches, shutters may have to be checked and cleaned once in a while. This work should be done by a competent repair man or the factory.

Kodak Shutter Data

Focal-Plane Shutter of the Kodak Ektra:

B, 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/250, 1/500, 1/1000, and delayed-action release.

Between-the-Lens or Central Shutters:

Presetting Type:

Flash Supermatic: T*, B, 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400. Built-in device for synchronizing flash lamps and Kodatron flashes.

Supermatic: T*, B, 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400 (No. 3 no 1/400). Practically all No. 1, 2, and 3 Supermatic shutters have a delayed-action release.

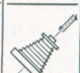
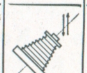
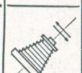
Note: Flash Supermatic and Supermatic Shutters for press, view, and similar cameras are equipped with a blade arrester.

Kodamatic: T*, B, 1/10, 1/25, 1/50, 1/100, 1/200, and delayed-action release.
Diomatic: T, B, 1/25, 1/50, 1/100.

Self-Setting Type:

Dakon: T, B, 1/25, 1/50, 1/100—some models without 1/100.
Dak: T (time), B (bulb), I (instantaneous—approx. 1/40 second).

Note: The number preceding or following the shutter name indicates the size of the shutter.
*On shutters used on cameras with a double exposure prevention device, "T" is omitted.

TABLE OF SHUTTER SPEEDS TO RECORD SUBJECTS IN MOTION			Motion Toward or Away from Camera	Motion at About 45° Angle to Camera	Motion at Right Angles to Camera
Approximate Speed of Subject in miles per hour	Characteristic Subjects	Distance of Subject from Camera			
			Proper Shutter Speeds		
5-10	Pedestrians, Slow-moving Animals, Construction Work, Street Activity, Children Playing, Boating	25 ft 50 ft. 100 ft	1/100 1/50 1/25	1/200 1/100 1/50	1/400 1/200 1/100
20-3	Athletics, Baseball, Yacht Races, Horse Racing, Motorboats, Surf Diving, Views from Trains	25 ft. 50 ft. 100 ft.	1/200 1/100 1/50	1/400 1/200 1/100	1/1000 1/400 1/200
60 and up	Auto Races, Motorcycles, Airplanes, Fast Trains	25 ft. 50 ft. 100 ft.	1/400 1/200 1/100	1/1000 1/400 1/200	 1/1000 1/400

USEFUL OPTICAL FORMULAS

In the photography of small objects, in special work with supplementary lenses, and with various projection arrangements, it often happens that the photographer wishes to compute the subject and image positions or sizes, field size, depth of field, etc. A few basic optical formulas are given here to assist in making such calculations

The usual diagram of the formation of an image by a lens shows rays proceeding in straight lines from points in the subject to corresponding points in the image, as though they passed through a pinhole at the center of the lens. In an actual lens this group of rays may not proceed in straight lines through the center of the lens. Usually, these rays from the subject converge toward one point or apparent pinhole, but after passing through the lens, they diverge apparently from another pinhole or point at a different position on the lens axis. For theoretical accuracy, the subject distance and image distance should be measured from these two points, known as the first and second nodal points. With normal photographic lenses, however, these points are not unduly separated, and the following formulas will apply with practical accuracy if distances are measured to the center of the lens. This approximation does not apply to telephoto lenses in which the principal planes or nodal points may be a considerable distance in front of the lens.

To Find the Focal Length of a Lens: The focal length is roughly equal to the distance from the center of the lens to the image plane when the lens is focused for a very distant object. The focal length can be found more accurately by focusing on a small subject, such as a ruler, so that the image is exactly one half the size of the subject. The focal length is then approximately one third of the distance from the subject to the center of the lens.

To Find the Back Focus of a Lens: Focus for a very distant object (infinity) and measure the distance between the rear lens surface and the image plane.

Formulas for approximate position of subject and image:

f = focal length | u = subject distance | h = height of subject
m = magnification | v = image distance | h' = height of image
x' = distance of image from focal point, or distance lens is moved from infinity setting

The fundamental relation between focal length and image and object distance is: $\frac{1}{f} = \frac{1}{u} + \frac{1}{v}$

More directly useful relations are:

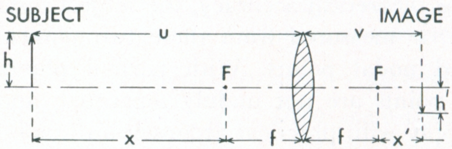
Lens to Image: $$v = \frac{fu}{u - f} = mu = (m + 1)f$$

Lens to Subject: $$u = \frac{fv}{v - f} = \frac{v}{m} = \left\{\frac{1}{m} + 1\right\}f$$

Subject to Image: $$u + v = \frac{(m + 1)^2}{m}f$$

Magnification: $$m = \frac{h'}{h} = \frac{v}{u} = \frac{v - f}{f} = \frac{f}{u - f}$$

Lens movement from infinity position: $$x' = \frac{f^2}{u - f}$$



Lens-Subject-Image Positions

These relations hold strictly if the measurements are made from the first and second nodal points. With a normal photographic objective, not a telephoto lens, practical accuracy results if u and v are measured from the lens center.

Effective Aperture for Close-Ups differs from the indicated aperture because of the increased image distance. This is especially important in work with Kodachrome Film and in copying.

$$\text{Effective } f\text{-number (for any subject distance)} = \frac{v \times f}{\mathrm{f}}$$

where v = lens-to-film distance, or focal length plus lens extension from infinity focus
and *f* = indicated *f*-number of aperture
and f = focal length

For close-ups, allow this aperture correction, or increase exposure time by v^2/f^2.

Both aperture and time corrections are given directly by the *Kodak Lens Guide* for all lenses 1 to 30 inches in focal length.

Approximate Formulas for Supplementary Lenses, when the separation between supplementary lens and camera lens is small in comparison with the focal length of the latter. For a negative supplementary lens, f_s must be treated as a negative value.

f = focal length of camera lens.
f_s = focal length of supplementary lens.
f_c = focal length of the combination.

$$\frac{1}{f_c} = \frac{1}{f} + \frac{1}{f_s}$$

u = distance from supplementary lens to subject.
v = distance from center of camera lens to film.
m = magnification on film (image size/subject size).
S = distance for which camera lens is focused.

Lens to Subject: $u = \dfrac{f_c v}{v - f_c}$

Lens to Image: $v = \dfrac{f_c u}{u - f_c}$

Magnification: $m = \dfrac{v}{u} = \dfrac{f_c}{u - f_c}$

Setting of camera focusing scale: $S = \dfrac{u f_s}{f_s - u}$

Effective *f*-number = Indicated *f*-number x $\dfrac{v}{f}$.

When camera lens is set at infinity mark,
$v = f$; $u = f_s$; effective *f*-number = indicated *f*-number.
For very distant objects,
$v = f_c$; effective *f*-number = indicated *f*-number x $\dfrac{f_c}{f}$.

Angle of View: The angle of view or angular field may mean (1) the diagonal of the picture size, (2) the long, or (3) the short sides of the picture. When a single value is given it usually refers to the angle subtended at the lens by the diagonal of the picture.

Angle of view when focused for infinity: $\dfrac{\frac{1}{2}d}{f} = \tan \Theta$

Angle of view for close-ups: $\dfrac{\frac{1}{2}d}{v} = \tan \Theta$

Where:

d = negative dimension (diagonal, or long or short side).
Θ = ½ the angle of view.

To find Θ, consult a table of trigonometric functions.

Depth of Field Computations can be made on the basis of a fixed circle of confusion or on a circle of confusion equal to a fraction of the focal length. When the latter method is used, all lenses of equal effective diameter (not relative aperture) have the same depth of field when the image is viewed at the distance for normal perspective. See the discussion of depth of field, page 9.

Method A, fixed circle of confusion:

f = focal length of lens

f = f-number of relative aperture

H = hyperfocal distance

u = distance for which camera is focused

d = diameter of circle of confusion

$$H = \frac{\mathrm{f} \times \mathrm{f}}{f \times \mathrm{d}}$$

Near limit of depth of field (measured from camera lens) $= \dfrac{H \times u}{H + (u - \mathrm{f})}$

Far limit of depth of field (measured from camera lens) $= \dfrac{H \times u}{H - (u - \mathrm{f})}$

Method B, circle of confusion a fraction of the focal length of the lens:

u = distance focused upon

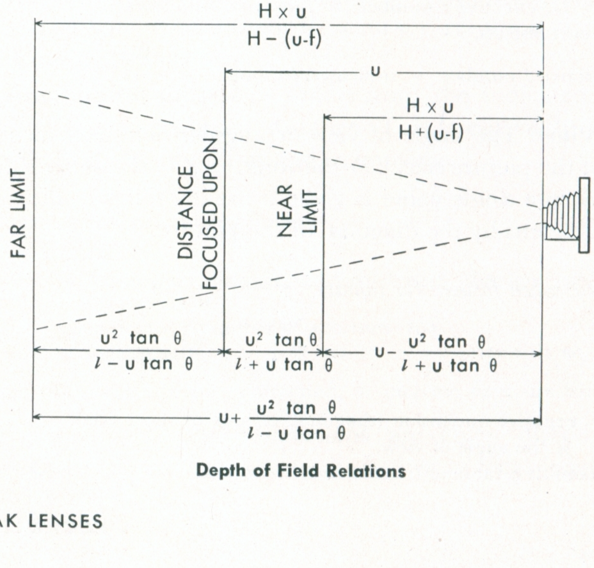
Θ = angular size of circle of confusion (in cases where critical definition is required, a common value for Θ is 2 minutes of arc [$\tan 2' = .00058$], or approximately f/1720)

l = *effective diameter of lens* $= \dfrac{\mathrm{f}}{f}$

Near limit of depth of field (measured from plane focused upon) $= \dfrac{u^2 \tan \Theta}{l + u \tan \Theta}$

Far limit of depth of field (measured from plane focused upon) $= \dfrac{u^2 \tan \Theta}{l - u \tan \Theta}$

All distances must be expressed in the same units, such as feet, inches, etc.



Depth of Field Relations

KODAK LENS SPECIFICATIONS

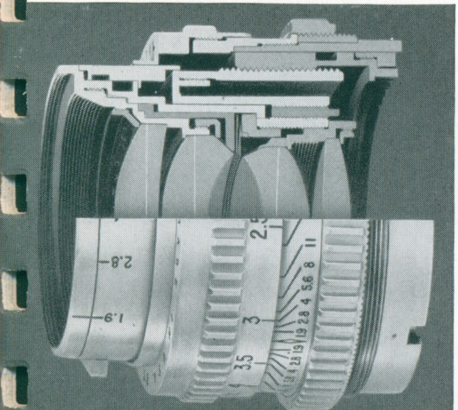
THE following pages contain data intended for use in working with Kodak lenses. Specifications for lenses are given for individual lenses or for groups of lenses of the same basic design.

Lens Diagrams: These drawings give a schematic presentation of a given lens design and show the number and approximate arrangement of the various lens elements. Cemented lens elements are shown as joined lens elements. The arrow indicates the direction in which the light normally passes through the lens on its way to the sensitized film. The two vertical lines indicate the approximate location of the lens diaphragm.

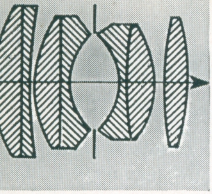
Depth of Field Tables: Where lack of space does not permit the listing of the depth of field for all aperture stops, the depth of field for the missing *f*-numbers can be approximately ascertained by interpolation.

Back Focus: For lenses supplied separately for use in studio, view, press, and reflex cameras, information about the back focus, that is, the distance between the rear-glass surface of the lens and the focal plane when focused at "infinity," is given.

Attachment Size: This indicates the size of the Adapter Ring of the Kodak Combination Lens Attachments fitting the lens mount. Adapter Rings listed by *inches* are of the slip-on type, those listed by *number* are of the screw-in type. "Ser. Attachments" indicates the Series number of the attachments fitting this ring.



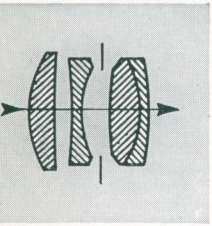
Kodak Ektar f/1.9, 50-mm., with section of lens mount cut away to show number and arrangements of lens elements.



Ektar f/1.9, 50 mm.

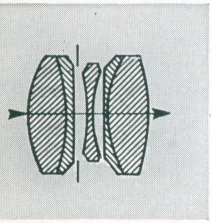
Specifications:

KODAK EKTARS f/1.9, 50 mm.; f/3.5, 50 mm.; f/3.3, 35 mm.; f/3.5, 90 mm.; f/3.8, 135 mm.; f/4.5, 153 mm. (as used on the Kodak Ektra)



Ektar f/3.5, 50 mm.

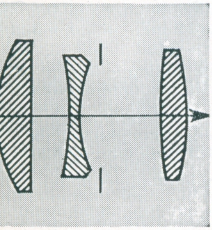
These lenses are entirely new in design. All corrections have been carried out to the high degree so essential for fine photography and especially important for precision miniature work. Particular attention has been given to lateral and longitudinal color corrections. Air-glass surfaces are coated to reduce reflections, thereby improving shadow details and brilliancy in black-and-white negatives and color purity in Kodachrome transparencies. Newly designed precision mounts assure permanent accuracy as well as ease in manipulation. Each lens has an integral depth of field indicator and a focusing mark for infrared film. All lenses are readily interchangeable on the Kodak Ektra, have accurate positioning with respect to the focal plane and to automatic co-ordination with the range finder and parallax correction in the view finder.



Ektar f/3.3, 35 mm.

Kodak Ektar f/1.9, 50 mm. Its high speed and normal focal length meet the requirements of a great range of photography. This lens is especially useful under extremely unfavorable light conditions or when working at maximum shutter speeds. *F*/1.9 is 3½ times faster than *f*/3.5.
Angle of View: When focused for infinity, 27° x 40°.
Focusing Range: Two-phase scale—Infinity to 3½ ft., and 3 ft. to 1½ ft.
Attachment Size: No. 24 Adapter Ring and Ser. VI Attachments.

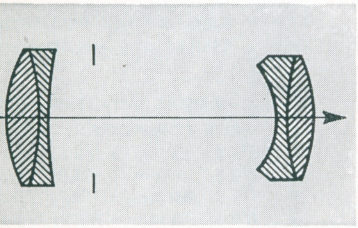
Kodak Ektar f/3.5, 50 mm., is also of normal focal length. The speed is ample to cope with everyday picture opportunities including those with unfavorable light conditions.
Angle of View: When focused for infinity, 27° x 40°.
Focusing Range: Two-phase scale—Infinity to 3½ ft., and 3 ft. to 1½ ft.
Attachment Size: No. 25 Adapter Ring and Ser. VI Attachments.



Ektar f/3.5, 90 mm.

Kodak Ektar f/3.3, 35 mm. This wide-angle lens serves outstandingly when it is desired to include a large portion of the subject in the picture; it is especially advantageous when working in close quarters. Due to its shorter focal length this lens has a greater depth of field than the others.
Angle of View: When focused for infinity, 38° x 55°.
Focusing Range: Two-phase scale—Infinity to 3½ ft., and 3 ft. to 1 ft.
Attachment Size: No. 26 Adapter Ring and Ser. VI Attachments.

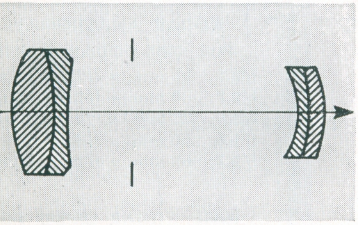
Kodak Ektar f/3.5, 90 mm. With its moderately long focus, this lens gives large, sharply detailed images of semi-distant subjects and is especially adapted to informal portraiture.
Angle of View: When focused for infinity, 15° x 23°.
Focusing Range: Infinity to 3½ ft.
Attachment Size: Ser. V Adapter Ring Insert and Ser. V Attachments or Ser. V-VI Step-up Ring and Ser. VI Attachments.



Telephoto Ektar f/3.8, 135 mm.

Kodak Telephoto Ektar f/3.8, 135 mm., is 60% faster than *f*/4.5 and especially suitable for work under unfavorable light conditions or at high shutter speeds.
Angle of View: When focused for infinity, 10° x 15°.
Focusing Range: Infinity to 4 feet.
Attachment Size: Ser. VI Adapter Ring Insert and Ser. VI Attachments.

Kodak Telephoto Ektar f/4.5, 153 mm., yields a 15% larger image size than the 135-mm. lens.
Angle of View: When focused for infinity, 9° x 13°.
Focusing Range: Infinity to 5 ft.
Attachment Size: Ser. VI Adapter Ring Insert and Ser. VI Attachments.



Telephoto Ektar f/4.5, 153 mm.

Lens Data for the Kodak Ektra

Field Sizes: **Kodak Ektar Lenses**

Lens	Ektar f/1.9, 50 mm.		Ektar f/3.5, 50 mm.		Ektar f/3.3, 35 mm.		Ektar f/3.5, 90 mm.		Telephoto Ektar f/3.8, 135 mm.		Telephoto Ektar f/4.5, 153 mm.	
Distance* to Subject	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.
200 feet	— —	— —	— —	— —	— —	— —	54 —	80 —	36 —	54 —	32 —	47 —
100 feet	— —	— —	— —	— —	— —	— —	27 —	40 —	18 —	27 —	16 —	23 —
50 feet	24 —	36 —	24 —	36 —	— —	— —	13 6	20 —	9 —	13 6	7 9	11 6
35 feet	— —	— —	— —	— —	24 —	36 —	— —	— —	— —	— —	— —	— —
25 feet	12 —	18 —	12 —	18 —	— —	— —	6 6	10 —	4 3	6 6	3 9	5 6
15 feet	7 3	10 6	7 3	10 6	10 —	15 —	4 —	6 —	2 6	3 9	2 3	3 3
10 feet	4 9	7 —	4 9	7 —	6 9	10 —	2 6	3 9	1 7½	2 5	1 5	2 1
8 feet	3 9	5 6	3 9	5 6	5 6	8 —	2 —	3 —	1 3½	1 11	1 1⅛	1 7½
6 feet	2 9	4 —	2 9	4 —	4 —	6 —	1 6	2 3	— 11	1 4	— 9¼	1 1¾
5 feet	2 3	3 4	2 3	3 4	3 3	5 —	1 2½	1 9½	— 8¾	1 ⅞	— 7¼	— 10⅞
4 feet	1 9	2 8	1 9	2 8	2 9	4 —	— 11⅛	1 4½	— 6½	— 9⅝	— —	— —
3½ feet	1 6½	2 3½	1 6½	2 3½	2 3	3 4	— 9½	1 2	— —	— —	— —	— —
3 feet	1 3¾	1 11¼	1 3¾	1 11¼	2 —	3 —	— —	— —	— —	— —	— —	— —
2½ feet	1 ¾	1 6⅞	1 ¾	1 6⅞	1 7	2 4	— —	— —	— —	— —	— —	— —
2 feet	— 9¾	1 2½	— 9¾	1 2½	1 2¾	1 9⅞	— —	— —	— —	— —	— —	— —
1¾ feet	— —	— —	— —	— —	1 ⅝	1 6¾	— —	— —	— —	— —	— —	— —
1½ feet	— 6¾	— 10⅛	— 6¾	— 10⅛	— 10½	1 3⅝	— —	— —	— —	— —	— —	— —
1¼ feet	— —	— —	— —	— —	— 8½	1 ½	— —	— —	— —	— —	— —	— —
1 foot	— —	— —	— —	— —	— 6¼	— 9¼	— —	— —	— —	— —	— —	— —

Depth of Field: **Ektar f/1.9, 50 mm.**

Distance* Focused On	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 in.											
	f/1.9		f/2.8		f/4		f/5.6		f/11		f/22	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	85 —	inf.	59 —	inf.	41 —	inf.	29 —	inf.	15 —	inf.	7 6	inf.
50 feet	32 —	120 —	27 —	inf.	23 —	inf.	19 —	inf.	11 9	inf.	6 9	inf.
25 feet	19 6	37 —	17 6	43 —	15 8	63 —	13 9	162 —	9 6	inf.	6 —	inf.
15 feet	12 9	17 9	12 —	20 —	11 —	23 —	10 —	32 —	7 9	inf.	5 3	inf.
10 feet	9 —	11 3	8 8	12 —	8 2	13 —	7 6	15 —	6 3	28 —	4 6	inf.
8 feet	7 4	8 9	7 1	9 2	6 10	9 10	6 5	10 9	5 4	16 4	4 —	inf.
6 feet	5 8	6 6	5 6	6 7	5 3	6 11	5 1	7 1	4 5	9 6	3 6	25 —
5 feet	4 9	5 3	4 8	5 4	4 6	5 7	4 4	5 10	3 11	6 6	3 2	13 —
4 feet	3 10¼	4 1¾	3 9¼	4 3	3 8⅜	4 4½	3 7	4 6½	3 3	5 3	2 9	7 9
3½ feet	3 4⅝	3 7⅜	3 4	3 8	3 3⅜	3 10	3 2	3 10¾	3 —	4 5	2 6	6 —
3 feet	2 11⅛	3 1	2 10⅝	3 1½	2 10	3 2⅛	2 9	3 3	2 7	3 7	2 3	4 6
2½ feet	2 5⅜	2 6⅝	2 5	2 7	2 4½	2 7½	2 4¼	2 8	2 2½	2 10½	2 —	3 4⅝
2 feet	1 11⅝	2 ⅜	1 11⅜	2 ⅝	1 11	2 1	1 10¾	2 1¼	1 9⅞	2 2½	1 8¼	2 5¾
1½ feet	1 5¾	1 6¼	1 5⅝	1 6⅜	1 5½	1 6½	1 5⅜	1 6⅝	1 5	1 7¼	1 4¼	1 9

The depth is not given for f/8 or f/16. For these two openings see depth on the following table.

Depth of Field: **Ektar f/3.5, 50 mm.**

Distance* Focused On	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 in.											
	f/3.5		f/4		f/5.6		f/8		f/11		f/16	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	47 —	inf.	41 —	inf.	29 —	inf.	20 —	inf.	15 —	inf.	10 —	inf.
50 feet	24 —	inf.	23 —	inf.	19 —	inf.	15 —	inf.	11 9	inf.	8 9	inf.
25 feet	16 6	53 —	15 8	63 —	13 9	162 —	11 6	inf.	9 6	inf.	7 6	inf.
15 feet	11 6	22 —	11 —	23 —	10 —	32 —	8 9	55 —	7 9	inf.	6 1½	inf.
10 feet	8 4	12 6	8 2	13 —	7 6	15 —	6 9	18 9	6 3	28 —	5 3	inf.
8 feet	6 11	9 6	6 10	9 10	6 5	10 9	5 10	12 8	5 4	16 4	4 8	32 —
6 feet	5 4½	6 9	5 3	6 11	5 1	7 1	4 9	8 2¼	4 5	9 6	4 —	13 —
5 feet	4 7	5 6	4 6	5 7	4 4	5 10	4 2	6 4	3 11	6 6	3 6	9 —
4 feet	3 8¾	4 4	3 8⅜	4 4½	3 7	4 6½	3 5¼	4 10	3 3	5 3	3 —	6 1½
3½ feet	3 3⅝	3 9	3 3⅜	3 10	3 2	3 10¾	3 1	4 1¼	3 —	4 5	2 9	5 1
3 feet	2 10⅜	3 2	2 10	3 2⅛	2 9	3 3	2 8	3 4¾	2 7	3 7	2 5	3 11
2½ feet	2 4¾	2 7⅜	2 4½	2 7½	2 4¼	2 8	2 3⅜	2 9	2 2½	2 10½	2 1⅜	3 1
2 feet	1 11⅛	2 ⅞	1 11	2 1	1 10¾	2 1¼	1 10½	2 1⅝	1 9⅞	2 2½	1 9	2 4
1½ feet	1 5½	1 6½	1 5½	1 6½	1 5⅜	1 6⅝	1 5¼	1 6¾	1 5	1 7¼	1 4½	1 7¾

*Distances are measured from the red focal plane index mark atop the Kodak Ektra.

Depth of Field: **Ektar f/3.3, 35 mm.**

Distance* Focused On	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 in.											
	f/3.3		f/5.6		f/8		f/11		f/16		f/22	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	24 —	inf.	14 6	inf.	10 —	inf.	7 6	inf.	5 3	inf.	3 9	inf.
35 feet	14 6	inf.	10 3	inf.	8 —	inf.	6 3	inf.	4 6	inf.	3 6	inf.
15 feet	9 4	40 —	7 6	inf.	6 3	inf.	5 —	inf.	4 —	inf.	3 3	inf.
10 feet	7 3	17 9	6 —	32 —	5 3	inf.	4 4	inf.	3 6	inf.	2 9	inf.
8 feet	6 —	11 9	5 3	17 6	4 6	36 —	4 —	inf.	3 3	inf.	2 8	inf.
6 feet	4 9	7 9	4 4	10 —	3 9	14 —	3 6	29 —	3 —	inf.	2 6	inf.
5 feet	4 3	6 3	3 9	7 6	3 6	9 6	3 —	14 6	2 9	130 —	2 3	inf.
4 feet	3 6	4 8	3 3	5 4	3 —	6 4	2 9	8 —	2 4	16 —	2 —	inf.
3½ feet	3 1	4 —	2 11	4 6	2 8	5 1	2 6	6 3	2 3	9 10	2 1	35 —
3 feet	2 9	3 4	2 7	3 8	2 5	4 1	2 3	4 9	2 —	6 6	1 10	12 —
2½ feet	2 4	2 9	2 2	2 11	2 1	3 2	2 —	3 6	1 9	4 5	1 8	6 4
2 feet	1 10½	2 1¾	1 9¾	2 3	1 8¾	2 4	1 8	2 7	1 6½	3 —	1 5	3 8
1¾ feet	1 8	1 10¼	1 7⅜	1 11	1 6⅝	2 —	1 6	2 2	1 4¾	2 4⅞	1 3¾	2 10
1½ feet	1 5¼	1 6⅞	1 4¾	1 7½	1 4⅜	1 8⅛	1 3¾	1 9	1 3	1 11	1 2⅛	2 2
1¼ feet	1 2½	1 3⅝	1 2¼	1 4	1 1⅞	1 4½	1 1½	1 5	1 1⅛	1 6	1 —	1 7⅝
1 foot	— 11¾	1 ¼	— 11½	1 ½	— 11⅜	1 ¾	— 11⅛	1 1⅛	— 10¾	1 1½	— 10½	1 2⅜

Depth of Field: **Ektar f/3.5, 90 mm.**

Distance* Focused On	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 in.											
	f/3.5		f/5.6		f/8		f/11		f/16		f/22	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	150 —	inf.	94 —	inf.	66 —	inf.	48 —	inf.	33 —	inf.	24 —	inf.
200 feet	88 —	inf.	66 —	inf.	50 —	inf.	39 —	inf.	29 —	inf.	21 —	inf.
100 feet	62 —	350 —	50 —	inf.	41 —	inf.	33 —	inf.	25 —	inf.	20 —	inf.
50 feet	38 —	75 —	33 —	106 —	29 —	210 —	25 —	inf.	20 —	inf.	17 —	inf.
25 feet	22 —	29 —	19 6	33 —	18 4	39 —	16 8	50 —	14 6	96 —	12 8	inf.
15 feet	13 9	16 8	13 —	17 6	12 4	19 —	11 8	21 —	10 6	26 —	9 6	37 —
10 feet	9 6	10 8	9 —	11 —	8 9	11 8	8 6	12 4	7 10	13 9	7 4	16 3
8 feet	7 8	8 4	7 5⅝	8 8	7 3	9 —	7 —	9 4	6 8	10 3	6 3	11 4
6 feet	5 10	6 2½	5 8½	6 4	5 7	6 6	5 5	6 8	5 3	7 —	5 —	7 8
5 feet	4 10½	5 1½	4 9⅝	5 2½	4 8⅝	5 4	4 7½	5 5⅜	4 6	5 8	4 4	6 —
4 feet	3 11	4 1	3 10½	4 1½	3 9⅞	4 2⅛	3 9¼	4 3	3 8	4 4⅝	3 6¾	4 6¾
3½ feet	3 5⅜	3 6⅝	3 4⅞	3 7⅛	3 4½	3 7½	3 4	3 8	3 3	3 9	3 2	3 11

The above tables do not give the depth for f/4. For this opening it can be estimated by comparison.

Depth of Field: **Ektar f/3.8, 135 mm.**

Distance* Focused On	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 in.											
	f/3.8		f/5.6		f/8		f/11		f/16		f/22	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	310 —	inf.	250 —	inf.	150 —	inf.	130 —	inf.	74 —	inf.	54 —	inf.
200 feet	119 —	inf.	103 —	inf.	85 —	inf.	72 —	inf.	54 —	inf.	42 —	inf.
100 feet	75 —	148 —	69 —	176 —	59 —	inf.	52 —	inf.	42 —	inf.	35 —	inf.
50 feet	42 —	59 —	40 —	65 —	37 —	75 —	34 —	90 —	30 —	148 —	26 —	inf.
25 feet	23 —	27 —	22 6	28 —	22 —	29 —	21 —	32 —	19 —	36 —	17 6	44 —
15 feet	14 5	15 9	14 3	16 —	13 10	16 6	13 5	17 —	12 9	18 4	12 —	20 —
10 feet	9 9	10 4	9 8	10 5	9 6	10 7	9 4	10 10	9 —	11 3	8 9	11 9
8 feet	7 10	8 2	7 9	8 3	7 8	8 4	7 6	8 6	7 4	8 9	7 2	9 —
6 feet	5 10⅞	6 1⅛	5 10½	6 1½	5 9⅞	6 2⅛	5 9	6 3	5 8	6 4	5 6	6 6
5 feet	4 11⅜	5 ⅝	4 11	5 1	4 10¾	5 1¼	4 10¼	5 1¾	4 9½	5 2⅝	4 9	5 5
4 feet	3 11⅝	4 ⅜	3 11⅜	4 ⅝	3 11⅛	4 ⅞	3 10⅞	4 1⅛	3 10½	4 1½	3 10⅛	4 2

Depth of Field: **Ektar f/4.5, 153 mm.**

Distance* Focused On	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 in.											
	f/4.5		f/5.6		f/8.0		f/11		f/16		f/22	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	335 —	inf.	280 —	inf.	190 —	inf.	138 —	inf.	95 —	inf.	69 —	inf.
200 feet	127 —	500 —	117 —	755 —	98 —	inf.	85 —	inf.	65 —	inf.	52 —	inf.
100 feet	78 —	145 —	75 —	160 —	67 —	217 —	59 —	380 —	50 —	inf.	42 —	inf.
50 feet	43 —	58 —	42 —	60 —	40 —	67 —	37 —	77 —	33 —	100 —	30 —	170 —
25 feet	24 —	27 —	23 —	27 4	22 —	28 —	21 —	30 —	20 —	33 —	18 9	38 —
15 feet	14 4	15 8	14 3½	15 8¾	14 —	16 —	13 9	16 8	13 3	17 4	12 9	18 6
10 feet	9 9	10 4	9 8⅝	10 5	9 8	10 6	9 6	10 8	9 3	10 9	9 —	11 4
8 feet	7 10⅜	8 1⅝	7 10	8 2¾	7 9	8 3	7 8	8 4	7 6	8 6	7 4	8 9
6 feet	5 11⅛	6 ⅞	5 11	6 1	5 10½	6 1½	5 10	6 2	5 9	6 3	5 8	6 4
5 feet	4 11½	5 ½	4 11¼	5 ¾	4 11⅛	5 1	4 10¾	5 1⅜	4 10¼	5 1⅞	4 9⅝	5 2⅝

*Distances are measured from the red focal plane index mark atop the Kodak Ektra.

Close-up and Small Object Photography With the Kodak Ektra

The Kodak Ektars *f*/3.3, 35 mm., *f*/3.5, 50 mm., and *f*/1.9, 50 mm., have two-phase focusing scales which permit close-up work without the use of supplementary lenses to a much greater extent than lenses of similar focal length with only the conventional focusing scale.

Normal focusing extends from "infinity" to 3½ feet. The coupled range finder measures any distance within this range and the automatic correction for parallax assures that the field seen in the view finder corresponds with the field covered by the lens.

Lifting a plunger releases the focusing sleeve for movement beyond the limit of the normal scale and into a secondary scale engraved in red. This extends the focusing range to 1½ feet with the 50-mm. Ektars and 1 foot with the 35-mm. Ektar. When using this secondary (red) focusing scale the range finder no longer operates nor does the view finder show any longer exactly the field covered by the lens. Correct focus and size of field can be accurately determined with the aid of the accessory Ground Glass Back.

By using the secondary (red) focusing scale, a field size down to

6¾" x 10⅛" with the 50-mm. Ektars set at 1½ feet
6¼" x 9¼" with the 35-mm. Ektar set at 1 foot

can be obtained. With lenses having only normal focusing scales, such a range of close-ups requires the use of Portra Lenses 1+ and 2+.

If the lens is focused by scale setting, after measuring the subject-camera distance, it is important to remember that the distance scale on the lenses for the Kodak Ektra is based on measurements from the red focal plane index mark atop the camera. This is especially important when making extreme close-ups.

Still smaller fields can be covered by using a Portra Lens 3+ with the 50-mm. Ektars. At the minimum distance setting, the subject will be reproduced on the film about ⅓ of its size.

Data on the Use of a 50-mm. Ektar supplemented by a Kodak Portra Lens 3+

Focusing Scale Set At	Distance* to Subject	DEPTH OF FIELD—IN INCHES Circle of Confusion, 1/500 in. Zone of sharpness extends from the point focused on, at								Approximate Size of Field in inches
		f/8		*f*/11		*f*/16		*f*/22		
		near	far	near	far	near	far	near	far	
INF.	16 9/16 in.	7/8	1 3/32	1 1/8	1 9/16	1 9/16	2 7/16	2 1/16	3 5/8	6¼ x 9⅜
50 feet	16 1/4 in.	27/32	1 1/32	1 3/32	1 1/2	1 1/2	2 11/32	1 31/32	3 15/32	6⅛ x 9¼
25 feet	15 15/16 in.	25/32	1	1 1/32	1 7/16	1 7/16	2 7/32	1 7/8	3 9/32	6 x 9
15 feet	15 5/8 in.	3/4	15/16	1	1 3/8	1 3/8	2 1/8	1 25/32	3 1/8	5⅞ x 8¾
10 feet	15 3/16 in.	23/32	7/8	15/16	1 9/32	1 9/32	1 31/32	1 11/16	2 15/16	5⅝ x 8⅜
8 feet	14 15/16 in.	11/16	27/32	29/32	1 1/4	1 1/4	1 29/32	1 5/8	2 13/16	5½ x 8¼
6 feet	14 7/16 in.	5/8	25/32	13/16	1 1/8	1 1/8	1 3/4	1 1/2	2 9/16	5¼ x 7⅞
5 feet	14 1/8 in.	19/32	3/4	25/32	1 1/16	1 3/32	1 21/32	1 7/16	2 7/16	5 x 7⅝
4 feet	13 9/16 in.	9/16	21/32	23/32	31/32	31/32	1 1/2	1 9/32	2 3/16	4¾ x 7¼
3½ feet	13 1/4 in.	17/32	5/8	11/16	29/32	15/16	1 13/32	1 7/32	2 1/16	4⅝ x 7
3 feet	12 13/16 in.	15/32	9/16	5/8	27/32	13/16	1 5/16	1 1/8	1 29/32	4¼ x 6⅝
2½ feet	12 1/4 in.	7/16	1/2	9/16	3/4	3/4	1 5/32	1 3/32	1 3/4	4⅛ x 6⅛
2 feet	11 1/2 in.	3/8	7/16	1/2	5/8	21/32	1	7/8	1 1/2	3¾ x 5½
1½ feet	10 1/2 in.	5/16	11/32	3/8	15/32	1/2	3/4	11/16	1 1/8	3⅛ x 4⅝

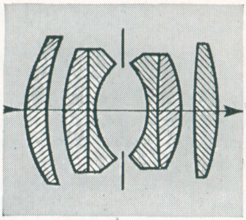
*Distances are measured from the red focal plane index mark atop the Kodak Ektra.

Note: With Kodak Portra Lens 3+, stop *f*/8 or a smaller opening should be used. The use of a Kodak Portra Lens 3+ with the 35-mm. (wide-angle) Ektar is not recommended for critical work.

Specifications:

KODAK EKTAR *f*/2.0, 45 mm.

(as used on the Kodak Bantam Special)



This Ektar, the fastest lens in a Kodak Bantam camera, is unexcelled in design and performance. It is made and mounted with great precision, factors of special importance with good miniature camera lenses, and highly corrected for all aberrations. Special attention, however, has been given to careful color correction. The air-glass surfaces are treated to reduce internal reflections. This increases shadow detail and brilliance in black-and-white negatives and color purity in Kodachrome transparencies. This lens has a relatively wide angle of view for a lens of this aperture, and due to its short focal length, a great depth of field. An auxiliary focusing mark for infrared film is provided.

Lens Speed: *f*/2.0, marked apertures—*f*/2.0, *f*/2.8, *f*/4, *f*/5.6, *f*/8, *f*/11, and *f*/16.

Focal Length: 45 mm.

Focusing Range: Infinity to 3 feet, coupled with range finder. Marked distances—infinity, 50, 25, 15, 10, 8, 6, 5, 4, 3½, and 3 feet.

Shutter Speeds: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400 sec., T, and B.

Negative Size: 28 x 40 mm.

Angle of View: When focused for infinity, 35° x 48°.

Attachment Size: 1¼ in., 31.5 mm., Ser. VI Attachments except Lens Hood—use Lens Hood Ser. VIA.

Working Distance and Field Size with Kodak Portra Lenses

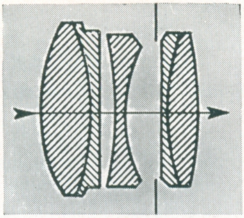
Camera Focus Scale at	Portra Lens 1+		Portra Lens 2+		Portra Lens 3+	
	Distance Subject to Lens	Approximate Field Size	Distance Subject to Lens	Approximate Field Size	Distance Subject to Lens	Approximate Field Size
INF.	38¾ in.	24⅛ x 34½ in.	19½ in.	12⅛ x 17⅜ in.	13 in.	8⅛ x 11½ in.
50 feet	37 in.	23 x 32¾ in.	19⅛ in.	11¾ x 16⅞ in.	12⅞ in.	8 x 11⅜ in.
25 feet	34¾ in.	21⅝ x 30¾ in.	18½ in.	11½ x 16⅜ in.	12½ in.	7¾ x 11 in.
15 feet	32⅜ in.	20 x 28⅝ in.	17¾ in.	11 x 15⅝ in.	12¼ in.	7½ x 10¾ in.
10 feet	29⅝ in.	18⅛ x 26 in.	16⅞ in.	10⅜ x 14¾ in.	11⅞ in.	7¼ x 10⅜ in.
8 feet	27⅞ in.	17⅛ x 24⅜ in.	16⅜ in.	10 x 14¼ in.	11½ in.	7 x 10 in.
6 feet	25½ in.	15½ x 22⅛ in.	15½ in.	9½ x 13½ in.	11⅛ in.	6⅝ x 9½ in.
5 feet	23¾ in.	14⅜ x 20¼ in.	14⅞ in.	9 x 12⅞ in.	10¾ in.	6½ x 9¼ in.
4 feet	21⅝ in.	13 x 18½ in.	14 in.	8⅜ x 12 in.	10⅜ in.	6¼ x 8⅞ in.
3½ feet	20⅜ in.	12⅛ x 17⅜ in.	13⅜ in.	8 x 11⅜ in.	10 in.	6 x 8½ in.
3 feet	18¾ in.	11⅛ x 15⅞ in.	12¾ in.	7½ x 10¾ in.	9⅝ in.	5¾ x 8⅛ in.

Depth of Field: **Kodak Ektar *f*/2.0, 45 mm.**

Distance Focused On	Approximate Field Size	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/500 inch.				
		f/2.0	*f*/4	*f*/8	*f*/11	*f*/16
INF.	35° x 48°	65 to inf.	32 to inf.	16 to inf.	12 to inf.	8 to inf.
50 feet	30⅓′ x 42½′	28 to inf.	19 to inf.	12½ to inf.	9⅔ to inf.	7 to inf.
25 feet	15½′ x 22′	18 to 40	14 to 106	10 to inf.	8 to inf.	6 to inf.
15 feet	9⅓′ x 13⅓′	12 to 19	10⅓ to 27	8 to inf.	6⅔ to inf.	5⅓ to inf.
10 feet	6⅙′ x 8¾′	8⅔ to 12	7⅔ to 14½	6¼ to 25	5½ to 62	4½ to inf.
8 feet	4⅚′ x 6⅚′	7⅙ to 9	6½ to 10⅔	5⅓ to 15⅔	4¾ to 24	4 to inf.
6 feet	3⅔′ x 5⅓′	5½ to 6⅔	5 to 7½	4¼ to 9⅔	4 to 12½	3½ to 24
5 feet	3′ x 4⅓′	4⅔ to 5⅙	4⅓ to 6	3⅚ to 7⅓	3½ to 8⅚	3⅙ to 13½
4 feet	2⅓′ x 3⅓′	3⅔ to 4¼	3½ to 4½	3¼ to 5⅓	3 to 6⅙	2⅔ to 8⅙
3½ feet	2⅙′ x 3′	3⅓ to 3⅔	3⅙ to 4	2⅚ to 4½	2¾ to 5	2½ to 6⅓
3 feet	1¾′ x 2½′	2⅚ to 3⅙	2¾ to 3⅓	2⅔ to 3¾	2½ to 4	2¼ to 5

The depth is not given for *f*/2.8 or *f*/5.6. For these two openings depth can be estimated.

Specifications:



KODAK EKTAR *f*/3.5, 100 mm.

(as used on the Kodak Medalist)

This lens is a new addition to Kodak's line of highest-grade precision lenses, which under the name of "Ektar" have won the acclaim of the really exacting and discriminating photographer. With its fast maximum aperture of *f*/3.5, this lens brings to photographic workers preferring larger negative sizes many of the picture-taking possibilities up to now restricted to miniature cameras. A carefully worked out formula, superior quality of the carefully chosen optical glass from which each one of the 5 elements is made, precision grinding, polishing, and mounting, all contribute to make it a really otustanding lens. Aberrations, especially those in any way affecting excellent color reproduction, are virtually non-existent. Greater clarity and brilliance of black-and-white negatives and also color purity in case of full-color pictures are assured by treating the air-glass surfaces of the lens. A coupled range finder and an automatic depth of field indicator aid in exact focusing. An auxiliary infrared focusing mark is provided.

Lens Speed: *f*/3.5, marked apertures—*f*/3.5, *f*/4, *f*/5.6, *f*/8, *f*/11, *f*/16, *f*/22, and *f*/32.

Focal Length: 100 mm.

Focusing Range: Infinity to 3½ feet, with coupled range finder. Marked distances: Infinity, 50, 25, 15, 10, 8, 6, 5, 4, 3½ feet.

Shutter Speeds: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400 sec., B, and delayed-action release.

Negative Size: 2¼ x 3¼ in. and 6.5 x 9 cm.

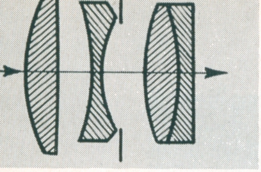
Angle of View: When focused for infinity, 32° x 45° for 2¼ x 3¼ in., 36° x 49° for 6½ x 9 cm.

Attachment Size: Threaded lens mount accepts Ser. VI Attachments.

Depth of Field: **Kodak Ektar *f*/3.5, 100 mm.**

Distance Focused On	Approximate Field Size with 2¼ x 3¼″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 1/200 in.			
		f/3.5	*f*/4	*f*/5.6	*f*/8
INF.	32° x 45°	74 to inf.	65 to inf.	46 to inf.	32 to inf.
50 feet	28′ x 41′	30 to 155	28¼ to inf.	24 to inf.	19½ to inf.
25 feet	14′ x 20′	19 to 38	18 to 40	16 to 55	14 to 110
15 feet	8⅓′ x 12¼′	12½ to 19	12¼ to 19½	11 to 22	10 to 28
10 feet	5½′ x 8′	8¾ to 11½	8⅔ to 11¾	8⅙ to 12¾	7⅔ to 14½
8 feet	4⅓′ x 6⅓′	7⅙ to 9	7⅙ to 9⅓	6¾ to 9⅔	6⅓ to 10½
6 feet	3¼′ x 4⅔′	5½ to 6½	5½ to 6¾	5⅓ to 7	5 to 7½
5 feet	2⅔′ x 3⅚′	4⅔ to 5⅓	4⅔ to 5½	4½ to 5⅔	4⅓ to 6
4 feet	2′ x 3′	3⅚ to 4¼	3¾ to 4⅓	3⅔ to 4½	3½ to 4⅔
3½ feet	1⅚′ x 2⅔′	3⅓ to 3⅔	3⅓ to 3¾	3¼ to 3⅚	3⅙ to 4
	Approximate Field Size with 6½ x 9 cm. Neg.	*f*/11	*f*/16	*f*/22	*f*/32
INF.	36° x 49°	23 to inf.	16 to inf.	11¾ to inf.	8 to inf.
50 feet	32′ x 45′	16 to inf.	12 to inf.	9½ to inf.	7 to inf.
25 feet	16′ x 22′	12 to inf.	10 to inf.	8 to inf.	6 to inf.
15 feet	9½′ x 13¼′	9 to 42	7¾ to inf.	6½ to inf.	5¼ to inf.
10 feet	6½′ x 9′	7 to 17	6⅙ to 26	5⅓ to 69	4½ to inf.
8 feet	5′ x 7′	6 to 12	5⅓ to 16	4¾ to 25	4 to inf.
6 feet	3⅔′ x 5′	4¾ to 8⅙	4½ to 10	4 to 13	3½ to 23
5 feet	3′ x 4⅙′	4⅙ to 6½	3⅚ to 7½	3½ to 9⅙	3 to 13⅙
4 feet	2⅓′ x 3⅓′	3½ to 4⅚	3¼ to 5½	3 to 6⅓	2⅔ to 8
3½ feet	2′ x 2⅚′	3⅙ to 4⅙	3 to 4⅔	2¾ to 5¼	2½ to 6⅓

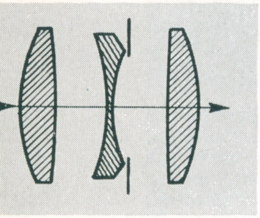
LENSES ON KODAKS



K. A. S. f/3.5, 50 mm.

KODAK ANASTIGMAT SPECIAL f/3.5, 50 mm. (as used on Kodak 35)

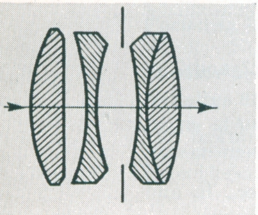
Aperture Range: f/3.5 to f/16. Negative Size: 24 x 36 mm.
Infrared Focusing: Turn focusing scale counterclockwise by 0.25 in.*
Shutter Speeds: 1/10 to 1/200 sec., T, B, and delayed-action release.
Attachment Size: 1¼ in., 31.5 mm., Ser. VI Attachments.



K. A. f/4.5, 51 mm., and f/5.6, 50 mm.

KODAK ANASTIGMAT f/4.5, 51 mm., and f/5.6, 50 mm. (as used on Kodak 35)

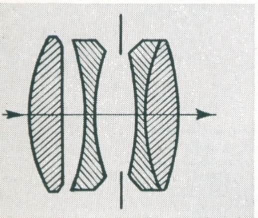
Aperture Range: f/4.5 or f/5.6, respectively, to f/16.
Infrared Focusing: Turn focusing scale counterclockwise by 0.17 in.*
Shutter Speeds: f/4.5 model: 1/25 to 1/150 sec., T, B, and delayed-action release. F/5.6 model: 1/25 to 1/100 sec., T, and B.
Negative Size: 24 x 36 mm.
Attachment Size: f/4.5–1¼ in., 31.5 mm., Ser. VI Attachments.
f/5.6–1 5/16 in., 33 mm., Ser. VI Attachments.



K. A. S. f/4.5, 47 mm.

KODAK ANASTIGMAT SPECIAL f/4.5, 47 mm. (as used on Kodak Bantam)

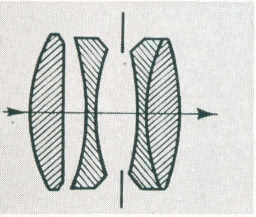
Aperture Range: f/4.5 to f/16. Negative Size: 28 x 40 mm.
Infrared Focusing: Turn focusing scale counterclockwise by 0.15 in.*
Shutter Speeds: 1/25 to 1/200 sec., T, and B.
Attachment Size: 15/16 in., 23.5 mm., Ser. V Attachments.



K. A. S. f/4.5, 100, 101, and 127 mm.

KODAK ANASTIGMAT SPECIAL f/4.5, 100 mm., 101 mm., and 127 mm. (as used on Kodak Monitors and Kodak Vigilants)

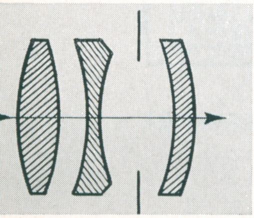
Aperture Range: f/4.5 to f/32.
Infrared Focusing: Turn focusing scale counterclockwise by 0.16 in.*
Shutter Speeds: 1 to 1/400 sec., T†, B, and delayed-action release.
Negative Size: 100 mm. and 101 mm.—2¼ x 3¼ inches. 127 mm.—2½ x 4¼ inches.
Attachment Size: 100 mm.–1¼ in., 31.5 mm., Ser. VI Attachments.
101 mm.–1 5/16 in., 33 mm., Ser. VI Attachments.
127 mm.–1½ in., 38 mm., Ser. VI Attachments.



K. A. f/4.5, 103 & 126 mm.

KODAK ANASTIGMAT f/4.5, 103 mm. and 126 mm. (as used on Kodak Monitors and Kodak Vigilants)

Aperture Range: f/4.5 to f/32.
Infrared Focusing: Turn focusing scale counterclockwise by 0.14 in.*
Shutter Speeds: 1/10 to 1/200 sec., T†, B, and delayed-action release.
Negative Size: 103 mm.—2¼ x 3¼ inches. 126 mm.—2½ x 4¼ inches.
Attachment Size: 103 mm.–1¼ in., 31.5 mm., Ser. VI Attachments.
126 mm.–1½ in., 38 mm., Ser. VI Attachments.



K. A. f/6.3, 105 & 130 mm.

KODAK ANASTIGMAT f/6.3, 105 mm. and 130 mm. (as used on Kodak Vigilants)

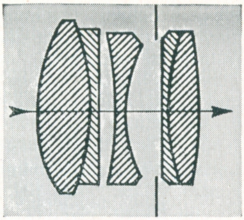
Aperture Range: f/6.3 to f/32.
Infrared Focusing: Turn focusing scale counterclockwise by 0.19 in.*
Shutter Speeds: 1/25 to 1/100 sec., T, and B.
Negative Size: 105 mm.—2¼ x 3¼ inches. 130 mm.—2¼ x 4¼ inches.
Attachment Size: 105 mm.–1¼ in., 31.5 mm., Ser. VI Attachments.
130 mm.–1¼ in., 31.5 mm., Ser. VI Attachments.

*This correction from the visual focus represents a working average for distance settings from 8 feet to Infinity.

†"T" is omitted on Kodak Monitors.

Specifications:

KODAK EKTAR *f*/3.7, 105 mm.



This lens has been designed for use on press and similar cameras or the Kodak Precision Enlarger when used as a camera, where excellence of performance and high speed are desired. It has been corrected for all the usual lens aberrations and works equally well at all distance settings from infinity to about ⅓ subject size at full lens aperture. It is especially suited for use with Kodachrome film. The performance of this lens, like other Ektars, is unsurpassed by any lens of similar type. The air-glass surfaces are treated. This lens is supplied in Kodak Flash Supermatic Shutter.

Lens Speed: *f*/3.7, marked apertures—*f*/3.7, *f*/4.5, *f*/5.6, *f*/8, *f*/11, *f*/16, *f*/22, and *f*/32.

Focal Length: 105 mm. (4⅛ in.), Back Focus 87.5 mm. ($3\frac{7}{16}$ in.).

Infrared Focusing: Extend lens .004 in. (.1 mm.) from visual focus.

Shutter Speeds: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400 sec., T, B, built-in flash synchronization, and blade-arrester.

Negative Size: 2¼ x 3¼ in.

Angle of View: When focused for infinity, 31° x 43°.

Attachment Size: 1½ in., 38 mm., Ser. VI Attachments.

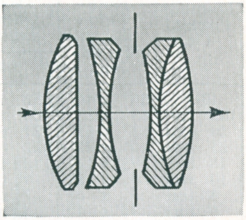
Depth of Field: For Critical Definition **Kodak Ektar *f*/3.7, 105 mm.**

Distance Focused On	Approximate Field Size with 2¼ x 3¼″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc. This equals approximately *f*/1720, and is for critical definition, and when extreme enlargements are to be made from the negatives. For normal work the depth of field is greater.					
		f/3.7	*f*/5.6	*f*/8	*f*/11	*f*/16	*f*/32
INF.	31° x 43°	160 to inf.	105 to inf.	74 to inf.	54 to inf.	37 to inf.	18½ to inf.
100 feet	54′ x 78′	62 to 266	51 to inf.	43 to inf.	35 to inf.	27 to inf.	15⅔ to inf.
50 feet	27′ x 39′	38 to 73	34 to 96	30 to 154	26 to inf.	21 to inf.	13½ to inf.
25 feet	13⅓′ x 19⅓′	22 to 30	20 to 33	18⅔ to 38	17 to 46	15 to 77	10½ to inf.
15 feet	8′ x 11½′	13⅔ to 16½	13 to 17½	12⅛ to 18⅚	11⅔ to 21	10⅔ to 25	8⅓ to 79
10 feet	5¼′ x 7⅔′	9½ to 10⅔	9⅙ to 11	8⅚ to 11½	8½ to 12⅓	7⅚ to 13⅔	6½ to 22
8 feet	4⅙′ x 6′	7⅔ to 8⅓	7½ to 8½	7¼ to 9	7 to 9⅓	6¾ to 10⅙	5⅔ to 14
6 feet	3¼′ x 4¾′	5⅚ to 6¼	5⅔ to 6⅓	5½ to 6½	5⅓ to 6¾	5 to 7	4⅔ to 8⅔
5 feet	2½′ x 3⅔′	4⅚ to 5⅙	4¾ to 5¼	4⅔ to 5⅓	4½ to 5½	4⅓ to 5¾	4 to 6⅔
4 feet	2′ x 2⅚′	4 to 4	3⅚ to 4⅙	3⅚ to 4¼	3¾ to 4⅓	3⅔ to 4½	3⅓ to 5
3½ feet	1¾′ x 2′	3½ to 3½	3⅓ to 3⅔	3⅓ to 3⅔	3¼ to 3¾	3¼ to 3⅚	3 to 4¼

The depth is not given for *f*/4.5 or *f*/22. For these openings it can be estimated by comparison.

Specifications:

KODAK EKTAR *f*/4.5, 101 mm. and *f*/4.7, 127 mm.



These two lenses make available to the users of small and medium sized press and similar cameras the optical pre-eminence represented by Kodak Ektar Lenses. Their ability to meet most exacting requirements in black-and-white and color photography is well known. Both lenses have treated, air-glass surfaces.

They produce definition of exceptional quality at all apertures and all working distances from infinity to about fourfocal lengths from the lens.

At this distance the image produced is one-third of the size of the subject. When a closer lens-to-subject distance is used, it is advisable to stop the lens below maximum aperture particularly for work demanding critical definition.

Kodak Ektar *f*/4.5, 101 mm. is recommended for negatives up to 2¼ x 3¼ inches and *f*/4.5, 127 mm. for 3¼ x 4¼-inch negatives. Both lenses are available in Kodak Flash Supermatic Shutters. They are also supplied with metal lens board for Kodak Precision Enlarger.

Lens Speed and Marked Apertures:
Kodak Ektar *f*/4.5, 101 mm.—*f*/4.5, *f*/5.6, *f*/8, *f*/11, *f*/16, *f*/22, and *f*/32.
Kodak Ektar *f*/4.7, 127 mm.—*f*/4.7, *f*/5.6, *f*/8, *f*/11, *f*/16, *f*/22, and *f*/32.

Focal Length:
Kodak Ektar *f*/4.5, 101 mm. (4 in.) Back Focus 90 mm.
Kodak Ektar *f*/4.7, 127 mm. (5 in.) Back Focus 113 mm.

Infrared Focusing: Extend lens .004 in. (.1 mm.) from visual focus for both lenses.

Shutter Speeds: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400 sec., T, B, built-in flash synchronization, and blade-arrester.

Negative Sizes and Angle of View, when focused for infinity:
Kodak Ektar *f*/4.5, 101 mm.—2¼ x 3¼ in. 32° x 45°.
Kodak Ektar *f*/4.7, 127 mm.—3¼ x 4¼ in. 36° x 46°.

Diameter of Lens Board Mounting Hole:
Kodak Ektar *f*/4.5, 101 mm.—1⅜ in., 35 mm.
Kodak Ektar *f*/4.7, 127 mm.—1½ in., 38 mm.

Attachment Sizes:
Kodak Ektar *f*/4.5, 101 mm.—1¼ in., 31.5 mm., Ser. VI Attachments.
Kodak Ektar *f*/4.7, 127 mm.—1½ in., 38 mm., Ser. VI Attachments.

Depth of Field: For Critical Definition **Kodak Ektar f/4.5, 101 mm.**

Distance Focused On	Approximate Field Size with 2¼ x 3¼″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc. This equals approximately *f*/1720, and is for critical definition, and when extreme enlargements are to be made from the negatives. For normal work the depth of field is greater.					
		f/4.5	*f*/5.6	*f*/8	*f*/11	*f*/16	*f*/32
INF.	32° x 45°	127 to inf.	102 to inf.	72 to inf.	52 to inf.	36 to inf.	18 to inf.
100 feet	62′ x 100′	56 to inf.	51 to inf.	42 to inf.	34 to inf.	26 to inf.	15 to inf.
50 feet	28′ x 41′	36 to 82	34 to 98	29 to 165	25 to inf.	21 to inf.	13¼ to inf.
25 feet	14′ x 20′	21 to 31	20 to 33	18½ to 38	17 to 48	15 to 83	10½ to inf.
15 feet	8⅓′ x 12¼′	13½ to 17	13 to 17½	12½ to 19	11¾ to 21	10½ to 26	8⅙ to 92
10 feet	5½′ x 8′	9¼ to 11⅓	9⅙ to 11	8¾ to 11½	8⅓ to 12½	7¾ to 14	6½ to 23
8 feet	4⅓′ x 6⅓′	7½ to 8½	7⅓ to 8⅔	7⅙ to 9	7 to 9½	6½ to 10¼	5½ to 14½
6 feet	3¼′ x 4⅔′	5¾ to 6⅓	5⅔ to 6⅓	5½ to 6½	5⅓ to 6¾	5⅙ to 6⅚	4½ to 8¾
5 feet	2⅔′ x 3⅚′	4¾ to 5¼	4⅚ to 5¼	4⅔ to 5⅓	4⅔ to 5½	4½ to 5¾	4 to 6¾
4 feet	2′ x 3′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4¼	3¾ to 4⅓	3⅔ to 4½	3⅓ to 5
3½ feet	1⅚′ x 2⅔′	3⅓ to 3⅔	3⅓ to 3⅔	3⅓ to 3⅔	3¼ to 3¾	3⅙ to 3⅚	3 to 4¼

The depth is not given for *f*/22. For this opening it can be estimated by comparison.

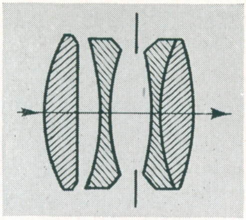
Depth of Field: For Critical Definition **Kodak Ektar f/4.7, 127 mm.**

Distance Focused On	Approximate Field Size with 3¼ x 4¼″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc. This equals approximately *f*/1720, and is for critical definition, and when extreme enlargements are to be made from the negatives. For normal work the depth of field is greater.					
		f/4.7	*f*/5.6	*f*/8	*f*/11	*f*/16	*f*/32
INF.	36° x 46°	152 to inf.	128 to inf.	90 to inf.	65 to inf.	45 to inf.	22 to inf.
100 feet	65′ x 85′	60 to 292	56 to inf.	47 to inf.	39 to inf.	31 to inf.	18 to inf.
50 feet	32′ x 42′	37 to 74	36 to 82	32 to 113	28 to inf.	24 to inf.	15½ to inf.
25 feet	16′ x 21′	22 to 30	21 to 31	19½ to 35	18 to 41	16 to 57	11¾ to inf.
15 feet	9½′ x 12⅓′	13⅔ to 16½	13⅓ to 17	12¾ to 18	12¼ to 19½	11¼ to 23	9 to 45
10 feet	6¼′ x 8¼′	9½ to 10¾	9¼ to 10⅚	9 to 11⅙	8⅔ to 11¾	8¼ to 13	7 to 18
8 feet	5′ x 6½′	7⅔ to 8⅓	7½ to 8½	7⅓ to 8¾	7⅙ to 9⅙	6⅚ to 9¾	6 to 12¼
6 feet	3⅔′ x 4¾′	5¾ to 6¼	5¾ to 6¼	5⅔ to 6½	5½ to 6⅔	5⅓ to 6⅚	4⅚ to 8
5 feet	3′ x 3⅚′	4⅚ to 5⅙	4⅚ to 5⅙	4¾ to 5¼	4⅔ to 5⅓	4½ to 5½	4⅙ to 6⅓
4 feet	2⅓′ x 3′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4⅙	3¾ to 4¼	3⅔ to 4⅓	3½ to 4¾
3½ feet	2′ x 2⅔	3½ to 3½	3½ to 3½	3⅓ to 3⅔	3⅓ to 3⅔	3¼ to 3¾	3 to 4

The depth is not given for *f*/22. For this opening it can be estimated by comparison.

Specifications:

EASTMAN EKTARS f/6.3, 8½ in.; f/6.3, 10 in.; f/6.3, 12 in.; f/6.3, 14 in.



These lenses are intended primarily for making color transparencies with Kodachrome Professional Film or color separation negatives. Although designed especially for color work, their use is by no means limited. They are suitable for all types of photography. When used at maximum aperture, the image size on the ground glass should not be larger than about one-third the subject size. At small apertures these lenses perform satisfactorily for almost all types of work, even at lens-to-subject distances giving about 1 to 1 image size.

These lenses are exceedingly well corrected for all lens aberrations, such as coma, astigmatism, curvature of field, and spherical and chromatic aberration both lateral and longitudinal. The air-glass surfaces are treated by a special process which reduces reflections. This increases shadow detail and brilliance in black-and-white, and color purity in Kodachrome pictures. Under certain conditions, lens treating adds to the effective speed of a lens.

The Eastman Ektars *f*/6.3 cover at full aperture an angle of 53° and at small stops an angle of 64°. For example, the *f*/6.3, 14-inch lens covers adequately the recommended negative size (8 x 10 inches) at maximum aperture with allowance for full use of the rising and falling front and swing back. At apertures below *f*/16 its 64° covering power permits its use on an 11 x 14-inch camera but without allowance for swing back or rising and falling front.

These four Ektar lenses are available in shutter or in barrel. The use of these lenses for enlarging or projection printing is not recommended.

Lens Speed: *f*/6.3, marked apertures—*f*/6.3, *f*/8, *f*/11, *f*/16, *f*/22, *f*/32, and *f*/45. In barrel, the diaphragm setting ring has "click" stops. As each marked *f*-number passes the index mark, a distinct click is heard and felt.

Focal Length, Recommended Negative Size, and Angle of View:

Focal Length		*Recommended Negative Size*	*Angle of View When Focused for Infinity*
8½ inches	216 mm.	5 x 7 inches	33° x 45°
10 inches	254 mm.	6½ x 8½ inches	36° x 46°
12 inches	304 mm.	8 x 10 inches	37° x 45°
14 inches	356 mm.	8 x 10 inches	32° x 40°

Infrared Focusing: Extend lens after focusing critically for visible light by:

0.008 inch (0.2 mm.) for Eastman Ektar *f*/6.3, 8½ in.
0.012 inch (0.3 mm.) for Eastman Ektar *f*/6.3, 10 in.
0.016 inch (0.4 mm.) for Eastman Ektar *f*/6.3, 12 in.
0.031 inch (0.8 mm.) for Eastman Ektar *f*/6.3, 14 in.

Shutter Speeds:

Ektar *f*/6.3, 8½ in.: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/150 sec., T, B.
Ektar *f*/6.3, 10 and 12 in.: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100 sec., T, B.
Ektar *f*/6.3, 14 in.: 1, 1/2, 1/5, 1/10, 1/25, 1/50 sec., T, B.

Diameter of Lens Board Mounting Hole:

		in.	*mm.*
Ektar *f*/6.3, 8½ in.	in shutter or barrel	2 3/16	55
Ektar *f*/6.3, 10 in.	in shutter or barrel	2 5/8	67
Ektar *f*/6.3, 12 in.	in shutter or barrel	2 7/8	73
Ektar *f*/6.3, 14 in.	in shutter	3 3/8	86
Ektar *f*/6.3, 14 in.	in barrel	3 3/16	81

Attachment Size:

Ektar *f*/6.3, 8½ in.: 1¾ in., 44.5 mm., Ser. VII Attachments.
Ektar *f*/6.3, 10 in.: 2⅛ in., 54 mm., Ser. VIII Attachments.
Ektar *f*/6.3, 12 in.: 2½ in., 63.5 mm., Ser. VIII Attachments.
Ektar *f*/6.3, 14 in.: 2 15/16 in., 75 mm. Use Eastman 4-inch Adjustable Filter Holder.

Depth of Field: For Critical Definition **Ektar f/6.3, 8½ in.**

Distance Focused On	Approximate Field Size with 5 x 7″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/6.3	*f*/11	*f*/16	*f*/22	*f*/45
INF.	33° x 45°	193 to inf.	111 to inf.	76 to inf.	55 to inf.	27 to inf.
200 feet	117′ x 163′	98 to inf.	71 to inf.	55 to inf.	43 to inf.	24 to inf.
100 feet	58′ x 82′	66 to 208	53 to inf.	43 to inf.	36 to inf.	21 to inf.
50 feet	29′ x 41′	40 to 68	34 to 91	30 to 146	26 to inf.	18 to inf.
25 feet	14′ x 20′	22 to 29	20 to 32	19 to 37	17 to 46	13 to inf.
15 feet	8⅓′ x 12′	14 to 16¼	13 to 17½	12½ to 19	12 to 21	9½ to 34
10 feet	5½′ x 7⅔′	9½ to 10⅔	9 to 11	8⅚ to 11½	8½ to 12	7⅓ to 16
8 feet	4⅓′ x 6′	7⅔ to 8⅓	7½ to 8⅔	7¼ to 8⅚	7 to 9⅓	6 to 11
6 feet	3⅙′ x 4⅓′	5⅚ to 6¼	5⅔ to 6⅓	5½ to 6½	5⅓ to 6¾	5 to 7½
5 feet	2½′ x 3½′	4⅚ to 5⅙	4¾ to 5¼	4¾ to 5⅓	4⅔ to 5½	4⅙ to 6⅓
4 feet	2′ x 2⅔′	3⅚ to 4⅙	3⅚ to 4¼	3⅚ to 4¼	3⅔ to 4⅓	3½ to 4¾
3½ feet	1⅔′ x 2⅓′	3½ to 3½	3½ to 3½	3⅓ to 3⅔	3⅓ to 3⅔	3 to 4

Depth of Field: For Critical Definition **Ektar f/6.3, 10 in.**

Distance Focused On	Approximate Field Size with 6½ x 8½″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/6.3	*f*/11	*f*/16	*f*/22	*f*/45
INF.	36° x 46°	227 to inf.	130 to inf.	90 to inf.	65 to inf.	32 to inf.
400 feet	259′ x 339′	146 to inf.	98 to inf.	73 to inf.	56 to inf.	29 to inf.
200 feet	129′ x 169′	107 to inf.	79 to inf.	62 to inf.	49 to inf.	27 to inf.
100 feet	65′ x 85′	70 to 178	57 to inf.	47 to inf.	39 to inf.	24 to inf.
50 feet	32′ x 42′	41 to 64	36 to 81	32 to 113	28 to 214	19 to inf.
25 feet	16′ x 21′	22½ to 28	21 to 31	20 to 35	18 to 40	14 to 117
15 feet	9′ x 12′	14 to 16⅙	13½ to 17	13 to 18	12 to 20	10 to 28
10 feet	6′ x 8′	9⅔ to 10½	9⅓ to 11	9 to 11⅓	8⅔ to 12	7½ to 14
8 feet	4⅔′ x 6′	7¾ to 8⅓	7⅔ to 8½	7⅓ to 8¾	7¼ to 9⅙	6⅓ to 10¾
6 feet	3⅓′ x 4⅓′	5⅚ to 6⅙	5¾ to 6⅓	5⅔ to 6½	5½ to 6¾	5⅙ to 7⅓
5 feet	2⅔′ x 3½′	4⅚ to 5⅙	4¾ to 5¼	4⅔ to 5⅓	4½ to 5½	4⅓ to 5¾
4 feet	2′ x 2¾′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4⅙	3¾ to 4¼	3⅔ to 4½
3½ feet	1¾′ x 2¼′	3½ to 3½	3½ to 3½	3⅓ to 3⅔	3⅓ to 3¾	3¼ to 4

Depth of Field: For Critical Definition **Ektar f/6.3, 12 in.**

Distance Focused On	Approximate Field Size with 8 x 10″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/6.3	*f*/11	*f*/16	*f*/22	*f*/45
INF.	37° x 45°	273 to inf.	156 to inf.	107 to inf.	78 to inf.	38 to inf.
400 feet	266′ x 332′	162 to inf.	112 to inf.	85 to inf.	65 to inf.	35 to inf.
200 feet	133′ x 166′	115 to inf.	88 to inf.	70 to inf.	56 to inf.	32 to inf.
100 feet	66′ x 83′	73 to 158	61 to 278	52 to inf.	45 to 310	28 to inf.
50 feet	33′ x 41′	42 to 61	38 to 74	34 to 94	31 to 139	22 to inf.
25 feet	16′ x 20′	23 to 27	21 to 30	20 to 33	19 to 37	15 to 73
15 feet	9⅓′ x 12′	14¼ to 16	13½ to 17	13 to 17½	12½ to 19	11 to 25
10 feet	6′ x 7½′	9⅔ to 10½	9¼ to 10⅚	9⅙ to 11⅙	8⅚ to 12	8 to 14
8 feet	4⅔′ x 5¾′	7¾ to 8¼	7⅔ to 8½	7½ to 8⅔	7⅓ to 8⅚	6⅔ to 10⅙
6 feet	3⅓′ x 4⅙′	5⅚ to 6¼	5¾ to 6⅓	5¾ to 6⅓	5⅔ to 6⅔	5¼ to 7
5 feet	2⅔′ x 3⅓′	4⅚ to 5⅙	4⅚ to 5⅙	4⅚ to 5⅙	4¾ to 5⅓	4⅓ to 5¾
4 feet	2′ x 2½′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4⅙	3¾ to 4¼	3⅔ to 4½
3½ feet	1⅔′ x 2⅙′	3½ to 3½	3½ to 3½	3½ to 3½	3⅓ to 3⅔	3¼ to 3⅚

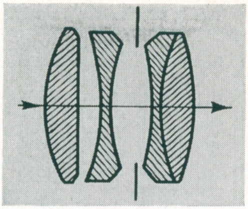
Depth of Field: For Critical Definition **Ektar f/6.3, 14 in.**

Distance Focused On	Approximate Field Size with 8 x 10″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/6.3	*f*/11	*f*/16	*f*/22	*f*/45
INF.	32° x 40°	318 to inf.	182 to inf.	125 to inf.	92 to inf.	45 to inf.
400 feet	228′ x 285′	177 to inf.	125 to inf.	95 to inf.	74 to inf.	41 to inf.
200 feet	113′ x 142′	123 to 540	96 to inf.	78 to inf.	63 to inf.	36 to inf.
100 feet	56′ x 71′	76 to 146	65 to 220	56 to inf.	48 to inf.	31 to inf.
50 feet	28′ x 35′	44 to 59	39 to 69	36 to 84	32 to 110	24 to 574
25 feet	14′ x 17′	23 to 27	22 to 29	21 to 31	19 to 34	16 to 61
15 feet	8′ x 10′	14½ to 16	14 to 16½	13½ to 17	13 to 18	11¼ to 23
10 feet	5′ x 6¼′	9⅔ to 10⅓	9½ to 10¾	9¼ to 11	9 to 11½	8⅓ to 13
8 feet	3⅚′ x 4⅚′	7¾ to 8¼	7¾ to 8⅓	7⅔ to 8½	7½ to 8¾	6¾ to 9¾
6 feet	2¾′ x 3½′	5⅚ to 6⅙	5¾ to 6⅓	5¾ to 6⅓	5⅔ to 6½	5⅓ to 6⅚
5 feet	2¼′ x 2¾′	4⅚ to 5⅙	4⅚ to 5⅙	4⅚ to 5¼	4¾ to 5⅓	4½ to 5¾
4 feet	1⅔′ x 2′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4¼	3⅔ to 4½
3½ feet	1⅓′ x 1⅔′	3½ to 3½	3½ to 3½	3½ to 3½	3½ to 3½	3⅓ to 3¾

The depth is not given for *f*/8 or *f*/32. For these openings depth can be estimated by comparison.
*This equals approximately *f*/1720, and is for very critical definition and when extreme enlargements are to be made from the negatives. For normal work, the depth of field is greater.

Specifications:

KODAK ANASTIGMATS f/4.5, 5½ in.; f/4.5, 6⅜ in.; f/4.5, 7½ in.; f/4.5, 8½ in.; f/4.5, 10 in.; f/4.5, 12 in.



These lenses, primarily intended for press, commercial, and studio cameras, are remarkably fine lenses, covering fully the recommended film or plate sizes at their *f*/4.5 maximum aperture. Every one of them gives very good definition and satisfactory flatness of field. These lenses are recommended for any type of work which requires the fine definition of an anastigmat and are especially suitable for home or studio portraiture, architectural, landscape, and sports photography. Lens corrections are maintained from infinity to about ⅓ subject size at *f*/4.5. At small stops these lenses perform satisfactorily for most work at even closer range. These lenses are available in barrels, and lenses Nos. 32 to 36 in shutters.

Focal Length, Negative Size, Angle of View, and Attachment Size:

Lens	*Focal Length in inches*	*Recommended Negative Size inches*	*Angle of View When Focused for Infinity*	*Attachment Size in.*	*mm.*	
No. 31	5½	3¼ x 4¼	33° x 42°	$1\frac{9}{16}$	39.5	Ser. VI
No. 32	6⅜	4 x 5	35° x 43°	1¾	44.5	Ser. VII
No. 33	7½	5 x 7	37° x 53°	2	50.5	Ser. VII
No. 34	8½	5 x 8	33° x 50°	2⅜	60	Ser. VIII
No. 35	10	6½ x 8½	36° x 46°	2⅝	67	Ser. VIII
No. 36	12	8 x 10	37° x 45°	3⅜	85.5	*

*Use Eastman 4-inch Adjustable Filter Holder.

Infrared Focusing: Extend lens from visual focus by:

.012 inch (.3 mm.) for 5½-inch (No. 31) lens
.023 inch (.6 mm.) for 6⅜-inch (No. 32) lens
.027 inch (.7 mm.) for 7½-inch (No. 33) lens
.031 inch (.8 mm.) for 8½- and 10-inch (No. 34 and No. 35) lens
.047 inch (1.2 mm.) for 12-inch (No. 36) lens

Shutter Speeds:

No. 32 lens : 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200 sec., T, B.
No. 33 and No. 34 lens: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100 sec., T, B.
No. 35 and No. 36 lens: 1, 1/2, 1/5, 1/10, 1/25, 1/50 sec., T, B.

Depth of Field: For Critical Definition **No. 31 K. A. f/4.5, 5½ in.**

Distance Focused On	Approximate Field Size with 3¼ x 4¼″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/4.5	*f*/8	*f*/11	*f*/22	*f*/45
INF.	33° x 42°	175 to inf.	99 to inf.	72 to inf.	36 to inf.	17 to inf.
100 feet	59′ x 77′	63 to 234	50 to inf.	42 to inf.	27 to inf.	15 to inf.
50 feet	28′ x 38′	39 to 70	33 to 101	30 to 166	21 to inf.	13 to inf.
25 feet	14′ x 19′	22 to 29	20 to 33	18 to 38	15 to 83	10 to inf.
15 feet	8½′ x 11′	14 to 16	13 to 18	12 to 19	10½ to 26	8 to 105
10 feet	5½′ x 7½′	9½ to 10¾	9 to 11¼	8⅚ to 11¾	7¾ to 14	6½ to 23
8 feet	4½′ x 5⅚′	7¾ to 8⅓	7½ to 8¾	7¼ to 9	6½ to 10¼	5⅓ to 15
6 feet	3¼′ x 4¼′	5¾ to 6¼	5⅔ to 6½	5½ to 6⅔	5¼ to 7⅙	4½ to 8¾
5 feet	2⅔′ x 3½′	4⅚ to 5⅙	4¾ to 5⅓	4⅔ to 5½	4⅓ to 5¾	3⅚ to 6¾
4 feet	2′ x 2¾′	3⅚ to 4⅙	3⅚ to 4⅙	3¾ to 4¼	3⅔ to 4½	3⅓ to 5⅓
3½ feet	1¾′ x 2⅓′	3½ to 3½	3⅓ to 3⅔	3⅓ to 3⅔	3¼ to 3⅚	2⅚ to 4⅓

The depth of field is not given for *f*/5.6, *f*/16, or *f*/32. The depth for these openings can be estimated.

*This equals approximately *f*/1720, and is for very critical definition and when extreme enlargements are to be made from the negatives. For normal work, the depth of field is greater.

Depth of Field: For Critical Definition **No. 32 K. A. *f*/4.5, 6⅜ in.**

Distance Focused On	Approximate Field Size with 4 x 5″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/4.5	*f*/8	*f*/11	*f*/22	*f*/45
INF.	35° x 42°	203 to inf.	114 to inf.	83 to inf.	42 to inf.	20 to inf.
100 feet	62′ x 78′	67 to 200	53 to inf.	45 to inf.	29 to inf.	17 to inf.
50 feet	31′ x 39′	40 to 67	35 to 89	31 to 126	23 to inf.	15 to inf.
25 feet	15′ x 18′	22 to 29	20 to 32	19 to 36	16 to 63	11 to inf.
15 feet	9′ x 11′	14 to 16¼	13 to 17	12½ to 18	11 to 24	8½ to 58
10 feet	6′ x 7½′	9½ to 10⅔	9¼ to 11	9 to 11⅔	8¼ to 13	6⅔ to 20
8 feet	4¾′ x 5⅚′	7¾ to 8⅓	7½ to 8⅔	7⅓ to 8¾	6¾ to 10	5⅔ to 13
6 feet	3½′ x 4⅓′	5¾ to 6¼	5¾ to 6½	5⅔ to 6½	5⅓ to 7	4¾ to 8¾
5 feet	2¾′ x 3½′	4⅚ to 5⅙	4¾ to 5¼	4¾ to 5⅓	4½ to 5¾	4 to 6½
4 feet	2⅙′ x 2¾′	3⅚ to 4⅙	3⅚ to 4⅙	3¾ to 4¼	3¾ to 4½	3½ to 5
3½ feet	1⅚′ x 2⅓′	3½ to 3½	3½ to 3½	3⅓ to 3⅔	3¼ to 3¾	3 to 4⅙

Depth of Field: For Critical Definition **No. 33 K. A. *f*/4.5, 7½ in.**

Distance Focused On	Approximate Field Size with 5 x 7″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/4.5	*f*/8	*f*/11	*f*/22	*f*/45
INF.	37° x 53°	239 to inf.	134 to inf.	98 to inf.	49 to inf.	24 to inf.
200 feet	113′ x 186′	109 to inf.	80 to inf.	66 to inf.	39 to inf.	21 to inf.
100 feet	66′ x 93′	70 to 172	58 to inf.	50 to inf.	33 to inf.	19 to inf.
50 feet	33′ x 46′	42 to 63	36 to 80	33 to 103	25 to inf.	16 to inf.
25 feet	16′ x 23′	23 to 28	21 to 31	20 to 34	17 to 51	12 to inf.
15 feet	10′ x 13′	14 to 16	13½ to 17	13 to 18	11 to 22	9 to 40
10 feet	6¼′ x 8¾′	9½ to 10½	9⅓ to 11	9⅙ to 11⅓	8⅓ to 12½	7 to 17
8 feet	4⅚′ x 6⅚′	7¾ to 8¼	7⅔ to 8½	7½ to 8¾	6⅚ to 9⅔	6 to 12
6 feet	3⅔′ x 5′	5¾ to 6¼	5¾ to 6⅓	5⅔ to 6½	5½ to 6¾	4¾ to 8
5 feet	3¼′ x 4⅔′	4⅚ to 5⅙	4¾ to 5¼	4¾ to 5⅓	4½ to 5⅔	4⅙ to 6⅓
4 feet	2¼′ x 3⅙′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4⅙	3⅔ to 4⅓	3½ to 4¾
3½ feet	1⅚′ x 2⅔′	3½ to 3½	3½ to 3⅔	3½ to 3⅔	3⅓ to 3¾	3 to 4

Depth of Field: For Critical Definition **No. 34 K. A. *f*/4.5, 8½ in.**

Distance Focused On	Approximate Field Size with 5 x 8″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/4.5	*f*/8	*f*/11	*f*/22	*f*/45
INF.	33° x 50°	271 to inf.	152 to inf.	111 to inf.	55 to inf.	27 to inf.
200 feet	117′ x 187′	115 to inf.	86 to inf.	71 to inf.	43 to inf.	24 to inf.
100 feet	58′ x 93′	73 to 158	60 to 292	53 to inf.	36 to inf.	21 to inf.
50 feet	29′ x 52′	42 to 61	37 to 75	34 to 91	26 to inf.	18 to inf.
25 feet	14′ x 23′	24 to 27	21¾ to 30	20 to 32	17 to 46	13 to inf.
15 feet	8⅓′ x 13¼′	14¼ to 16½	13½ to 17	13 to 17½	12 to 21	9½ to 34
10 feet	5½′ x 8¾′	9⅔ to 10½	9⅓ to 10¾	9 to 11	8½ to 12	7⅓ to 16
8 feet	4⅓′ x 6⅚′	7¾ to 8¼	7⅔ to 8½	7½ to 8⅔	7 to 9⅓	6 to 11
6 feet	3⅙′ x 5′	5⅚ to 6⅙	5¾ to 6⅓	5⅔ to 6⅓	5⅓ to 6¾	5 to 7½
5 feet	2½′ x 4′	4⅚ to 5⅙	4¾ to 5¼	4¾ to 5¼	4⅔ to 5½	4⅙ to 6⅓
4 feet	2′ x 3⅙′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4¼	3⅔ to 4⅓	3½ to 4¾
3½ feet	1⅔′ x 2⅔′	3½ to 3½	3½ to 3½	3½ to 3½	3⅓ to 3⅔	3 to 4

Depth of Field: For Critical Definition **No. 35 K. A. *f*/4.5, 10 in.**

Distance Focused On	Approximate Field Size with 6½ x 8½″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/4.5	*f*/8	*f*/11	*f*/22	*f*/45
INF.	36° x 46°	318 to inf.	179 to inf.	130 to inf.	65 to inf.	32 to inf.
400 feet	259′ x 339′	175 to inf.	124 to inf.	98 to inf.	56 to inf.	29 to inf.
200 feet	129′ x 169′	128 to 550	95 to inf.	79 to inf.	49 to inf.	27 to inf.
100 feet	65′ x 85′	78 to 144	64 to 226	57 to inf.	39 to inf.	24 to inf.
50 feet	32′ x 42′	43 to 59	39 to 69	36 to 81	28 to 214	19 to inf.
25 feet	16′ x 21′	23 to 27	22 to 29	21 to 31	18 to 40	14 to 117
15 feet	9′ x 12′	14½ to 16	13⅔ to 16⅔	13½ to 17	12 to 20	10 to 28
10 feet	6′ x 8′	9½ to 10½	9⅔ to 10⅔	9⅓ to 11	8⅔ to 12	7½ to 14
8 feet	4⅔′ x 6′	7¾ to 8¼	7¾ to 8⅓	7⅔ to 8½	7¼ to 9⅙	6⅓ to 10¾
6 feet	3⅓′ x 4⅓′	5⅚ to 6⅙	5¾ to 6⅓	5¾ to 6⅓	5½ to 6¾	5⅙ to 7⅓
5 feet	2⅔′ x 3½′	4⅚ to 5⅙	4⅚ to 5⅙	4¾ to 5¼	4½ to 5½	4⅓ to 5¾
4 feet	2′ x 2¾′	3⅚ to 4⅙	3⅚ to 4⅙	3⅚ to 4⅙	3¾ to 4¼	3⅔ to 4½
3½ feet	1¾′ x 2¼′	3½ to 3½	3½ to 3½	3½ to 3½	3⅓ to 3¾	3¼ to 4

The depth of field is not given for *f*/5.6, *f*/16, or *f*/32. The depth for these openings can be estimated.
*This equals approximately *f*/1720, and is for very critical definition, and when extreme enlargements are to be made from the negatives. For normal work, the depth of field is greater.

Depth of Field: For Critical Definition **No. 36 K. A. f/4.5, 12 in.**

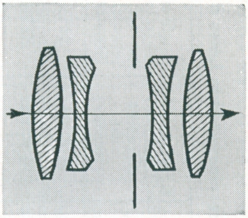
Distance Focused On	Approximate Field Size with 8 x 10″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/4.5	f/8	f/11	f/22	f/45
INF.	37° x 45°	382 to inf.	215 to inf.	156 to inf.	78 to inf.	38 to inf.
400 feet	266′ x 332′	185 to inf.	140 to inf.	112 to inf.	65 to inf.	35 to inf.
200 feet	133′ x 166′	135 to 425	110 to inf.	88 to inf.	56 to inf.	32 to inf.
100 feet	66′ x 83′	81 to 135	68 to 187	61 to 278	45 to 310	28 to inf.
50 feet	33′ x 41′	45 to 57	41 to 65	38 to 74	31 to 139	22 to inf.
25 feet	16′ x 20′	24 to 26	22 to 28	21 to 30	19 to 37	15 to 73
15 feet	$9\frac{1}{3}$′ x 12′	$14\frac{1}{2}$ to $15\frac{1}{2}$	14 to $16\frac{1}{2}$	$13\frac{1}{2}$ to 17	$12\frac{1}{2}$ to 19	11 to 25
10 feet	6′ x $7\frac{1}{2}$′	$9\frac{3}{4}$ to $10\frac{1}{4}$	$9\frac{1}{2}$ to $10\frac{2}{3}$	$9\frac{1}{4}$ to $10\frac{5}{6}$	$8\frac{5}{6}$ to 12	8 to 14
8 feet	$4\frac{2}{3}$′ x $5\frac{3}{4}$′	$7\frac{3}{4}$ to $8\frac{1}{4}$	$7\frac{3}{4}$ to $8\frac{1}{3}$	$7\frac{2}{3}$ to $8\frac{1}{2}$	$7\frac{1}{3}$ to $8\frac{5}{6}$	$6\frac{2}{3}$ to $10\frac{1}{6}$
6 feet	$3\frac{1}{3}$′ x $4\frac{1}{6}$′	$5\frac{5}{6}$ to $6\frac{1}{6}$	$5\frac{3}{4}$ to $6\frac{1}{4}$	$5\frac{3}{4}$ to $6\frac{1}{3}$	$5\frac{2}{3}$ to $6\frac{2}{3}$	$5\frac{1}{4}$ to 7
5 feet	$2\frac{2}{3}$′ x $3\frac{1}{3}$′	$4\frac{5}{6}$ to $5\frac{1}{6}$	$4\frac{5}{6}$ to $5\frac{1}{6}$	$4\frac{5}{6}$ to $5\frac{1}{6}$	$4\frac{3}{4}$ to $5\frac{1}{3}$	$4\frac{1}{3}$ to $5\frac{3}{4}$
4 feet	2′ x $2\frac{1}{2}$′	$3\frac{5}{6}$ to $4\frac{1}{6}$	$3\frac{5}{6}$ to $4\frac{1}{6}$	$3\frac{5}{6}$ to $4\frac{1}{6}$	$3\frac{3}{4}$ to $4\frac{1}{4}$	$3\frac{2}{3}$ to $4\frac{1}{2}$
$3\frac{1}{2}$ feet	$1\frac{2}{3}$′ x $2\frac{1}{6}$′	$3\frac{1}{2}$ to $3\frac{1}{2}$	$3\frac{1}{2}$ to $3\frac{1}{2}$	$3\frac{1}{2}$ to $3\frac{1}{2}$	$3\frac{1}{3}$ to $3\frac{2}{3}$	$3\frac{1}{4}$ to $3\frac{5}{6}$

The depth is not given for f/5.6, f/16, or f/32. For these openings depth can be estimated by comparison.

*This equals approximately f/1720 and is for very critical definition and when extreme enlargements are to be made from the negatives. For normal work the depth of field is greater.

Specifications:

No. 70 KODAK ANASTIGMAT f/7.7, 8 in.



This lens, primarily intended for the Eastman 2D View and other 5 x 7 cameras, is of the symmetrical, air-spaced type which retains its corrections to a high degree when used for extreme close-ups. It gives extremely sharp definition over the whole field for all subject distances at maximum lens aperture. This lens is supplied in a Kodak Flash Supermatic Shutter.

Lens Speed: f/7.7, marked apertures—f/7.7, f/11, f/16, f/22, f/32, and f/45.

Focal Length: 8 inches, 203 mm., Back Focus $7\frac{1}{2}$ inches, 190 mm.

Infrared Focusing: Extend lens .016 inch (.4 mm.) from visual focus.

Negative Size: 5 x 7 inches.

Angle of View: When focused for infinity, 35° x 47°.

Shutter Speeds: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400 sec., T, B, built-in flash synchronization, and blade-arrester.

Diameter of Lens Board Mounting Hole: $1\frac{1}{2}$ inches (38 mm.).

Attachment Size: $1\frac{5}{16}$ in., 33 mm., Ser. VI Attachments.

Depth of Field: For Critical Definition **No. 70 K. A. f/7.7, 8 in.**

Distance Focused On	Approximate Field Size with 5 x 7″ Neg.	DEPTH OF FIELD—IN FEET. Circle of Confusion, 2′ arc.*				
		f/7.7	f/11	f/16	f/22	f/45
INF.	35° x 47°	149 to inf.	104 to inf.	72 to inf.	52 to inf.	26 to inf.
200 feet	124′ x 174′	86 to inf.	68 to inf.	53 to inf.	41 to inf.	23 to inf.
100 feet	62′ x 87′	60 to 304	51 to inf.	42 to inf.	34 to inf.	21 to inf.
50 feet	31′ x 43′	37 to 75	34 to 96	30 to 165	26 to inf.	17 to inf.
25 feet	15′ x 21′	21 to 30	20 to 33	18 to 38	17 to 48	13 to inf.
15 feet	$8\frac{5}{6}$′ x $12\frac{1}{2}$′	14 to 17	13 to 18	$12\frac{1}{2}$ to 19	$11\frac{3}{4}$ to 21	$9\frac{1}{3}$ to 36
10 feet	$5\frac{3}{4}$′ x $8\frac{1}{4}$′	$9\frac{1}{3}$ to $10\frac{3}{4}$	$9\frac{1}{6}$ to $11\frac{1}{4}$	$8\frac{3}{4}$ to $11\frac{3}{4}$	$8\frac{1}{2}$ to $12\frac{1}{3}$	$7\frac{1}{4}$ to $16\frac{1}{4}$
8 feet	$4\frac{2}{3}$′ x $6\frac{1}{2}$′	$7\frac{2}{3}$ to $8\frac{1}{2}$	$7\frac{1}{2}$ to $8\frac{2}{3}$	$7\frac{1}{4}$ to 9	$6\frac{5}{6}$ to $9\frac{1}{3}$	$6\frac{1}{6}$ to $11\frac{2}{3}$
6 feet	$3\frac{1}{3}$′ x $4\frac{2}{3}$′	$5\frac{3}{4}$ to $6\frac{1}{4}$	$5\frac{3}{4}$ to $6\frac{1}{2}$	$5\frac{2}{3}$ to $6\frac{2}{3}$	$5\frac{1}{2}$ to $6\frac{3}{4}$	$4\frac{5}{6}$ to 8
5 feet	$2\frac{3}{4}$′ x $3\frac{3}{4}$′	$4\frac{3}{4}$ to $5\frac{1}{4}$	$4\frac{3}{4}$ to $5\frac{1}{4}$	$4\frac{3}{4}$ to $5\frac{1}{3}$	$4\frac{2}{3}$ to $5\frac{1}{2}$	$4\frac{1}{4}$ to $6\frac{1}{3}$
4 feet	2′ x $2\frac{5}{6}$′	$3\frac{5}{6}$ to $4\frac{1}{6}$	$3\frac{5}{6}$ to $4\frac{1}{6}$	$3\frac{3}{4}$ to $4\frac{1}{4}$	$3\frac{3}{4}$ to $4\frac{1}{3}$	$3\frac{1}{2}$ to $4\frac{3}{4}$
$3\frac{1}{2}$ feet	$1\frac{3}{4}$′ x $2\frac{1}{2}$′	$3\frac{1}{2}$ to $3\frac{1}{2}$	$3\frac{1}{2}$ to $3\frac{1}{2}$	$3\frac{1}{2}$ to $3\frac{2}{3}$	$3\frac{1}{3}$ to $3\frac{3}{4}$	$3\frac{1}{6}$ to 4

The depth is not given for f/32. For this opening depth can be estimated by comparison.

*This equals approximately f/1720 and is for very critical definition and when extreme enlargements are to be made from the negatives. For normal work the depth of field is greater.

Kodak Lenses Supplied Separately in Shutters or Barrels for Use on Commercial, Portrait, Press, View, and Reflex Cameras with Interchangeable Lens Boards

LENS	Available in	Focal Length in.	Focal Length mm.	Back Focus in.	Recommended Maximum Negative Size inches	Angle of View when focused for "inf." with recommended Negative Size	Kodak Adapter Ring Size in.	Kodak Adapter Ring Size mm.	Kodak Lens Attach. Ser.	Diameter of Lens Board Mounting Hole in.	Diameter of Lens Board Mounting Hole mm.	Over-All Length of Lens Mount inches
Kodak Ektar f/4.5, 101 mm.	Flash Supermatic Shutter	4	101	3 1/2	2 1/4 x 3 1/4	32° x 45°	1 1/4	31.5	VI	1 3/8	35	1
Kodak Ektar f/3.7, 105 mm.	Flash Supermatic Shutter	4 1/8	105	3 7/16	2 1/4 x 3 1/4	31° x 42°	1 1/2	38	VI	1 3/8	35	1 11/32
Kodak Ektar f/4.7, 127 mm.	Flash Supermatic Shutter	5	127	4 7/16	3 1/4 x 4 1/4	36° x 46°	1 1/2	38	VI	1 1/2	38	1 5/32
No. 31 Kodak Anastigmat f/4.5, 5 1/2 in.	Barrel only	5 1/2	140	5	3 1/4 x 4 1/4	33° x 42°	1 9/16	39.5	VI	1 7/8	47.5	1 5/16
No. 32 Kodak Anastigmat f/4.5, 6 3/8 in.	No. 3 Supermatic Shutter	6 3/8	161	5 3/4	4 x 5	35° x 43°	1 3/4	44.5	VII	2	50.5	1 3/8
	Barrel	6 3/8	161	5 3/4	4 x 5	35° x 43°	1 3/4	44.5	VII	2 3/32	53	1 7/16
No. 33 Kodak Anastigmat f/4.5, 7 1/2 in.	No. 4 Ilex Univ. Shutter	7 1/2	190	6 3/4	5 x 7	37° x 53°	2	50.5	VII	2 5/8	67	1 9/16
	Barrel	7 1/2	190	6 3/4	5 x 7	37° x 53°	2	50.5	VII	2 3/8	60	1 5/8
No. 70 Kodak Anastigmat f/7.7, 8 in.	Flash Supermatic Shutter	8	203	7 1/2	5 x 7	35° x 47°	1 5/16	33	VI	1 1/2	38	1 1/4
Eastman Ektar f/6.3, 8 1/2 in.	No. 3 Ilex Univ. Shutter	8 1/2	216	7 3/4	5 x 7	33° x 45°	1 3/4	44.5	VII	2 3/16	55	1 3/4
	Barrel	8 1/2	216	7 3/4	5 x 7	33° x 45°	1 3/4	44.5	VII	2 3/16	55	1 3/4
No. 34 Kodak Anastigmat f/4.5, 8 1/2 in.	No. 4 Ilex Univ. Shutter	8 1/2	216	7 3/4	5 x 8	33° x 50°	2 3/8	60	VIII	2 5/8	67	1 3/4
	Barrel	8 1/2	216	7 3/4	5 x 8	33° x 50°	2 3/8	60	VIII	2 5/8	67	1 13/16
Eastman Ektar f/6.3, 10 in.	No. 4 Ilex Univ. Shutter	10	254	9 1/8	6 1/2 x 8 1/2	36° x 46°	2 1/8	54	VIII	2 5/8	67	2 1/16
	Barrel	10	254	9 1/8	6 1/2 x 8 1/2	36° x 46°	2 1/8	54	VIII	2 5/8	67	2 1/16
No. 35 Kodak Anastigmat f/4.5, 10 in.	No. 5 Ilex Univ. Shutter	10	254	9	6 1/2 x 8 1/2	36° x 46°	2 5/8	67	VIII	3 3/8	86	2 1/8
	Barrel	10	254	9	6 1/2 x 8 1/2	36° x 46°	2 5/8	67	VIII	2 7/8	73	2 3/16
Eastman Ektar f/6.3, 12 in.	No. 4 Ilex Univ. Shutter	12	304	11	8 x 10	37° x 45°	2 1/2	63.5	VIII	2 7/8	73	2 1/2
	Barrel	12	304	11	8 x 10	37° x 45°	2 1/2	63.5	VIII	2 7/8	73	2 1/2
No. 36 Kodak Anastigmat f/4.5, 12 in.	No. 5 Ilex Univ. Shutter	12	304	10 7/8	8 x 10	37° x 45°	3 3/8	85.5	—*	3 3/8	86	2 9/16
	Barrel	12	304	10 7/8	8 x 10	37° x 45°	3 3/8	85.5	—*	3 5/8	92	2 9/16
Eastman Ektar f/6.3, 14 in.	No. 5 Ilex Univ. Shutter	14	356	12 3/4	8 x 10	32° x 40°	2 15/16	75	—*	3 3/8	86	2 15/16
	Barrel	14	356	12 3/4	8 x 10	32° x 40°	2 15/16	75	—*	3 3/16	81	2 15/16

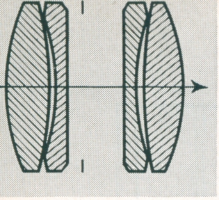
Kodak Flash Supermatic (pre-setting): 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, 1/400, T, B, with Blade Arrester and built-in flash synchronization.
Kodak No. 3 Supermatic (pre-setting): 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/200, T, B, with Blade Arrester and built-in delayed-action release.
Ilex Universal (self-setting) No. 3: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, 1/150, T, B; No. 4: 1, 1/2, 1/5, 1/10, 1/25, 1/50, 1/100, T, B; No. 5: 1, 1/2, 1/5, 1/10, 1/25, 1/50, T, B—
*Use Eastman 4-in. Adjustable Filter Holder.

Kodak Projection Lenses for Enlarging

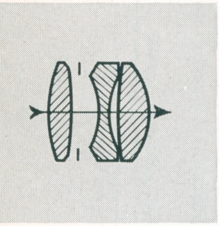
Among the many lenses manufactured by the Eastman Kodak Company, there is a group designed particularly for enlarging. A good camera lens is not necessarily the best enlarger lens. Enlarger lenses must work between the flat surface of the paper and the flat negative at relatively short subject-image distances. Kodak enlarging lenses have a flat field, good covering power, and precise corrections of aberrations at short working distances. The Projection Ektars are specially designed for color work and corrected for lateral chromatic aberrations to an exceptionally high degree.

LENS	Aperture Range	Focal Length		For Negatives Up To	Adapter Ring Size		Lens Attachment Series	Supplied in	Used for
		in.	mm.		in.	mm.			
Eastman Projection Anastigmat f/ 4.5, 10 in.	f/ 4.5–f/32	10	254	8 x 10 in.	$2\frac{5}{8}$	67	VIII	—	Eastman Projection Printer 8 x 10
Eastman Projection Anastigmat f/ 8, 10 in.	f/ 8 –f/45	10	254	8 x 10 in.	$1\frac{3}{4}$	44.5	VII	—	Line Process work with above Printer
*Eastman Projection Anastigmat f/ 4.5, $7\frac{1}{2}$ in.	f/ 4.5–f/32	$7\frac{1}{2}$	190	5 x 7 in.	2	50.5	VII	—	Eastman Auto-Focus Enlarger 5 x 7
Kodak Projection Anastigmat f/ 4.5, $6\frac{3}{8}$ in.	f/ 4.5–f/22	$6\frac{3}{8}$	161	4 x 5 in.	2	50.5	VII		Kodak Precision Enlarger with "B" Assembly and Kodak Advance Enlarger
Kodak Projection Anastigmat f/ 4.5, $5\frac{3}{8}$ in.	f/ 4.5–f/22	$5\frac{3}{8}$	135	$3\frac{1}{4}$ x $4\frac{1}{4}$ in.	$1\frac{3}{4}$	44.5	VII		
Kodak Projection Anastigmat f/ 6.3, 5 in.	f/ 6.3–f/16	5	128	$2\frac{1}{2}$ x $4\frac{1}{4}$ in.	$1\frac{9}{16}$	39.5	VI		
*Kodak Projection Ektar f/ 4.5, 4 in.	f/ 4.5–f/22	4	100	$2\frac{1}{4}$ x $3\frac{1}{4}$ in.	$1\frac{9}{16}$	39.5	VI	$2\frac{5}{8}$″ x $2\frac{5}{8}$″ lens boards	As above but with small negatives and Kodak Precision Enlarger with "A" Assembly
Kodak Projection Anastigmat f/ 4.5, 4 in.	f/ 4.5–f/22	4	105	$2\frac{1}{4}$ x $3\frac{1}{4}$ in.	$1\frac{9}{16}$	39.5	VI		
*Kodak Projection Ektar f/ 4.5, 3 in.	f/ 4.5–f/22	3	75	$2\frac{1}{4}$ x $2\frac{1}{4}$ in.	$1\frac{3}{16}$	30	V		
Kodak Projection Anastigmat f/ 4.5, 3 in.	f/ 4.5–f/22	3	75	$2\frac{1}{4}$ x $2\frac{1}{4}$ in.	$1\frac{3}{16}$	30	V		
*Kodak Projection Ektar f/ 4.5, 2 in.	f/ 4.5–f/22	2	50	$1\frac{3}{16}$ x $1\frac{9}{16}$ in.	$\frac{15}{16}$	23.5	V		Kodak Precision Enlarger with "A" Assembly and Kodak Advance Enlarger
Kodak Projection Anastigmat f/ 4.5, 2 in.	f/ 4.5–f/22	2	50	$1\frac{3}{16}$ x $1\frac{9}{16}$ in.	$\frac{15}{16}$	23.5	V		
Kodak Projection Anastigmat f/ 6.3, 2 in.	f/ 6.3 fixed	2	50	$1\frac{3}{16}$ x $1\frac{9}{16}$ in.	$\frac{13}{16}$	20.5	V		
Kodak Projection Anastigmat f/11.0, 98 mm.	f/11.0 fixed	4	98	$3\frac{1}{4}$ x $4\frac{1}{4}$ in.	1	25.5	V		
*Kodak Projection Ektar f/ 4.5, 2 in.	f/ 4.5–f/22	2	50	28 x 40 mm.	$\frac{15}{16}$	23.5	V	focusing tube	Kodak Portable Miniature Enlarger for 24 x 36 and 28 x 40 mm. negatives
Kodak Projection Anastigmat f/ 4.5, 2 in.	f/ 4.5–f/22	2	50	28 x 40 mm.	$\frac{15}{16}$	23.5	V		
Kodak Projection Anastigmat f/ 6.3, 2 in.	f/ 6.3 fixed	2	51	28 x 40 mm.	$\frac{13}{16}$	20.5	V		
Kodak Anastigmat f/ 7.7, 130 mm.	f/11.0 fixed	5	130	4 x 5 in.	1	25.5	V	—	Kodak Auto-Focus Enlarger Mod. C
*Eastman Projection Anastigmat "K" f/ 4.5, 105 mm.	f/ 4.5–f/22	4	105	28 x 40 mm.	$1\frac{1}{4}$	31.5	VI	—	Process color work from 24 x 36 and 28 x 40 mm. originals

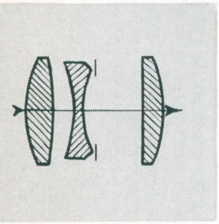
*Specially corrected for lateral chromatic aberration.



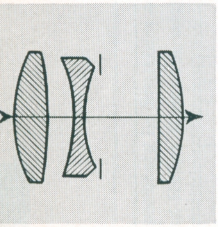
K. A. *f*/1.9, 25 mm.



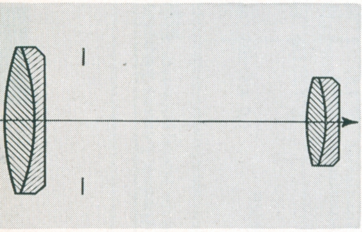
K. A. *f*/2.7, 15 mm.



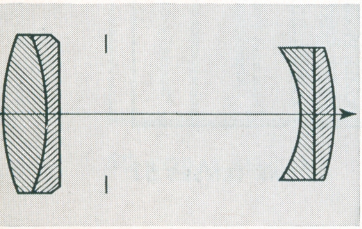
K. A. *f*/3.5, 20 mm.



K. A. *f*/3.5, 50 mm.



K. A. *f*/1.6, 50 mm., *f*/2.7, 63 mm., and *f*/2.7, 102 mm.



K. A. *f*/4.5, 76 mm., *f*/4.5, 114 mm., and *f*/4.5, 152 mm.

LENSES FOR CINÉ-KODAK—16 MM.

KODAK ANASTIGMAT:

f/1.9, 25 mm. This high speed lens of normal focal length is the ideal all-purpose lens, able to cope with extremely poor light conditions.
Angle of View: 21.5° x 16.2°. Focusing Range: Inf. to 2 ft.
Attachment Size: W Mount or 1 1/16 in., 27 mm., Ser. V Attachments.

f/2.7, 15 mm. This wide-angle lens includes a greater picture area from a given position than any other Ciné-Kodak lens. This is especially useful for photography in close quarters.
Angle of View: 34.0° x 25.7°. Focusing Range: Inf. to 6 inches.
Attachment Size: 1 9/16 in., 39.5 mm., Ser. VI Attachments.

f/3.5, 20 mm. A moderate speed lens for home movie cameras designed for simplicity in operation.
Angle of View: 26.5° x 20.0°. Focusing Range: Fixed Focus.
Attachment Size: Z Mount.

f/3.5, 50 mm. This lens gives twice the image size as compared with the normal focal length. Its speed is ample for general photography.
Angle of View: 10.9° x 8.1°. Focusing Range: Inf. to 2¼ ft.*
Attachment Size: 1 1/16 in., 27 mm., Ser. V Attachments.

f/1.6, 50 mm. This long-focus lens gives twice the image size of the 25-mm. lens and, because of its unusual speed, is especially useful for sport and similar pictures under extremely poor light conditions.
Angle of View: 10.8° x 8.1°. Focusing Range: Inf. to 2 ft.*†
Attachment Size: Ser. VI Retaining Ring, Ser. VI Attachments.

f/2.7, 63 mm. This long-focus lens will serve best when medium telephoto effects under unfavorable light conditions are desired.
Angle of View: 8.7° x 6.5°. Focusing Range: Inf. to 1½ ft.*
Attachment Size: 1 5/16 in., 33 mm., Ser. VI Attachments.

f/4.5, 76 mm. A telephoto lens giving an image size three times larger than the one obtained with a 25-mm. lens.
Angle of View: 7.2° x 5.4°. Focusing Range: Inf. to 3¾ ft.*
Attachment Size: 1 1/16 in., 27 mm., Ser. V Attachments.

f/2.7, 102 mm. This fast long-focus lens is especially useful when light conditions or fast shutter speeds call for a large lens aperture.
Angle of View: 5.4° x 4.1°. Focusing Range: Inf. to 4½ ft.*
Attachment Size: 1 13/16 in., 46 mm., Ser. VII Attachments.

f/4.5, 114 mm. This telephoto lens will serve well where lens speed is not a prime consideration.
Angle of View: 4.8° x 3.6°. Focusing Range: Inf. to 4¼ ft.*
Attachment Size: 1 5/16 in., 33 mm., Ser. VI Attachments.

f/4.5, 152 mm. This telephoto lens gives a six times larger image size than that obtained with a 25-mm. lens and is especially useful when large image size at great distances is essential.
Angle of View: 3.6° x 2.7°. Focusing Range: Inf. to 10 ft.*
Attachment Size: 1 9/16 in., 39.5 mm., Ser. VI Attachments.

*With cameras having a Reflex Focusing or an Accessory Focusing Finder, it is possible to focus this lens much closer after lifting a plunger or removing a screw.

†This lens has a depth of field indicator.

Table of Field Sizes for 16 mm. Ciné-Kodak Lenses

Name	Kodak Anastigmat f/3.5, 20 mm. (13/16 in.)		Kodak Anastigmat f/2.7, 15 mm. (⅝ in.)		Kodak Anastigmat f/1.9, 25 mm. (1 in.)		Kodak Anastigmat f/1.6, 50 mm. (2 in.)		Kodak Anastigmat f/3.5, 50 mm. (2 in.)		Kodak Anastigmat f/2.7, 63 mm. (2½ in.)		Kodak Telephoto Anast. f/4.5, 76 mm. (3 in.)		Kodak Anastigmat f/2.7, 102 mm. (4 in.)		Kodak Telephoto Anast. f/4.5, 114 mm. (4½ in.)		Kodak Telephoto Anast. f/4.5, 152 mm. (6 in.)	
	Fixed Focus		**Focusing Mount**																	
Angular Field at Inf.	26.5° x 20.0°		34.0° x 25.7°		21.5° x 16.2°		10.8° x 8.1°		10.9° x 8.1°		8.7° x 6.5°		7.2° x 5.4°		5.4° x 4.1°		4.8° x 3.6°		3.6° x 2.7°	
	Field Size																			
Distance* to subject	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.	Width ft. in.	Height ft. in.
400 feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	25 3	18 10
200 feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	19 —	14 2	16 10	12 7	12 7	9 5
100 feet	— —	— —	— —	— —	— —	— —	19 —	14 2	19 —	14 2	— —	— —	12 7	9 5	9 5½	7 1	8 4½	6 3	6 3	4 8
50 feet	23 6	17 7	— —	— —	19 —	14 2	9 5½	7 1	9 5½	7 1	7 7	5 8	6 3½	4 8	4 8½	3 6	4 2	3 1	3 1	2 3¾
25 feet	11 9	8 9½	— —	— —	9 5½	7 1	4 8½	3 6½	4 8½	3 6½	3 9	2 10	3 1	2 3¾	2 4	1 9	2 ½	1 6¼	1 6	1 1½
15 feet	7 ½	5 3½	9 2	6 10	5 8	4 3	2 10	2 1½	2 9¾	2 1¼	2 3	1 8¼	1 10	1 4½	1 4½	1 ½	1 2½	— 10¾	— 10½	— 7⅞
12 feet	— —	— —	— —	— —	— —	— —	— —	— —	2 3	1 8	— —	— —	1 5½	1 1	1 1¼	— 9⅞	— 11¼	— 8½	— 8¼	— 6⅛
10 feet	4 8½	3 6	— —	— —	3 9	2 9¾	1 10½	1 5	1 10¼	1 4¾	1 5¾	1 1¼	1 2¼	— 10¾	— 10⅞	— 8⅛	— 9¼	— 6⅞	— 6¾	— 5
8 feet	3 9	2 9¾	4 10½	3 7½	3 —	2 3	1 6	1 1½	1 5¾	1 1¼	1 2¼	— 10⅝	— 11⅜	— 8½	— 8⅝	— 6½	— 7¼	— 5⅜	— —	— —
6 feet	2 9¾	2 1¼	3 8	2 8½	2 3	1 8	1 1½	— 10⅛	1 1¼	— 9⅞	— 10½	— 7⅞	— 8¼	— 6¼	— 6⅜	— 4¾	— 5¼	— 3⅞	— —	— —
5 feet	— —	— —	3 ½	2 3¼	— —	— —	— 11¼	— 8⅜	— 10⅞	— 8⅛	— 8¾	— 6½	— 6¾	— 5	— 5⅛	— 3⅞	— 4⅛	— 3⅛	— —	— —
4½ feet	— —	— —	— —	— —	— —	— —	— 10⅛	— 7½	— 9¾	— 7¼	— —	— —	— 6	— 4½	— 4⅝	— 3½	— —	— —	— —	— —
4¼ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 3⅜	— 2½	— —	— —
4 feet	1 10½	1 4¾	2 5¼	1 9¾	1 5¾	1 1¼	— 9	— 6¾	— 8⅝	— 6½	— 6⅞	— 5⅛	— 5¼	— 3⅞	— —	— —	— —	— —	— —	— —
3¾ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 4⅞	— 3⅝						
3½ feet	— —	— —	— —	— —	— —	— —	— 7⅞	— 5⅞	— 7½	— 5⅝	— —	— —	— —	— —						
3 feet	1 5	1 ¾	1 9¾	1 4¼	1 1¼	— 9⅞	— 6¾	— 5	— 6⅜	— 4¾	— 5	— 3¾	— —	— —						
2½ feet	— —	— —	1 6	1 1½	— —	— —	— 5⅝	— 4⅛	— 5¼	— 3⅞	— 4⅛	— 3	— —	— —						
2¼ feet	— —	— —	— —	— —	— —	— —	— —	— —	— 4⅝	— 3½	— —	— —	— —	— —						
2 feet	— —	— —	1 2½	— 10¾	— 8¾	— 6½	— 4⅜	— 3⅜	— —	— —	— 3⅛	— 2⅜	— —	— —						
1½ feet	— —	— —	— 10¾	— 8	— —	— —	— —	— —	— —	— —	— 2¼	— 1⅝	— —	— —						
1¼ feet	— —	— —	— 9	— 6½	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —						
1 foot	— —	— —	— 7⅛	— 5⅜	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —						

Field Size—distance settings less than 1 ft.
Kodak Anastigmat f/2.7, 15 mm. (⅝ in.)

Distance* to subject	Width ft.	Width in.	Height ft.	Height in.
10 inches	—	5¾	—	4¼
9 inches	—	5¼	—	3¾
8 inches	—	4½	—	3¼
7 inches	—	4	—	3
6 inches	—	3⅝	—	2⅝

*Distances measured from front of camera for all lenses except f/1.6, 50 mm. lens, for which they are measured from the engraved focusing line on the lens barrel.

DEPTH OF FIELD TABLES FOR 16 MM. CINÉ-KODAK LENSES

The distances given in the following tables are measured from the front of the camera except for the Kodak Anastigmat *f*/1.6, 50 mm., for which they are measured from the engraved focusing line on lens barrel.

The depth of field for *f*-numbers not given or for intermediate diaphragm settings can be estimated by comparison.

"inf." is the abbreviation for "infinity."

Depth of Field: Kodak Anastigmat *f*/1.9, 25 mm. (1 in.)

Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/1.9		*f*/2.8		*f*/4		*f*/5.6		*f*/8		*f*/16	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	44 —	inf.	30 —	inf.	21 —	inf.	15 —	inf.	10 6	inf.	5 3	inf.
50 feet	23 —	inf.	18 8	inf.	15 —	inf.	11 6	inf.	8 7	inf.	4 9	inf.
25 feet	16 —	58 —	13 7	155 —	11 4	inf.	9 4	inf.	7 5	inf.	4 4	inf.
15 feet	11 2	23 —	10 —	30 —	8 9	54 —	7 6	inf.	6 2	inf.	3 11	inf.
10 feet	8 2	13 —	7 6	15 —	6 9	19 —	6 —	30 —	5 1	240	3 5	inf.
8 feet	6 9	9 9	6 4	11 —	5 9	13 —	5 2	17 3	4 6	34 —	3 2	inf.
6 feet	5 3	7 —	5 —	7 6	4 8	8 5	4 3	10 —	3 10	14 —	2 9	inf.
4 feet	3 8	4 5	3 6	4 7	3 4	5 —	3 2	5 6	2 11	6 6	2 3	17 —
3 feet	2 10	3 3	2 9	3 4	2 7	3 6	2 6	3 9	2 4	4 2	1 11	7 —
2 feet	1 11	2 1	1 10	2 2	1 10	2 2	1 9	2 4	1 8	2 6	1 5	3 3

Depth of Field: Kodak Anastigmat *f*/2.7, 15 mm. (⅝ in.)

Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/2.7		*f*/4		*f*/5.6		*f*/8		*f*/11		*f*/16	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	12 —	inf.	8 —	inf.	5 9	inf.	4 —	inf.	3 —	inf.	2 —	inf.
15 feet	6 8	inf.	5 3	inf.	4 2	inf.	3 2	inf.	2 5	inf.	1 9	inf.
8 feet	4 10	24 —	4 —	inf.	3 4	inf.	2 8	inf.	2 2	inf.	1 7	inf.
6 feet	4 —	12 —	3 5	23 —	3 —	inf.	2 5	inf.	2 —	inf.	1 6	inf.
5 feet	3 7	8 7	3 1	13 —	2 8	38 —	2 3	inf.	1 10	inf.	1 5	inf.
4 feet	3 —	6 —	2 8	8 —	2 4	13 —	2 —	inf.	1 8	inf.	1 4	inf.
3 feet	2 5	4 —	2 2	4 9	2 —	6 3	1 9	12 —	1 6	inf.	1 2½	inf.
2½ feet	2 1	3 2	1 11	3 7	1 9	4 5	1 6	6 7	1 4	17 —	1 1½	inf.
2 feet	1 9	2 5	1 7	2 8	1 6	3 —	1 4	4 —	1 2	6 4	1 —	inf.
1½ feet	1 4	1 8	1 3	1 10	1 2	2 —	1 1	2 5	1 —	3 1	— 10½	6 —
1¼ feet	1 1½	1 5	1 1	1 6	1 —	1 7	— 11½	1 9	— 10½	2 2	— 9¼	3 1
1 foot	— 11	1 1	— 10¾	1 1½	— 10¼	1 2	— 9¾	1 4	— 9	1 6	— 8¼	1 11
10 in.	— 9½	— 10¾	— 9	— 11	— 8¾	— 11¾	— 8¼	1 —	— 8	1 2	— 7	1 5
9 in.	— 8½	— 9½	— 8¼	— 9¾	— 8	— 10¼	— 7¾	— 11	— 7¼	1 —	— 6¾	1 2
8 in.	— 7½	— 8½	— 7½	— 8½	— 7¼	— 9	— 7	— 9½	— 6¾	— 10	— 6	1 —
7 in.	— 6¾	— 7¼	— 6½	— 7½	— 6½	— 7¾	— 6¼	— 8	— 6	— 8½	— 5½	— 10
6 in.	— 5¾	— 6¼	— 5¾	— 6¼	— 5½	— 6½	— 5½	— 6½	— 5¼	— 7	— 5	— 7¾

Depth of Field: Kodak Anastigmat *f*/3.5, 20 mm. ($\frac{13}{16}$ in.)

Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/3.5		*f*/4		*f*/5.6		*f*/8		*f*/11		*f*/16	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
Fixed Focus	7 8	inf.	7 2	inf.	5 11	inf.	4 8	inf.	3 9	inf.	2 9	inf.

Depth of Field: Kodak Anastigmat *f*/1.6, 50 mm. (2 in.) and *f*/3.5, 50 mm. (2 in.)

Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/1.6		*f*/2		*f*/3.5		*f*/5.6		*f*/11		*f*/22	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	210 —	inf.	168 —	inf.	95 —	inf.	60 —	inf.	30 —	inf.	15 —	inf.
100 feet	68 —	190 —	63 —	250 —	48 —	inf.	38 —	inf.	23 —	inf.	14 —	inf.
50 feet	40 —	66 —	38 —	71 —	33 —	105 —	27 —	310 —	19 —	inf.	11 6	inf.
25 feet	22 —	28 —	22 —	29 —	20 —	34 —	17 6	43 —	14 —	150 —	9 6	inf.
15 feet	14 —	16 —	13 9	16 6	13 —	18 —	12 —	20 —	10 —	30 —	7 6	inf.
10 feet	9 6	10 6	9 6	10 8	9 1	11 2	8 6	12 —	7 6	15 —	6 —	30 —
8 feet	7 8	8 4	7 7	8 4	7 5	8 8	7 —	9 3	6 4	11 —	5 3	17 —
6 feet	5 10	6 2	5 9	6 3	5 8	6 4	5 6	6 8	5 —	7 6	4 4	10 —
5 feet	4 10½	5 1½	4 10	5 2	4 10	5 3	4 8	5 5	4 3	6 —	3 9	7 5
4½ feet	4 5	4 7	4 4	4 8	4 4	4 9	4 2	4 10	3 11	5 3	3 6	6 4
4 feet	3 11	4 1	3 10½	4 ¼	3 10	4 2	3 9	4 3	3 6	4 7	3 2	5 5
3½ feet	3 5½	3 6¾	3 5	3 7	3 4	3 8	3 3	3 9	3 2	3 11	2 11	4 6
3 feet	2 11½	3 ½	2 11	3 ½	2 10¾	3 1	2 10½	3 2	2 9	3 4	2 6	3 9
2½ feet	2 5¾	2 6¼	2 5½	2 6½	2 5	2 7	2 4½	2 7½	2 4	2 9	2 2	3 —
2 feet	1 11¾	2 ¼	1 11¾	2 ¼	1 11½	2 ½	1 11	2 1	1 10½	2 1½	1 9	2 3

Depth of Field: Kodak Anastigmat *f*/2.7, 63 mm. (2½ in.)

Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/2.7		*f*/4		*f*/5.6		*f*/8		*f*/11		*f*/22	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	193 —	inf.	130 —	inf.	93 —	inf.	65 —	inf.	47 —	inf.	24 —	inf.
50 feet	40 —	67 —	36 —	81 —	32 —	108 —	28 —	216 —	24 —	inf.	16 —	inf.
25 feet	22 —	29 —	21 —	31 —	20 —	34 —	18 —	40 —	16 —	52 —	12 —	inf.
15 feet	14 —	16 2	13 5	16 11	12 11	17 11	12 2	19 5	11 5	22 —	9 3	41 —
10 feet	9 6	10 6	9 4	10 10	9 —	11 3	8 8	11 10	8 4	12 8	7 —	17 4
8 feet	7 8	8 4	7 6	8 6	7 5	8 8	7 1	9 1	6 11	9 7	6 —	12 —
6 feet	5 9	6 3	5 9	6 4	5 7	6 5	5 6	6 7	5 4	6 10	4 10	8 —
5 feet	4 11	5 1	4 10	5 2	4 9	5 3	4 8	5 5	4 7	5 6	4 2	6 4
4 feet	3 11	4 1	3 11	4 1	3 10	4 2	3 10	4 3	3 8	4 4	3 6	4 10
3 feet	2 11½	3 ½	2 11¼	3 ¾	2 11	3 1¼	2 10½	3 1½	2 10	3 2¼	2 8½	3 5
2½ feet	2 5½	2 6½	2 5½	2 6½	2 5¼	2 6¾	2 5	2 7	2 4½	2 7½	2 3¼	2 9¼
2 feet	1 11¾	2 ¼	1 11¾	2 ¼	1 11½	2 ½	1 11½	2 ¾	1 11¼	2 1	1 10¼	2 2
1½ feet	1 5⅞	1 6⅛	1 5⅞	1 6⅛	1 5¾	1 6¼	1 5⅝	1 6⅜	1 5½	1 6½	1 5	1 7

Kodak Anastigmat *f*/2.7, 102 mm. (4 in.)

Distance Focused On	*f*/2.7		*f*/4		*f*/5.6		*f*/8		*f*/11		*f*/22	
INF.	494 —	inf.	332 —	inf.	238 —	inf.	167 —	inf.	121 —	inf.	61 —	inf.
200 feet	142 —	336	125 —	500 —	109	1250 —	91 —	inf.	75 —	inf.	47 —	inf.
100 feet	83 —	125 —	77 —	143 —	70 —	172 —	62 —	250 —	55 —	576 —	38 —	inf.
50 feet	46 —	56 —	44 —	59 —	41 —	63 —	38 —	71 —	35 —	85 —	27 —	286 —
25 feet	23 10	26 3	23 4	27 —	22 8	28 —	21 10	29 6	20 10	31 7	17 8	42 —
15 feet	14 6	15 6	14 4	15 8	14 1	16 —	13 10	16 6	13 5	17 1	12 —	20 —
12 feet	11 8	12 4	11 7	12 5	11 5	12 7	11 2	12 11	10 11	13 4	10 —	15 —
10 feet	9 10	10 2	9 9	10 3	9 7	10 5	9 5	10 7	9 3	10 11	8 7	12 —
8 feet	7 11	8 1	7 10	8 2	7 9	8 3	7 7	8 4	7 6	8 6	7 1	9 2
6 feet	5 11	6 1	5 11	6 1	5 10	6 1½	5 9½	6 2½	5 8¾	6 3½	5 6	6 7
5 feet	4 11½	5 ½	4 11⅛	5 ¾	4 10¾	5 1¼	4 10	5 1½	4 9¾	5 2½	4 8	5 5
4½ feet	4 5½	4 6½	4 5½	4 6½	4 5	4 7	4 4½	4 7¼	4 4	4 8	4 2½	4 10

Depth of Field: Kodak Anastigmat *f*/4.5, 76 mm. (3 in.)

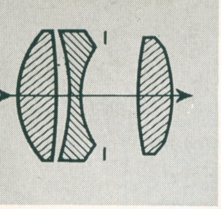
Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/4.5		*f*/5.6		*f*/8		*f*/11		*f*/16		*f*/22	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	167 —	inf.	134 —	inf.	94 —	inf.	68 —	inf.	47 —	inf.	34 —	inf.
100 feet	62 —	250 —	58 —	390 —	49 —	inf.	41 —	inf.	32 —	inf.	26 —	inf.
50 feet	39 —	70 —	37 —	80 —	33 —	105 —	29 —	185 —	24 —	inf.	21 —	inf.
25 feet	22 —	29 —	21 —	31 —	20 —	34 —	19 —	39 —	16 6	52 —	14 8	85 —
15 feet	13 10	16 4	13 6	16 10	13 —	17 9	12 5	19 —	11 5	21 8	10 7	26 —
12 feet	11 3	12 10	11 —	13 2	10 8	13 8	10 4	14 5	9 8	15 10	9 —	18 —
10 feet	9 6	10 7	9 4	10 9	9 1	11 —	8 10	11 6	8 4	12 6	7 11	13 8
8 feet	7 8	8 4	7 7	8 5	7 5	8 8	7 3	9 —	7 —	9 6	6 8	10 2
6 feet	5 10	6 2	5 9	6 3	5 8	6 4	5 7	6 6	5 5	6 9	5 3	7 1
5 feet	4 10	5 2	4 10	5 2	4 9	5 3	4 8	5 4	4 7	5 6	4 6	5 9
4½ feet	4 5	4 7	4 5	4 7	4 4	4 8	4 3	4 9	4 2	4 11	4 1	5 1
4 feet	3 11	4 1	3 11	4 1	3 10	4 2	3 10	4 2	3 9	4 3	3 8	4 5
3¾ feet	3 8	3 10	3 8	3 10	3 8	3 10	3 7	3 11	3 6	4 —	3 5	4 1

Kodak Anastigmat *f*/4.5, 114 mm. (4½ in.)

Distance Focused On	*f*/4.5		*f*/5.6		*f*/8		*f*/11		*f*/16		*f*/22	
INF.	375 —	inf.	300 —	inf.	210 —	inf.	155 —	inf.	105 —	inf.	77 —	inf.
200 feet	130 —	430 —	120 —	590 —	105 —	inf.	87 —	inf.	69 —	inf.	56 —	inf.
100 feet	79 —	135 —	75 —	148 —	68 —	190 —	61 —	285 —	52 —	inf.	44 —	inf.
50 feet	45 —	57 —	44 —	60 —	41 —	65 —	38 —	73 —	34 —	96 —	31 —	140 —
25 feet	23 6	26 8	23 —	27 —	22 —	28 —	22 —	29 —	20 —	32 —	19 —	36 —
15 feet	14 6	15 7	14 4	15 9	14 1	16 1	13 9	16 6	13 3	17 3	12 8	18 4
12 feet	11 8	12 5	11 7	12 6	11 5	12 8	11 2	13 —	10 10	13 5	10 6	14 —
10 feet	9 9	10 3	9 8	10 4	9 7	10 5	9 5	10 7	9 2	11 —	9 —	11 4
8 feet	7 10	8 2	7 10	8 3	7 9	8 4	7 8	8 5	7 6	8 7	7 4	8 10
6 feet	5 11	6 1	5 11	6 2	5 11	6 2	5 10	6 3	5 9	6 4	5 7	6 5
5 feet	4 11	5 1	4 11	5 1	4 11	5 1	4 10	5 2	4 10	5 2	4 9	5 3
4¼ feet	4 2	4 4	4 2	4 4	4 2	4 4	4 2	4 4	4 2	4 4	4 1	4 5

Depth of Field: Kodak Anastigmat *f*/4.5, 152 mm. (6 in.)

Distance Focused On	On 16-mm. Ciné-Kodak. Circle of Confusion, 1/1000 inch											
	f/4.5		*f*/5.6		*f*/8		*f*/11		*f*/16		*f*/22	
	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.	ft. in. to	ft. in.
INF.	670 —	inf.	540 —	inf.	375 —	inf.	275 —	inf.	190 —	inf.	137 —	inf.
400 feet	250 —	1000 —	230 —	1580 —	195 —	inf.	163 —	inf.	128 —	inf.	102 —	inf.
200 feet	154 —	285 —	146 —	320 —	130 —	425 —	116 —	750 —	97 —	inf.	82 —	inf.
100 feet	87 —	117 —	84 —	123 —	79 —	135 —	73 —	157 —	65 —	212 —	58 —	370 —
50 feet	47 —	54 —	46 —	55 —	44 —	57 —	42 —	61 —	40 —	67 —	37 —	78 —
25 feet	24 3	25 11	24 —	26 2	23 6	26 8	23 —	27 4	22 3	28 8	21 4	30 —
15 feet	14 8	15 4	14 7	15 5	14 5	15 7	14 3	15 9	14 —	16 2	13 7	16 8
12 feet	11 9	12 3	11 9	12 3	11 8	12 4	11 6	12 6	11 4	12 8	11 —	13 —
10 feet	9 10	10 2	9 10	10 2	9 9	10 3	9 8	10 4	9 6	10 6	9 5	10 7



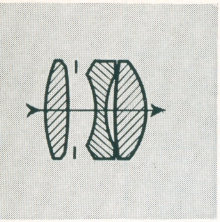
. A. *f*/3.5, 13 mm., and *f*/2.7, 13 mm.

LENSES FOR CINÉ-KODAK EIGHT

KODAK ANASTIGMAT:

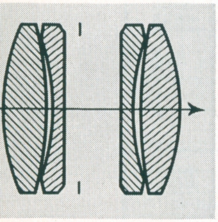
***f*/3.5, 13 mm.** This lens of normal focal length combines sufficient speed for all outdoor and some indoor work with simplicity in use.
Angle of View: 19.7° x 14.9°. Focusing Range: Fixed Focus.
Attachment Size: Z Mount.

***f*/2.7, 13 mm.** This lens, also of normal focal length and fixed focus design, is about 70% faster than *f*/3.5, permitting picture taking under less favorable light conditions.
Angle of View: 18.7° x 14.1°. Focusing Range: Fixed Focus.
Attachment Size: Z Mount.



K. A. *f*/2.7, 9 mm.

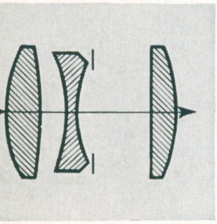
***f*/2.7, 9 mm.** A wide-angle lens designed to include a large field—a feature especially useful for photography in close quarters.
Angle of View: 26.1° x 19.8°. Focusing Range: Fixed Focus.
Attachment Size: 15/16 in., 23.5 mm., Ser. V Attachments.



. A. *f*/1.9, 13 mm., and *f*/1.9, 25 mm.

***f*/1.9, 13 mm.** This ultra fast standard focal length lens—twice as fast as *f*/2.7 and 3.5 times as fast as *f*/3.5—is the ideal lens for all-round outdoor and indoor filming, even under adverse light conditions.
Angle of View: 19.4° x 14.6°. Focusing Range: Inf. to 2 ft.
Attachment Size: Magazine Model, 15/16 in., 23.5 mm. Ser. V Attachments. 8-60 Model, 13/16 in., 20.5 mm. Ser. V Attachments.

***f*/1.9, 25 mm.** This lens gives twice the image size of the 13-mm. lens and is useful for pictures when a near-by camera position is not accessible.
Angle of View: 9.9° x 7.4°. Focusing Range: Inf. to 2 ft.
Attachment Size: W Mount or 1 1/16 in., 27 mm., Ser. V Attachments.

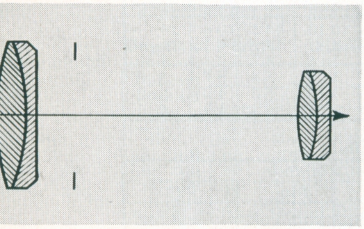


K. A. *f*/3.5, 50 mm.

***f*/2.5, 38 mm.** A long-focus lens—with three times the film image size given by a normal focal length lens.
Angle of View: 6.6° x 5.0°. Focusing Range: Inf. to 2 ft.*†
Attachment Size: Ser. V Retaining Ring, Ser. V Attachments.

***f*/1.6, 50 mm.** This long-focus lens combines considerable image magnification (about 4 times) with ultra-fast speed, making it the ideal lens for telephoto effects under adverse light conditions.
Angle of View: 4.9° x 3.7°. Focusing Range: Inf. to 2 ft.*
Attachment Size: Ser. VI Retaining Ring, Ser. VI Attachments.

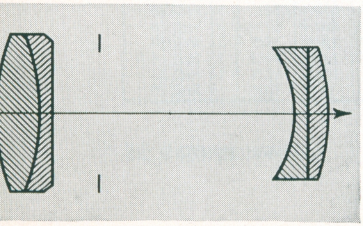
***f*/3.5, 50 mm.** While this lens gives the same image size as the one above, its speed is less, yet ample for all general outdoor and some indoor long distance filming.
Angle of View: 5° x 3.7°. Focusing Range: Inf. to 2 1/4 ft.*
Attachment Size: 1 1/16 in., 27 mm., Ser. V Attachments.



. A. *f*/2.5, 38 mm., *f*/1.6, 50 mm., and *f*/2.7, 63 mm.

***f*/2.7, 63 mm.** This lens gives a five times telephoto effect as compared to a view obtained with a 13-mm. focal length lens.
Angle of View: 4° x 3°. Focusing Range: Inf. to 1 1/2 ft.*
Attachment Size: 1 5/16 in., 33 mm., Ser. VI Attachments.

***f*/4.5, 76 mm.** This telephoto lens gives an image six times larger than the one made with the 13-mm. lens.
Angle of View: 3.3° x 2.5°. Focusing Range: Inf. to 3 3/4 ft.*
Attachment Size: 1 1/16 in., 27 mm., Ser. V Attachments.



K. A. *f*/4.5, 76 mm.

*With a Kodak Focusing Finder, it is possible to focus this lens much closer after lifting a plunger or removing a screw.

†This lens has a depth of field indicator.

Table of Field Sizes for Ciné-Kodak Eight Lenses

Name	Kodak Anastigmat f/2.7, 9 mm. (⅜ in.)	Kodak Anastigmat f/2.7, 13 mm. (½ in.)	Kodak Anastigmat f/3.5, 13 mm. (½ in.)	Kodak Anastigmat f/1.9, 13 mm. (½ in.)	Kodak Anastigmat f/1.9, 25 mm. (1 in.)	Kodak Anastigmat f/2.5, 38 mm. (1½ in.)	Kodak Anastigmat f/1.6, 50 mm. (2 in.)	Kodak Anastigmat f/3.5, 50 mm. (2 in.)	Kodak Anastigmat f/2.7, 63 mm. (2½ in.)	Kodak Telephoto Anast. f/4.5, 76 mm. (3 in.)
	Fixed Focus			**Focusing Mount**						
Angular Field at Inf.	26.1° x 19.8°	18.7° x 14.1°	19.7° x 14.9°	19.4° x 14.6°	9.9° x 7.4°	6.6° x 5.0°	4.9° x 3.7°	5.0° x 3.7°	4.0° x 3.0°	3.3° x 2.5°

Field Size

Distance* to subject	f/2.7, 9 mm. Width ft. in.	f/2.7, 9 mm. Height ft. in.	f/2.7, 13 mm. Width ft. in.	f/2.7, 13 mm. Height ft. in.	f/3.5, 13 mm. Width ft. in.	f/3.5, 13 mm. Height ft. in.	f/1.9, 13 mm. Width ft. in.	f/1.9, 13 mm. Height ft. in.	f/1.9, 25 mm. Width ft. in.	f/1.9, 25 mm. Height ft. in.	f/2.5, 38 mm. Width ft. in.	f/2.5, 38 mm. Height ft. in.	f/1.6, 50 mm. Width ft. in.	f/1.6, 50 mm. Height ft. in.	f/3.5, 50 mm. Width ft. in.	f/3.5, 50 mm. Height ft. in.	f/2.7, 63 mm. Width ft. in.	f/2.7, 63 mm. Height ft. in.	f/4.5, 76 mm. Width ft. in.	f/4.5, 76 mm. Height ft. in.
100 feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	8 8	6 6	8 8	6 6	— —	— —	5 9	4 3¾
50 feet	— —	— —	16 5	12 4	17 5	13 1	17 1	12 10	8 7	6 5½	5 9¼	4 4	4 3¾	3 3	4 3¾	3 3	3 5½	2 7	2 10¼	2 1¾
25 feet	11 7	8 8½	8 2¾	6 2	8 8½	6 6½	8 6¾	6 5	4 3¾	3 2¾	2 10½	2 2	2 1¾	1 7½	2 1¾	1 7½	1 8½	1 3½	1 5	1 ¾
15 feet	6 11½	5 2¾	4 11¼	3 8½	5 3	3 11¼	5 1¾	3 10½	2 6¾	1 11	1 8¾	1 3½	1 3½	— 11⅝	1 3½	— 11½	1 ¼	— 9¼	— 10	— 7½
12 feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	1 ¼	— 9¼	— —	— —	— 7⅞	— 6
10 feet	4 7¾	3 6	3 3½	2 5¾	3 6	2 7½	3 5¼	2 7	1 8½	1 3¼	1 1¾	— 10⅜	— 10⅜	— 7¾	— 10⅛	— 7⅝	— 8⅛	— 6⅛	— 6½	— 4⅞
8 feet	3 8¾	2 9½	2 7¾	1 11¾	2 9½	2 1¼	2 9	2 ¾	1 4¼	1 ¼	— 11	— 8¼	— 8¼	— 6¼	— 8⅛	— 6⅛	— 6½	— 4⅞	— 5⅛	— 3⅞
6 feet	2 9½	2 1¼	1 11¾	1 5⅞	2 1¼	1 6⅝	2 ¾	1 6½	1 ¼	— 9⅛	— 8¼	— 6⅛	— 6⅛	— 4⅝	— 6	— 4½	— 4¾	— 3⅝	— 3¾	— 2⅞
5 feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 6⅞	— 5⅛	— 5⅛	— 3⅞	— 5	— 3¾	— 4	— 3	— 3⅛	— 2¼
4½ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 4⅝	— 3½	— 4½	— 3⅜	— —	— —	— 2¾	— 2
4 feet	1 10½	1 5	1 3⅞	— 11⅞	1 4¾	1 ⅝	1 4½	1 ½	— 8⅛	— 6⅛	— 5½	— 4⅛	— 4⅛	— 3⅛	— 3⅞	— 3	— 3⅛	— 2⅜	— 2⅜	— 1¾
3¾ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 2¼	— 1⅝
3½ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 4¾	— 3⅝	— 3⅝	— 2¾	— 3⅜	— 2½	— —	— —	— —	— —
3 feet	1 5	1 ¾	— 11⅞	— 8⅞	1 ⅝	— 9½	1 ½	— 9¼	— 6	— 4½	— 4	— 3	— 3	— 2¼	— 2⅞	— 2⅛	— 2¼	— 1¾	— —	— —
2½ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 3⅜	— 2½	— 2½	— 1⅞	— 2⅜	— 1¾	— 1⅞	— 1⅜	— —	— —
2¼ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 2⅛	— 1⅝	— —	— —	— —	— —
2 feet	— 11⅜	— 8⅝	— 8	— 6	— 8½	— 6⅜	— 8¼	— 6⅛	— 4	— 3	— 2⅝	— 2	— 2	— 1½	— —	— —	— 1½	— 1⅛	— —	— —
1½ feet	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— —	— 1	— ¾	— —	— —

*Distances measured from front of camera for all lenses except f/2.5, 38 mm. and f/1.6, 50 mm. lenses for which they are measured from the engraved focusing line on the lens barrel.

DEPTH OF FIELD TABLES FOR CINÉ-KODAK EIGHT LENSES

The distances given in the following tables are measured from the front of the camera except for Kodak Anastigmat *f*/2.5, 38 mm., and *f*/1.6, 50 mm., for which they are measured from the engraved focusing line on the lens barrel.

The depth of field for *f*-numbers not given or for intermediate diaphragm settings can be estimated by comparison.

"inf." is the abbreviation for "infinity."

Depth of Field: Kodak Anastigmat *f*/3.5, and *f*/2.7, 13 mm., and *f*/2.7, 9 mm.

Fixed Focus	On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch											
	f/2.7		*f*/3.5		*f*/5.6		*f*/8		*f*/11		*f*/16	
	ft. in.	to ft.	ft. in.	to ft.	ft. in.	to ft.	ft. in.	to ft.	ft. in.	to ft.	ft. in.	to ft.
f/3.5, 13 mm. (½ inch)	—	—	5 10	inf.	4 6	inf.	3 7	inf.	2 10	inf.	2 1	inf.
f/2.7, 13 mm. (½ inch)	8 6	inf.	6 10	inf.*	5 6	inf.	4 3	inf.	3 4	inf.	2 5	inf.
f/2.7, 9 mm. (⅜ inch)	4 3	inf.	3 5	inf.*	2 9	inf.	2 2	inf.	1 8	inf.	1 3	inf.

*These distances are for *f*/4.

Depth of Field: Kodak Anastigmat *f*/1.9, 13 mm. (½ in.)

Distance Focused On	On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch											
	f/1.9		*f*/2.8		*f*/4		*f*/5.6		*f*/11		*f*/22	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	22 6	inf.	15 3	inf.	10 7	inf.	7 7	inf.	3 10	inf.	1 11	inf.
50 feet	15 6	inf.	11 8	inf.	8 9	inf.	6 7	inf.	3 7	inf.	1 10	inf.
25 feet	11 10	inf.	9 6	inf.	7 6	inf.	5 10	inf.	3 4	inf.	1 9	inf.
15 feet	9 —	45 —	7 7	75 —	6 3	inf.	5 1	inf.	3 1	inf.	1 8	inf.
10 feet	6 11	18 —	6 1	29 —	5 2	156 —	4 4	inf.	2 10	inf.	1 7	inf.
8 feet	5 11	12 5	5 3	16 10	4 7	32 —	3 11	inf.	2 7	inf.	1 6	inf.
6 feet	4 9	8 2	4 4	9 11	3 10	13 8	3 4	28 —	2 4	inf.	1 5	inf.
4 feet	3 5	4 10	3 2	5 5	2 11	6 5	2 7	8 5	1 11	inf.	1 4	inf.
3 feet	2 8	3 6	2 6	3 9	2 4	4 2	2 2	4 11	1 8	13 2	1 2	inf.
2 feet	1 10	2 2	1 9	2 4	1 8	2 6	1 7	2 9	1 4	4 2	1 —	inf.

Depth of Field: Kodak Anastigmat *f*/1.9, 25 mm. (1 in.)

Distance Focused On	On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch											
	f/1.9		*f*/2.8		*f*/4		*f*/5.6		*f*/8		*f*/16	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	88 —	inf.	60 —	inf.	42 —	inf.	30 —	inf.	21 —	inf.	10 5	inf.
50 feet	33 —	115 —	27 —	310 —	23 —	inf.	18 8	inf.	14 9	inf.	8 8	inf.
25 feet	19 6	35 —	17 8	43 —	15 8	62 —	13 7	154 —	11 5	inf.	7 5	inf.
15 feet	12 10	18 —	12 —	20 —	11 1	23 —	10 —	30 —	8 9	53 —	6 2	inf.
10 feet	9 —	11 3	8 7	12 —	8 1	13 1	7 6	15 —	6 9	19 2	5 1	210 —
8 feet	7 4	8 10	7 1	9 3	6 9	9 11	6 4	11 —	5 10	13 —	4 7	33 —
6 feet	5 8	6 5	5 6	6 8	5 3	7 —	5 —	7 6	4 8	8 5	3 10	14 —
4 feet	3 10	4 2½	3 9	4 3½	3 8	4 5	3 6½	4 7½	3 4½	4 11	2 11	6 5
3 feet	2 11	3 1¼	2 10¼	3 1¾	2 9½	3 2¾	2 8¾	3 4	2 7½	3 6	2 4	4 2
2 feet	1 11½	2 ½	1 11¼	2 ¾	1 11	2 1¼	1 10½	2 1¾	1 10	2 2½	1 8¼	2 5½

Depth of Field: Kodak Anastigmat *f*/2.5, 38 mm. (1½ in.)

Distance Focused On	On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch											
	f/2.5		*f*/4		*f*/5.6		*f*/8		*f*/11		*f*/22	
	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.	ft. in.	to ft. in.
INF.	150 —	inf.	94 —	inf.	67 —	inf.	47 —	inf.	34 —	inf.	17 —	inf.
50 feet	38 —	75 —	33 —	107 —	29 —	197 —	24 —	inf.	20 —	inf.	12 8	inf.
25 feet	21 —	30 —	20 —	34 —	18 2	40 —	16 3	54 —	14 5	94 —	10 1	inf.
15 feet	13 7	16 9	12 11	17 10	12 3	19 4	11 4	22 —	10 5	26 9	8 —	122 —
10 feet	9 4	10 9	9 —	11 2	8 8	11 9	8 3	12 9	7 9	14 2	6 3	24 —
8 feet	7 7	8 5	7 4	8 9	7 2	9 1	6 10	9 7	6 6	10 5	5 5	15 —
6 feet	5 9	6 3	5 8	6 5	5 6	6 7	5 4	6 11	5 1	7 3	4 5	9 3
5 feet	4 10	5 2	4 9	5 3	4 8	5 5	4 6	5 7	4 4	5 10	3 10	7 1
4 feet	3 10¾	4 1¼	3 10	4 2	3 9¼	4 3	3 8	4 4½	3 7	4 6½	3 2¾	5 3
3½ feet	3 5	3 7	3 4½	3 7½	3 3¾	3 8¼	3 3	3 9½	3 2	3 10¾	2 10¾	4 5
3 feet	2 11¼	3 ¾	2 11	3 1¼	2 10½	3 1¾	2 9¾	3 2½	2 9	3 3½	2 6½	3 7¾
2½ feet	2 5½	2 6½	2 5¼	2 7	2 5	2 7¼	2 4½	2 7¾	2 4	2 8½	2 2	2 11¼
2 feet	1 11¾	2 ¼	1 11½	2 ½	1 11¼	2 ¾	1 11	2 1	1 10¾	2 1½	1 9½	2 3¼

Depth of Field: Kodak Anastigmat f/1.6, 50 mm. (2 in.)

On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch

Distance Focused On	f/1.6 ft. in.	to ft. in.	f/2 ft. in.	to ft. in.	f/2.8 ft. in.	to ft. in.	f/5.6 ft. in.	to ft. in.	f/11 ft. in.	to ft. in.	f/22 ft. in.	to ft. in.
INF.	420 —	inf.	335 —	inf.	240 —	inf.	120 —	inf.	60 —	inf.	30 —	inf.
100 feet	81 —	130 —	77 —	140 —	70 —	170 —	55 —	600 —	38 —	inf.	23 —	inf.
50 feet	45 —	57 —	43 6	59 —	41 6	63 —	35 6	86 —	27 6	275 —	19 —	inf.
25 feet	23 7	26 7	23 3	27 —	22 7	28 —	20 8	31 6	17 9	42 —	13 8	135 —
15 feet	14 6	15 6	14 5	15 8	14 2	16 —	13 4	17 2	12 —	20 —	10 —	29 6
10 feet	9 9	10 3	9 8	10 4	9 7	10 5	9 3	10 11	8 7	12 —	7 6	15 —
8 feet	7 10	8 2	7 10	8 2	7 9	8 3	7 6	8 7	7 1	9 3	6 4	10 10
6 feet	5 11	6 1	5 11	6 1	5 10	6 2	5 8	6 4	5 6	6 8	5 —	7 6
5 feet	4 11	5 1	4 11	5 1	4 11	5 1	4 10	5 3	4 8	5 5	4 4	6 —
4½ feet	4 5⅜	4 6⅝	4 5¼	4 6¾	4 5	4 7	4 4	4 8	4 2¼	4 10½	3 11	5 3½
4 feet	3 11½	4 ½	3 11½	4 ½	3 11¼	4 ¾	3 10½	4 1¾	3 9	4 3½	3 6½	4 7½
3½ feet	3 5⅝	3 6⅜	3 5⅝	3 6½	3 5⅜	3 6⅝	3 4¾	3 7¼	3 3¾	3 8¾	3 1½	3 11½
3 feet	2 11¾	3 ¼	2 11¾	3 ¼	2 11½	3 ½	2 11⅛	3 1	2 10¼	3 1¾	2 8¾	3 4
2½ feet	2 5⅞	2 6⅛	2 5⅞	2 6⅛	2 5¾	2 6¼	2 5¼	2 6¾	2 4¾	2 7¼	2 3½	2 8¾
2 feet	1 11⅞	2 ⅛	1 11⅞	2 ⅛	1 11¾	2 ¼	1 11⅝	2 ½	1 11¼	2 ⅞	1 10½	2 1¾

Depth of Field: Kodak Anastigmat f/3.5, 50 mm. (2 in.)

On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch

Distance Focused On	f/3.5 ft. in.	to ft. in.	f/5.6 ft. in.	to ft. in.	f/8 ft. in.	to ft. in.	f/11 ft. in.	to ft. in.	f/16 ft. in.	to ft. in.	f/22 ft. in.	to ft. in.
INF.	190 —	inf.	120 —	inf.	85 —	inf.	60 —	inf.	42 —	inf.	30 —	inf.
100 feet	66 —	210 —	54 —	635 —	45 —	inf.	38 —	inf.	30 —	inf.	23 —	inf.
50 feet	40 —	68 —	35 —	86 —	31 —	125 —	28 —	285 —	23 —	inf.	19 —	inf.
25 feet	22 —	29 —	21 —	31 —	19 3	35 —	17 9	42 —	15 8	62 —	13 9	140 —
15 feet	13 11	16 3	13 4	17 2	12 9	18 3	12 1	19 11	11 1	23 —	10 1	29 —
12 feet	11 4	12 9	10 11	13 4	10 6	14 —	10 1	14 11	9 4	16 9	8 8	19 9
10 feet	9 6	10 7	9 3	10 11	9 —	11 4	8 7	11 11	8 1	13 1	7 7	14 10
8 feet	7 8	8 4	7 6	8 7	7 4	8 10	7 1	9 2	6 9	9 10	6 5	10 9
6 feet	5 10	6 2	5 9	6 4	5 7	6 5	5 6	6 8	5 3	7 —	5 1	7 5
5 feet	4 11	5 1	4 10	5 2	4 9	5 4	4 8	5 5	4 6	5 8	4 4	5 11
4½ feet	4 4¾	4 7¼	4 4¼	4 8	4 3¼	4 9	4 2½	4 10	4 1	5 —	3 11¼	5 2¾
4 feet	3 11	4 1	3 10½	4 1½	3 10	4 2¼	3 9¼	4 3¼	3 8	4 4¾	3 6¾	4 6¾
3½ feet	3 5¼	3 6¾	3 4⅞	3 7¼	3 4⅜	3 7¾	3 3⅞	3 8¼	3 3	3 9½	3 2	3 11
3 feet	2 11½	3 ½	2 11¼	3 ¾	2 10¾	3 1¼	2 10⅜	3 1¾	2 9¾	3 2½	2 9	3 3⅝
2½ feet	2 5⅝	2 6⅜	2 5½	2 6½	2 5¼	2 6¾	2 5	2 7⅛	2 4½	2 7¾	2 4	2 8⅜
2¼ feet	2 2¾	2 3¼	2 2½	2 3½	2 2⅜	2 3⅝	2 2⅛	2 3⅞	2 1¾	2 4⅜	2 1⅜	2 4⅞

Depth of Field: Kodak Anastigmat f/2.7, 63 mm. (2½ in.)

On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch

Distance Focused On	f/2.7 ft. in.	to ft. in.	f/4 ft. in.	to ft. in.	f/5.6 ft. in.	to ft. in.	f/8 ft. in.	to ft. in.	f/11 ft. in.	to ft. in.	f/22 ft. in.	to ft. in.
INF.	385 —	inf.	260 —	inf.	185 —	inf.	130 —	inf.	95 —	inf.	47 —	inf.
50 feet	44 —	57 —	42 —	62 —	40 —	68 —	36 —	81 —	33 —	105 —	24 6	inf.
25 feet	23 6	26 9	23 —	27 9	22 —	28 9	21 —	31 —	19 9	34 —	16 5	53 —
15 feet	14 5	15 7	14 2	15 11	13 11	16 4	13 6	16 11	13 —	17 9	11 5	21 9
10 feet	9 9	10 3	9 8	10 5	9 6	10 6	9 4	10 10	9 1	11 2	8 4	12 7
8 feet	7 10	8 2	7 9	8 3	7 8	8 4	7 7	8 6	7 5	8 8	6 10	9 7
6 feet	5 11	6 1	5 10½	6 1½	5 10	6 2½	5 9	6 3	5 8	6 5	5 4	6 10
5 feet	4 11¼	5 ¾	4 11	5 1½	4 10½	5 2	4 10	5 2½	4 9	5 3½	4 7	5 7
4 feet	3 11½	4 ½	3 11¼	4 ¾	3 11	4 1	3 10¾	4 1½	3 10¼	4 2	3 8½	4 4¼
3 feet	2 11¾	3 ¼	2 11⅝	3 ⅜	2 11½	3 ½	2 11¼	3 ¾	2 11	3 1	2 10	3 2¼
2½ feet	2 5¾	2 6¼	2 5¾	2 6¼	2 5⅝	2 6⅜	2 5½	2 6½	2 5¼	2 6¾	2 4½	2 7½
2 feet	1 11⅞	2 ⅛	1 11⅞	2 ⅛	1 11¾	2 ¼	1 11½	2 ¼	1 11½	2 ½	1 11⅝	2 ⅞
1½ feet	1 5⅞	1 6⅛	1 5⅞	1 6⅛	1 5⅞	1 6⅛	1 5⅞	1 6¼	1 5¾	1 6¼	1 5⅝	1 6½

Depth of Field: Kodak Anastigmat f/4.5, 76 mm. (3 in.)

On Ciné-Kodak Eight. Circle of Confusion, 1/2000 inch

Distance Focused On	f/4.5 ft. in.	to ft. in.	f/5.6 ft. in.	to ft. in.	f/8 ft. in.	to ft. in.	f/11 ft. in.	to ft. in.	f/16 ft. in.	to ft. in.	f/22 ft. in.	to ft. in.
INF.	335 —	inf.	270 —	inf.	190 —	inf.	135 —	inf.	95 —	inf.	70 —	inf.
100 feet	77 —	140 —	73 —	160 —	65 —	210 —	58 —	370 —	49 —	inf.	41 —	inf.
50 feet	44 —	59 —	42 —	61 —	40 —	68 —	37 —	78 —	33 —	105 —	29 —	180 —
25 feet	23 3	27 —	23 —	27 6	22 —	29 —	21 3	30 —	20 —	34 —	18 6	39 —
15 feet	14 5	15 8	14 3	15 10	14 —	16 3	13 7	16 9	13 —	17 8	12 5	19 —
12 feet	11 7	12 5	11 6	12 6	11 4	12 9	11 1	13 1	10 9	13 7	10 4	14 4
10 feet	9 9	10 3	9 8	10 4	9 6	10 6	9 4	10 8	9 1	11 1	8 10	11 6
8 feet	7 10	8 2	7 9	8 3	7 8	8 4	7 7	8 5	7 5	8 8	7 3	8 11
6 feet	5 11	6 1	5 10½	6 1½	5 10	6 2	5 9	6 3	5 8	6 4	5 7	6 6
5 feet	4 11	5 ½	4 10¾	5 1	4 10½	5 1¼	4 10	5 2	4 9½	5 2½	4 8½	5 4
4½ feet	4 5¼	4 6½	4 5	4 6¾	4 4¾	4 7	4 4½	4 7¼	4 3¾	4 8	4 3	4 9
4 feet	3 11½	4 ¼	3 11¼	4 ½	3 11	4 ¾	3 10¾	4 1	3 10¼	4 1½	3 9½	4 2
3¾ feet	3 8½	3 9¼	3 8¼	3 9⅜	3 8	3 9½	3 7¾	3 9¾	3 7½	3 10¼	3 7	3 10¾

OVER

Kodak Lenses for Kodascopes and Kodaslide Projectors

Lenses ordinarily used on Kodascopes and Kodaslide Projectors have twice the focal length of the usual taking lenses, and consequently a narrower angle of view. For 16-mm. Kodascopes, a 2-inch (50 mm.), for 8-mm. Kodascopes, a 1-inch (25 mm.), and for Kodaslide Projectors a 4- or 5-inch lens is recommended for normal use. With these lenses, a picture of proper perspective is presented to a spectator seated about half way between projector and screen. For use in small rooms where the throw is limited, 1- and 1½-inch lenses are available for 16-mm. Kodascopes. Projection lenses with longer focal length are useful for larger rooms where long throws with large screen sizes are needed. All lenses listed below are made with great care and precision, are highly corrected, and assure clean-cut, undistorted pictures with the projectors for which they are designed.

LENS	Aperture	Nominal Focal Length in.	Nominal Focal Length mm.	Projection throw for different screen picture sizes: 16½″ x 22″	22″ x 30″	30″ x 40″	39″ x 52″	54″ x 72″	63″ x 84″	Designed for
For 16-mm. Kodascopes										
Kodak Projection Lens	f/2.5	1	25	5 ft.	6¾ ft.	9 ft.	11½ ft.	16 ft.	19 ft.	Kodascope Model G, E, EE, Sixteen-10, Sixteen-20, and Sound Kodascope Model F Series
Kodak Projection Lens	f/2.5	1½	38	7½ ft.	10 ft.	13½ ft.	17 ft.	24 ft.	28 ft.	
Kodak Projection Lens	f/2.5	2	50	10 ft.	13½ ft.	18 ft.	23 ft.	32 ft.	37 ft.	
Kodak Projection Lens	f/1.6	2	50	10 ft.	13½ ft.	18 ft.	23 ft.	32 ft.	37 ft.	
Kodak Projection Lens	f/2.0	3	76	—	—	26½ ft.	34½ ft.	48 ft.	56 ft.	
Kodak Projection Lens	f/2.5	4	102	—	—	36 ft.	46 ft.	64 ft.	74 ft.	
Kodak Projection Lens	f/1.6	2	50	10 ft.	13½ ft.	18 ft.	23 ft.	32 ft.	37 ft.	Sound Kodascope Special
Kodak Projection Lens	f/1.4	3	76	—	—	26½ ft.	34½ ft.	48 ft.	56 ft.	
Kodak Projection Lens	f/1.6	4	102	—	—	36 ft.	46 ft.	64 ft.	74 ft.	
For 8-mm. Kodascopes										
Kodak Projection Lens	f/2.0	1	25	11 ft.	14½ ft.	19½ ft.	25 ft.	—	—	Kodascope Eight-33
Kodak Projection Lens	f/1.6	1	25	11 ft.	14½ ft.	19½ ft.	25 ft.	—	—	Kodascope Eight-70 and 70A
				Projection throw for different screen picture sizes. If vertical as well as horizontal Kodaslides are projected, a square screen is needed.						
For Kodaslide Projectors				15″ x 22″	21″ x 30″	28″ x 40″	36″ x 52″	50″ x 72″	58″ x 84″	
Kodak Projection Lens	f/3.5	4	102	a: 6 ft.	8 ft.	10½ ft.	13½ ft.	—	—	Kodaslide Projector Model 1
				b: 5 ft.	7 ft.	9 ft.	12 ft.	—	—	
Kodak Projection Lens	f/3.5	5	127	a: 7½ ft.	10 ft.	13 ft.	16½ ft.	23 ft.	26½ ft.	Kodaslide Projector Model 2 and 2A
				b: 6½ ft.	8½ ft.	11 ft.	14½ ft.	20 ft.	24 ft.	
Kodak Projection Lens	f/4.5	7½	190	a: 11 ft.	15 ft.	20 ft.	25½ ft.	35 ft.	41 ft.	
				b: 9½ ft.	13 ft.	17 ft.	22 ft.	31 ft.	36 ft.	

Note: Screen-picture sizes are based on the following projected film areas:
16 mm.: .380 x .284 in.; 8 mm.: .172 x .129 in.; Kodaslide Projector a: 29/32 x 1 5/16 in. for 35-mm., b: 1 1/32 x 1½ in. for Bantam.

New Names for Kodak Lenses

A REVISED SYSTEM of naming Kodak lenses is now being introduced. While not all lens names will be superseded, a fundamental change is being made through the dropping of *Anastigmat*, a generic term which has been applied to so many grades of lenses as no longer to have significance. It will be replaced, in Kodak nomenclature, by trade-marks which designate Kodak lenses exclusively. A brief outline of the new system follows:

Kodak Ektar Lenses. The name *Kodak Ektar* will be retained and, when applied to taking lenses for normal still photography, will not be qualified further. In other fields of use, a qualifying term will be applied, such as *Kodak Ciné Ektar*, *Kodak Enlarging Ektar*, *Kodak Projection Ektar*, etc. The latter term, *Kodak Projection Ektar*, will be applied only to lenses for still- and motion-picture projectors, not to enlargers as in the past.

Firmly established in the photographic world as being of the highest grade, Kodak Ektar Lenses give unsurpassed results in their intended applications. They are supplied on cameras and separately in shutters and barrels. In all cases, Ektar lenses focus as a unit.

Kodak Ektanon Lenses. Kodak lenses, known in many instances as *Kodak Anastigmats*, will have the name *Kodak Ektanon*. As in the case of the Ektar lenses, the Ektanon names will be qualified to indicate lens function. Lenses in this group for still- or motion-picture projectors will thus be known as *Kodak Projection Ektanon Lenses;* those for enlargers, as *Kodak Enlarging Ektanon Lenses*, etc.

Although suitable for most types of work, Ektanon lenses do not quite meet all of the critical additional requirements of the Ektar. For example, while Ektanon lenses give high-quality results in most fields of black-and-white and color photography, they are not designed for taking critical color pictures which are to be reproduced photomechanically or greatly enlarged in color printing. Like the Ektar lenses, some of the Ektanon lenses which are intended for still-picture taking are supplied in either a barrel or shutter; all Ektanon lenses focus as a unit.

Kodak Anastar Lenses. Those Kodak lenses formerly known as *Kodak Anastigmat Specials* are being named *Kodak Anastar Lenses*. Designed for use on amateur cameras employing the convenience of front-element focusing, such as the Kodak 35 *f*/3.5 with Range Finder, the Kodak Bantam *f*/4.5, and the Kodak Monitor Six-20 with Flash Supermatic Shutter, Kodak Anastar Lenses usually consist of four elements. They are unsurpassed in this field and approach Ektar lenses closely in definition and color correction at generally used lens-to-subject distances. In particular, Anastar lenses on Kodak 35 or Bantam cameras yield outstandingly sharp Kodachrome transparencies. These lenses are not available separately.

Kodak Anaston Lenses. Kodak lenses previously known as *Kodak Anastigmat Lenses* will be named *Kodak Anaston*. Designed for use on amateur cameras such as the Kodak 35 *f*/4.5, the Kodak Monitor Six-20 with Flash Kodamatic Shutter, and the Kodak Vigilant Six-20, Kodak Anaston Lenses generally have three elements. Employing the advantage of front-element focusing, Kodak Anastons are precision-made and yield a performance of high quality with the cameras on which they are used. Kodak Anaston Lenses are not available separately.

Kodar, Kodet, Twindar Lenses. These and other trade-mark names designating the simpler types of lenses will continue to be used as in the past.

Although the changes in lens names described have already been started, time will be required to complete the program. Intended to classify Kodak lenses more accurately, the new system does not represent any change in the formulas of lenses being renamed, or any variation from established quality standards in Kodak lens manufacture. The aim of the Eastman Kodak Company, as heretofore, is to provide in every case the lens that best meets the requirements of the task for which it is intended. Kodak's great Hawk-Eye Works, the most advanced photographic lens plant, is equipped to carry out this policy.

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