



5th Edition

# KODAK FILMS



FIFTH EDITION

## KODAK FILMS

FIRST 1952 PRINTING

THIS DATA BOOK is an extensive revision of the Fourth Edition. The Data Sheets have been completely revised and brought up to date, and several of them include new sensitometric curves which are more representative of the average current products. The sections on Exposure Indexes and the Use of Exposure Meters have been reorganized and rewritten, and the section on Negative Density Scale and Gradation has been revised. Specific recommendations have also been added for the development of electronic flash-tube exposures.

This new edition of KODAK FILMS provides owners of the *Kodak Reference Handbook* with a replacement unit for any Films section bearing an earlier printing or copyright date than that at the bottom of the contents page of this book.

**Kodak Films** is one of a whole series of Kodak Data Books. Most of them are sold as units; some are also components of the various Kodak Handbooks, such as the *Kodak Reference Handbook* or the *Kodak Color Handbook*. Each is a complete unit in itself.

The *Reference Handbook* contains detailed information on the characteristics and uses of Kodak films, papers, filters, lenses, formulas, and related products. It also treats comprehensively such topics as picture taking, flash and flood lighting, processing, and other photographic techniques.

The *Color Handbook* contains four Color Data Books: Color As Seen and Photographed, Color Photography Outdoors, Color Photography in the Studio, and Kodak Color Films. Extra separators are included in the *Color Handbook* for indexing other color publications.

Additional Data Books and other punched publications describing materials, techniques, and processes for better photography are available for the *Kodak Photographic Notebook*. See your Kodak dealer for complete information.



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FIFTH EDITION, 1951

First 1952 Printing



Film  
Data Sheets

Characteristic  
Curve

Density Scale  
Gradation

Color  
Sensitivity

Graininess

Sharpness  
Resolving Power

Speed and  
Exposure

Use of  
Exposure Meters

Physical  
Properties

Film Storage

Plate Data



Panchromatic sensitivity is extremely desirable in the portraiture of women to help insure smooth skin texture. Kodak Portrait Pan, or for a film of higher speed Kodak Tri-X Pan, is suggested.

# KODAK FILMS

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- This information has been prepared for the convenience of the photographic craftsman who desires more than a superficial knowledge of negative materials. Specific recommendations are included which will aid the worker in obtaining consistently finer results with Kodak Film.

Serious workers are today applying their originality and technical abilities to numerous fields of photography. For this reason, a knowledge of the many materials available as well as their suitability for each purpose is invaluable if the results are to meet today's high standards of photographic quality.

The high quality of Kodak-made photographic materials is the result of extensive research coupled with the technical experience of the manufacturing departments of the Eastman Kodak Company. The Kodak Research Laboratories are the foremost organization of the kind in the world, and the experience of the manufacturing divisions in making films and plates for over 50 years is unsurpassed. The meticulous care and laboratory control exercised in manufacture assure the user of maximum dependability in all Kodak sensitized products.

Negative materials differ widely because they are designed for various specific purposes. Their differences may be broadly classed under two heads: photographic and physical. The term "photographic" is used here to refer to such properties as gradient, color sensitivity, and speed, while "physical" refers to the type of base, antihalation feature, and so on. An understanding of these factors is of considerable aid in selecting the negative material most suitable for any purpose.

Data Sheets are given for a number of the more popular films. These contain descriptions of the photographic and physical characteristics, exposure and development recommendations, and complete working instructions. Information on the infrared films and their use is given in the Kodak Data Book on Infrared and Ultraviolet Photography.



# Photographic Properties

Many emulsion properties, such as speed, exposure latitude, and development rate, are best analyzed by means of numerical measurements. The science of such analysis is known as sensitometry.

## CHARACTERISTIC CURVE

• Under accurately controlled and standardized conditions, a photographic material is subjected, by means of an instrument called a sensitometer, to a series of exposures, each greater by a constant factor ( $\sqrt{2}$  or  $\sqrt[3]{2}$ ) than the preceding step. The material is developed under carefully controlled conditions, after which the density<sup>1</sup> of each step is read on a densitometer and plotted against the logarithm of the exposure which produced it. Such curves, representing the average product when exposed and processed under average practical conditions, are given in the Film Data Sheets. They are sufficiently accurate for all ordinary photographic work. For special problems the material should be calibrated under the actual working conditions. If the material is to be used in photometric measurements, all the requirements of photographic photometry must be understood and met.<sup>2</sup>

The characteristic curve is often called the H and D curve, because this method of plotting was first employed by Hurter and Driffield. A typical family of characteristic curves, for a series of development times, is shown in the figure on the following page. The slope or gradient at any part of the curve indicates how much density difference will be produced by a small increase in exposure. The gradient varies over the length of the curve, and this divides it into three regions, as follows:

**Toe.** For exposures less than that at A, no image density results on development. At A, and for greater exposures, density results, and exposure differences reproduce as density differences. From A to B, density difference or gradient increases. This region is known as the toe of the curve and is widely used in making negatives.

**Straight-Line.** The portion of the curve from B to C defines the range

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<sup>1</sup>Density =  $\text{Log} \frac{1}{\text{Transmission}}$  where  $\text{Transmission} = \frac{\text{Transmitted illumination}}{\text{Incident illumination}}$

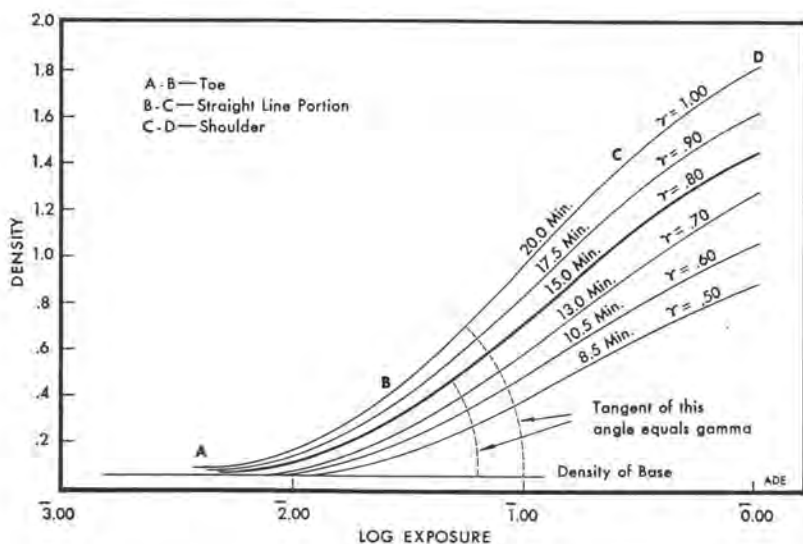
<sup>2</sup>Measurement of Radiant Energy with Photographic Materials. L. A. Jones, in "Measurement of Radiant Energy," by W. E. Forsythe, Editor. McGraw-Hill Book Company, Inc., New York, 1937, pp. 246-82.

wherein the gradient is constant and the density increases proportionally with the logarithm of exposure. This region is also usable in negative making.

**Shoulder.** Above C, in the region of overexposure the gradient of the curve decreases, and eventually the curve becomes horizontal and no longer records exposure differences by corresponding density differences. Scenes recorded on the shoulder show a falling off in highlight gradient, characteristic of extreme overexposure.

**Gamma.** The slope of the straight-line portion of the characteristic curve, or tangent of the angle it forms with the horizontal, is known as *gamma* ( $\gamma$ ). It is a measure of the degree of development. Gamma is equivalent to the maximum gradient, but it does not rigidly define the average gradient over the portion of the curve utilized in a negative. In general, however, the average gradient increases with gamma. Up to a certain point, gamma increases as development proceeds. Gamma can be plotted against development time, and the resulting time-gamma curve can subsequently be used to determine correct developing time for any desired negative gamma.

Gamma also increases with agitation during development, higher developing temperatures, and increased developer strength or freshness. The effect of these and many other factors can be most readily analyzed by sensitometric means.



Typical Characteristic Curves

**Latitude.** The range of tone or brightness values which can be reproduced by the film is indicated in characteristic curves as the exposure interval between a point fairly low on the toe and another point located on the shoulder. This interval is called the exposure scale of the material. Since the brightness range in most scenes is considerably less than this exposure scale, there is considerable camera exposure latitude or freedom in the choice of shutter speed and lens aperture settings. Actually, with most modern negative materials of normal contrast, the upper limit of useful exposure is set by other factors such as increased graininess, loss of definition, and difficulty of printing very dense negatives, long before the upper end of the exposure scale is reached.

## DENSITY SCALE AND GRADATION

• Two characteristics of a negative, *density scale* and *gradation*, determine its printing properties. Density scale is the difference between the maximum and minimum densities. Gradation is the relation between the density differences in the negative and the brightness differences in the corresponding portions of the subject.

These characteristics are the result of the independent or combined action of a number of factors, among which are:

**Subject Brightness Scale.** The brightness scale of a scene determines to a large extent the density scale of the negative. The brightness scale depends on the *reflecting power* of various parts of the scene and also on *differences in illumination* over the scene.

For example, on a dull day an open landscape has a low brightness scale, since differences in reflecting power are chiefly responsible for brightness differences. On the other hand, a sunlit path in the woods usually has a high brightness scale, since there are not only differences in reflecting power but also wide differences in illumination on various parts of the scene.

Continuous-tone negative materials can record a much greater scale of brightnesses than printing paper can reproduce. Whenever possible, the brightness scale of the subject should be kept within printable limits.

**Flare Light.** The illumination scale of the image in the camera is always less than the subject brightness scale because of the effect of flare light in the camera. This compression of brightness differences does not occur equally throughout the entire brightness range but to a much greater extent in the lower brightness region. The effect is a reduction in the gradation of the negative, primarily in the shadow



areas. The degree of this effect depends on the distribution of high brightness areas in and around the subject, as well as on the construction of the camera and lens. Kodak Lumenized lenses have an anti-reflection coating on all glass-air surfaces. This reduces flare light and increases negative density scale and gradation.

**Exposure.** A negative which tends toward underexposure is lower in density scale and gradation, as well as lower in average density, than a fully exposed negative. A negative which is greatly overexposed also is lower in density scale and gradation but of high average density.

**Gradient of the Negative Material.** The inherent gradient characteristic of the negative material is an important factor governing the density scale and gradation of the negative. Kodak negative materials range from low gradient (Kodak Tri-X Panchromatic Film) through materials of medium gradient (Kodak Super Panchro Press, Type B, and Kodak Super Ortho Press Films) to materials of extreme gradient (Kodak Contrast Process Panchromatic Film), which are intended to yield black-and-white line negatives completely lacking in intermediate tones.

Wide exposure latitude—that is the primary film requirement for snapshot type subjects. Verichrome and Plus-X are ideal roll films to use.



**Degree of Development.** Negative density scale and gradation increase over a wide range with increase in development time. Variation of the developing time is the most satisfactory method of controlling negative density scale and gradation for a particular type of subject matter, negative material, exposure, and developer. The increase in gradient of Kodak negative materials with increasing developing time in the recommended developers is shown by the time-gamma curves in the Data Sheets.

Gradient of the negative material for a particular developing time increases with increasing developer temperature up to a point where fogging begins to reduce gradient. The more vigorous the agitation of the developer the greater the rate of development, causing higher gradient for a particular developing time.

Strong developers, such as Kodak Developer D-19, develop more rapidly and can produce higher maximum gradient than the slow working developers such as Kodak Developer D-76. A fresh developer works faster and is capable of producing higher gradient than an exhausted developer.

Fogging, whether resulting from exposure to an unsafe light or to faulty processing, tends to reduce negative density scale and gradation, particularly in the shadow areas.

**Development for Flash Tube Exposure.** With most films the extremely short exposures given by electronic flash tubes tend to change the shape of the characteristic curve. Generally the toe region is considerably extended, so that negatives are likely to have rather low gradations unless they have been given very full exposures. This effect can be offset to a large extent by increasing the development time. While the effects of electronic flash vary somewhat with different films, it is generally desirable to increase the development about 50 per cent beyond the time normally used for exposures by other light sources.

**Color of the Negative Image.** A brownish image, given by many fine-grain developers, such as Kodak Microdol Developer and Kodak Developer DK-20, strongly absorbs the blue-violet light to which printing papers are most sensitive. As a result, the printing gradient is slightly higher than is indicated by the time-gamma curves shown in the Data Sheets, since they are based on visual measurements of density. This is one reason why the development recommendations for these developers usually produce slightly lower visual gamma values than do the recommendations for the general-purpose developers.

## COLOR SENSITIVITY

• The color sensitivity of an emulsion defines the degree of its photographic response to light of various wavelengths or colors. While the average normal eye is sensitive to all these colors, the same is not necessarily true of photographic films. In fact, plain silver bromide, the fundamental sensitive element in all negative emulsions, is sensitive only to blue and ultraviolet. Incorporated in modern orthochromatic, panchromatic, and infrared emulsions, however, are sensitizing dyes, which render the film sensitive to certain other colors of light. The type of sensitizing is one of a film's most important photographic characteristics because it so profoundly affects both the handling of the material and the results obtained.

It is the color sensitivity of a negative material which determines the following:

**Monochromatic Rendition of Colored Subjects.** Any material which is not sensitized to green or red light will render these colors too dark, while a panchromatic material having somewhat the same sensitivity to all colors as the human eye will record colors in approximately the same relative brightness as they appear to the eye. By the use of the proper correction filter, a very close approximation to visual brightness rendering can be obtained.

**The Relation of Speed in Tungsten Light to That in Daylight.** Every negative material has a higher speed in daylight than in tungsten light because tungsten light contains a lower percentage of the blue-violet light to which all films are *most* sensitive.

This speed difference is less, however, in the case of films having high sensitivity to the green, yellow, orange, and red regions of the spectrum than it is with films having their principal sensitivity in the violet, blue, and green regions. The reason for this is that the former type of emulsion (panchromatic) is able to utilize the red, orange, and yellow which form a large proportion of tungsten light.

**Filters Usable and Their Factors.** The filters which can be used depend on the color sensitivity of the film. Obviously, a red filter can be used only with a material sensitive to red light. Furthermore, the filter factor, or exposure increase required, also depends on the color sensitivity of the material. For example, a negative material with a large portion of its sensitivity in the blue-violet requires a much greater relative exposure through a yellow filter which eliminates most of the blue light, than a panchromatic material which, being sensitive to all colors, is able to utilize the red and green transmitted by the filter.

**Safelight Color or Transmission.** It is the function of a safelight to transmit the color of visible light to which the film is least sensitive. For example, a negative material, such as Kodak Verichrome Film, which is sensitive only to blue-violet, blue, and green, may be handled without danger of fogging by a safelight transmitting only deep red. In the case of materials which are sensitive to all colors, the safelight must transmit in the region to which the eye has its maximum sensitivity in order that a minimum amount of light may be used. Hence, panchromatic materials may be handled only under a dark green safelight—and even under that light for only a brief period.

### WEDGE SPECTROGRAMS

- The color sensitivity of a negative material is usually shown by wedge spectrograms, such as those on the following page. The numbers beneath the horizontal axis represent the color of light or the wavelengths in millimicrons ( $m\mu$  or millionths of a millimeter). These spectrograms are positive prints from films which have been exposed to a light spectrum through a neutral density wedge. This wedge is opaque at the top, decreasing in density or opacity until it is transparent at the bottom. As the transmitted light diminishes toward the top, the height of the film image at any point is an indication of the film's response to that particular wavelength. Due to the absorption of much of the ultraviolet by the lens system of the spectrograph, the indicated ultraviolet sensitivity of all films, as shown by the wedge spectrograms, is lower than the true value. The spectrograms show relative color sensitivity only, and give no indication of film speed.

General aerial obliques, as illustrated, require a film such as Panatomic-X or Super-XX which combines moderate-to-high speed plus the ability to yield, if needed, a fairly high development contrast because of aerial haze conditions. Panchromatic sensitivity is usually necessary so that haze-cutting yellow, orange, or red filters can be used.



## SENSITIZING CLASSES AND TYPES

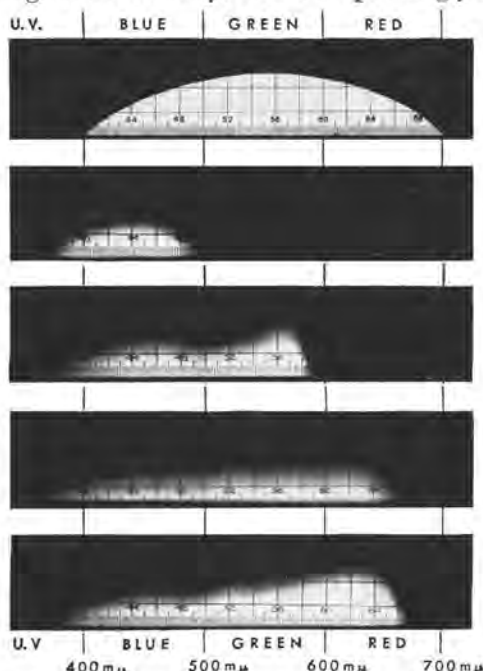
• Kodak negative materials are divided into sensitizing classes and types, both for purposes of description and also for convenience in the assignment of filter factors. The negative materials of any one group are sufficiently alike in color sensitivity so that the same filter factors can be used. Aside from certain special sensitizings there are three general classes as follows:

**Non-Color-Sensitized or "Ordinary"** materials possess only the ultraviolet and blue-violet sensitivity inherent in any silver halide.

**Orthochromatic** materials possess sensitivity to green, in addition to the ultraviolet and blue-violet.

**Panchromatic** materials are sensitive to all visible colors, including red, as well as to the invisible ultraviolet light.

Panchromatic materials are further classified into Types B and C with respect to their relative sensitivities to blue, green, and red light. Type B materials, having relatively high green sensitivity, most nearly approximate the color sensitivity of the eye and give excellent monochromatic rendering. Type C panchromatic materials have relatively high red sensitivity, and correspondingly high speed in artificial light.



### SENSITIVITY OF THE EYE

Approximate sensitivity of the normal eye.

### NON-COLOR-SENSITIZED

Have only the ultraviolet and blue-violet sensitivity inherent in every silver halide emulsion.

### ORTHOCHROMATIC

Ultraviolet, blue, and green sensitivity.

### PANCHROMATIC TYPE B

Sensitivity closely approximating that of the eye. Kodak Wratten Filters for correction: Daylight, K-2; Tungsten, X1.

### PANCHROMATIC TYPE C

Extreme sensitivity in yellow, orange, and red. Kodak Wratten Filters for correction: Daylight, X1; Tungsten, X2.

Spectrograms showing color sensitivity of Kodak film sensitizing types to tungsten light.

## GRAININESS

- When a negative is viewed as sufficiently high magnification it is seen to possess a grainy or granular structure. This impression of non-uniformity in the image is called graininess. It is caused by the irregular distribution of the silver grains, rather than by the individual grains themselves which are visible only under magnifications much greater than used in making ordinary enlargements.

For emulsions of a given general type, graininess tends to increase with the emulsion speed. When development is carried to the same gradient, the common developers of normal and high activity (e.g., Kodak Developers DK-50, D-72, and Dektol) produce approximately equal graininess with a given film. Some fine-grain developers (e.g., Kodak Developers DK-20 and Microdol) produce noticeably less graininess but at the expense of some loss of speed.

The graininess of the negative is reproduced in the print and is most apparent in the lighter middle tones, especially in large, uniform areas. The graininess of the print increases with the density of the negative, so overexposure or overdevelopment of the latter should be avoided.

The graininess of both negatives and prints increases with increasing gradient. However, a negative of low gradient calls for a paper of high gradient and vice versa, so what might be gained by holding one gradient down would be largely lost by the high gradient of the other. It is usually true that a low negative gradient and correspondingly high print gradient is more favorable than the alternative combination, but the negative may then suffer a loss in effective speed.

It is possible to conceal graininess somewhat by softening the focus or using paper with a rough surface, but only at some sacrifice in definition.

## SHARPNESS

- The ability of a film to produce pictures having good definition is commonly referred to as its sharpness. It is most apparent where the brightness of the scene and consequently the density in the negative changes abruptly from a high to a low value. If a knife edge is laid in contact with a film and the film is exposed to light, the density of the developed image does not drop abruptly at the former site of the knife edge but encroaches on the shielded area. The shape of this density gradient when properly evaluated largely indicates the sharpness of the film.



## **SHARPNESS AND RESOLVING POWER**

- Resolving power refers to the ability of an emulsion to record fine detail distinguishably. It is customary to express resolving power in terms of the number of lines per millimeter that can be distinguished as separated in a photographic image. In measuring resolving power a parallel-line test chart is photographed greatly reduced in size. The lines of the test chart are separated by spaces of the same width as the lines. The image is examined under a microscope, and the number of lines per millimeter just resolved is determined. Lines closer together (more lines per millimeter) than indicated by this number will appear on the film, not as individual lines, but as an indistinct, gray mass.

The resolving power of a film depends on the brightness scale of the test chart but only slightly on the degree of development of the film. The values given in the Data Sheets are determined for recommended processing and for a subject contrast of 30:1, which is about the range in ordinary photography.

Resolution falls off greatly at high and low exposure values, reaching a maximum at some intermediate exposure, and it is for this exposure that the resolving power figure is given. The loss of resolution with over- and under-exposure is an important reason for exposing miniature negatives correctly.

The maximum resolution which can be obtained in practical negative making is limited by the lens as well as by the negative material and is lower than the resolution of either one alone. The maximum resolution of which a photographic material is capable could be obtained only if a geometrically perfect image of the test object could be formed by the lens. Even a theoretically perfect lens cannot form a geometrically perfect image, since diffraction effects prevent the formation of perfectly sharp edges of the lines, and with actual practical lenses residual aberrations produce a diffuse background illumination which tends to fill in further the space between the lines of the image.

The new optical materials now available have made possible the design and construction of a specialized lens which has even lower residual aberrations than did the special lens formerly used for resolving-power determination. This improvement has increased considerably the resolving-power values measured on the films, so that, except for the materials of very high resolving power, they now approach the maximum values of which the films are capable.

Experience has shown that while resolving power is an important property of a film, it does not correlate well with sharpness and in some cases is even misleading.

# Speed and Exposure

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The speed of a film is a photographic property of immediate practical importance to the photographer since it has a direct bearing on lens settings required to yield good negatives. Speed enters into the three commonly used methods of determining exposure settings: Estimation based on experience, exposure tables and guides, and photoelectric and other exposure meters. Figures for the last application are derived from film speed, as described later.

## EXPOSURE GUIDES

- The Eastman Kodak Company provides exposure tables and dial-type guides which have been derived with great care from exhaustive practical tests and from extensive data on illumination, subject brightness, film speed, and print-making requirements. The principles involved have been confirmed by a number of years' experience. For any picture-taking situation specifically covered by a Kodak exposure guide, the camera settings indicated by the guide will yield an extremely high percentage of excellent photographs.

Kodak exposure guides for black-and-white negative materials are based on the recording of important shadow detail. The exposures indicated by the guides for daylight include a safety factor of 4 times; that is, for a normal subject photographed under normal conditions, the exposure recommended is about two stops greater than the least exposure required for a negative that will produce an excellent print. However, less exposure should not be given unless picture-taking conditions demand it and the photographer is thoroughly familiar with all the factors involved. A smaller safety factor is used in Kodak exposure guides for artificial light, because there is less variation in illumination and subject matter in indoor photography than in outdoor photography.

Exposure guides for color films and black-and-white reversal materials are based essentially upon the quality obtained in the important highlight areas of a photograph, since the rendering of the highlights is much more critical in color and reversal processes than in black-and-white negative making. Because these materials have limited exposure latitude, little or no safety factor can be included in the exposure guides. The guides should be followed strictly unless experience with certain equipment dictates a consistent change.



The Kodak Master Photoguide contains dial-type exposure calculators covering the use of daylight, flash, and flood light with a variety of Kodak films. The text of this booklet includes valuable information on lighting techniques, filter selection, depth of field, and other essentials for general and special application. Daylight and flash exposure of Kodak black-and-white and color films is also available in a separate guide, *The Snapshot-and-Flash Kodaguide*. These guides are sold by Kodak dealers.

## EXPOSURE INDEXES

- Exposure indexes are numbers assigned to photographic films and plates for use in conjunction with exposure meters and other exposure computing devices to aid the photographer in obtaining correct camera exposure. These numbers are derived from but should not be confused with film speed.

Film speed refers to the inherent sensitivity of the film and is directly related to the minimum exposure which can yield a good print. This is the basic concept of the Kodak Speeds which were introduced in 1939, after extensive research had shown that the sensitometric procedure by which these speeds are derived gave values agreeing remarkably well with the practical speeds found in normal picture-taking experience. The American Standard Method for Determining Photographic Speed and Exposure Index, Z38.2.1-1947, adopted by

the American Standards Association, follows essentially the same procedure.

Obviously, it would be unwise to give this minimum exposure unless the conditions were such that it would be difficult or impossible to give more exposure. Also, camera exposures require consideration of other factors, such as the latitude of the emulsion, its development, its intended field of use, and the spectral quality of the light which illuminates the subject. The exposure indexes take these factors into account and also include a safety factor to take care of possible variations in equipment and methods of working. For the black-and-white continuous-tone negative materials covered by the standard, a safety factor of 2.5 is used.

The American Standard does not cover exposure indexes for light sources of other than daylight quality, but such indexes can be calculated by the use of a factor for the photographic efficiency of the illumination with each material. Suitable indexes for tungsten illumination, as well as those for daylight, are given in the instruction sheets packed with the films and in the Data Sheets in this book.

For all types of black-and-white materials, a suitable exposure index can be found for "daylight" fluorescent lamps by setting the exposure meter to the next higher division than the daylight exposure index, while for "white" fluorescent lamps it is suggested that a figure two steps lower than the daylight exposure index be tried. Thus, for a film having a daylight exposure index of 50, a value of 64 should be tried for "daylight" fluorescent lamps, or 32 for "white" fluorescent lamps.

Most of the newer models of exposure meters make direct use of the ASA exposure indexes in their computers. Fortunately, the exposure indexes of the black-and-white continuous-tone negative materials can be used with the older as well as with the newer models. The latitude of these negative materials is ample to allow for the difference in the meters. In the case of color films which have relatively short exposure latitude, it is better, when using the older meters, to use the settings recommended for these meters by their manufacturers.

While the exposure indexes normally allow a safety factor in exposure when the material is processed as recommended, the use of special developers or unusually high or low degrees of development may render a change desirable in the index. The use of such fine-grain developers as Kodak Microdol Developer and Kodak Developer DK-20, however, does not usually require any change in index.

## METHODS OF USING EXPOSURE METERS

- The exposure meter cannot be used in a purely mechanical fashion. Its proper use and reasons for such use must be understood. Above all, judgment must be used as to what is measured and how. The limitations of the type of meter should be known and allowed for. In other words, the meter is only as good as the person using it.

Exposure indexes usually lead to correct exposure with meters calibrated in accordance with the American Standard, provided the intended method of making a light reading is followed.

**Reflected Light Readings from Camera Position.** Exposure indexes have been correlated with the statistical average of reflected-light readings from a large number of scenes. These indexes therefore apply if certain precautions are observed.

The makers of certain reflection exposure meters recommend that a meter used in daylight should be tilted downward to avoid undue influence from the sky. Such effects can otherwise lead to underexposure. This precaution is particularly important on overcast days when the sky brightness is many times that of the landscape. Other large, bright areas must also be avoided in the meter field of view. Reflections from water, snow, white sand, and even sidewalk foreground can unduly influence the meter.

Medical photography of gross specimens and for surgery requires panchromatic films—but orthochromatic materials where pale red areas are to be reproduced darker than normal. Infrared sensitivity is necessary to emphasize such subjects as sub-surface veins.



Surroundings can also be quite misleading in making meter readings for telephoto pictures. Such pictures of a skier against a snow field, for example, will tend to be underexposed if an ordinary reflected-light reading from the camera position is followed. A converse case is that of a stage performer or carnival skater in a spotlight. No reading at all would be indicated by the meter, yet there may be ample light on the subject for proper exposure.

**Substitution of a Test Card for Indoor Subjects.** One of the most successful techniques of using a reflected-light type of exposure meter involves making a reading on a card of known reflectance. For indoor work, it has been found that, on the average, a gray card having a reflectance of about 18 per cent held in the position of the subject will show very nearly the same light reading as a reading taken from the camera position for an average indoor subject under identical lighting. It follows that the exposure index, which has been adjusted to yield satisfactory exposure information when the light reflected from an average subject is measured from the camera position, will also be suitable for use with readings made on a gray card of 18 per cent reflectance. To meet this need, the Kodak Neutral Test Card has been introduced. The gray side has 18 per cent reflectance, the white side 90 per cent reflectance. If the white side of the card or any other white card of about 90 per cent reflectance is used, the exposure index must be divided by 5 and rounded to the nearest figure on the exposure meter calculator.

When the meter reading is made on a gray or white card, the card should be placed close in front of the subject, facing the camera. It should be large enough to fill the acceptance cone of the meter, which must not cast a shadow on the card. Since the highlight region is important in the exposure of reversal color film, the modeling light should appropriately influence the meter reading. A test card or flat-celled incident-light meter, when facing the camera, does not respond at all to 90° side light. Therefore, in color work, such a card or meter should face half way between the camera and modeling light, up to a 90° position of the light. All the lights should be turned on when the reading is taken. Some allowance—about half a stop—must be made if the subject is unusually light or dark in color and color film is concerned.

The palm of the operator's hand or the face of the subject is sometimes used instead of a card. Since the reflectance of average skin is about 35 per cent, the exposure index should be divided by 2 in computing exposure in the conventional manner.



**Incident-Light Method.** The test card method described above is essentially a measurement of illumination falling on the subject. Incident-light meters are designed to do this directly. Either type of measurement is preferable to reflection measurements of artificially-lighted subjects, since a reflection measurement may include underlighted or unlighted background areas.

It is recommended that incident-light measurements made with the G-E Meters, Types DW-58 and earlier, be divided by two, or else the film index be divided by two. This applies whether the meter is used with or without the multiplying masks.

Some reflection-type meters can be improvised to make incident-light readings. The light entering the cell must be decreased, and this must be done in such a way that light from all directions which can illuminate a flat surface will affect the cell properly. In other words, the cone of acceptance should be nearly  $180^\circ$  solid angle. This can be done by a combination of a neutral density filter and an opal glass.

Since the photographer is not equipped to construct such devices with the specified light transmission, he should choose the neutral density by experiment so that there is nearly a full-scale deflection of the meter for the highest illumination he is likely to use. He can then conduct a set of photographic trials to arrive at a suitable film setting for the meter so equipped.

## EXPOSURE INDEXES FOR COPYING

- The American Standard Exposure Indexes for continuous-tone materials can be used in copying. These indexes can be used directly with incident-light meters held in the plane of the original being copied. The indexes also apply directly to reflected-light meters when the reading is taken from a surface having a reflectance of 18% substituted for the original being copied. The gray side of the Kodak Neutral Test Card is recommended for this purpose.

In the absence of the proper gray card, a reflected light reading can be made on a matte white surface of 90% reflectance, such as the back of double weight white photographic paper. The reading is of course much higher. Compensation can be made by dividing the exposure index by 5 and rounding to the nearest figure on the meter calculator.

Exposure indexes for high contrast materials for line work are not yet covered by an American standard. Such values are needed so that the modern type of exposure meter can be used in line copying. These values have therefore been derived for Kodak materials and are listed as exposure indexes. These values are used in the same manner as the

usual exposure indexes for continuous-tone materials. They apply directly to incident-light meters, and to 18% gray card readings with reflected-light meters. Likewise, a white card can be used with indexes divided by 5.

Unlike the indexes for continuous tone, those for line work are intended merely for trial exposure. The first reason for this is that the exposure should be adjusted to the maximum that can be given without causing filling in or veiling of the lines. Thus the exposure is affected by the reflectance of the lines or dark areas of the copy subject. The second reason is the inherently short exposure latitude of the high contrast materials.

The copying indexes for some materials are lower than the lowest figure on the computer scale of some exposure meters. When this situation is encountered, multiply the index by 100 and give 100 times the calculated exposure time.

**Correction for Bellows Extension.** In computing exposure for copying, it is particularly important to allow for the effective increase in the  $f$ -value caused by extended bellows. If this factor is ignored, an error of 4 times is introduced in the exposure in the case of same size or 1:1 copying. The effective  $f$ -value can be found by the relation

$$\text{Effective } f\text{-value} = \frac{\text{Indicated } f\text{-value} \times \text{Lens-to-film distance}}{\text{Focal length}}$$

The lens-to-film distance is the focal length plus the distance which the lens is extended beyond its position at infinity focus. The Effective Aperture Kodaguide and the calculators on some exposure meters offer a most convenient means for making such calculations.

Films for copying naturally depend on the nature of the original to be copied. For line work, Kodak Contrast Process Ortho or Contrast Process Panchromatic is suggested. For continuous-tone subjects, many photographers prefer Kodak Commercial or Commercial Ortho Sheet Films.



## PHOTOGRAPHIC CALIBRATION OF A METER

- Any published exposure index or other meter setting should be regarded by the critical worker as merely a basis for trial. He should conduct a series of photographic trials with his own equipment and on typical subject matter. He should make a series of exposures, each differing by half a stop from the next. The midpoint of the series should be that indicated by the published exposure data or meter setting for the film. In the case of an improvised incident-light meter or a meter calibrated in Scheiner or DIN, the midpoint of the series should be arrived at either by exposure tables or by preliminary tests. Careful readings should be made with the meter using the intended technique, and complete records should be kept of the meter readings and the lens settings used. From the quality of the test pictures and the readings of the meter, a suitable index can be derived by working the calculator backwards, so to speak. It is well to make several such tests on different types of subject matter. It is also most important to allow for the influence on effective aperture of extended camera bellows if the subject is closer than 8 times the focal length of the lens.

Even though formal tests have not been carried out by the photographer, he should not hesitate to depart from the published exposure indexes if his results consistently indicate the need for such a change. Note: If the above test is carried out for color film, appropriate indexes for black-and-white film can be derived by applying to their published indexes the ratio between the published and derived indexes for the color film used. Indexes for color films cannot be derived with sufficient accuracy from black-and-white film tests.

## SETTINGS FOR METERS WITH SCHEINER AND DIN SCALES

- Experience has shown that each different make of meter using the same type of film rating scale may require a different setting for the same film. For example, a certain film was found to require a Scheiner rating of 21 for one type of meter, and a rating of 28 for another brand. Therefore, it is impractical to give conversion tables for use of the film exposure indexes with meters marked in the Scheiner and DIN systems. The proper conversion for a particular meter is best determined by making a series of trial exposures as described above.

The settings for other films can easily be calculated if it is remembered that an increase of 3° on either the Scheiner or the DIN scales corresponds to a doubling of the film exposure index. For instance, if a meter setting of 29° Scheiner is found to give proper exposure for a film having an exposure index of 50, a setting of 32° (3° higher) should be correct for a film with an exposure index of 100.



A high speed film—even though artificial light is used—is obviously the best choice for indoor sport or action shots. If electronic flash is used, remember to develop the film about 50% more than normal.

# Physical Properties

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## **BASE**

- The film base is the support for the light-sensitive emulsion.

Kodak film base is made in various thicknesses for different negative materials: roll film, 35mm film, film pack, and sheet film. All Kodak films are now coated on safety base, which is slow burning, and which presents somewhat less hazard in storage than common newsprint paper in the same form and quantity.

Specially selected glass is used for Kodak plates.

## **OVERCOATING**

- A thin transparent gelatin layer is applied over the emulsion to protect it from abrasion. All Kodak amateur roll films, film packs, miniature films, and portrait sheet films are overcoated.

## **NONCURLING BACKING**

- A gelatin layer is applied to the back of the film base. The shrinkage of this layer compensates for that of the emulsion and thus prevents severe curling of the film. This backing is not needed or used on the 35mm and 70mm roll films.

## **ANTIHALATION FEATURE**

- Light penetrating an emulsion may reflect from the back of the base and strike the emulsion once more, causing halation around the image of bright objects. Antihalation base or backing is designed to absorb such light and prevent halation. While the emulsion itself absorbs much of the light striking it, Kodak negative materials are treated in various ways to insure good antihalation properties.

In the case of the sheet films, roll films, and film packs, the antihalation feature consists of a light-absorbing dye incorporated in the non-curling backing layer. The dyes used bleach out completely in a properly compounded developer and fixing bath.

Incorporated in the base of Kodak 35mm and 70mm Film is a gray dye. Light transmitted by the emulsion must pass through the dye twice in order to get back to the emulsion and cause halation. The gray dye is therefore twice as effective as it would at first appear. This dye does not bleach out in the processing solutions, but its presence has no effect on printing quality.

# Storage and Care of Films

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All photographic films are perishable products which are damaged by high temperatures and high relative humidities. For best results they must be handled and stored properly. Correct care and storage involve protection from heat, moisture, harmful gases, x-rays, and radioactive substances, and require proper handling of the packaged product at all times.

## PACKAGE PROTECTION OF UNEXPOSED FILMS

- Kodak sheet films, film packs, and 35mm films are regularly supplied in vapor-tight packaging, so that they require no additional protection against high relative humidities until the package is opened.

Kodak black-and-white roll films and 828 films are supplied in vapor-resistant packaging. This provides ample protection to withstand, through the expiration dates stamped on the film cartons, the normal handling and humidities commonly encountered in temperate zones. This packaging is also sufficiently moisture-resistant to provide protection for films to be taken to tropical regions on trips of short duration. These films can be specially ordered in tropical packaging, which is vapor-tight, when they are to be taken for a period of longer than 1 week into regions having sustained high relative humidities. Such regions include not only those commonly thought of as tropical, but also any locality where relative humidities of 70 percent or higher prevail, as in a number of areas in the continental United States. Extra protection for films in moisture-resistant packaging can also be obtained by storing them in an airtight container such as a glass jar with a rubber gasket in the cover.

## STORAGE IN ORIGINAL PACKAGE

**Protection from Moist Air.** Films which are supplied in moisture-tight packaging require no additional protection against high relative humidities until the package is opened. For this reason, a *film package should not be opened until the film is to be used*, because the protection originally provided is then no longer effective.

Films which are in moisture-resistant packages (Kodak black-and-white roll films and 828 films) should not be stored in damp basements, ice boxes, refrigerators, or other places where the relative humidity is high. The ideal relative humidity for storage of such pack-



ages is between 40 and 60 percent, preferably near 40 percent.

When humid storage locations cannot be avoided, or when the use of a refrigerator is necessary for cooling, additional moisture protection should first be provided for films not in moisture-tight packaging. As many rolls of film as possible should be placed in a can or jar which is then tightly sealed.

Note that it is the *relative humidity*, not the *absolute humidity*, that determines the moisture content of films. Absolute humidity refers to the amount of water vapor actually present in the air, and is expressed in weight of water per given volume of air. Relative humidity is the ratio, expressed as a percentage, of the amount of water vapor actually present in the air to the greatest amount the air will hold at the same temperature. The relative humidity is best measured by means of a sling psychrometer. In a small storage chamber, a calibrated humidity indicator, such as those sold for home use, is satisfactory.

**Protection from Heat.** *Neither moisture-resistant nor moisture-tight packaging is heat-proof.* Regardless of the type of packaging, do not leave films near steam pipes or other sources of heat. In warm weather, do not leave them on the top floors of uninsulated buildings or in closed automobile compartments.

During summer heat in temperate or tropical zones, refrigerated storage is recommended for keeping films cool, provided they are in vapor-tight packages or are sealed in cans or jars.

Where possible, the following storage temperatures should be maintained.

For storage periods up to	2 months	6 months	12 months
Keep films below	75 F	60 F	50 F

Films in moisture-resistant packages should be made moisture-tight as described previously before they are placed in a refrigerator. When special storage precautions are not practical, it should be borne in mind that a moderate temperature and relative humidity, such as 60 F with 40 percent relative humidity, are better than a low temperature with high relative humidity, such as 40 F with 80 percent relative humidity.

Films not in moisture-tight packaging must be kept away from for-

**Caution:** To avoid condensation of moisture on the cold film surfaces, film packages removed from cold storage should be allowed to reach approximate room temperature (in from 1 to 2 hours time) before they are opened for use. Packages of plates should be allowed at least four hours to warm up to room temperature.



Excellent rendition of shadow detail makes Kodak Super Speed Ortho Portrait Film a wise choice for photographs of industrial interiors.

maldehyde, industrial gases, motor exhausts, and vapors of solvents. All films must be protected from x-rays and radioactive materials.

### **PROTECTION OF FILMS AFTER PACKAGE IS OPENED**

- When a film package is opened, the film, (depending on its quantity and form) reaches equilibrium with the surrounding air in a period of time varying from about an hour to a number of days. Under humid conditions, *films should be exposed and processed as quickly as possible after the package is opened.* High relative humidity and high temperature often cause undesirable changes in the latent image and *it is particularly important that exposed films be kept no longer than absolutely necessary before processing.*

Under adverse conditions, films should not remain in the camera or holders longer than necessary. A carrying case containing films should be protected from direct sunlight, because the temperature inside the case may rise extremely high, even in a temperate region. Similarly, films should not be left in automobile compartments or in closed automobiles parked in the sun, where the temperature may quickly reach a high value. If this is unavoidable, keep the film in an insulated container, such as a camp ice box (without ice).

Unused sheet films in an opened package should be sealed in a vapor-tight container before being returned to cold storage. If the prevailing relative humidity is above 60 percent, the films should first be dried by means of a suitable desiccating agent. Methods for drying films are described in the Color Films section of the Kodak Reference Handbook and in the Data Book on Kodachrome Films for Miniature and Movie Cameras.

### **STORAGE OF PROCESSED FILMS**

- To insure maximum life, developed films should be thoroughly fixed and washed. Storage should be in a cool, dry place, to reduce the possibility of decomposition of emulsion or film base and to avoid the possibility of mold or fungus growth. Since the silver image may be attacked by certain sulfur compounds, the materials should be protected against fumes of hydrogen sulfide and coal gas. The paper and adhesive used in storage envelopes should meet the requirements of the American Standards Association standard Z38.3.21-1950 "Photographic Filing Envelopes for Storing Processed Photographic Films, Plates and Papers," so that they will have no harmful effect on the photographic image. The envelope seams should be narrow and near the edge of the envelope rather than in the center.

## SUGGESTED KODAK NEGATIVE MATERIALS FOR VARIOUS SUBJECTS

SUBJECT CLASSIFICATION	CHIEF REQUIREMENTS	KODAK NEGATIVE MATERIALS RECOMMENDED			
		ROLL FILM	FILM PACK	SHEET FILM	35MM FILM
ACTION Outdoors	Speed for Full Exposure at High Shutter Speeds	Super-XX	Super-XX	Super Panchro-Press, Type B Tri-X Pan	Plus-X
	Indoors or Extremely Poor Lighting	Super-XX	Super-XX	Tri-X Pan	Super-XX
ARCHITECTURE Exteriors	Texture Rendition	Plus-X	Plus-X	Super Panchro-Press, Type B Portrait Panchromatic	Plus-X
	Interiors or Night	Super-XX Plus-X	Super-XX Plus-X	Super-XX Super Panchro-Press, Type B	Super-XX Plus-X
NEWS "Candid"	High Speed	Super-XX Plus-X	Super-XX Plus-X	Super Panchro-Press, Type B Super Ortho-Press	Super-XX Plus-X
PORTRAITURE Children	Low Contrast High Speed	Super-XX Plus-X	Super-XX Plus-X	Tri-X Pan Super Panchro-Press, Type B	Super-XX Plus-X
	Women	Plus-X	Plus-X	Super Panchro-Press, Type B Portrait Panchromatic	Plus-X
	Men	Verichrome	Plus-X	Ortho-X Super Speed Ortho Portrait Portrait Panchromatic	Plus-X
GENRE	Wide Exposure Latitude, Modeling	Plus-X Verichrome	Plus-X	Super Panchro-Press, Type B Super-XX	Plus-X
LANDSCAPES Atmospheric Effects	Ortho or Non-Color-Sensitized Emulsions Emphasize Haze	Verichrome	Plus-X with C-5 Filter	Super Speed Ortho Portrait Ortho-X	Plus-X with C-5 Filter
	Cloudscapes } Marine Views } Snowscapes } Extreme Distance } Spectacular Effects }	Plus-X Verichrome	Plus-X	Super Panchro-Press, Type B Portrait Panchromatic Panatomic-X	Plus-X
				Infrared	Infrared
NATURE PHOTOGRAPHY Animals	Speed—Medium Contrast	Super-XX Plus-X	Super-XX Plus-X	Super Panchro-Press, Type B Super Ortho-Press Tri-X	Super-XX Plus-X
	Insects	Plus-X	Plus-X	Super Panchro-Press, Type B Portrait Panchromatic	Plus-X
	Flowers, Shrubs, Plants	Plus-X	Plus-X	Super Panchro-Press, Type B Super-XX	Plus-X
STILL-LIFE Table-Top Photography	Texture, Modeling	Plus-X	Plus-X	Portrait Panchromatic Super Panchro-Press, Type B	Plus-X

# SUGGESTED KODAK NEGATIVE MATERIALS FOR SPECIAL USE

SUBJECT CLASSIFICATION	CHIEF REQUIREMENTS	KODAK NEGATIVE MATERIALS RECOMMENDED			
		ROLL FILM	FILM PACK	SHEET FILM	35MM FILM
COLOR-SEPARATION NEGATIVES	Balanced Rendering by Red, Green, and Blue Light	Not Recommended	Not Recommended	Super-XX (Separation Negative Plate, Type 1)	Not Recommended
BLACK-&WHITE NEGATIVES FROM COLOR TRANSPARENCIES	Panchromatism	Plus-X	Plus-X	Super Panchro-Press, Type B Panatomic-X	Plus-X
COPIES Line—Black-and-White Line—Color	High Contrast	High Contrast Plus-X	Development Plus-X	Contrast Process Ortho	Micro-File
	High Contrast, Color Sensitivity	Plus-X	Plus-X	Contrast Process Panchromatic	Micro-File
COPIES Continuous-Tone—B. & W. Color	Medium Contrast	Plus-X	Plus-X	Commercial	Fine Grain Positive Plus-X
	Medium Contrast, Color Sensitivity	Plus-X	Plus-X	Super Panchro-Press, Type B Panatomic-X	Plus-X
DUPLICATES By Means of Intermediate Negatives or Positives	Medium Contrast, Negligible Graininess	Plus-X	Plus-X	Commercial (Kodak 33 Plate)	Fine Grain Positive
LANTERN SLIDES	Extremely Fine Grain, Good Contrast			(Kodak Lantern Slide Plates)	Fine Grain Positive Micro-File
MEDICAL PHOTOGRAPHY Predominately Red Subjects Surgery, etc.  Pale Red Areas (To Reproduce Darker) Sub-Surface, Veins, etc.	Panchromatic Materials	Plus-X	Plus-X	Super Panchro-Press, Type B	Super-XX
	Panchromatic Materials	Super-XX Plus-X	Super-XX Plus-X	Tri-X Pan Super-XX	Plus-X
	Orthochromatic Materials	Verichrome		Ortho-X Super Ortho-Press	Plus-X (with #58 Filter)
	Infrared Sensitivity			Infrared	Infrared
PHOTOMICROGRAPHY General Use Metallurgy	High Resolving Power and Contrast	Plus-X	Plus-X	Super Panchro-Press, Type B Super-XX	Plus-X
	Panchromatic Materials			Contrast Process Pan (Kodak M Plate)	Micro-File
	Orthochromatic Sensitivity			Contrast Process Ortho (Kodak Metallographic Plate)	
ASTRONOMY and Spectroscopy	Speed and Resolving Power High Contrast	Super-XX	Super-XX	Super Panchro-Press, Type B (Spectroscopic Plates)	Super-XX

## SPEED AND DEVELOPMENT DATA FOR KODAK PLATES

KODAK PHOTOGRAPHIC PLATES	Exposure Index*			Recommended Kodak Developers and Developing Times at 68 F—Tank	Kodak Safelight Filter, Wratten Series
	Daylight	Tungsten	White Flame Arc		
<b>Non-Color-Sensitized</b>					
33	20	5	40	{DK-50, 6 min; Maximum contrast: D-11, 8 min (tray). D-8 (2:1), 2 min (tray); D-11, 5 min.	1
33 Matte	20	5	40		
Process	—	12†	100†		
Lantern Slide, Medium	—	12†	—	{Versatol (1:3), Dektol (1:2), or D-72 (1:2), 1-3 min (tray): Warm Tones: D-32, 5 min (tray); Soft results: DK-50, 2-3 min (tray). [Versatol (1:3), Dektol (1:2), or D-72 (1:2), 2-6 min (tray); High contrast: D-11, 5 min (tray).]	1
Contrast Anti-Abrasion Contrast }	—	8†	—		
<b>Orthochromatic</b>					
Super Ortho-Press	64	32	125	{Press: DK-60a, 4½ min; Dektol (1:1) or D-72 (1:1), 2½ min. Commercial: DK-60a, 4 min; DK-50, 5 min. Photomicrography: DK-50, 10 min; D-19, 4 min. DK-50, 5 min; DK-50 (1:1), 7½ min; D-61a (1:3), 8½ min.	2
50	32	12	—		
<b>Panchromatic Type B</b>					
Tri-X Pan, Type B Tri-X Pan, Type B Matte }	160	100	320	{General photography: DK-50, 5 min. [Color separation: D-11 and DK-50 (See directions with material)]. [General photography: DK-50, 5 min. [Color separation: D-11 and DK-50 (See directions with material)]. [DK-50, 4 min; D-76, 9 min. [Color separation: D-11 and DK-50 (See directions with material)]. D-11, 5 min; High contrast: D-8 (2:1), 2 min (tray).]	TD†
Separation Negative, Type 1	64	50	150		
Separation Negative, Type 1 Matte	64	50	150		
Panchromatic, and Matte	16	10	32		
Process Panchromatic	—	125†	400†		
<b>Panchromatic Type C</b>					
Super Pancho-Press	100	80	—	{Press: DK-60a, 5 min. Commercial: DK-60a, 4 min; DK-50, 5½ min. [Color separation: DK-50 (See directions with material)].	TD†

\*These settings are recommended for meters marked for American Standard Exposure Indexes.

†For Line Copying—for incident-light meters directly or for reflected-light meters with a Kodak Neutral Test Card (18% gray side) at the copy board. For readings on a matte white card, divide these values by 5.

‡Total Darkness. A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds only, at 4 feet, after development is half completed.



# Data Sheets for Kodak Films

On the following data sheets detailed information is presented on Kodak roll films, film packs, miniature films, and sheet films as indexed on the right. Although the sheets contain more information than any one photographer may need, they are purposely made comprehensive so as to meet specific as well as general requirements. Much of this information is also given in the instruction sheets packed with the films. Since recommendations may change, whenever there is a discrepancy between the Data Sheet and the instruction sheet for a product, it is best to follow the instruction sheet in the particular package of film.

**Data on Exposure** include such subjects as exposure indexes, filter factors, and Flash Exposure Guide Numbers, and in some instances tables of camera settings for exposures by daylight or by flood lamps.

**Information on Processing** includes a listing of Kodak developers and development times at 68 F recommended for various purposes. Time-temperature development charts show the times at other temperatures to produce the same degrees of development.

**The Sensitometric Data** include both characteristic and time-gamma curves, plus descriptions of such film properties as color sensitivity, and resolving power.

For additional information on camera films and plates not covered in this book, the following Kodak publications are recommended: *Kodak Color Handbook*, *Kodak Graphic Arts Handbook*, *Kodak Industrial Handbook*, *Eastman Motion Picture Films for Professional Use*, and the *Kodak Data Books on Slides, Copying, Infrared and Ultraviolet Photography, Negative Making for Professional Photographers, Kodak Photographic Plates for Scientific and Technical Use*, and *Kodak Materials for Aerial Photography*. For specialized uses of Kodak films, write the Sales Service Division of the Eastman Kodak Company, 343 State Street, Rochester 4, New York.

ROLL FILM

Verichrome

Plus-X

Super-XX

35MM &amp; 828

Plus-X

Super-XX

Fine Grain  
Positive

Micro-File

Tri-X

Super-Panchro-  
Press, Type B

Super-XX

Portrait  
Panchromatic

Panatomic-X

Ortho-X

Super  
Ortho-PressSuper Speed  
Ortho Portrait

Commercial

Contrast Process

SHEET FILMS

## KODAK VERICHROME FILM

A high-speed, orthochromatic film for general outdoor use. It is satisfactory for night photography with flash lamps, and can also be used with photographic flood lamps.

**Safelight:** Use a Kodak Safelight Filter, Wratten Series 2 (dark red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet.

### Exposure

**Exposure Index:** Daylight—64 Tungsten—32

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	No. 58 (B)	No. 47 (CS)	Pola- Screen
Sunlight	2	2.5	5	8	3	2.5
Photoflood or high-efficiency tungsten	1.5	2	3	5	4	2.5

**Daylight Exposure Table:** Lens openings at 1/50 second.

SUBJECT TYPE	CLEAR SUN	HAZY SUN	CLOUDY-BRIGHT	CLOUDY-DULL OR OPEN SHADE (4)
Light Subject (1)	<i>f/16</i>	<i>f/11</i>	<i>f/8</i>	<i>f/5.6</i>
Average Subject (2)	<i>f/11</i>	<i>f/8</i>	<i>f/5.6</i>	<i>f/4 or f/4.5</i>
Dark Subject (3)	<i>f/8</i>	<i>f/5.6</i>	<i>f/4 or f/4.5</i>	<i>1/25 at f/4 or f/4.5</i>

(1) **Light Subject:** Distant scenery, near-by people in marine, beach, snow scenes. Light subjects predominating.

(2) **Average Subject:** Near-by people, gardens, houses, scenes not in shade. Light and dark objects in about equal proportions. Use this class if in doubt.

(3) **Dark Subject:** People in dark clothing; dark foliage, animals, buildings.

(4) **Open-Shade Subject:** Subjects shaded from the sun but lighted by a wide area of unobstructed clear sky. Larger lens openings are needed as the sky area decreases.

**Flood Lamp Exposures:** Two No. 2 Flood Lamps in Kodak Vari-Beam Lights at "STILL" position, or two No. R2 Reflector Flood Lamps.

Side Light-to-Subject Distance	3 ft	3½ ft	5½ ft	6 ft	7 ft
Camera Light-to-Subject Distance	5½ ft	6½ ft	8 ft	9 ft	10 ft
Lens Opening at 1/25 sec	<i>f/6.3</i>	<i>f/5.6</i>	<i>f/4.5</i>	<i>f/4</i>	<i>f/3.5</i>

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SP*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	65	120	170	200	1/100	80
1/50	65	100	140	170	1/250	50
1/100	60	90	125	140	1/500	35
1/200	50	70	95	110		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. Do not flash lamps in an explosive atmosphere.

## Recommended Development at 68 F:

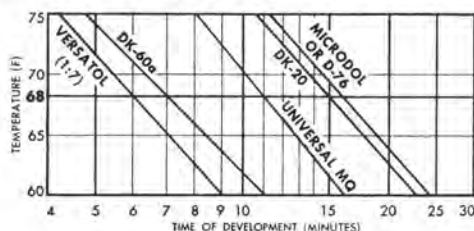
KODAK DEVELOPER	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-76*	13 minutes	16 minutes
Versatol**	(1:3) 3½ minutes	(1:7) 6 minutes
Universal M-Q*	(8 oz) 3½ minutes	(32 oz) 11 minutes
Microdol* (fine grain)	13 minutes	16 minutes
DK-20 (fine grain)	12 minutes	15 minutes
DK-60a*	5½ minutes	7 minutes

\*These developers are available in prepared powder form in several package sizes. Universal M-Q is supplied in convenient packets.

\*\*Kodak Versatol is supplied in concentrated liquid form.

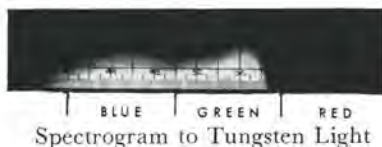
†Agitation at one-minute intervals during development.

**Time-Temperature Development Chart:** Showing developing times at various temperatures corresponding to recommended times at 68 F. Best results are obtained at 65 to 70 F.



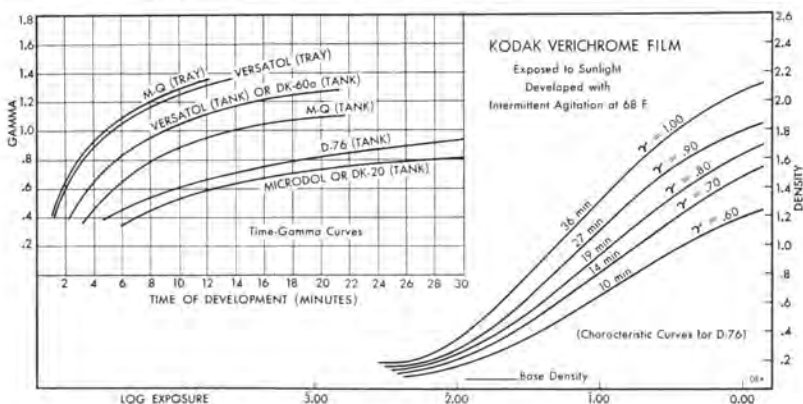
## Sensitometric Data

**Color Sensitivity:** Orthochromatic.



**Resolving Power:** 95 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



**Rolls Available:** V127, V120, V620, V116, V616, V101, V118, V124, V130, and V122.

# KODAK PLUS-X PANCHROMATIC ROLL FILM AND FILM PACK

A high-speed, fine-grain, Type B panchromatic film; it has excellent gradation and wide exposure latitude. Suited to a wide range of outdoor conditions, it also has ample speed for well-lighted indoor subjects. The low graininess and high resolving power permit high quality enlargements.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** Daylight—50 Tungsten—40

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	A	No. 58 (B)	No. 47 (C5)	Pola- Screen
Sunlight	1.5	2*	3	4	8	8	5	2.5
Photo flood or high-efficiency tungsten	1.5	1.5	2	3*	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Daylight Exposure Table:** Lens openings at 1/50 second.

SUBJECT TYPE	CLEAR SUN	HAZY SUN	CLOUDY-BRIGHT	CLOUDY-DULL OR OPEN SHADE (4)
Light Subject (1)	f/16	f/11	f/8	f/5.6
Average Subject (2)	f/11	f/8	f/5.6	f/4 or f/4.5
Dark Subject (3)	f/8	f/5.6	f/4 or f/4.5	1/25 at f/4 or f/4.5

(1) **Light Subject:** Distant scenery, near-by people in marine, beach, snow scenes. Light subjects predominating.

(2) **Average Subject:** Near-by people, gardens, houses, scenes not in shade. Light and dark objects in about equal proportions. Use this class if in doubt.

(3) **Dark Subject:** People in dark clothing; dark foliage, animals, buildings.

(4) **Open-Shade Subject:** Subjects shaded from the sun but lighted by a wide area of unobstructed clear sky. Larger lens openings are needed as the sky area decreases.

**Flood Lamp Exposures:** Two No. 2 Flood Lamps in Kodak Vari-Beam Lights at "STILL" position, or two No. R2 Reflector Flood Lamps.

Side Light-to-Subject Distance	3½ ft	4½ ft	6 ft	7 ft	8 ft
Camera Light-to-Subject Distance	6½ ft	7½ ft	9 ft	10 ft	11 ft
Lens Opening at 1/25 sec	f/6.3	f/5.6	f/4.5	f/4	f/3.5

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	75	140	190	220	1/100	90
1/50	75	110	160	190	1/250	55
1/100	65	100	140	160	1/500	40
1/200	55	80	110	120		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. Do not flash lamps in an explosive atmosphere.

## Recommended Development at 68 F:

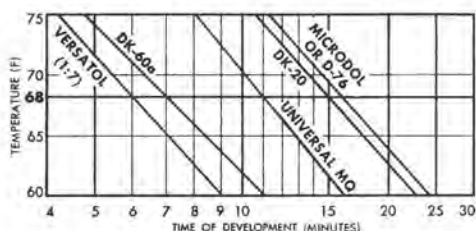
KODAK DEVELOPER	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-76*	13 minutes	16 minutes
Versatol**	(1:3) 3½ minutes	(1:7) 6 minutes
Universal M-Q*	(8 oz) 3½ minutes	(32 oz) 11 minutes
Microdol* (fine grain)	13 minutes	16 minutes
DK-20 (fine grain)	12 minutes	15 minutes
DK-60a*	5½ minutes	7 minutes

\*These developers are available in prepared powder form in several package sizes. Universal M-Q is supplied in convenient packets.

\*\*Kodak Versatol is supplied in concentrated liquid form.

†Agitation at one-minute intervals during development.

**Time-Temperature Development Chart:** Showing developing times at various temperatures corresponding to recommended times at 68 F. Best results are obtained at 65 to 70 F.



## Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



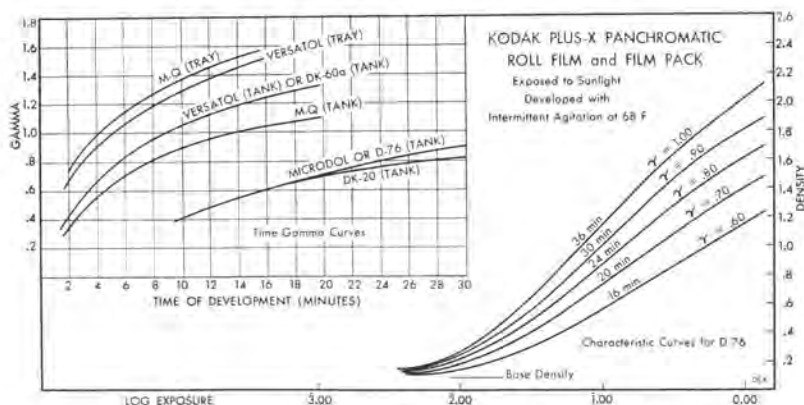
Spectrogram to Sunlight



Spectrogram to Tungsten Light

**Resolving Power:** 95 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



**Rolls and Packs Available:** Roll Films: PX127, PX120, PX620, PX116, PX616, and PX122. Film Packs: PX520, PX518, PX541, and PX523.

# KODAK SUPER-XX PANCHROMATIC ROLL FILM AND FILM PACK

A very high-speed, Type B panchromatic film, for indoor and outdoor use under adverse lighting conditions. Especially valuable for use with artificial light. With photoflood lamps, permits instantaneous exposures with simple lens cameras.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** *Daylight—100 Tungsten—80*

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	A	No.58 (B)	No.47 (C5)	X1	Pola- Screen
Sunlight	1.5	2*	3	8	8	5	4	2.5
Photoflood or high-efficiency tungsten	1.5	1.5	2	4	8	10	3*	2.5

\*For correct monochromatic rendering of colored objects.

**Daylight Exposure Table:** Lens openings at 1/100 second.

SUBJECT TYPE	CLEAR SUN	HAZY SUN	CLOUDY-BRIGHT	CLOUDY-DULL OR OPEN SHADE (4)
Light Subject (1)	f/16	f/11	f/8	f/5.6
Average Subject (2)	f/11	f/8	f/5.6	f/4 or f/4.5
Dark Subject (3)	f/8	f/5.6	f/4 or f/4.5	1/50 at f/4 or f/4.5

(1) **Light Subject:** Distant scenery, near-by people in marine, beach, snow scenes. Light subjects predominating.

(2) **Average Subject:** Near-by people, gardens, houses, scenes not in shade. Light and dark objects in about equal proportions. Use this class if in doubt.

(3) **Dark Subject:** People in dark clothing; dark foliage, animals, buildings.

(4) **Open-Shade Subject:** Subjects shaded from the sun but lighted by a wide area of unobstructed clear sky. Larger lens openings are needed as the sky area decreases.

**Flood Lamp Exposures:** Two No. 2 Flood Lamps in Kodak Vari-Beam Lights at "STILL" position, or two No. R2 Reflector Flood Lamps.

Side Light-to-Subject Distance	3 ft	4 ft	7 ft	8½ ft	10 ft	11 ft
Camera Light-to-Subject Distance	4½ ft	7 ft	10 ft	12 ft	14 ft	16 ft
Lens Opening at 1/25 sec	f/11	f/8	f/5.6	f/4.5	f/4	f/3.5

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	110	200	260	300	1/100	130
1/50	110	160	220	260	1/250	80
1/100	95	140	200	220	1/500	55
1/200	75	110	150	170		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash lamps in an explosive atmosphere.*



## Recommended Development at 68 F:

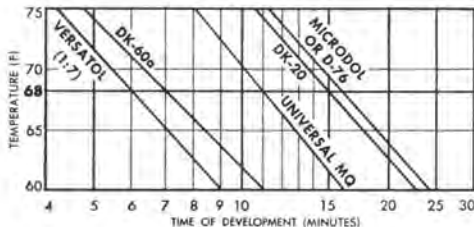
KODAK DEVELOPER	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-76*	13 minutes	16 minutes
Versatol**	(1:3) 3½ minutes	(1:7) 6 minutes
Universal M-Q*	(8 oz) 3½ minutes	(32 oz) 11 minutes
Microdol* (fine grain)	13 minutes	16 minutes
DK-20 (fine grain)	12 minutes	15 minutes
DK-60a*	5½ minutes	7 minutes

\*These developers are available in prepared powder form in several package sizes. Universal M-Q is supplied in convenient packets.

\*\*Kodak Versatol is supplied in concentrated liquid form.

†Agitation at one-minute intervals during development.

**Time-Temperature Development Chart:** Showing development times at various temperatures corresponding to recommended times at 68 F. Best results are obtained at 65 to 70 F.



## Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



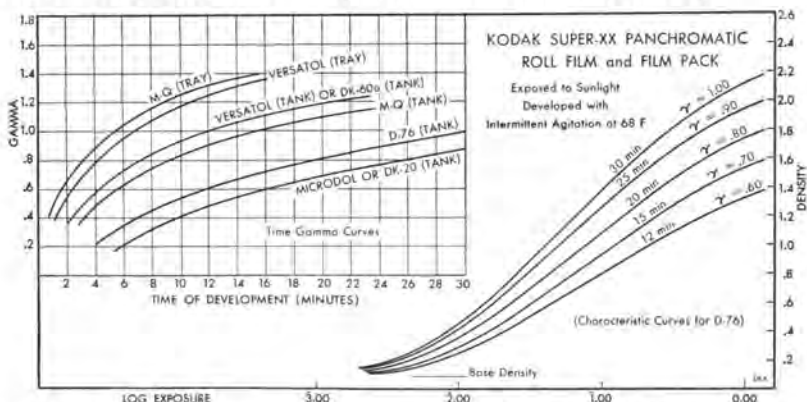
Spectrogram to Sunlight



Spectrogram to Tungsten Light

**Resolving Power:** 90 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



**Rolls and Packs Available:** Roll Films: XX127, XX120, XX620, XX116, XX616, XX118, XX130, and XX122. Film Packs: XX520, XX516, XX518, XX541, XX522, XX523, and XX515.

## KODAK PLUS-X PANCHROMATIC FILM FOR MINIATURE CAMERAS (35mm and 828)

A high-speed, fine-grain, Type B panchromatic film. For general miniature camera work this film should be used unless light conditions are very adverse.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

### Exposure

**Exposure Index:** *Daylight—50 Tungsten—40*

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	A	No. 58 (B)	No. 47 (C5)	Pola- Screen
Sunlight	1.5	2*	3	4	8	8	5	2.5
Photoflood or high-efficiency tungsten	1.5	1.5	2	3*	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Daylight Exposure Table:** Lens openings at 1/100 second.

SUBJECT TYPE	CLEAR SUN	HAZY SUN	CLOUDY-BRIGHT	CLOUDY-DULL OR OPEN SHADE (4)
Light Subject (1)	<i>f/11</i>	<i>f/8</i>	<i>f/5.6</i>	<i>f/4</i>
Average Subject (2)	<i>f/8</i>	<i>f/5.6</i>	<i>f/4</i>	<i>f/2.8</i>
Dark Subject (3)	<i>f/5.6</i>	<i>f/4</i>	<i>f/2.8</i>	<i>f/2</i>

(1) **Light Subject:** Distant scenery, near-by people in marine, beach, snow scenes. Light subjects predominating.

(2) **Average Subject:** Near-by people, gardens, houses, scenes not in shade. Light and dark objects in about equal proportions. Use this class if in doubt.

(3) **Dark Subject:** People in dark clothing; dark foliage, animals, buildings.

(4) **Open-Shade Subject:** Subjects shaded from the sun but lighted by a wide area of unobstructed clear sky. Larger lens openings are needed as the sky area decreases.

**Flood Lamp Exposures:** Two No. 2 Flood Lamps in Kodak Vari-Beam Lights at "STILL" position, or two No. R2 Reflector Flood Lamps.

Side Light-to-Subject Distance	3½ ft	4½ ft	6 ft	7 ft	8 ft	10 ft	14 ft
Camera Light-to-Subject Distance	6½ ft	7½ ft	9 ft	10 ft	11 ft	14 ft	20 ft
Lens Opening at 1/25 sec.	<i>f/6.3</i>	<i>f/5.6</i>	<i>f/4.5</i>	<i>f/4</i>	<i>f/3.5</i>	<i>f/2.8</i>	<i>f/2</i>

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	6† or 26†
Open, 1/25	75	140	190	220	1/100	90
1/50	75	110	160	190	1/250	55
1/100	65	100	140	160	1/500	40
1/200	55	80	110	120		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector. ‡In 4- to 5-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash lamps in an explosive atmosphere.*

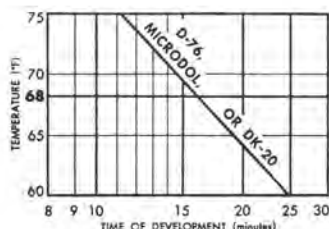
## Recommended Development at 68 F:

KODAK DEVELOPER	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-76* (general use)	13 minutes	16 minutes
Microdol* or DK-20 (fine grain)	13 minutes	16 minutes

\*These developers are available in prepared powder form in several package sizes.  
†Agitation at one-minute intervals during development.

### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to recommended times at 68 F. Best results are obtained at 65 to 70 F.



### Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



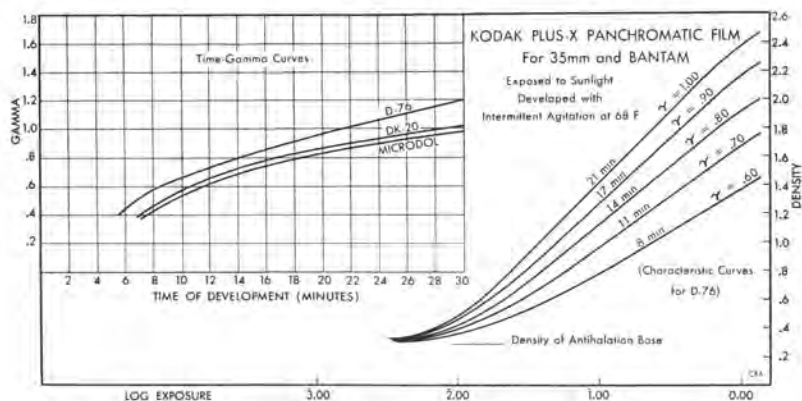
Spectrogram to Sunlight



Spectrogram to Tungsten Light

**Resolving Power:** 95 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak D-76.

**Sensitometric Curves:** For average product and average processing.



**Rolls Available:** PX828 (8 exposures). 35mm—PX135 magazine (20 or 36 exposures), and bulk rolls 35mm, perforated, frame-numbered, PX410 (27½ ft), PX401 (50 ft), PX402 (100 ft), and other not frame-numbered special spoolings, also in 35mm and 70mm, unperforated, not frame-numbered, bulk rolls.

# KODAK SUPER-XX PANCHROMATIC FILM FOR MINIATURE CAMERAS (35mm and 828)

A very high-speed, Type B panchromatic film; for indoor and outdoor use under adverse lighting conditions and where very fast shutter speeds are necessary. Especially valuable for exposures by artificial light.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** Daylight—100 Tungsten—80

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	A	No.58 (B)	No.47 (C5)	Pola- Screen
Sunlight	1.5	2*	3	4	8	8	5	2.5
Photoflood or high-efficiency tungsten	1.5	1.5	2	3*	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Daylight Exposure Table:** Lens openings at 1/100 second.

SUBJECT TYPE	CLEAR SUN	HAZY SUN	CLOUDY-BRIGHT	CLOUDY-DULL OR OPEN SHADE (4)
Light Subject (1)	f/16	f/11	f/8	f/5.6
Average Subject (2)	f/11	f/8	f/5.6	f/4
Dark Subject (3)	f/8	f/5.6	f/4	f/2.8

(1) **Light Subject:** Distant scenery, near-by people in marine, beach, snow scenes. Light subjects predominating.

(2) **Average Subject:** Near-by people, gardens, houses, scenes not in shade. Light and dark objects in about equal proportions. Use this class if in doubt.

(3) **Dark Subject:** People in dark clothing; dark foliage, animals, buildings.

(4) **Open-Shade Subject:** Subjects shaded from the sun but lighted by a wide area of unobstructed clear sky. Larger lens openings are needed as the sky area decreases.

**Flood Lamp Exposures:** Two No. 2 Flood Lamps in Kodak Vari-Beam Lights at "STILL" position, or two No. R2 Reflector Flood Lamps.

Side Light-to-Subject Distance	3 ft	4 ft	7 ft	10 ft	14 ft	20 ft
Camera Light-to-Subject Distance	4½ ft	7 ft	10 ft	14 ft	20 ft	28 ft
Lens Opening at 1/25 sec	f/11	f/8	f/5.6	f/4	f/2.8	f/2

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	6† or 26†
Open, 1/25	110	200	260	300	1/100	130
1/50	110	160	220	260	1/250	80
1/100	95	140	200	220	1/500	55
1/200	75	110	150	170		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector. ‡In 4- to 5-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash lamps in an explosive atmosphere.*

## Recommended Development at 68 F:

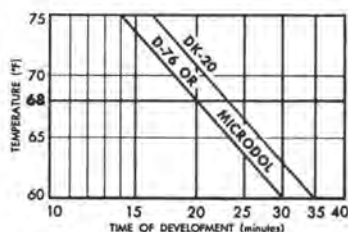
KODAK DEVELOPER	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-76* (general use)	16 minutes	20 minutes
Microdol* (fine grain)	16 minutes	20 minutes
DK-20 (fine grain)	18 minutes	23 minutes

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to recommended times at 68 F. *Best results are obtained at 65 to 70 F.*



### Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



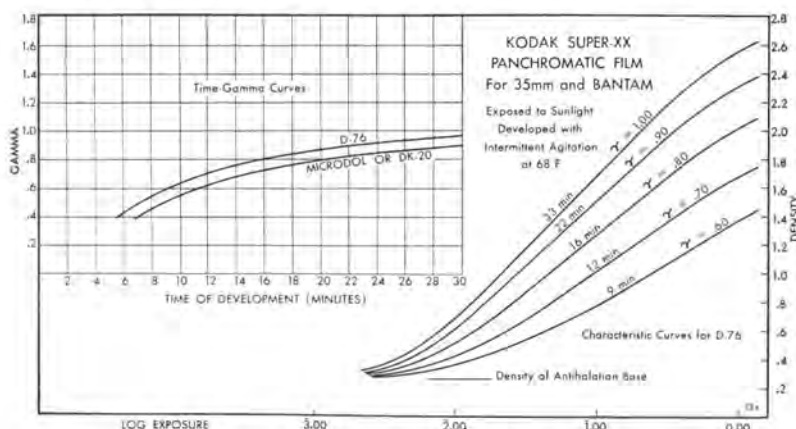
Spectrogram to Sunlight



Spectrogram to Tungsten Light

**Resolving Power:** 90 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak D-76.

**Sensitometric Curves:** For average product and average processing.



**Rolls Available:** XX828 (8 exposures), 35mm—XX135 magazine (20 or 36 exposures), and bulk rolls 35mm, perforated, frame-numbered, XX410 (27½ ft), XX401 (50 ft), XX402 (100 ft), and other not frame-numbered special spoolings, also in 35mm and 70mm, unperforated, not frame-numbered, bulk rolls.

## KODAK FINE GRAIN POSITIVE FILM

This film has a low-speed, positive-type emulsion, useful for printing positive transparencies, from continuous-tone or line negatives, for use in miniature slide projectors. It is not recommended for general camera work, but can be used for copying.

**Safelight:** Use a Kodak Safelight Filter, Wratten Series 1A (light red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet. A Series 0A (greenish yellow) can be used up to 2 minutes at 4 feet from the film with the 15-watt bulb in the lamp.

### For Transparencies

#### Relative Printing Speed:

Fine Grain Positive—about 2 times speed of Kodabromide Paper No. 2.

The exact printing speed will depend on the development time to be used. Transparencies can be printed by projection or by contact with reduced illumination in the printer.

**Develop** at 68 F for times given in the following table, to obtain contrasts corresponding approximately to the grade of paper given:

EQUIVALENT GRADE OF PAPER		DEVELOPMENT TIME WITH CONTINUOUS AGITATION AT 68 F KODAK DEVELOPERS: DEKTOL (1:2); VERSATOL (1:3); OR D-72 (1:2)		
Azo	Kodabromide			
Contact Printed	Contact Printed	Projection Printed	Films Printed by Contact	Films Printed by Projection
0	1	—	1¼ minutes	—
1	2	1	3½ minutes	1¼ minutes
2	3	2	5 minutes	3½ minutes
3	4	3	7 minutes	5 minutes
4	5	4	—	7 minutes

**Examples:** If a negative is known to yield good prints by contact on Kodak Azo Paper, Grade No. 1, then a transparency properly exposed by contact on Kodak Fine Grain Positive Film should develop to the proper contrast in approximately 3½ minutes (column 4). If the negative is printed by *projection* on Fine Grain Positive Film, development time should be reduced to 1¼ minutes (column 5). Likewise, a negative should produce good transparencies with this film and processing, if it is known to yield good prints by projection on Kodabromide Paper, Grade No. 1 (column 3).

If the contrast of the negative is judged by tests, it is suggested that the test exposures be made on Kodabromide Paper, even for transparencies printed by contact, since the intensity of the printing illumination suitable for Kodak Fine Grain Positive Film is too low for regular contact papers such as Azo.

**For higher contrast** from low-contrast negatives, develop in Kodak Developer D-11 for 7 minutes.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

**Fix** 5 to 10 minutes at 65 to 70 F in a solution prepared from Kodak Acid Fixer or in Kodak Fixing Bath F-5. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water; then place the film in a tray of clean water, swab it with cotton while under water, and rinse it under a faucet. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

**Toners Suitable:** Kodak Sepia Toner, Kodak Sulfide Toner T-10 (sepia), Kodak Iron Toner T-11 (blue), Kodak Dye Toner T-20, Kodak Toner T-18.

### **Exposure and Development Recommendations for Copying**

KIND OF ORIGINAL	COPYING INDEXES		RECOMMENDED DEVELOPMENT	
			KODAK DEVELOPER	TIME AT 68 F WITH CONTINUOUS AGITATION
Continuous Tone	<i>Daylight</i> <b>1.2</b>	<i>Tungsten</i> <b>0.3</b>	D-76	3 minutes
Line	<b>12</b>	<b>3</b>	D-11	7 minutes

The above Copying Indexes are recommended for meters marked for American Standard Exposure Indexes. They are for trial exposure only. They apply to *incident light meters* directly and to *reflected light meters* used with the Kodak Neutral Test Card (18% gray side) at the copy board. A matte white card will serve, in which case use one-fifth the above values, e.g., 0.06 and 0.6 as tungsten values for the two conditions given above. Since these numbers are too low to appear on the meter calculator scale, multiply them by 100, and give 100 times the calculated exposure time.

Allow for the increase in the effective *f*-number caused by extended bellows.

**Exposure Example for Copying:** With two No. 1 photographic flood lamps in Kodak Copying Lights, Model 2, or in satin-finished reflectors at 40 inches: Fine Grain Positive Film (developed in Kodak D-76 for continuous-tone originals) about 30 seconds at *f*/11.

**Rinse, fix, wash, and dry** as recommended for transparencies.

**Note:** Kodak Developers D-11, D-76, and Dektol (powder form), and Kodak Versatol Developer (concentrated liquid form) are available in several sizes.

**Forms Available:** Kodak Fine Grain Positive Film 35mm, *perforated, not frame-numbered*, P402 (100 ft) bulk rolls, and 35mm, *unperforated, not frame-numbered*, P426 (100 ft) rolls, also some sheet-film sizes.

Kodak Fine Grain Positive Film P412 (100 ft), 35mm, *perforated, not frame-numbered*, for use in the Graflex Photorecord Microfilm Outfit and 35mm Graflex Photorecord Identification Unit or Camera.





For the portraiture of men, orthochromatic films, such as Kodak Ortho X or Super Ortho Press, help to strengthen character by emphasizing facial textures.

## Sensitometric Data

### Color Sensitivity:

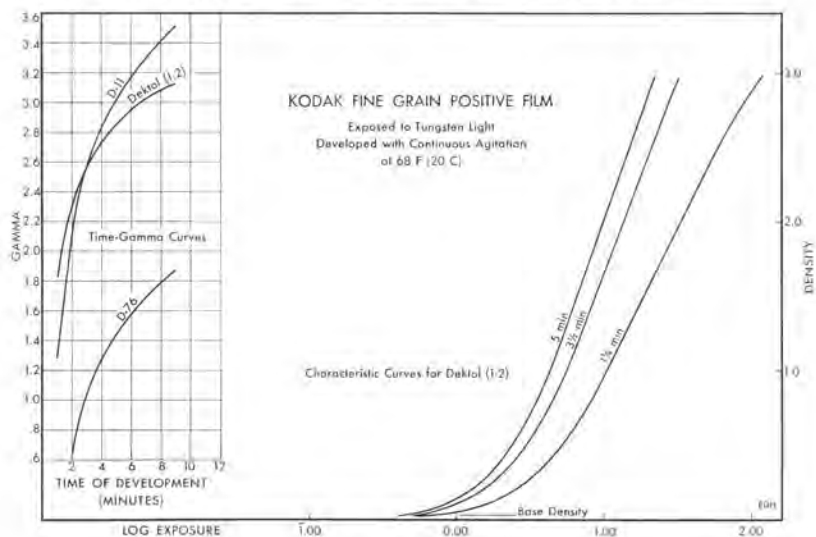
Blue sensitive only.

Spectrogram to Tungsten Light



**Resolving Power:** 120 lines per mm. For optimum exposure, subject contrast 50 to 1, and recommended development in Kodak Dektol (1:2).

**Sensitometric Curves:** For average product and average processing.



## KODAK MICRO-FILE FILM (35mm)

This film has an extremely fine-grain, slow, special panchromatic emulsion, especially designed for making greatly reduced copies of books, newspapers, manuscripts, line drawings, letters, etc. It should be used in all cases where the copy negatives represent more than a tenfold reduction in size.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds at not less than 4 feet.

### Exposure

**Exposure Index** for meters marked for American Standard Exposure Indexes:

#### *Tungsten—16*

This setting is recommended for trial exposures in copying. It applies to *incident light meters* directly and to *reflected light meters* with the Kodak Neutral Test Card (18% gray side) at the copy board. A matte white card will serve, in which case use one-fifth the above value, e.g., 3 as the tungsten value.

Allow for the increase in effective *f*-number caused by the extension of the lens.

**Illumination:** It is recommended that two light sources be used, one on either side of the copy material. Arrange them so that the light strikes the material at about a 45° angle. A sheet of plate glass is often used to hold the copy flat.

**Exposure Example:** With two No. 1 Flood Lamps in matte-surfaced reflectors at about 24 inches from the copy, the exposure will be about  $\frac{1}{2}$  second at *f*/16. The use of No. 2 Flood Lamps will permit shorter exposures. To obtain an image of sufficient size, it may be necessary to use a supplementary lens, such as the Kodak Portra 1+, 2+, or 3+ Lens on the camera. Care should be taken in centering the copy and focusing the camera.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K2	G	A
Photoflood or high-efficiency tungsten	1.5	2	6

For copying badly aged, faded manuscripts or books with yellowed paper, use the Kodak Wratten K2 or G Filter to secure added contrast. For copying blueprints, the Kodak Wratten A Filter is recommended.

### Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-11 (High contrast)	4 minutes	5 minutes

\*This developer is available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

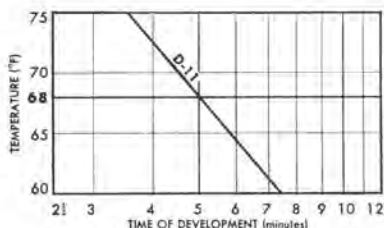
\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

**Fix** 5 to 10 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water; then place the film in a tray of clean water, swab it with cotton while under water, and rinse it under a faucet. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

**Time-Temperature Development Chart:** Showing developing times at various temperatures corresponding to recommended time at 68 F. *Best results are obtained at 65 to 70 F.*



### Sensitometric Data

#### Color Sensitivity:

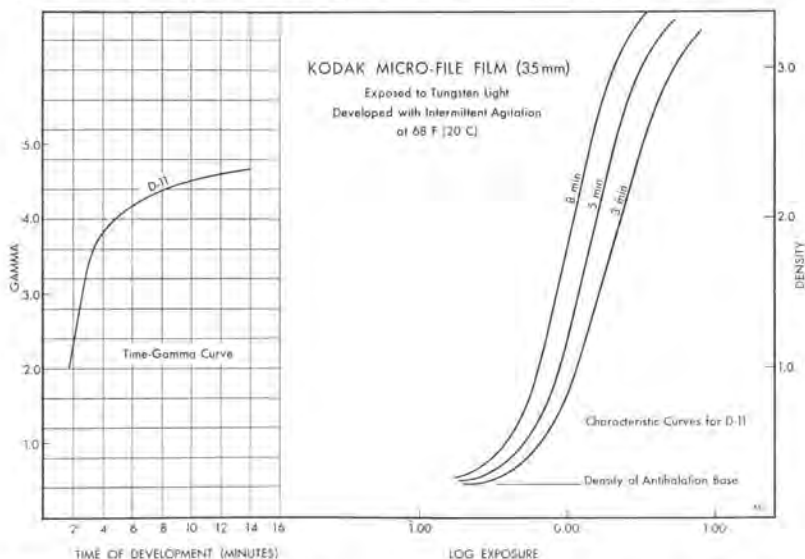
Special Panchromatic.

Spectrogram to Tungsten Light

**Graininess:** Extremely low.

**Resolving Power:** 175 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak D-11.

**Sensitometric Curves:** For average product and average processing.



**Rolls Available:** 35mm—M135 magazine (36 exposures), and bulk rolls, 35mm, perforated, frame-numbered, M402 (100 ft), also in 35mm, perforated, not frame-numbered, M412 (100 ft) for use in the Graflex Photorecord Microfilm Outfit and 35mm Graflex Photorecord Identification Unit or Camera.

# KODAK TRI-X PANCHROMATIC SHEET FILM

Code Notch

An extremely fast, Type C panchromatic, antihalation film of moderate contrast. It is suitable for portraiture and for commercial and illustrative work whenever short exposures are required.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** Daylight—200 Tungsten—160

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	X2	A	B	C5	Pola-Screen
Sunlight	1.5	2	2.5	5*	6	6	10	5	2.5
Photo flood or high-efficiency tungsten	1.5	1.5	2	4	5*	3	10	10	2.5

\*For correct monochromatic rendering of colored objects.

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	150	280	380	450	1/100	180
1/50	150	220	320	380	1/250	110
1/100	130	200	280	320	1/500	80
1/200	110	160	220	240		
1/400	70	120	160	170		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Commercial (DK-60a)	6½ minutes	8 minutes
Photography (DK-50)	7½ minutes	9½ minutes
Portrait (DK-60a)	4½ minutes	5½ minutes
Photography (DK-50)	5½ minutes	7 minutes

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

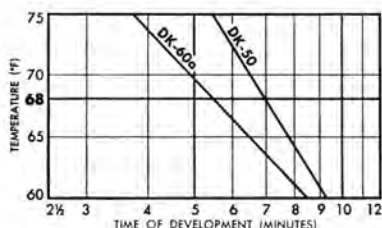
**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

**Time-Temperature Development Chart:**

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



**Sensitometric Data**

**Color Sensitivity:** Panchromatic, Type C.



Spectrogram to Sunlight

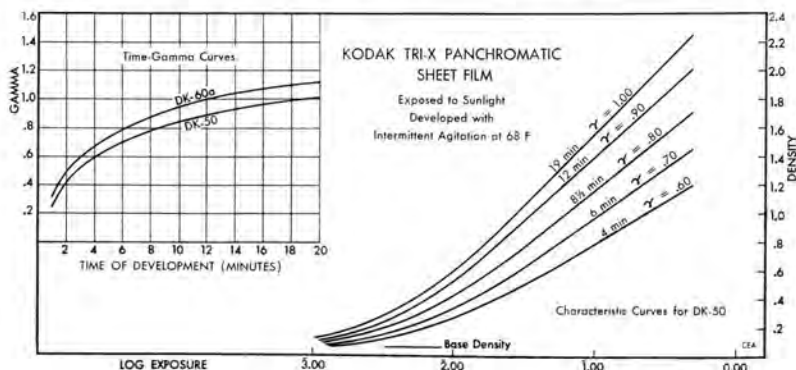


Spectrogram to Tungsten Light

**Graininess:** Allows moderate enlargement without objectionable grain.

**Resolving Power:** 65 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



# KODAK SUPER PANCHRO-PRESS TYPE B SHEET FILM

Code Notch

A very fast, Type B panchromatic, antihalation film of moderate graininess. Its high quality and great versatility make it equally suitable for portraiture, commercial, illustrative, and press photography. This film produces excellent negatives with all types of indoor and outdoor illumination. Its color sensitivity is particularly suitable for Kodatron, fluorescent, and flash lighting.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** Daylight—125 Tungsten—100

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	No. 29 (F)	A	No. 58 (B)	No. 47 (C5)	Pola-Screen
Sunlight	1.5	2*	3	4	16	8	8	5	2.5
Photofood or high-efficiency tungsten	1.5	1.5	2	3*	8	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	120	220	300	350	1/100	140
1/50	120	180	250	300	1/250	90
1/100	110	160	220	250	1/500	65
1/200	85	130	170	190		
1/400	60	95	125	130		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash lamps in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*		Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Press Photography	DK-60a	5 minutes	6 minutes
	D-19	4 minutes	5 minutes
	Dektol (1:1)	3 minutes	4 minutes
	D-72 (1:1)	3 minutes	4 minutes
Commercial Photography	DK-50	5 minutes	6 minutes
	DK-60a	4 minutes	5 minutes
Portrait Photography	DK-50	4½ minutes (full strength)	8 minutes (diluted 1:1)

\*These developers (except D-72) are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.



**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

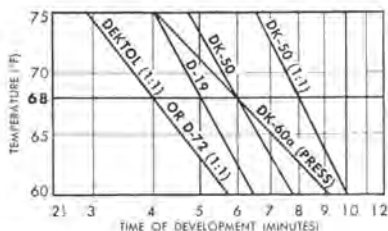
**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

#### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



#### Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



Spectrogram to Sunlight

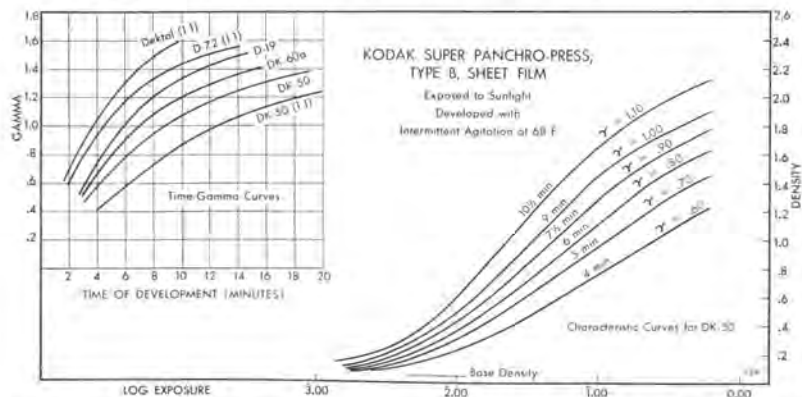


Spectrogram to Tungsten Light

**Graininess:** Allows moderate enlargement without objectionable grain.

**Resolving Power:** 80 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak D-19.

**Sensitometric Curves:** For average product and average processing.



# KODAK SUPER-XX PANCHROMATIC SHEET FILM

Code Notch

A high-speed, Type B panchromatic, antihalation film of moderate contrast and low enough graininess to permit reasonable enlargement without loss of quality. It is suitable for general indoor and outdoor use, portraiture, commercial, and illustrative work, and for color-separation negatives.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** Daylight—100 Tungsten—80

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	F	A	B	C5	Polar-Screen
Sunlight	1.5	2*	3	4	16	8	8	5	2.5
Photo flood or high-efficiency tungsten	1.5	1.5	2	3*	8	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	110	200	260	300	1/100	130
1/50	110	160	220	260	1/250	80
1/100	95	140	200	220	1/500	55
1/200	75	110	150	170		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Commercial Photography		
DK-60a	4½ minutes	5½ minutes
DK-50	6½ minutes	8 minutes
D-76	13 minutes	16 minutes
Portrait Photography		
DK-60a	3½ minutes	4½ minutes
DK-50	5 minutes	6 minutes
DK-50 (1:1)	7 minutes	9 minutes

\*Available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

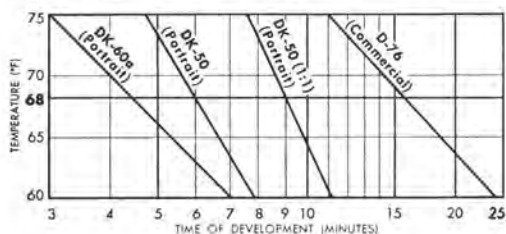
\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

**Time-Temperature Development Chart:** Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



### Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



BLUE GREEN RED  
Spectrogram to Sunlight

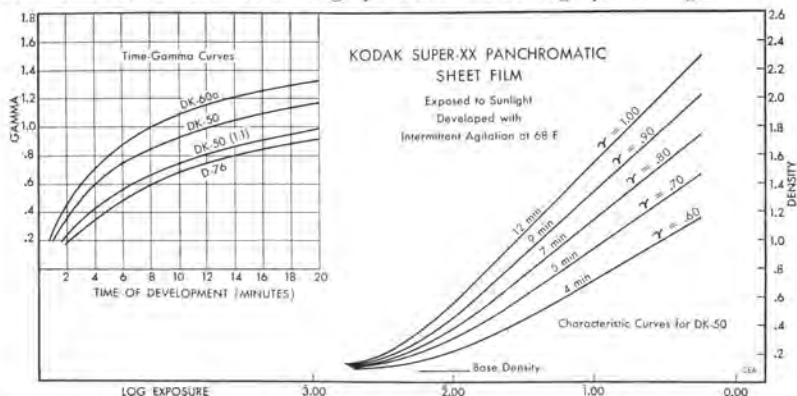


BLUE GREEN RED  
Spectrogram to Tungsten Light

**Graininess:** Moderately fine grain. Allows considerable degree of enlargement without objectionable grain.

**Resolving Power:** 90 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



**Note:** Recommendations for making color-separation negatives are included in the instruction sheet packed with the film.

# KODAK PORTRAIT PANCHROMATIC SHEET FILM

Code Notch

A Type B panchromatic, antihalation film of moderately high speed and good exposure latitude. Its many uses include portraiture by daylight or tungsten light, landscape work, and general photography of colored objects when accurate rendering of colors in tones of gray is required.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Index:** *Daylight—64 Tungsten—40*

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	No. 29 (F)	A	No. 58 (B)	No. 47 (C5)	Pola- Screen
Sunlight	1.5	2*	3	4	16	8	8	5	2.5
Photoflood or high-efficiency tungsten	1.5	1.5	2	3*	8	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	75	140	190	220	1/100	90
1/50	75	110	160	190	1/250	55
1/100	65	100	140	160	1/500	40
1/200	55	80	110	120		

\*In Kodak Flashholder or similar 4-to 5-inch satin-finished reflector. †In 6-to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash lamps in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*		Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Portrait Photography	DK-60a	3 minutes	4 minutes
	DK-50	4 minutes	5 minutes
	DK-50 (1:1)	6½ minutes	8 minutes
Commercial Photography	DK-60a	4½ minutes	5½ minutes
	DK-50	5½ minutes	7 minutes
	DK-50 (1:1)	8½ minutes	11 minutes

\*Available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

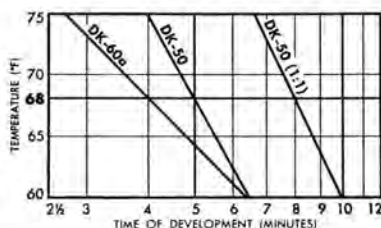
**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

#### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



#### Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



BLUE GREEN RED  
Spectrogram to Sunlight

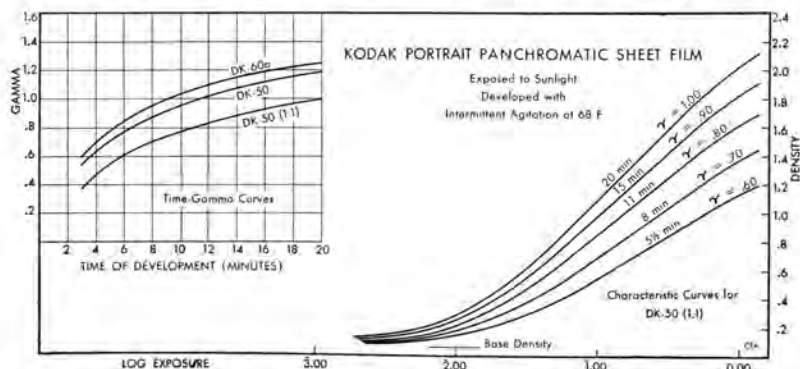


BLUE GREEN RED  
Spectrogram to Tungsten Light

**Graininess:** Allows moderate enlargement without objectionable grain.

**Resolving Power:** 85 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-50.

**Sensitometric Curves:** For average product and average processing.



# KODAK PANATOMIC-X SHEET FILM

Code Notch

A Type B panchromatic, antihalation film of moderate speed and contrast, adapted by its very fine grain to use whenever a considerable degree of enlargement is required. It is excellent for copying, and for general use in commercial work when high speed is not necessary.

**Safelight:** *Total darkness required.* A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds *only*, at 4 feet, after development is half completed.

## Exposure

**Exposure Indexes** for meters marked for American Standard Exposure Indexes:

*Daylight—32*

*Tungsten—25*

*White Flame Arc—80*

**For Copying:** These settings are recommended for trial exposures and apply to *incident light meters* directly and to *reflected light meters* with the Kodak Neutral Test Card (18% gray side) at the copy board. A matte white card will serve, in which case use one-fifth the above values, e.g., 5 as the tungsten value.

Allow for the increase in effective *f*-number caused by extended bellows.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	X1	A	B	C5	Pola-Screen
Sunlight	1.5	2*	3	4	8	8	5	2.5
Photoflood or high-efficiency tungsten	1.5	1.5	2	3*	4	8	10	2.5

\*For correct monochromatic rendering of colored objects.

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	60	110	150	170	1/100	70
1/50	60	90	125	150	1/250	45
1/100	55	80	110	125	1/500	32
1/200	45	65	85	95		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-76*	13 minutes	16 minutes
DK-60a*	3½ minutes	4½ minutes
DK-50*	4½ minutes	5½ minutes
Microdol* (fine grain)	13 minutes	16 minutes
DK-20 (fine grain)	14 minutes	18 minutes

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

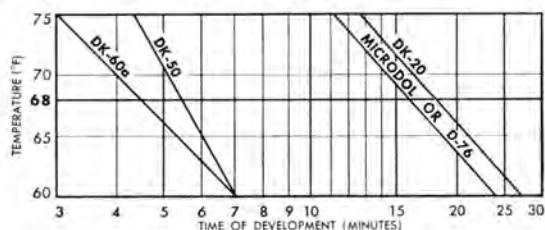
\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

**Time-Temperature Development Chart:** Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



### Sensitometric Data

**Color Sensitivity:** Panchromatic, Type B.



Spectrogram to Sunlight

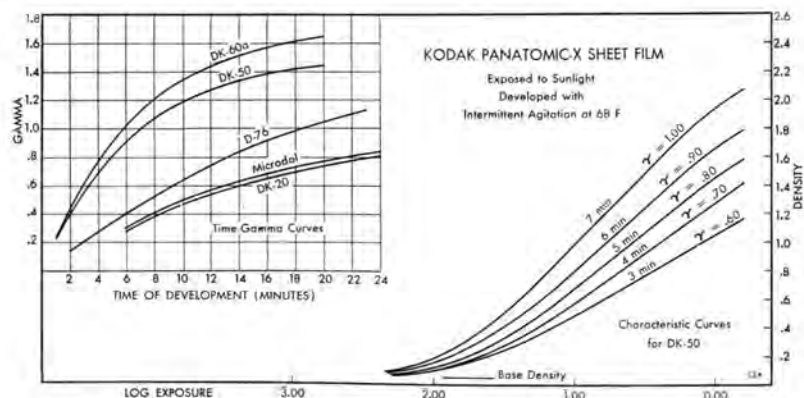


Spectrogram to Tungsten Light

**Graininess:** Very fine grain. Permits great enlargement without noticeable grain even without special fine-grain processing.

**Resolving Power:** 100 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.





A very fast, orthochromatic, antihalation film of moderate contrast, well adapted to portraiture and many types of commercial and illustrative photography. It can be used effectively with all types of lighting, including either tungsten or fluorescent, and is particularly suitable for portraits of men.

**Safelight:** Use a Kodak Safelight Filter, Wratten Series 2 (dark red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet.

### Exposure

**Exposure Index:** Daylight—125 Tungsten—64

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	B	C5	Polar-Screen
Sunlight	2	2.5	5	8	3	2.5
Photoflood or high-efficiency tungsten	1.5	2	3	5	4	2.5

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	95	170	240	380	1/100	110
1/50	95	140	200	240	1/250	70
1/100	85	125	170	200	1/500	50
1/200	70	100	130	150		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. Do not flash in an explosive atmosphere.

### Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Commercial /DK-60a Photography /DK-50	5½ minutes 7 minutes	7 minutes 9 minutes
Portrait /DK-60a Photography /DK-50	4 minutes 5 minutes	5 minutes 6 minutes

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

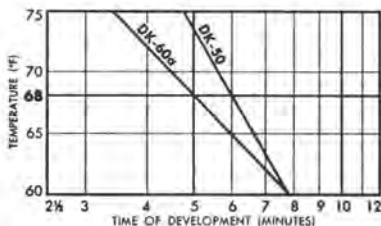
**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

#### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



#### Sensitometric Data

**Color Sensitivity:** Orthochromatic.



Spectrogram to Sunlight

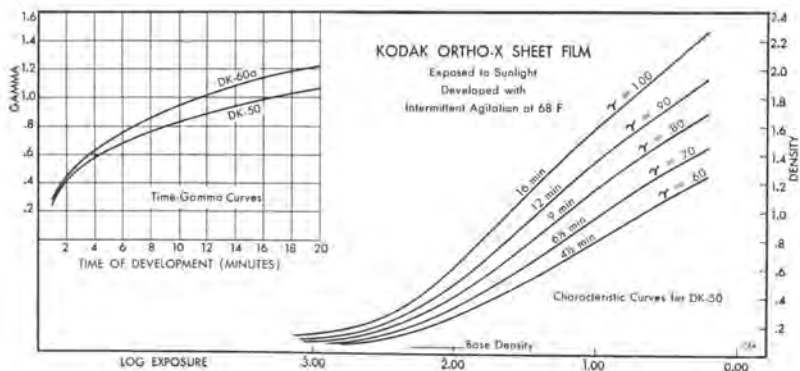


Spectrogram to Tungsten Light

**Graininess:** Allows moderate enlargement without objectionable grain.

**Resolving Power:** 85 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



# KODAK SUPER ORTHO-PRESS SHEET FILM

Code Notch

A high-speed, orthochromatic, antihalation film. Intended primarily for press work, it is also suitable for commercial and illustrative work requiring high speed and brilliant negatives. The orthochromatic sensitivity aids in securing good rendering of flesh tones in flash pictures.

**Safelight:** Use a Kodak Safelight Filter, Wratten Series 2 (dark red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet.

## Exposure

**Exposure Index:** Daylight—100 Tungsten—50

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	B	C5	Polar-Screen
Sunlight	2	2.5	5	8	3	2.5
Photoflood or high-efficiency tungsten	1.5	2	3	5	4	2.5

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SP*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	85	150	210	250	1/100	100
1/50	85	130	180	210	1/250	65
1/100	75	110	160	180	1/500	45
1/200	60	90	120	130		
1/400	40	65	90	95		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*		Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Press Photography	DK-60a	4½ minutes	5½ minutes
	D-19	4 minutes	5 minutes
	Dektol (1:1)	3 minutes	4 minutes
	D-72 (1:1)	3 minutes	4 minutes
Commercial Photography	DK-50	4½ minutes	5½ minutes
	DK-60a	3½ minutes	4½ minutes

\*These developers (except D-72) are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

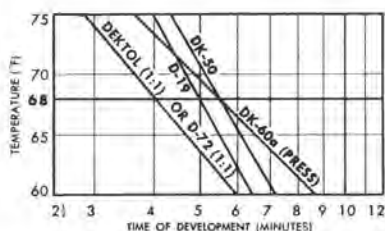
**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

#### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



#### Sensitometric Data

**Color Sensitivity:** Orthochromatic.



Spectrogram to Sunlight

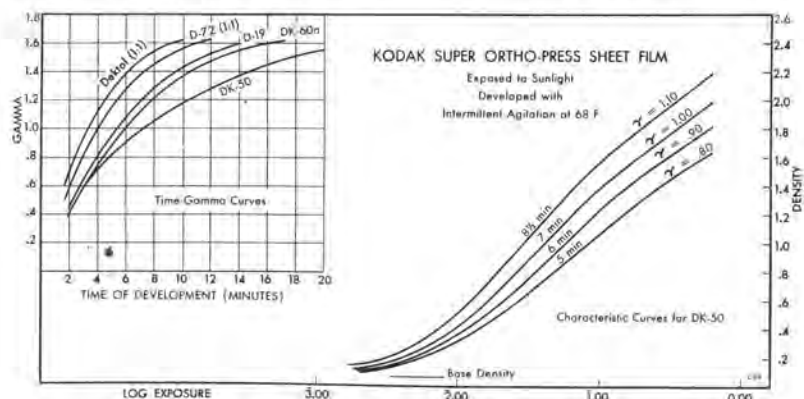


Spectrogram to Tungsten Light

**Graininess:** Moderate. Allows enlargement without objectionable grain.

**Resolving Power:** 95 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing,



# KODAK SUPER SPEED ORTHO PORTRAIT SHEET FILM

Code Notch

A moderately fast, orthochromatic, antihalation film with a long scale of gradation giving good tonal separation even in extreme highlights and deep shadows. It can be used with all normal types of lighting, and is suitable for use under a wide range of studio conditions.

**Safelight:** Use a Kodak Safelight Filter, Wratten Series 2 (dark red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet.

## Exposure

**Exposure Index:** Daylight—50 Tungsten—25

These settings are recommended for meters marked for American Standard Exposure Indexes. Normally they provide a safety factor in exposure when the film is developed as recommended.

**Filter Factors:** Increase normal exposure by filter factor given below:

LIGHT SOURCE	K1	K2	G	No. 58 (B)	No. 47 (C5)	Polar-Screen
Sunlight	2	2.5	5	8	3	2.5
Photoflood or high-efficiency tungsten	1.5	2	3	5	4	2.5

**Flash Exposure Guide Numbers:** To get *f*-number, divide guide number by lamp-to-subject distance in feet, taken to a point midway between nearest and farthest details of interest. In small white rooms, use one stop smaller.

BETWEEN-LENS SHUTTERS	SM* or SF*	5* or 25*	11† or 40†	22† or 2†	FOCAL-PLANE SHUTTERS	31† or 2A†
Open, 1/25	55	100	150	180	1/100	70
1/50	55	90	130	160	1/250	45
1/100	50	80	110	140	1/500	32
1/200	45	60	85	100		

\*In Kodak Flashholder or similar 4- to 5-inch satin-finished reflector. †In 6- to 7-inch polished reflector.

**Caution:** Since lamps may shatter when flashed, the use of a Kodak 2-Way Flashguard or other shield over the reflector is recommended. *Do not flash lamps in an explosive atmosphere.*

## Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*		Continuous Agitation (Tray)†	Intermittent Agitation† (Tank)
Portrait Photography	DK-60a	3½ minutes	4½ minutes
	DK-60a (1:1)	6½ minutes	8 minutes
	DK-50	4½ minutes	5½ minutes
	DK-50 (1:1)	8 minutes	10 minutes
Commercial Photography	DK-60a	5½ minutes	7 minutes
	DK-60a (1:1)	11 minutes	14 minutes
	DK-50	7½ minutes	9½ minutes

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5 about 30 seconds with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

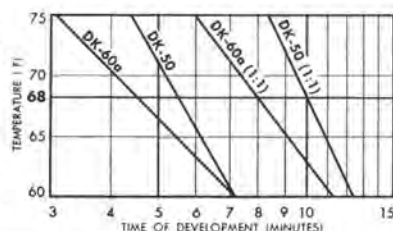
Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois, a soft viscose sponge, a Kodak Rubber Squeegee, or other soft squeegee (such as a windshield wiper blade).

**Dry** in a dust-free place.

#### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



#### Sensitometric Data

**Color Sensitivity:** Orthochromatic.



Spectrogram to Sunlight

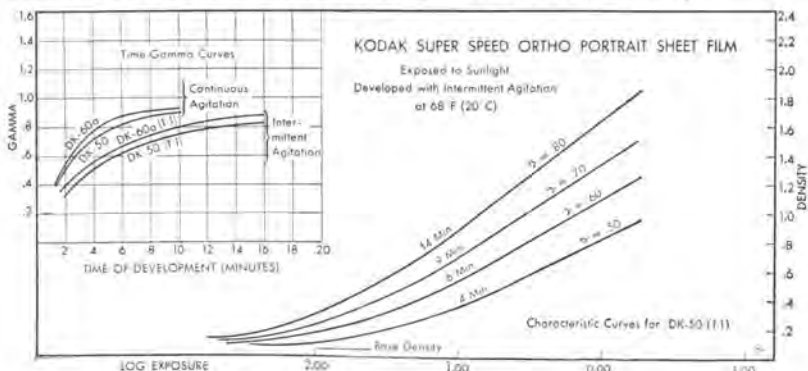


Spectrogram to Tungsten Light

**Graininess:** Enlargements up to 10 diameters are possible without fine-grain processing.

**Resolving Power:** 70 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** For average product and average processing.



## KODAK COMMERCIAL, COMMERCIAL MATTE, AND COMMERCIAL ORTHO SHEET FILMS

**Kodak Commercial Film** is a blue-sensitive, antihalation film of medium speed and capable of giving moderately high contrast. It is suitable for copying continuous-tone subjects, for duplicating by means of an intermediate step, photogravure, and other work not requiring green or red sensitivity.

**Kodak Commercial Matte Film** has a matte emulsion and a matte back to permit pencil retouching on either or both sides without retouching fluid.

**Kodak Commercial Ortho Film** is an orthochromatic, antihalation film of medium speed, capable of giving moderately high contrast. It is suitable for commercial work when red sensitivity is not required (as in copying some types of colored continuous-tone originals or photographing light-colored furniture).

**Safelight:** Commercial Film (also Matte) requires a Kodak Safelight Filter, Wratten Series 1 (red); and the Commercial Ortho, a Kodak Safelight Filter, Wratten Series 2 (dark red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet.

### Exposure

**Exposure Indexes** for meters marked for American Standard Exposure Indexes:

	Daylight	Tungsten	White Flame Arc
COMMERCIAL (ALSO MATTE)	25	6	50
COMMERCIAL ORTHO	32	10	50

**For Copying:** These settings apply to *incident-light meters* directly and to *reflected-light meters* with the Kodak Neutral Test Card (18% gray side) at the copy board. A matte white card will serve, in which case use one-fifth the above values, e.g., 1.2 and 2 as tungsten values for the two films, respectively.

Allow for the increase in effective *f*-number caused by extended bellows.

**Filter Factors:** Increase normal exposure by filter factor given below:

Filter-Factor Table		K1	K2	K3	G	No. 58 (B)	No. 47 (C5)	Pola- Screen
Commercial Ortho	Sunlight	2.5	8	12	16	25	3	2.5
	Tungsten	2	4	6	8	12	3	2.5
	White Flame Arc*	5	20	32	40	60	4	—

\*With the positive carbon in the lower position for direct-current arc lamps.

### Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*		Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
Commercial (also Matte)	DK-50	5 minutes (average contrast)	6 minutes (average contrast)
	DK-60a	4 minutes (average contrast)	5 minutes (average contrast)
	D-11	8 minutes (maximum contrast)	—
Commercial Ortho	DK-50	7 minutes (average contrast)	9 minutes (average contrast)
	DK-60a	5 minutes (average contrast)	6 minutes (average contrast)
	D-11	8 minutes (maximum contrast)	—

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5 about 30 seconds, or Kodak Stop Bath SB-1a at least 10 seconds, with agitation at 65 to



70 F. A running water rinse can be used if an acid rinse bath is not available.

**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

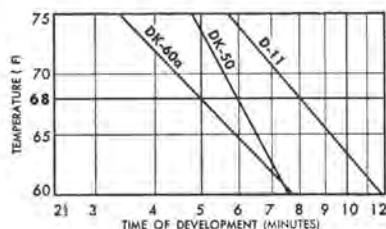
Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

**Wash** for 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois, a soft viscose sponge, a Kodak Rubber Squeegee, or other soft squeegee (such as a windshield wiper blade).

**Dry** in a dust-free place.

**Time-Temperature Development Chart:**

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



**Notching Code:**



Commercial



Commercial Matte



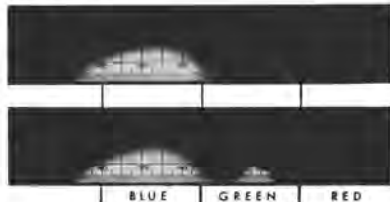
Commercial Ortho

**Sensitometric Data**

**Color Sensitivity:**

COMMERCIAL (ALSO MATTE)  
Blue sensitive only

COMMERCIAL ORTHO  
Orthochromatic



Spectrograms to Tungsten Light

**Resolving Power:** Commercial (also Matte) and Commercial Ortho 85 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak DK-60a.

**Sensitometric Curves:** See page 68.

## KODAK CONTRAST PROCESS ORTHO, AND CONTRAST PROCESS PANCHROMATIC SHEET FILMS

KODAK CONTRAST PROCESS ORTHO FILM is a very fine-grain orthochromatic, antihalation film of very high contrast. It is capable of giving sharp separation of light and dark tones in copies of written or printed matter and other line originals (black-and-white or having yellow, light-blue, or green backgrounds).

KODAK CONTRAST PROCESS PANCHROMATIC FILM is a fine-grain, Type B panchromatic, antihalation film of very high contrast. It gives sharp separation of light and dark tones in copies of line originals and written or printed matter. It is suitable for all types of colored originals and can be used with all filters.

**Safelight:** Contrast Process Ortho requires the Kodak Safelight Filter, Wratten Series 1 (red), in a suitable safelight lamp with a 15-watt bulb at not less than 4 feet. Contrast Process Panchromatic requires *total darkness*. A Kodak Safelight Filter, Wratten Series 3 (dark green), in a suitable safelight lamp with a 15-watt bulb can be used for a few seconds at not less than 4 feet.

### Exposure

**Exposure Indexes** for meters marked for American Standard Exposure Indexes:

	<i>Tungsten</i>	<i>White Flame Arc</i>
CONTRAST PROCESS ORTHO	<b>60</b>	<b>250</b>
CONTRAST PROCESS PANCHROMATIC	<b>80</b>	<b>250</b>

These settings are recommended for trial exposures in copying. They apply to *incident light meters* directly and to *reflected light meters* used with the Kodak Neutral Test Card (18% gray side) at the copy board. A matte white card will serve, in which case use one-fifth the above values, e.g., 12 and 16 as tungsten values for the two films respectively.

Allow for the increase in effective *f*-number caused by extended bellows.

**Filter Factors:** Increase normal exposure by filter factor given below:

Filter-Factor Table		K1	K2	K3	G	F	A	B	C5	Polar-Screen
Contrast Process Ortho	White Flame Arc*	2	3	4	6	—	—	8	6	2.5
	Tungsten	1.5	2	2.5	4	—	—	5	4	2.5
Contrast Process Panchromatic	White Flame Arc*	—	2	3	5	32	16	12	6	2.5
	Tungsten	—	1.5	2	2.5	8	5	6	16	2.5

\*With the positive carbon in the lower position for direct-current arc lamps.

### Processing

**Develop** at 68 F for approximate times given below:

KODAK DEVELOPER*	Continuous Agitation (Tray)	Intermittent Agitation† (Tank)
D-11 (high contrast)	4 minutes	5 minutes
D-8 (max. contrast) (2:1)‡	2 minutes	

\*These developers are available in prepared powder form in several package sizes.

†Agitation at one-minute intervals during development.

‡2 parts stock solution, 1 part water. Shake stock solution bottle well before diluting D-8 developer for use. Do not use D-8 developer above 70 F.

**Rinse** in Kodak Indicator Stop Bath or Kodak Stop Bath SB-5\* about 30 seconds, or Kodak Stop Bath SB-1a\* at least 10 seconds, with agitation at 65 to 70 F. A running water rinse can be used if an acid rinse bath is not available.

\*Use Kodak Testing Outfit for Stop Baths and Fixing Baths to test condition of baths.

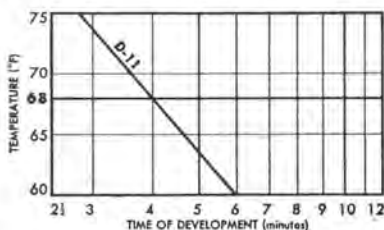
**Fix** 10 to 20 minutes at 65 to 70 F with Kodak Acid Fixer or Kodak Fixing Bath F-5, or 3 to 5 minutes with Kodak Rapid Liquid Fixer with Hardener (two-solution) or Kodak Rapid Fixing Bath F-7. *Agitate films frequently during fixing.*

**Wash** 20 to 30 minutes in running water. To minimize drying marks, treat in Kodak Photo-Flo Solution after washing, or wipe surfaces carefully with a Kodak Photo Chamois or a soft viscose sponge.

**Dry** in a dust-free place.

#### Time-Temperature Development Chart:

Showing developing times at various temperatures corresponding to certain recommended times at 68 F. For other times at 68 F, additional lines can be drawn parallel to the existing diagonal line for the developer concerned. *Best results are obtained at 65 to 70 F.*



#### Notching Code:



Contrast Process Ortho



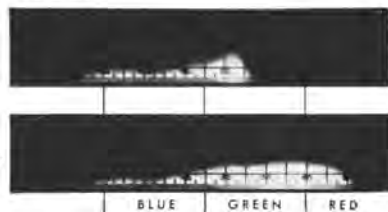
Contrast Process Panchromatic

#### Sensitometric Data

##### Color Sensitivity:

CONTRAST PROCESS ORTHO  
Orthochromatic

CONTRAST PROCESS PANCHROMATIC  
Panchromatic, Type B

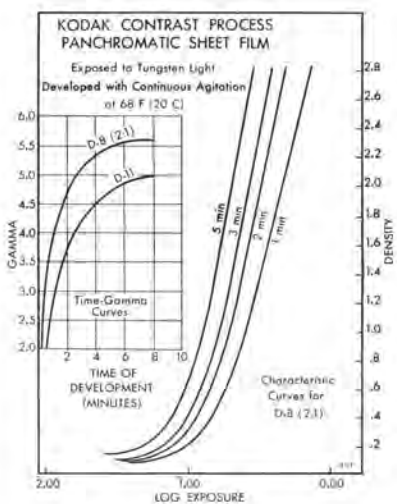
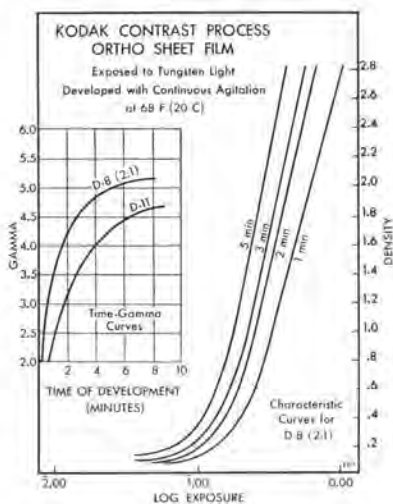
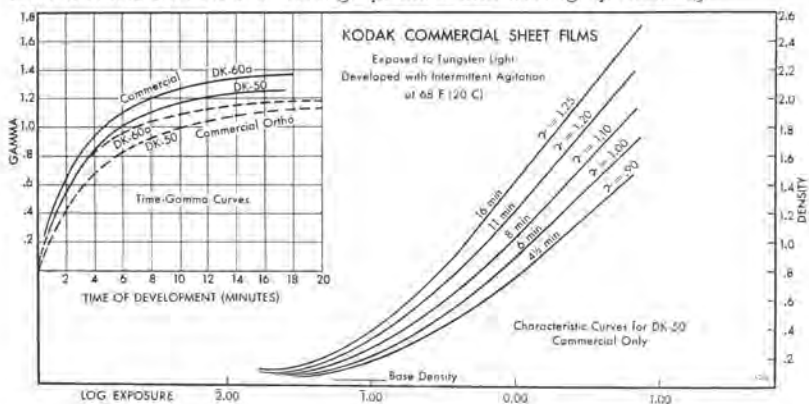


Spectrograms to Tungsten Light

**Resolving Power:** Contrast Process Ortho 125; Contrast Process Panchromatic 105 lines per mm. For optimum exposure, subject contrast 30 to 1, and recommended development in Kodak D-11.

**Sensitometric Curves:** See page 68.

**Sensitometric Curves:** For average product and average processing.



# FROM EXPOSURE TO NEGATIVE WITH KODAK CHEMICAL PREPARATIONS

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## DEVELOPERS

**Kodak Versatol:** An all-purpose developer, it comes in concentrated liquid form, requiring only dilution. For films, plates, and papers.

**Kodak DK-50:** Extremely popular with commercial and portrait photographers, DK-50 keeps well with use, has high capacity, and can be used with or without dilution in a tank or tray.

**Kodak DK-60a:** A fast-acting developer recommended for general use. Produces brilliant negatives with short development time.

**Kodak D-76:** Unsurpassed by any other developer in ordinary use for its ability to give full emulsion speed and maximum shadow detail with normal contrast, D-76 has long been a favorite of pictorialists.

**Kodak Microdol:** No other developer can match Microdol for fine-grain results with minimum effect on emulsion speed and with relatively short time of development. Produces extremely low fog level.

## STOP BATH

**Kodak Indicator Stop Bath:** Bottled in concentrated liquid form, Indicator Stop Bath is yellow before use, turning purple when exhausted. Simply dilute for use with films, plates, and papers.

## FIXING BATHS

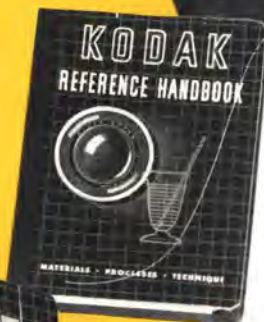
**Kodak Acid Fixer:** A single-powder preparation containing fixer and hardener, this rapid, long-lasting, high-capacity fixer can be used for films, plates, and papers. It is packed in convenient darkroom sizes.

**Kodak Rapid Liquid Fixer, with Hardener:** Compounded for very rapid fixing and hardening of films and plates when diluted 1:3. For prints, dilute 1:7. This concentrated easy-to-prepare hardening fixing bath has long life and high-capacity.

## OTHER PREPARATIONS

Additional Kodak Chemical preparations recommended for convenience in use or for improving negative quality include: Chromium Intensifier, Farmer's Reducer, Reducer and Stain Remover, Anti-Calcium, Anti-Fog No. 1, Anti-Foam, Desensitizer, Photo-Flo Solution, and others. See your Kodak dealer for complete information.

## Authoritative Reference Books



**Kodak Reference Handbook.** A comprehensive Mult-O Ring binder containing several complete Kodak Data Books. Discusses materials, processes, and exposing and processing techniques.

**Kodak Color Handbook.** A complete guide to taking still pictures in color. Four Kodak Color Data Books in a Mult-O Ring binder cover theory, data, and use of color materials.

**Kodak Photographic Notebook.** A flexible Mult-O Ring binder containing five separators and a supply of blank paper. Ideal for filing notes and booklets to supplement the Kodak Handbooks.

**Kodak Master Photoguide.** A pocket library of photo data with many computing aids. Contains exposure data for most types of situations encountered in the studio, at home, or in the field.

**EASTMAN KODAK COMPANY • ROCHESTER 4, N. Y.**