



*Professional*

DATA GUIDE

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# 1. COLOR FILM AND RELATED PHOTOSENSITIVE MATERIALS

## 1-1. FILMS FOR COLOR PHOTOGRAPHY

There are two basic types of color films—reversal (positive) and negative. The choice of one type over the other depends on the intended use.

Color reversal films (transparencies) produce positive images which can be viewed right after processing by using a light source from behind, such as a viewing box or daylight, as well as projected up to any size with slide projection equipment. Reversal film is particularly suited to color separation work, as used in the production of high-quality printed matter, as well as having many other professional and amateur applications.

In comparison to negative films, reversal films have narrower exposure latitudes and are much more sensitive to differences in light quality and intensities. As a result, reversal films require much stricter exposure control.

However, with correctly exposed reversal film, the resulting transparencies have a wider density range, richer gradation and deeper color saturation than negative film/prints. Furthermore, they are not subject to printing differences which can affect density, color balance, sharpness, and size, etc.

The advantages of using reversal film in color separation work are very important, as color scanner operators can make accurate comparisons between transparency originals and printed matter tests, regarding such aspects as density, color rendition, contrast, and texture.

Through the use of transparency duplicating films, any number of reversal duplicates of transparency originals can be made, but these copies are never quite equal to the original in terms of sharpness and density range. Therefore, when several copies are needed, it is best to expose several frames as originals initially if possible.

Color negative films are used mainly for the production of color prints. Exposure accuracy is less of a problem with negative films since they have a wider exposure latitude, and a considerable degree of density and color compensation can be made in the negative-to-positive printing stages. Color transparencies can also be produced directly from color negatives.

Color negatives can be made from reversal films through the use of internegative film. Printing these color negatives on color paper or other printing materials results in high-quality prints that are ideal for display purposes.

The reversal and negative films produced by the Fuji Photo Film Company are identified and described in the following pages. Reversal films designed for professional use are designated "FUJICHROME Professional" while amateur reversal films are designated simply "FUJICHROME." Negative films designed for special uses are designated "FUJICOLOR Professional", while amateur negative films are simply designated "FUJICOLOR."

Highly unique and specialized Fujifilm technologies have been used in the design and manufacture of "FUJICHROME" and "FUJICOLOR" films. These exclusive technological innovations have resulted in:

- High and ultrahigh ISO ratings
- Fine grain
- Great dimensional depth
- Exceptional sharpness
- Vivid color saturation
- High color fidelity
- Rich gradation
- Fine detail
- Improved reciprocity characteristics

**COLOR REVERSAL FILMS (1)**

Film Name and Processing	Type and Speed	Film Sizes	Features and Uses
<b>FUJICHROME Velvia for Professionals [RVP]</b>  Process E-6/CR-56	Daylight ISO 50/18°	135 (36-exp.) 135 (36-exp., 5 and 20-roll packs) 35 mm 30.5 m (100 ft) 120, 120 (5-roll packs) 220 (5-roll packs) 4x5 in. (10 and 50 sheets) 8x10 in. (10 and 50 sheets) 13x18cm (10 sheets) QuickLoad 4x5 in. (20 sheets) (See NOTE below.)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type color reversal film with high sharpness, highly saturated colors, and fine grain (RMS: 9).</li> <li>Suited to such applications as landscape, marine and product photography.</li> <li>Provides high sharpness and unique image color, producing full-bodied photos with a feeling of three-dimensional depth.</li> </ul>
<b>FUJICHROME Velvia 100 Professional [RVP 100]</b>  Process E-6/CR-56	Daylight ISO 100/21°	135 (36-exp.) 135 (36-exp., 5- and 20-roll packs) 35 mm 30.5 m (100 ft) 120, 120 (5-roll packs) 220 (5-roll packs) 4x5 in. (10 and 50 sheets) 8x10 in. (10 sheets) QuickLoad 4x5 in. (20 sheets) (See NOTE below.)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type, color reversal film with ultrafine grain (RMS: 8) and ultrahigh color saturation through the incorporation of new-generation cyan, magenta and yellow couplers.</li> <li>Suited especially to scenery and nature photography as well as other subjects that require precisely modulated vibrant color reproduction and high image quality.</li> <li>Provides color image stability equal to that of RVP 100F and can be push-processed up to +1 stops with excellent results and little photographic variation.</li> </ul>
<b>FUJICHROME Velvia 100F Professional [RVP100F]</b>  Process E-6/CR-56	Daylight ISO 100/21°	135 (36-exp.), 135 (36-exp., 5- and 20-roll packs), 35 mm 30.5 m (100 ft), 120, 120 (5-roll packs) 220 (5-roll packs) 4x5 in. (10 and 50 sheets) 8x10 in. (10 and 50 sheets) 9x12cm (10 sheets) 13x18cm (10 sheets) QuickLoad 4x5 in. (20 sheets) (See NOTE below.)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type color reversal film with ultrafine grain, designed to produce high-contrast images with the highest color saturation among 100F series films. Incorporates new-generation cyan, magenta and yellow couplers.</li> <li>Suited to a variety of uses such as landscape, nature, commercial, food, and interior applications.</li> <li>Provides ultrahigh-saturation colors and unsurpassed hue fidelity, along with the ability to reproduce purples, greens and other subtle colors with a fidelity not found in previous films, as well as good light source compatibility, resulting in minimal color tinging under mixed light sources or fluorescent lighting. Can be push-processed up to +1 stops with excellent results and little photographic variation.</li> </ul>
<b>FUJICHROME PROVIA 100F Professional [RDPIII]</b>  Process E-6/CR-56	Daylight ISO 100/21°	135 (36-exp.) 135 (36-exp, 5 and 20-roll packs) 35 mm 30.5 m (100 ft) 120, 120 (5-roll packs) 220 (5-roll packs) 4x5 in. (10 and 50 sheets) 8x10 in. (10 and 50 sheets) 9x12cm (10 sheets) 13x18cm (10 sheets) QuickLoad 4x5 in. (20 sheets) (See NOTE below.)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type color reversal film with ultrafine grain (RMS: 8), designed to provide medium color saturation and contrast compared to other films in the 100F series.</li> <li>Suited to a wide range of applications, such as product, landscape, nature and fashion photography as well as portraiture.</li> <li>Provides ideal color saturation and contrast, making it suitable for all types of subject matter, along with minimal variation in performance even in long exposures and the ability to be push-processed up to +2 stops with excellent results.</li> </ul>

**NOTE** • For RVP, RVP100, RVP100F, and RDPIII films, some formats and packaging may not be available in your area. Please consult with your local Fujifilm distributor for details.  
• For information about color duplicating film, see page 37.

**COLOR REVERSAL FILMS (2)**

Film Name and Processing	Type and Speed	Film Sizes	Features and Uses
<b>FUJICHROME ASTIA 100F Professional [RAP100F]</b>  Process E-6/CR-56	Daylight ISO 100/21°	135 (36-exp.), 135 (36-exp., 5- and 20-roll packs), 35 mm 30.5 m (100 ft), 120, 120 (5-roll packs) 220 (5-roll packs) 4x5 in. (10 and 50 sheets) 8x10 in. (10 sheets) QuickLoad 4x5 in. (20 sheets) (See NOTE below.)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type color reversal film with ultrafine grain (RMS: 7), subdued color reproduction and the softest tone reproduction among the 100F films. Incorporates new-generation cyan, magenta and yellow couplers.</li> <li>Suited to such uses as fashion, portraiture, interior, and product photography.</li> <li>Provides exceptionally fine grain, smooth, natural-looking skin tone continuity, and faithful reproduction of delicate hues, along with good light source compatibility, resulting in minimal color tinging under mixed light or fluorescent lighting. Produces excellent results with little photographic variation even when push-processed up to +2 stops.</li> </ul>
<b>FUJICHROME PROVIA 400F Professional [RHPIII]</b>  Process E-6/CR-56	Daylight ISO 400/27°	135 (36-exp.) 35 mm 30.5m (100 ft) 120, 120 (5-roll packs)	<ul style="list-style-type: none"> <li>Professional-quality, high-speed, daylight-type color reversal film with the finest grain (RMS: 13) in its class and highly saturated colors.</li> <li>Suited to such uses as sports photography, reportage, and stage show coverage.</li> <li>Provides the finest granularity in ISO 400 class films, vibrant color reproduction comparable to that of medium-density films, smooth gradation, and the ability to be push-processed up to +3 stops, and even up to +3 1/2 stops depending on the scenes.</li> </ul>
<b>FUJICHROME 64T TYPE II Professional [RTPII]</b>  Process E-6/CR-56	Tungsten (3100K) ISO 64/19°	135 (36-exp.) 35 mm 30.5 m (100 ft) 120, 4x5 in. (10 and 50 sheets) 8x10 in. (10 and 50 sheets) 9x12cm (10 sheets) QuickLoad 4x5 in. (20 sheets)  (See NOTE below.)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, tungsten-type color reversal film with natural color reproduction.</li> <li>Suited to product photography, interiors and for reproducing illustrations and paintings.</li> <li>Provides smooth, continuous gray gradations, excellent color reproduction and subtle textural depiction of the subject matter.</li> </ul>
<b>FUJICHROME Sensia 100 [RA]</b>  Process E-6/CR-56	Daylight ISO 100/21°	135 (24- and 36-exp.)	<ul style="list-style-type: none"> <li>Medium-speed, daylight-type color reversal film with faithful color reproduction and fine grain (RMS: 8). Incorporates new cyan, magenta and yellow couplers.</li> <li>Suited to a wide range of applications, including general subject matter such as landscape and portraiture.</li> <li>Provides faithful color reproduction, natural, smooth skin tones, and wide exposure latitude.</li> </ul>
<b>FUJICHROME Sensia 200 [RM]</b>  Process E-6/CR-56	Daylight ISO 200/24°	135 (24- and 36-exp.)	<ul style="list-style-type: none"> <li>Versatile, medium-speed, high-quality, daylight-type color reversal film with extremely fine grain and improved sharpness.</li> <li>Suited not only to normal outdoor photography, but also to a wide variety of indoor applications and situations requiring the use of high shutter speeds, such as at sports and racing events.</li> <li>Provides faithful and brilliant color reproduction and rich tones, ranging from the brightest highlights to the deepest shadows, and high suitability for slide projection and big enlargements.</li> </ul>
<b>FUJICHROME Sensia 400 [RH]</b>  Process E-6/CR-56	Daylight ISO 400/27°	135 (24- and 36-exp.)	<ul style="list-style-type: none"> <li>Multi-use, high-speed, daylight-type color reversal film providing fine grain (RMS: 13) and vibrant color reproduction in spite of its high speed.</li> <li>Suited to such applications as sports, portraiture, nighttime photography, astrophotography, portraiture, and snapshots.</li> <li>Provides smoothly continuous gray gradation and vibrant color reproduction, along with ease of use that makes it ideal for amateur photographers.</li> </ul>

**NOTE** • For RAP100F and RTPII films, other sizes, beside the sizes indicated above, are also available.  
• For information about color duplicating film, see page 37.

available. Please contact your local dealer for details.

**COLOR NEGATIVE FILMS (1)**

Film Name and Processing	Type and Speed	Film Sizes	Features and Uses
<b>FUJICOLOR PRO 160S PROFESSIONAL</b>  Process C-41/CN-16	Daylight ISO 160/23°	Rolls: 135 (36-exp.) 135 (36-exp., 20-roll packs) 120 (5 and 20-roll packs) 220 (5-roll packs) Sheets: 4x5 in. (10 and 50 sheets) QL 4x5 in. (20 sheets) 8x10 in. (10 sheets) 9x12 cm (20 sheets) 13x18 cm (20 sheets)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type, extremely fine-grain color negative film.</li> <li>Suited especially to portrait photography.</li> <li>Provides wide exposure latitude from under- to overexposures, superb skin tones with smoothly continuous gradation from the highlights to the shadows, highly faithful color reproduction, an exciting three-dimensional appearance to the image and single-channel suitability for uniform printing efficiency. New generation emulsion design allows for optimum scanning quality.</li> </ul>
<b>FUJICOLOR PRO 160C PROFESSIONAL</b>  Process C-41/CN-16	Daylight ISO 160/23°	Rolls: 135 (36-exp.) 120 (5-roll packs) 220 (5-roll packs) Sheets: QL 4x5 in. (20 sheets)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, daylight-type, extremely fine-grain, higher-contrast color negative film.</li> <li>Suited to a wide range of photographic applications, including portrait, commercial work, fashion, architectural and interior photography.</li> <li>Provides enhanced saturation and higher sharpness, superb gray balance, wide exposure latitude and single-channel suitability for uniform printing efficiency. It also has improved reciprocity characteristics and enhanced color image stability. New generation emulsion design allows for optimum scanning quality.</li> </ul>
<b>FUJICOLOR NPL 160 PROFESSIONAL [NPL]</b>  Process C-41/CN-16	Tungsten ISO 160/23°	Rolls: 120, 120 (5-roll packs) Sheets: 4x5 in. (10 and 50 sheets) 8x10 in. (10 sheets) QL 4x5 (20)	<ul style="list-style-type: none"> <li>Professional-quality, medium-speed, tungsten-type, fine-grain color negative film for exposure durations of 1/30th to 2 seconds.</li> <li>Suited to studio portrait and copy work.</li> <li>Provides smooth, pleasing skin tones and natural color images with exceptional detail ideal for portraits. It also has improved reciprocity characteristics and enhanced color image stability.</li> </ul>
<b>FUJICOLOR PRO 400H PROFESSIONAL</b>  Process C-41/CN-16	Daylight ISO 400/27°	135 (36-exp.) 135 (36-exp., 20-roll packs) 120 (5 and 20-roll packs) 220 (5-roll packs)	<ul style="list-style-type: none"> <li>Professional-quality, high-speed, daylight-type, fine-grain, color negative film, incorporating Fujifilm's proprietary 4th color layer.</li> <li>Suited especially to wedding, portrait and fashion photography where accurate rendition of the subject is essential.</li> <li>Provides wide exposure latitude from under- to overexposures, superb skin tones with smoothly continuous gradation from the highlights to the shadows, highly faithful color reproduction, an exciting three-dimensional appearance to the image and single-channel suitability for uniform printing efficiency.</li> </ul>
<b>FUJICOLOR PRO 800Z PROFESSIONAL</b>  Process C-41/CN-16	Daylight ISO 800/30°	135 (36-exp., 5 roll packs) 120 (5-roll packs) 220 (5-roll packs)	<ul style="list-style-type: none"> <li>Professional-quality, very-high-speed, daylight-type, fine-grain, high-contrast color negative film.</li> <li>Suited especially to portrait, wedding and fashion photography.</li> <li>Provides vibrant colors with high fidelity, smooth textures, excellent grays, wide exposure latitude and single-channel suitability for uniform printing efficiency.</li> </ul>
<b>FUJICOLOR SUPERIA REALA [CS]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 100/21°	135 (12-, 24- and 36-exp.)	<ul style="list-style-type: none"> <li>Medium-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>Suited particularly to exacting photographic work, especially for big enlargements where fine grain reproduction is essential.</li> <li>Provides superb granular fineness, faithful and natural color reproduction, rich highlight-to-shadow tone reproduction, greater latitude for underexposures, and good results even under mixed-light sources including fluorescent light.</li> </ul>
<b>FUJICOLOR SUPERIA 100 [CN]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 100/21°	135 (12-, 24- and 36-exp.) 120	<ul style="list-style-type: none"> <li>Medium-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>Suited to all general applications and produces fine-quality prints, especially in conjunction with FUJICOLOR papers.</li> <li>Provides great vividness and enhanced color realism across the entire spectrum, beautiful and natural skin tones, refined sharpness, wide exposure latitude, fine grain quality for outstanding enlargements, and accurate reproduction of difficult colors, such as certain violets and greens, even under fluorescent lighting*.</li> </ul>

\* When the proper color compensation filters are used.

**COLOR NEGATIVE FILMS (2)**

Film Name and Processing	Type and Speed	Film Sizes	Features and Uses
<b>FUJICOLOR SUPERIA 200 [CA]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 200/24°	135 (12-, 24- and 36-exp.) 110 (12- and 24-exp.)	<ul style="list-style-type: none"> <li>• Medium-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>• Suited to all general applications, including candid work under low illumination and produces fine-quality prints, especially in conjunction with FUJICOLOR papers.</li> <li>• Provides great vividness and enhanced color realism across the entire spectrum, beautiful and natural skin tones, refined sharpness, wide exposure latitude, fine grain for high-quality enlargements, and accurate reproduction of difficult colors, such as certain violets and greens, even under fluorescent lighting*.</li> </ul>
<b>FUJICOLOR SUPERIA X-TRA 400 [CH]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 400/27°	135 (12-, 24- and 36-exp.)	<ul style="list-style-type: none"> <li>• High-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>• Suited to general, available-light and action-stopping high shutter-speed applications and produces fine-quality prints, especially in conjunction with FUJICOLOR papers.</li> <li>• Provides great vividness and enhanced color realism across the entire spectrum, smooth and beautiful skin tones, extremely high sharpness, fine grain quality for superb enlargements, wide exposure latitude, neutral gray balance, enhanced storability, and accurate reproduction of difficult colors, such as certain violets and various greens, even under fluorescent lighting.*</li> </ul>
<b>FUJICOLOR TRUE DEFINITION 400 [CH]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 400/27°	135 (24-exp.)	<ul style="list-style-type: none"> <li>• High-speed, daylight-type, fine grain color negative film incorporating a 4th color layer and new gradation design.</li> <li>• Suited especially to the capturing of scenes in precise detail, with brilliant colors maintained under a wide range of exposure conditions.</li> <li>• Provides natural skin tones and soft gradation with fine details fully reproduced, a wide exposure latitude and extremely sharp images including the precise depiction of textures.</li> </ul>
<b>FUJICOLOR SUPERIA X-TRA 800 [CZ]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 800/30°	135 (24- and 36-exp.)	<ul style="list-style-type: none"> <li>• Very-high-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>• Suited to outdoor and flash photography, high-speed action situations, low-light scenes and increased depth-of-field work using small lens openings.</li> <li>• Provides great vividness and enhanced color realism, even under fluorescent lights*, across the entire spectrum, including brilliant reds, bright blues and strong yellows, plus accurate rendition of hard-to-reproduce colors, such as violet and certain greens, thanks to Fujifilm's 4th color layer technology, as well as rendering natural-looking face tones and extremely sharp images for big enlargements.</li> </ul>
<b>FUJICOLOR SUPERIA 1600 [CU]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 1600/33°	135 (12-, 24- and 36-exp.)	<ul style="list-style-type: none"> <li>• Ultrahigh-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>• Suited to low-light environments such as indoor available-light scenes, parties, wedding ceremonies, stage performances and early morning/evening twilight scenes as well as sports and other high-shutter-speed action-stopping photography, in addition to general applications, producing fine-quality prints, especially in conjunction with FUJICOLOR papers.</li> <li>• Provides outstanding grain quality in spite of its ISO 1600 speed rating, faithful color reproduction, beautiful skin tones, superb sharpness, wide exposure latitude, neutral gray balance, enhanced storability, and faithful reproduction of violets and various greens for more natural color reproduction, even under fluorescent lighting.*</li> </ul>
<b>FUJICOLOR PRESS 400 [CH]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 400/27°	135 (36-exp., 5-roll and 20-roll packs)	<ul style="list-style-type: none"> <li>• High-speed, press-use, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>• Suited to a wide range of applications, including outdoor available-light photography, electronic-flash use, and high shutter speed work, whenever fine prints are required.</li> <li>• Provides exceptionally faithful color reproduction, stunningly natural skin tones, excellent gray balance and unexcelled fluorescent light suitability, thanks to Fujifilm's 4th color layer technology, plus superb grain quality and outstanding sharpness.</li> </ul>
<b>FUJICOLOR PRESS 800 [CZ]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 800/30°	135 (36-exp., 20-roll packs)	<ul style="list-style-type: none"> <li>• Very-high-speed, press-use, daylight-type, fine-grain color negative film incorporating a 4th color layer.</li> <li>• Suited not only to all outdoor available-light and electronic flash photography, but especially to news and sports coverage where high shutter speeds are essential for stop-action shots, and when exposures under low-light conditions are unavoidable.</li> <li>• Provides realistic color rendition, with high saturation, even of hard-to-reproduce violets and greens, and unexcelled fluorescent light suitability, thanks to Fujifilm's 4th color layer technology, along with outstanding grain quality, excellent gradation balance and wide exposure latitude.</li> </ul>

\* When the proper color compensation filters are used.



## 1-3. FILM IDENTIFICATION EDGE MARKINGS AND CODE NOTCHES

FUJICHROME and FUJICOLOR film types are distinguishable by either their edge markings or code notches.

- Roll films: Edge markings
- Sheet films: Code notches

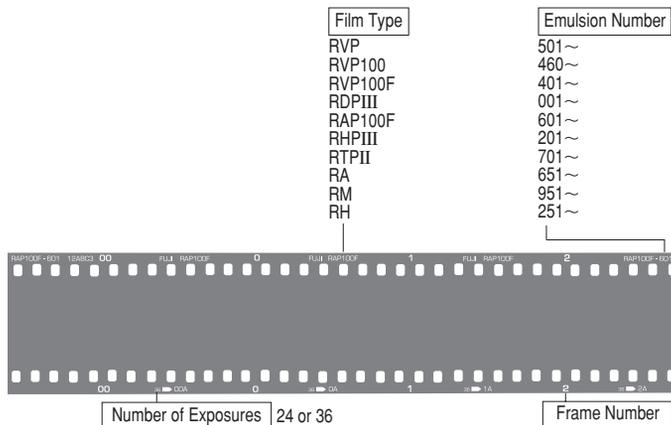
### Roll Film Edge Markings

Edge markings are used for identifying processed film. In addition to edge markings, "DX" codes are also seen on 135-size color negatives. Code patterns are designated for each film type.

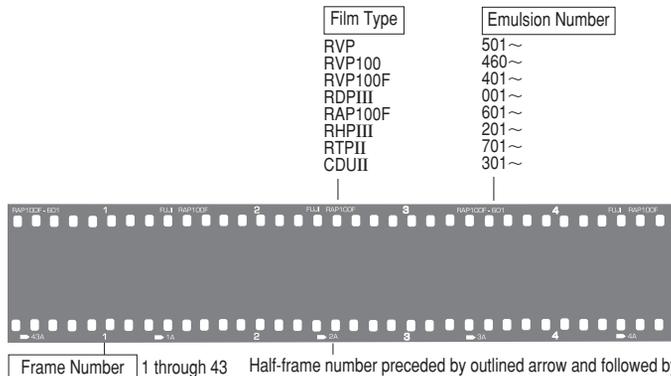
The correlation between film type, edge markings, and "DX" and frame number bar codes is indicated below.

#### ■ FUJICHROME Films

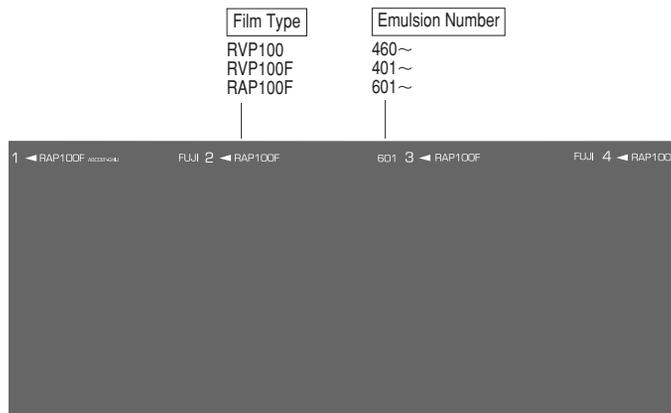
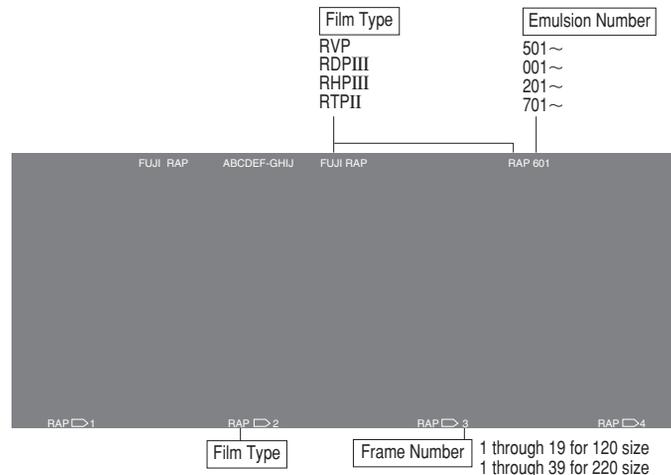
- **135 Size:** RVP, RVP100, RVP100F, RDPIII, RAP100F, RHPIII, RTPII, RA, RM, RH



- **35 mm Long Roll:** RVP, RVP100, RVP100F, RDPIII, RAP100F, RHPIII, RTPII, CDUII

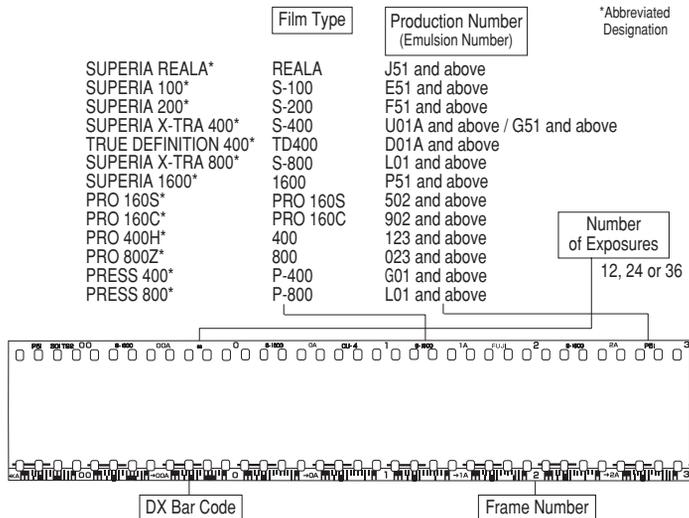


- **120 Size:** RVP, RVP100, RVP100F, RDPIII, RAP100F, RHPIII, RTPII
- **220 Size:** RVP, RVP100, RVP100F, RDPIII, RAP100F

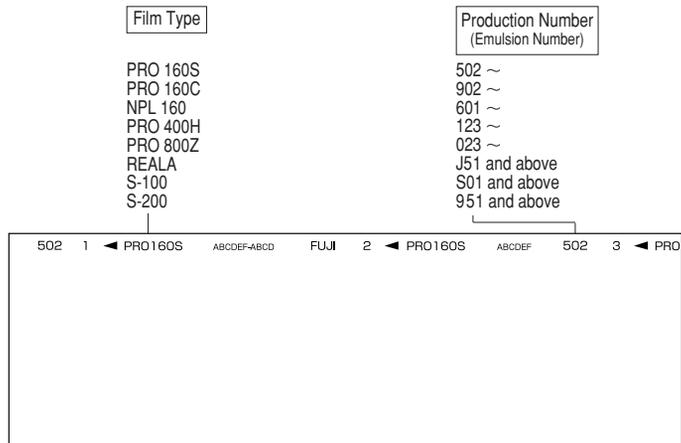


■ **FUJICOLOR Films**

- **135 Size:** SUPERIA REALA\*, SUPERIA 100\*, SUPERIA 200\*, SUPERIA X-TRA 400\*, TRUE DEFINITION 400\*, SUPERIA X-TRA 800\*, SUPERIA 1600\*, PRO 160S\*, PRO 160C\*, PRO 400H\*, PRO 800Z\*, PRESS 400/800\*



- **120 Size:** PRO 160S, PRO 160C, NPL, PRO 400H, PRO 800Z, SUPERIA REALA, SUPERIA 100
- 220 Size:** PRO 160S, PRO 160C, PRO 400H, PRO 800Z, SUPERIA REALA
- 110 Size:** SUPERIA 200



**Sheet Film Code Notches and Emulsion Numbers**

The code notches used in FUJICHROME and FUJICOLOR films serve two purposes.

- (1) They enable photographers and laboratory personnel to distinguish films by touch and shape.
- (2) They confirm emulsion surface position when loading film holders. It can be ascertained that the emulsion surface is facing upward when the code notch is located at the upper right-hand corner of a vertical sheet.

Film Designation	Code Notch/Emulsion Number
FUJICHROME Velvia for Professionals [RVP]	501~
FUJICHROME Velvia 100 Professional [RVP100]	460~
FUJICHROME Velvia 100F Professional [RVP100F]	401~
FUJICHROME PROVIA 100F Professional [RDP111]	001~
FUJICHROME ASTIA 100F Professional [RAP100F]	601~
FUJICHROME 64T TYPEII Professional [RTPII]	701~
FUJICOLOR PRO 160S PROFESSIONAL	502~
FUJICOLOR PRO 160C PROFESSIONAL	902~
FUJICOLOR NPL 160 PROFESSIONAL [NPL]	601~
FUJICHROME DUPLICATING FILM CDU TYPE II [CDU II]	301~



## 1-5. CORRECTIONS FOR VARIOUS LIGHT CONDITIONS

Light quality varies with the particular light source. FUJICHROME and FUJICOLOR films are generally designed either for exposure under normal daylight or tungsten light conditions, but in certain situations it is advisable to use filters to obtain optimum color balance.

### ●Filter Selection and Exposure Adjustments for Natural Light Sources

The term natural light refers to the various conditions of daylight. Light quality varies greatly with the time of day, the weather and the particular location. To compensate for such wide natural light variations, it is advisable to use filters.

Natural light contains ultraviolet radiation which varies in intensity with the location and time. Since ultraviolet radiation adversely affects dye images, photosensitive emulsions are designed to filter out such radiation.

However, when photographing seashore, mountain or snow scenes in

which ultraviolet radiation is intense, use of UV filters is advisable to obtain optimum quality.

### ●Filter Selection and Exposure Adjustments for Artificial Light Sources (Pages 26-30)

Artificial light sources used in photography include electronic flash, daylight photoflood / photo-reflector lamps, and fluorescent lamps, in addition to tungsten and discharge lamps.

Since electronic flash and daylight-type lamps have many of the properties of daylight, the use of filters is not normally required. Other artificial light sources, however, may require the use of filters, as is often the case with reversal films which are highly susceptible to changes in lighting.

Filter information and exposure adjustments for light source variations are provided in the tables that follow.

### Filter Selection and Exposure Adjustments for Natural Light Source

### Variations

Subject	FUJICHROME Films (Daylight Type)		FUJICOLOR PORTRAIT FILM NPS 160 PROFESSIONAL [NPS]	
	Filter	Exposure Adjustments	Filter	Exposure Adjustments
Fair weather, open shade, and shady landscapes	Kodak No.2C (Fuji Filter SC-39 or SC-40) Kodak No.2C or 2B for Velvia, (Fuji Filter SC-40 or SC-41 for Velvia)	None	Kodak No.2C (Fuji Filter SC-40)	None
Bright distant scenes, snow landscapes, seaside scenes, aerial views and other open landscapes			Kodak No.1A (Fuji Filter SC-40M)	
Close-ups of flowers and other subjects with bright colors				
High Color Temperature: Cloudy weather landscapes and portraits, or subjects in the shade on a clear day.	Kodak No.81A (Fuji Filter LBA-2)	+1/3 stop	Kodak No.81A (Fuji Filter LBA-2)	+1/3 stop
Low Color Temperature: Scenes and portraits in morning or evening twilight.	Kodak No.82A or No.82B (Fuji Filter LBB-2 or LBB-3)	+1/3 to +2/3 stop	Kodak No.82A (Fuji Filter LBB-2)	+1/3 stop

**Filter Selection and Exposure Adjustments for Artificial Light Source**
**Variations (1)**

Films	Recommended Meter Setting (ISO) and Illumination Balance	Correction Filters / Exposure Adjustments					
		Daylight	Tungsten Lamps (3200K)* <sup>2</sup>	Fluorescent Lamps* <sup>1</sup>			
				White (W)	Daylight (D)	Cool White (CW)	Warm White (WW)
FUJICHROME Velvia for Professionals [RVP]	Daylight 50	None	No. 80A +2 stops	40M+10B +1 2/3 stops	40R+10M +1 2/3 stops	40M+5R +1 1/2 stops	No. 80C+25M +2 stops
FUJICHROME Velvia 100 Professional [RVP100]	Daylight 100	None	No. 80A +2 stops	5B+10M +1 1/2 stop	30R +1 stop	20M +2/3 stop	No. 80C+15M +1 1/3 stops
FUJICHROME Velvia 100F Professional [RVP100F]	Daylight 100	None	No. 80A +2 stops	10B+5M +1/2 stop	25R +1 stop	15M+5B +2/3 stop	No. 80C+10M +1 stop
FUJICHROME PROVIA 100F Professional [RDPIII]	Daylight 100	None	No. 80A +2 stops	25M+20B +1 stop	30R+10M +1 stop	35M +1 stop	No. 80B+15M+10R +2 1/3 stops
FUJICHROME ASTIA 100F Professional [RAP100F]	Daylight 100	None	No. 80A +2 stops	10B+5M +1/2 stop	25R +1 stop	15M+5B +2/3 stop	No. 80C+10M +1 stop
FUJICHROME PROVIA 400F Professional [RHPIII]	Daylight 400	None	No. 80A +2 stops	25M +2/3 stop	30R+10M +1 1/3 stops	30M +1 stop	No. 80B+10M+10R +2 stops
FUJICHROME 64T TYPEII Professional [RTPII]	Tungsten (3100K) 64	No. 85B +2/3 stop	None* <sup>2</sup>	No. 85B+81D +40B+10M +2 1/2 stops	No. 85B+40R +1 1/2 stops	No. 85B+25M +10R +1 1/2 stops	30R+5M +1 stop
FUJICHROME Sensia 100 [RA]	Daylight 100	None	No. 80A +2 stops	10B+5M +1 1/2 stop	25R +1 stop	15M+5B +2/3 stop	No. 80C+10M +1 stop
FUJICHROME Sensia 200 [RM]	Daylight 200	None	No. 80A +2 stops	25M +2/3 stop	30R+10M +1 1/3 stops	30M +1 stop	No. 80B+10M+10R +2 stops
FUJICHROME Sensia 400 [RH]	Daylight 400	None	No. 80A +2 stops	25M +2/3 stop	30R+10M +1 1/3 stops	30M +1 stop	No. 80B+10M+10R +2 stops

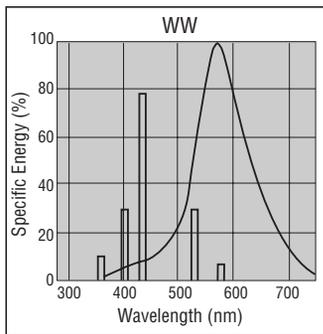
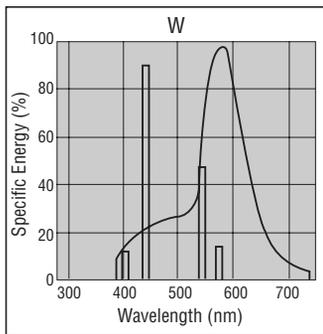
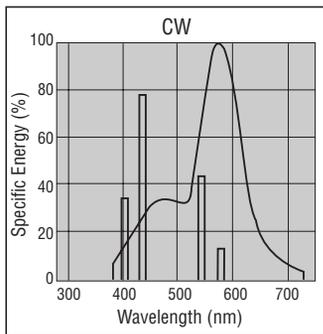
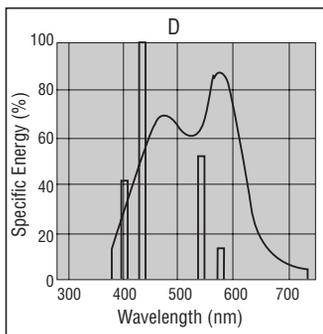
\*1 When using fluorescent lighting, exposure meter readings tend to be low. Therefore, the exposure exposures made under actual fluorescent lighting conditions.

\*2 The rated color temperature of photographic tungsten lamps is 3200K, but in actual use, designed to provide the best results at a color temperature of 3100K.

adjustments indicated in this table are approximate in that they have been derived from actual film the color temperature is about 3100K. FUJICHROME 64T TYPEII Professional [RTPII] is thus

### Spectral Characteristics of Fluorescent Lighting

The fluorescent light distribution curves below plot comparative energy against wavelength. The curves indicate the phosphor-derived continuous light spectra while the bars represent the mercury-induced bright-line spectra. To take into consideration all the radiant light energy emitted by a fluorescent lamp, the mercury bright-line spectrum must be superimposed on the continuous phosphor spectrum.



### Filter Selection and Exposure Adjustments for Artificial Light Source Variations (2)

- FUJICOLOR PRO 160S PROFESSIONAL
- FUJICOLOR PRO 160C PROFESSIONAL
- FUJICOLOR PRO 400H PROFESSIONAL
- FUJICOLOR PRO 800Z PROFESSIONAL
- FUJICOLOR SUPERIA REALA [CS]

	Sunlight	Electronic Flash	Daylight Type Photoflood Lamps
Filter	None	None	None
Lens Aperture	—	—	—
	*1	*2	*2

\*1 When photographic subjects come under the influence of ultraviolet radiation or are illuminated by extremely high or low color temperature light, refer to the table on page 26 to 27.

\*2 The effective light intensity and color balance of artificial light sources will vary according to the maker. It is thus recommended that you obtain the relevant information from the lamp manufacturer.

- FUJICOLOR NPL 160 PROFESSIONAL [NPL]

	Tungsten (3200K)	Daylight
Filter	None	No.85B
Lens Aperture	—	+2/3 stop
		*1

\*1 Recommended shutter speeds: 1/30 sec. to 2 seconds. Exposures longer than 2 seconds require exposure compensation.

### Filter Selection and Exposure Adjustments for Artificial Light Source Variations (3)

#### High-intensity Discharge Lamps

The most commonly encountered high-intensity discharge lamps are :

- **Sodium Vapor Discharge Lamps**

There are two types of sodium-vapor discharge lamps—high-pressure and low-pressure. The low-pressure type is used mainly for tunnel and certain road illumination. Photographic compensation for the strong orange color which these lamps emit is impossible.

- **Metal Halide Discharge Lamps**

High-pressure metal halide lighting is used mainly for illuminating outdoor stadiums, baseball grounds and gymnasiums.

- **Mercury Vapor Discharge Lamps**

Mercury vapor discharge lamps can be divided basically into two types: one used for lighting roads, parks, etc. and the other for factories, gymnasiums, and other outdoor / indoor spaces.

All of the foregoing lamps emit energy spikes (peaks) in different areas of the spectrum, according to the elements involved. As a result, rating them in terms of color temperature is impossible because they are not temperature dependent for the color of light emitted. Use of the Kelvin and mired scales is, therefore, inappropriate for these sources.

Good color rendition when the main (or only) illumination comes from high-intensity discharge lamps is very difficult, and in some cases impossible. With negative film, considerable color correction can be done during the printing stage, often with quite acceptable results. However, with reversal film the undesirable effects are intensified, especially if no attempt at color correction during exposure is made. As the quality of the light emitted by these sources is affected by many factors such as the type of lighting equipment, manufacturer, length of use, output level, etc., it is recommended that tests be done well in advance of the actual photographic work.

The following table can be used as a rough guide if actual testing cannot be carried out. It gives various color correction (CC) filter combinations that may provide a reasonable degree of color correction.

**For Daylight-rated Films**

Source	CC Filters	Exposure Adjustments
Low-Pressure Sodium Vapor	CC - Impossible	-
High-Pressure Sodium Vapor	LBB - 16*+30M+10B	+3 stops
Metal Halide	20M+10R	+1 stop (approx.)
Mercury Vapor (Indoor)	20M+20R	+1 stop (approx.)
Mercury Vapor (outdoor)	40R+30M or 30R+40M	+1 <sup>2</sup> / <sub>3</sub> stops

\*Fuji Light Balancing Filter

## 1-6. RECIPROCITY FAILURE COMPENSATION FOR SPEED AND COLOR BALANCE

During photographic exposures, a decrease in density occurs with certain combinations of exposure time and illumination. This phenomenon, known as reciprocity law failure, affects film speed and color balance. Therefore, to prevent this phenomenon films are generally designed so that speed and color balance match the range of normally used shutter speeds and do not vary too much even when this range is exceeded.

Satisfactory results can generally be obtained without correcting the exposure conditions, but to meet strict requirements, especially with reversal films, color and exposure corrections should be made using as a guide the data given in the following table.

**Reciprocity Characteristics of FUJICHROME Films**

Film	Shutter Speed / Correction Filters / Exposure Adjustments					
	1/4000 sec. to 1 sec.	4 sec.	5M +1/3 stop	16 sec.	64 sec. and longer	
FUJICHROME Velvia for Professionals [RVP]	None	5M +1/3 stop	10M +2/3 stop	16 sec.	64 sec. and longer	Not recommended
FUJICHROME Velvia 100 Professional [RVP100]	1/4000 sec. to 1 min.	2 min.	4 min.	4 min.	8 min.	8 min.
FUJICHROME Velvia 100F Professional [RVP100F]	None	2.5M +1/3 stop	2.5M +1/2 stop	4 min.	2.5M +2/3 stop	8 min.
FUJICHROME PROVIA 100F Professional [RDP100]	None	2.5B +1/3 stop	2.5B +1/2 stop	4 min.	2.5B +2/3 stop	8 min.
FUJICHROME ASTIA 100F Professional [RAP100F]	None	2.5G +1/3 stop	2.5G +1/2 stop	4 min.	2.5G +2/3 stop	8 min.
FUJICHROME PROVIA 400F Professional [RHP100]	None	2 min.	4 min.	4 min.	8 min.	8 min.
FUJICHROME 64T TYPE II Professional [RTP II]	None	None	None +1/3 stop	None +1/3 stop	None +1/2 stop	None +1/2 stop
FUJICHROME Sensia 100 [RA]	None	64 sec.	5B +1/2 stop	5B +1/2 stop	5B +2/3 stop	8 min.
FUJICHROME Sensia 200 [RM]	None	64 sec.	2 min. to 4 min.	2 min. to 4 min.	2 min. to 4 min.	8 min.
FUJICHROME Sensia 400 [RH]	None	64 sec.	7.5G +1 stop	7.5G +1 stop	7.5G +1 stop	8 min.

**Reciprocity Characteristics of FUJICOLOR Films**

Film	Shutter Speed / Exposure Adjustments	
	1/4000 sec. to 2 sec.	4 sec.
FUJICOLOR PRO 160S PROFESSIONAL	None	+1/3 stop
FUJICOLOR PRO 160C PROFESSIONAL	1/4000 sec. to 2 sec.	4 sec.
FUJICOLOR NPL 160 PROFESSIONAL [NPL]	None	+1/3 stop
FUJICOLOR PRO 400H PROFESSIONAL	1/4000 sec. to 1 sec.	4 sec.
FUJICOLOR PRO 800Z PROFESSIONAL	Not recommended	+1/2 stop
FUJICOLOR SUPERIA REALA [CS]	1/4000 sec. to 1 sec.	4 sec.
FUJICOLOR SUPERIA 100 [CN]	None	+1/2 stop
FUJICOLOR SUPERIA 200 [CA]	None	+2/3 stop
FUJICOLOR SUPERIA X-TRA 400 [CH]	1/4000 sec. to 1 sec.	4 sec.
FUJICOLOR TRUE DEFINITION 400 [CH]	None	+1/3 stop
FUJICOLOR SUPERIA X-TRA 800 [CZ]	None	+1/3 stop
FUJICOLOR SUPERIA 1600 [CU]	None	+1/3 stop
FUJICOLOR PRESS 400 [CH]	None	+1/3 stop
FUJICOLOR PRESS 800 [CZ]	None	+2/3 stop

**1-7. PRINTING/DUPLICATING MATERIALS**

Fujifilm's advanced technologies and expertise accumulated in the development and production of photographic materials have been fully exploited in the design of printing materials,

duplicating films, and internegative films. FUJICHROME DUPLICATING FILM CDU II is designed for optimum performance in photo-mechanical reproduction.

**COLOR NEGATIVE PAPERS (1)**

Paper Name and Processing	Paper Type	Surfaces	Sizes	Features and Uses
FUJICOLOR CRYSTAL ARCHIVE PAPER TYPE II  Process CP-49E/CP-48S/CP-47U CP-43F/A/CP-40FA/RA-4 or equivalent	—	Glossy, Lustre, Matte	<b>Rolls:</b> Widths ranging from 3.5 in. to 12 in. <b>Length:</b> 275 ft. to 1750 ft.	<ul style="list-style-type: none"> <li>High-image-quality, silver halide color paper designed for use with both analog and digital printers.</li> <li>Suited to the fast output of high-image quality prints especially in conjunction with the Frontier 570.</li> <li>Provides vivid color reproduction, more brilliant whites and clearer highlight details due to the adoption of new silver halide emulsion, coupler and layer design technologies, along with high image stability under both dark and light storage conditions.</li> </ul>

**COLOR NEGATIVE PAPERS (2)**

Paper Name and Processing	Paper Type	Surfaces	Sizes	Features and Uses
FUJICOLOR CRYSTAL ARCHIVE PROFESSIONAL PAPER TYPE P111  Process RA-4 or equivalent	—	Glossy, Lustre, Matte	<b>Rolls:</b> Widths ranging from 2.75 in. to 40 in. <b>Sheets:</b> Sizes ranging from 8 × 10 in. to 30 × 40 in.	<ul style="list-style-type: none"> <li>Professional-quality, enlarging and contact-printing paper.</li> <li>Suited especially to printing and enlarging from FUJICOLOR professional negatives or similar negatives of other manufacturers designed primarily for wedding and portrait applications and provides even longer lasting prints than before. This paper is intended for processing in Kodak RA-4 processing chemicals.</li> <li>Provides enhanced image stability, unsurpassed whites, excellent skin tone reproduction, true-to-life color reproduction, ideal gradation balance and wide printing latitude.</li> <li>Backprinted with "Fujicolor Professional Paper" and an advice to customers and photographers regarding copyright.</li> </ul>
FUJICOLOR CRYSTAL ARCHIVE PROFESSIONAL PAPER SUPER TYPE PD  Process RA-4 or equivalent	—	Lustre	<b>Rolls:</b> Widths ranging from 3.5 in. to 50 in.	<ul style="list-style-type: none"> <li>Professional-quality, silver-halide color printing paper designed for use with digital exposure systems.</li> <li>Suited especially to the production of high-image-quality professional and commercial prints from medium and large format digital printers and FUJI MINILAB FRONTIER series.</li> <li>Provides high D-max and enhanced suitability to laser exposure, pure whites and cleaner/crisper highlights, improved processing stability, enhanced latent image stability, and the highest level of color image stability.</li> <li>Backprinted with "Fujicolor Professional Paper" and an advice to customers and photographers regarding copyright.</li> </ul>
FUJICOLOR CRYSTAL ARCHIVE PROFESSIONAL PAPER SUPER TYPE C  Process RA-4 or equivalent	—	Glossy, Matte	<b>Rolls:</b> Widths ranging from 4 in. to 50 in. <b>Sheets:</b> Sizes ranging from 8 × 10 in. to 30 × 40 in.	<ul style="list-style-type: none"> <li>Professional-quality, silver-halide color printing paper designed for use with both digital and conventional exposure systems.</li> <li>Suited especially to the production of high-image-quality professional and commercial prints from medium and large format digital printers and FUJI MINILAB FRONTIER series.</li> <li>Provides high D-max and enhanced suitability to laser exposure, pure whites, and cleaner/crisper highlights, improved processing stability, enhanced latent image stability, and the highest level of color image stability.</li> </ul>

**COLOR NEGATIVE PAPERS (3)**

Paper Name and Processing	Paper Type	Surfaces	Sizes	Features and Uses
NEW FUJIFLEX CRYSTAL ARCHIVE PRINTING MATERIAL  Process RA-4 or equivalent	—	Super Glossy	<b>Rolls:</b> Width ranging from 3 1/2 in. to 50 in.	<ul style="list-style-type: none"> <li>Professional-quality laser printer-dedicated silver halide printing material with a polyester base.</li> <li>Suited to the production of high-quality exhibition prints, displays, advertisements and a wide variety of other uses.</li> <li>Provides an expanded color range, high color saturation, pure whites for clearer images and sharper text outline and the highest level of post-processing stability, plus superb latent image stability, for higher productivity.</li> </ul>

**COLOR DISPLAY MATERIAL**

Material Name and Processing	Film Sizes	Features and Uses
<b>FUJITRANS</b> Display Material for Digital Printers  Process RA-4 or equivalent	<b>Rolls:</b> Widths ranging from 20 in. to 50 in.	<ul style="list-style-type: none"> <li>Professional-quality, translucent-base, color display material optimized for exposure, by laser light, using laser printers or other digital printing devices.</li> <li>Suited to use with digital image data of color film and other sources, for the production of extremely high-quality, back-lit displays in sizes from small to large.</li> <li>Provides high D-max, assuring rich color saturation with great detail and a wide range of gradation setup, neutral gray balance, vibrant color reproduction, excellent latent image stability, and the highest level of color image stability and increased whiteness for improved highlight clarity.</li> </ul>
<b>FUJICLEAR</b> Display Material for Digital Printers  Process RA-4 or equivalent	<b>Rolls:</b> Widths ranging from 20 in. to 50 in.	<ul style="list-style-type: none"> <li>Professional-quality, clear-base, color display material optimized for exposure, by laser light, using laser printers or other digital printing devices.</li> <li>Suited to use with digital image data of color film and other sources, for the production of extremely high-quality, back-lit displays in sizes from small to large.</li> <li>Provides high D-max, assuring rich color saturation with great detail and a wide range of gradation setup, neutral gray balance, vibrant color reproduction, excellent latent image stability and the highest level of color image stability.</li> </ul> <p><b>NOTE</b> Without a built-in translucent layer for light diffusion.</p>

**COLOR DUPLICATING FILM**

Film Name and Processing	Exposure	Film Sizes	Features and Uses
<b>FUJICHROME</b> <b>DUPLICATING</b> <b>FILM</b> CDU TYPE II [CDU I1]  Process E-6/CR-56	Light sources: Electronic flash and tungsten lamps Exposure times: 1/1000 to 20 sec.	<b>Rolls:</b> 35 mm 30.5 m (100 ft) 35 mm 122 m (400 ft) 70 mm 30.5 m (100 ft) <b>Sheets:</b> 4 × 5 in. (25 sheets × 2) 8 × 10 in. (25 sheets × 2)	<ul style="list-style-type: none"> <li>Professional-quality transparency duplicating film.</li> <li>Suited to making same-size, reduced, or enlarged positive duplicates from reversal film, or for making high-quality copies of duplicated films.</li> <li>Provides enhanced gray balance, shadow detail and black depth for improved original-to-duplicate fidelity.</li> </ul>

**NOTE** For the CDU II film, other sizes are available. Please contact your local dealer for details.

## 1-8. COLOR FILM AND PAPER PROCESSING SPECIFICATIONS

Described below are the standard processing steps and specifications which result in maximum quality for Fujifilm color reversal films, color negative films, color reversal papers and color negative papers when these materials are processed using suitable processors under controlled conditions.

### 1. Process CR-56

For FUJICHROME films. The table below summarizes the standard Process CR-56 steps and conditions for continuous type (cine film type) and hanger type (dip system) processors used for processing FUJICHROME films.

#### CR-56 Standard Processing Steps

No.	Step	Code	Time (min:sec)			Temperature °C (°F)	Replenishment Rates (mL/m <sup>2</sup> )			Safelight
			Lower Limit	Stand- ard	Upper Limit		Continuous type	Dip-and- dunk Type 135-24   135-36		
1	First Developer	H1	–	6:00	–	38.0±0.3 (100.4±0.5)	2,150	80.6	111	Total darkness
2	First Wash	W1	1:30	2:00	4:00	33 to 39 (92 to 102)	21L/min/m <sup>2</sup>	0.8L/min	1.1L/min	
3	Reversal Bath	H2II	1:30	2:00	4:00	33 to 39 (92 to 102)	1,100	40	56	
4	Color Developer	H3	–	6:00	8:00	38.0±0.6 (100.4±1.0)	2,150	80.6	111	Normal room light
5	Pre-bleach	H4II	1:30	2:00	4:00	33 to 39 (92 to 102)	1,100	40	56	
6	Bleach	H5II	–	6:00	8:00	33 to 39 (92 to 102)	215	8.1	11	
7	Fixer	H6	–	4:00	6:00	33 to 39 (92 to 102)	1,100	40	56	
8	Second Wash	W2	1:30	2:00	4:00	33 to 39 (92 to 102)	Countercurrent cascade water flow from Third Wash (W3)			
9	Third Wash	W3	1:30	2:00	4:00	33 to 39 (92 to 102)	21L/min/m <sup>2</sup>	0.8L/min	1.1L/min	
10	Final Rinse	H7III	0:30	1:00	4:00	Room temp.	1,100	40	56	
11	Drying	–	–	–	–	63°C (145°F) or less	–	–	–	

**NOTE** E-6 chemicals can be used in place of CR-56 chemicals for processing any type of FUJICHROME film.

### 2. Process CN-16Q

For FUJICOLOR negative films. The table below summarizes the standard Process CN-16Q steps and conditions for Minilab film processors used for processing FUJICOLOR negative films.

#### CN-16Q Standard Processing Steps

No.	Step	Code	Time (min:sec)	Temperature °C (°F)	Replenishment Rate (mL/135-24 exp.)	Safelight
1	Color Developer	NQ1	3:15	38.0±0.2 (100.4±0.4)	45	Total darkness
2	Bleach	NQ2	1:00	35 to 41 (95 to 106)	20	
3	Bleach-Fix	NQ3	3:15	35 to 41 (95 to 106)	30	Normal room light
4	Super Rinse 1	NQS-1	0:40	32 to 38 (90 to 100)	–	
5	Super Rinse 2	NQS-2	1:00	32 to 38 (90 to 100)	30	
6	Stabilizer	NQ4	0:40	35 to 41 (95 to 106)	20	
7	Drying	–	–	50 (122)	–	

### 3. Process CN-16FA

For FUJICOLOR negative films. The table below summarizes the standard Process CN-16FA steps and conditions for Minilab film processors used for processing FUJICOLOR negative films.

#### CN-16FA Standard Processing Steps

No.	Step	Code	Time (min:sec)	Temperature °C (°F)	Replenishment Rate (mL/135-24 exp.)	Safelight
1	Color Developer	N1	3:05	38.0±0.2 (100.4±0.4)	23	Total darkness
2	Bleach	N2	0:50	35 to 41 (95 to 106)	5	
3	Fixer 1	N3-1	0:50	35 to 41 (95 to 106)	–	Normal room light
4	Fixer 2	N3-2	0:50	35 to 41 (95 to 106)	16	
5	Super Rinse	NS	0:30	35 to 41 (95 to 106)	34	
6	Stabilizer 1	N4-1	0:20	35 to 41 (95 to 106)	–	
7	Stabilizer 2	N4-2	0:20	35 to 41 (95 to 106)	20	
8	Drying	–	–	50 (122)	–	

#### 4. Process CN-16L

For FUJICOLOR negative films. The table below summarizes the standard Process CN-16L steps and conditions for Minilab film processors used for processing FUJICOLOR negative films.

##### CN-16L Standard Processing Steps

No.	Step	Code	Time (min:sec)	Temperature °C (°F)	Replenishment Rate (mL/135-24 exp.)	Safelight
1	Color Developer	N1	3:05	38.0±0.2 (100.4±0.4)	21	Total darkness
2	Bleach	N2	0:50	35 to 41 (95 to 106)	5	
3	Fixer 1	N3-1	0:50	35 to 41 (95 to 106)		
4	Fixer 2	N3-2	0:50	35 to 41 (95 to 106)	8	Normal room light
5	Super Rinse	NS	0:30	35 to 41 (95 to 106)	17	
6	Stabilizer 1	N4-1	0:20	35 to 41 (95 to 106)		
7	Stabilizer 2	N4-2	0:20	35 to 41 (95 to 106)	15	
8	Drying	—	—	50 (122)		

#### 5. Process CN-16S

For FUJICOLOR negative films. The table below summarizes the standard Process CN-16S steps and conditions for Fujifilm Minilab film processors FP363SC/FP563SC used for processing FUJICOLOR negative films.

##### CN-16S Standard Processing Steps

No.	Step	Code	Time (min:sec)	Temperature °C (°F)	Replenishment Rate (mL/135-24 exp.)	Safelight
1	Color Developer	N1	3:05	38.0±0.2 (100.4±0.4)	15	Total darkness
2	Bleach	N2	0:50	35 to 41 (95 to 106)	5	
3	Fixer 1	N3-1	0:50	35 to 41 (95 to 106)		
4	Fixer 2	N3-2	0:50	35 to 41 (95 to 106)	7.5	Normal room light
5	Stabilizer 1	N4-1	0:30	35 to 41 (95 to 106)		
6	Stabilizer 2	N4-2	0:20	35 to 41 (95 to 106)		
7	Stabilizer 3	N4-3	0:20	35 to 41 (95 to 106)	30	
8	Drying	—	—	50 (122)		

#### 6. Process CP-40FA

For FUJICOLOR negative papers. The table below summarizes the standard Process CP-40FA steps and conditions for Minilab printer processors used for processing FUJICOLOR negative papers.

##### CP-40FA Standard Processing Steps

No.	Step	Code	Time (sec)	Temperature °C (°F)	Replenishment Rate (mL/m <sup>2</sup> )	Safelight
1	Color Developer	P1	45	35.0±0.3 (95.0±0.5)	161	Total darkness or Fuji Safelight Filter SLG-103A (10W lamp)
2	Bleach-Fix	P2	45	33 to 37 (91 to 99)	218	
3	Super Rinse	PS	90	33 to 37 (91 to 99)	364	Normal room light
4	Drying	—	—	60 to 90 (140 to 194)		

**NOTE** RA-4 chemicals can be used in place of CP-40FA chemicals for processing any type of FUJICOLOR negative paper.

#### 7. Process CP-43FA

For FUJICOLOR negative papers. The table below summarizes the standard Process CP-43FA steps and conditions for Minilab printer processors used for processing FUJICOLOR negative papers.

##### CP-43FA Standard Processing Steps

No.	Step	Code	Time (sec)	Temperature °C (°F)	Replenishment Rate (mL/m <sup>2</sup> )	Safelight
1	Color Developer	P1	45	38.5±0.3 (101.3±0.5)	73	Total darkness
2	Bleach-Fix	P2	45	33 to 37 (91 to 99)	61	
3	Super Rinse	PS	90	33 to 37 (91 to 99)	121 <sup>*1</sup> 242 <sup>*2</sup>	Normal room light
4	Drying	—	—	60 to 90 (140 to 194)		

\*1 With RC50D incorporated

\*2 Without RC50D incorporated

**NOTE** The CP-43FA processing formula is a reduced replenishment version of Process CP-40FA.

### 8. Process CP-47L

For FUJICOLOR negative papers. The table below summarizes the standard Process CP-47L steps and conditions for Minilab printer processors used for processing FUJICOLOR negative papers.

#### CP-47L Standard Processing Steps

No.	Step	Code	Time (sec)	Temperature °C (°F)	Replenishment Rate (mL/m <sup>2</sup> )	Safelight
1	Color Developer	P1	45	38.5±0.3 (101.3±0.5)	45	Total darkness
2	Bleach-Fix	P2	45	36 to 40 (96.8 to 104)	35	
3	Super Rinse	PS	90	35 to 40 (95 to 104)	121 <sup>*1</sup> 242 <sup>*2</sup>	Normal room light
4	Drying	—	—	60 to 90 (140 to 194)		

\*1 With RC50D incorporated

\*2 Without RC50D incorporated

**NOTE** The CP-47L processing formula is used as a substitute for CP-43FA thereby reducing replenishment rates.

### 9. Process CP-48S

For FUJICOLOR negative papers. The table below summarizes the standard Process CP-48S steps and conditions for Fujifilm Digital Minilab FRONTIER 330/350/370/390 used for processing FUJICOLOR negative papers.

#### CP-48S Standard Processing Steps

No.	Step	Code	Time (sec)	Temperature °C (°F)	Replenishment Rate (mL/m <sup>2</sup> )	Safelight
1	Color Developer	P1	45	38.5±0.3 (101.3±0.5)	45	Total darkness
2	Bleach-Fix	P2	45	36 to 40 (96.8 to 104)	35	
3	Super Rinse	PS	90	35 to 40 (95 to 104)	150 <sup>*1</sup> 175 <sup>*2</sup> 242 <sup>*3</sup>	Normal room light
4	Drying	—	—	45 to 65 (113 to 149)		

\*1 FRONTIER 350/370

\*2 FRONTIER 330

\*3 FRONTIER 390

### 10. Process CP-49E

For FUJICOLOR negative papers. The table below summarizes the standard Process CP-49E steps and conditions for Fujifilm Digital Minilab FRONTIER 340 and FRONTIER 550/570 used for processing FUJICOLOR negative papers.

#### CP-49E Standard Processing Steps for FRONTIER 340

No.	Step	Code	Time (sec)	Temperature °C (°F)	Replenishment Rate (mL/m <sup>2</sup> )	Safelight
1	Color Developer	P1	25	45.0±0.3 (113±0.5)	45	Total darkness
2	Bleach-Fix	P2	25	38 to 42 (100 to 108)	35	
3	Super Rinse	PS	24	38 to 42 (100 to 108)	215	Normal room light
4	Drying	—	—	65 to 85 (149 to 185)		

#### CP-49E Standard Processing Steps for FRONTIER 550/570

No.	Step	Code	Time (sec)	Temperature °C (°F)	Replenishment Rate (mL/m <sup>2</sup> )	Safelight
1	Color Developer	P1	19	43.0±0.3 (109.4±0.5)	45	Total darkness
2	Bleach-Fix	P2	19	41 to 45 (106 to 113)	35	
3	Super Rinse	PS	17	43 to 46 (109 to 115)	175	Normal room light
4	Drying	—	—	75 to 80 (167 to 176)		

## 1-9. TECHNICAL DATA ON CAMERA FILMS

This section contains technical data on FUJICHROME films and FUJICOLOR films.

### ● Films

FUJICHROME Velvia for Professionals	[RVP]
FUJICHROME Velvia 100 Professional	[RVP100]
FUJICHROME Velvia 100F Professional	[RVP100F]
FUJICHROME PROVIA 100F Professional	[RDP111]
FUJICHROME ASTIA 100F Professional	[RAP100F]
FUJICHROME PROVIA 400F Professional	[RHP111]
FUJICHROME 64 T TYPE II Professional	[RTP111]
FUJICHROME Sensia 100	[RA]
FUJICHROME Sensia 200	[RM]
FUJICHROME Sensia 400	[RH]
FUJICOLOR PRO 160S PROFESSIONAL	[PRO 160S]
FUJICOLOR PRO 160C PROFESSIONAL	[PRO 160C]
FUJICOLOR NPL 160 PROFESSIONAL	[NPL]
FUJICOLOR PRO 400H PROFESSIONAL	[PRO 400H]
FUJICOLOR PRO 800Z PROFESSIONAL	[PRO 800Z]
FUJICOLOR SUPERIA REALA	[CS]
FUJICOLOR SUPERIA 100	[CN]
FUJICOLOR SUPERIA 200	[CA]
FUJICOLOR SUPERIA X-TRA 400	[CH]
FUJICOLOR TRUE DEFINITION 400	[CH]
FUJICOLOR SUPERIA X-TRA 800	[CZ]
FUJICOLOR SUPERIA 1600	[CU]
FUJICOLOR PRESS 400	[CH]
FUJICOLOR PRESS 800	[CZ]

### ● Technical Data

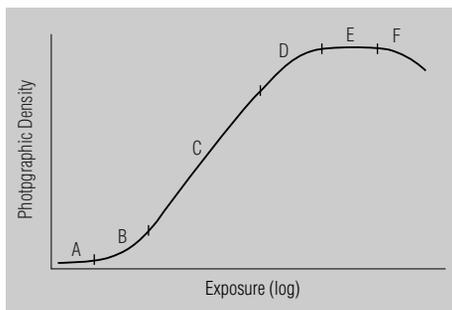
- Spectral Sensitivity Curves
- Spectral Dye Density Curves
- Characteristic Curves
- MTF Curve
- Diffuse RMS Granularity Value
- Resolving Power

To help readers better understand the graphs which follow, these brief technical explanations are given.

### Characteristic Curves

Characteristic curves graphically represent the densities that are produced on a given photographic emulsion by a specific exposure using a given combination of developer and development time. They serve as a standard yardstick for evaluating the exposure-density relationship for different emulsions and different processing conditions. A characteristic curve consists of densitometric measurements plotted against the log of exposure. Each part of the curve reflects a different density characteristic of the given exposure, as follows:

Point	Name	Density Characteristic
A	Base Fog Density Level	Area with no visible exposure and no detail.
B	Toe	Area where density gradually begins to increase.
C	Straight Line	Area where density increases at a more or less linear rate.
D	Shoulder	Area where the curve changes from diagonal to horizontal.
E	Maximum Density	Area of maximum density. Referred to as "D-max" or "Max. black."
F	Reversal	Area where increasing exposure causes the density to drop. This effect is called "solarization."



The nature of a photosensitive material is indicated by its characteristic curve. For example, the slope (or gamma) of the straight line indicates the film's relative contrast. The larger the gamma, the higher the contrast (3.0 is typical for high-contrast lithographic black-and-white film). The position of the characteristic curve with respect to the exposure scale indicates the speed of the emulsion. The further left it is, the faster the emulsion and the shorter the time required to produce any particular density on the curve.

Since color emulsions usually have three photosensitive layers, one curve is plotted for each layer. These curves, however, will not be identical because each layer responds to light in a different way.

### Spectral Sensitivity Curves

Spectral sensitivity curves graphically represent a film's response to different colors of the spectrum. They are produced by plotting wavelength against sensitivity (indicated by "log sensitivity," or the reciprocal of the exposure (J/cm<sup>2</sup>) needed to obtain a density of 1.0 above minimum density). A set of three curves is used for color films, one for each of the color-sensitive layers (blue, green and red). These curves are obtained by exposing the photographic material to narrow-band (5-10 nm) radiation.

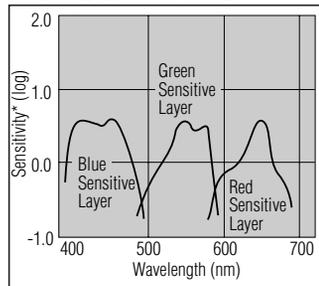
### Spectral Dye Density Curves

Spectral density is a measure of the amount of light absorbed by a given area illuminated by light within a narrow range of wavelengths. Spectral dye density curves graphically represent the light-absorption characteristics of dyes in reversal, duplicating, and negative films. A spectrophotometer or color analyzer is used to take spectral diffuse density measurements for a given emulsion under given lighting conditions, and these values are plotted against wavelength to produce a spectral dye density curve.

- Two spectral density curves are obtained for negative films: one for standard neutral gray (i.e., a spectral density of 1.0) and one for minimum density.
- Three spectral density curves are obtained for reversal films (one for each photosensitive dye layer) with the obtained spectral density level set at 1.0.

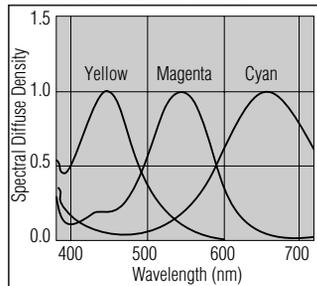
**FUJICHROME Velvia for Professionals [RVP]**  
 ISO 50/18°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



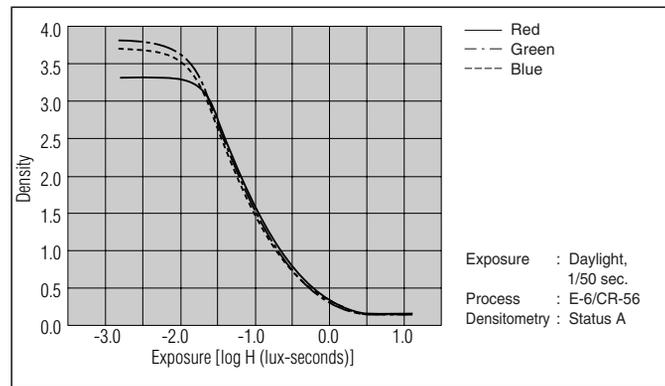
Process : E-6/CR-56  
 Densitometry : Status A  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



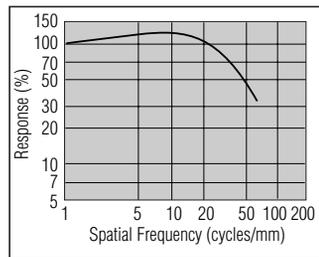
Exposure: Separated Light  
 Process : E-6/CR-56

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
 1/50 sec.  
 Process : E-6/CR-56  
 Densitometry : Status A

• **MTF CURVE**



Exposure: Daylight  
 Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY VALUE.....9**

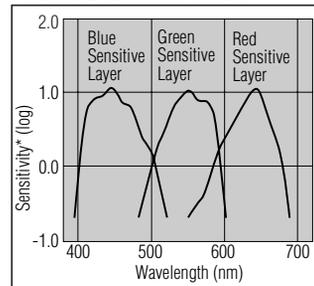
Micro-densitometer Measurement Aperture:  
 48µm in diameter  
 Sample Density:1.0

• **RESOLVING POWER**

Chart Contrast 1.6:1 - **80** lines/mm  
 Chart Contrast 1000:1 - **160** lines/mm

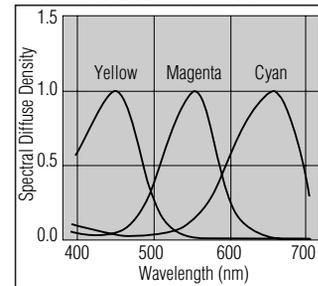
**FUJICHROME Velvia 100 Professional [RVP100]**  
 ISO 100/21°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



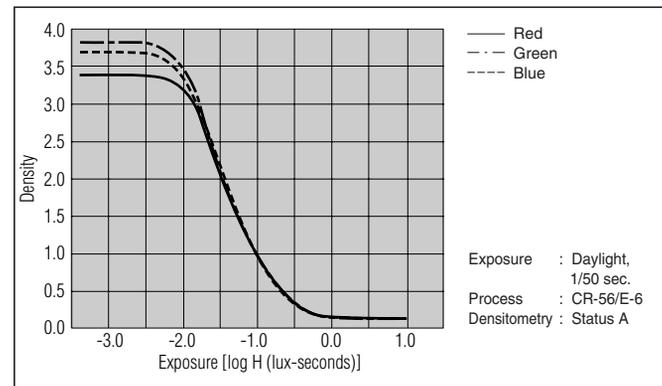
Process : CR-56/E-6  
 Densitometry : Status A  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



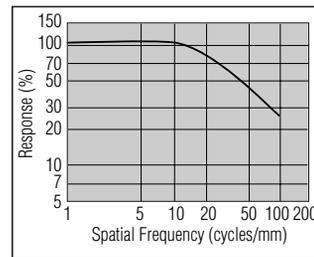
Exposure: Separated Light  
 Process : CR-56/E-6

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
 1/50 sec.  
 Process : CR-56/E-6  
 Densitometry : Status A

• **MTF CURVE**



Exposure: Daylight  
 Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY VALUE.....8**

Micro-densitometer Measurement Aperture:  
 48µm in diameter  
 Sample Density:1.0

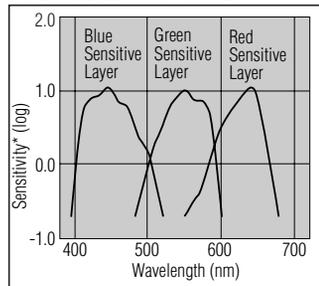
• **RESOLVING POWER**

Chart Contrast 1.6:1 - **80** lines/mm  
 Chart Contrast 1000:1 - **160** lines/mm

**FUJICHROME Velvia 100F Professional [RVP100F]**

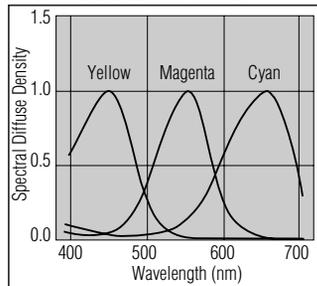
ISO 100/21°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



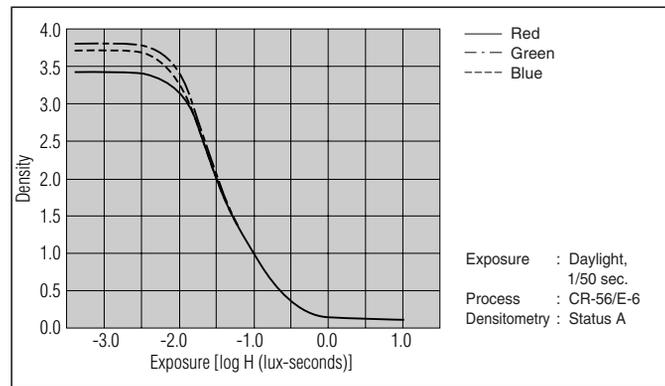
Process : CR-56/E-6  
 Densitometry : Status A  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



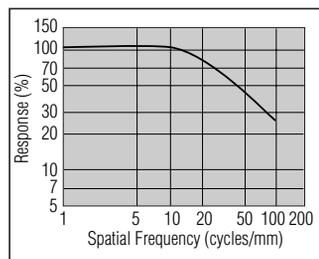
Exposure: Separated Light  
 Process : CR-56/E-6

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
 1/50 sec.  
 Process : CR-56/E-6  
 Densitometry : Status A

• **MTF CURVE**



Exposure: Daylight  
 Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY**  
 VALUE.....8

Micro-densitometer Measurement Aperture:  
 48μm in diameter  
 Sample Density:1.0

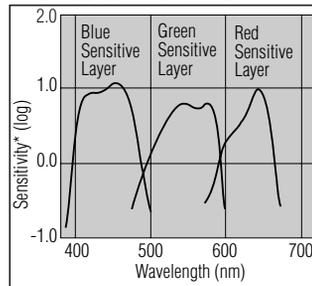
• **RESOLVING POWER**

Chart Contrast 1.6:1 - 80 lines/mm  
 Chart Contrast 1000:1 - 160 lines/mm

**FUJICHROME PROVIA 100F Professional [RDP111]**

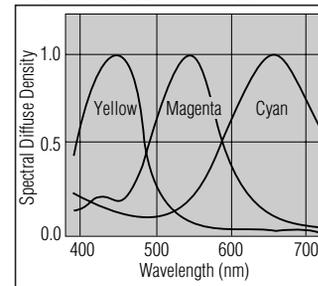
ISO 100/21°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



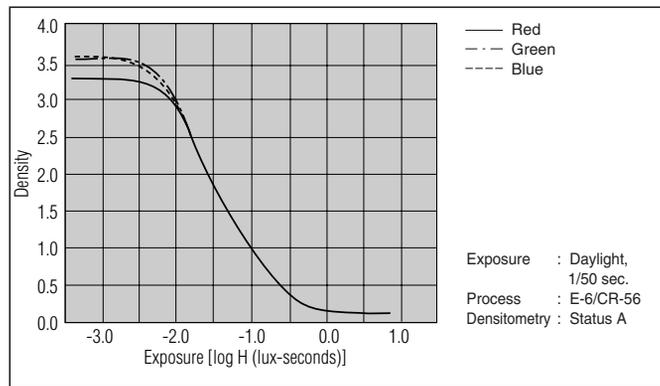
Process : E-6/CR-56  
 Densitometry : Status A  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



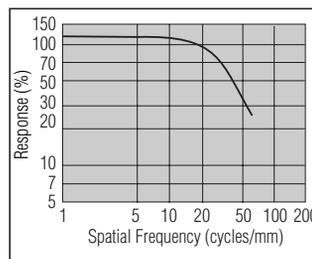
Exposure: Separated Light  
 Process : E-6/CR-56

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
 1/50 sec.  
 Process : E-6/CR-56  
 Densitometry : Status A

• **MTF CURVE**



Exposure: Daylight  
 Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY**  
 VALUE.....8

Micro-densitometer Measurement Aperture:  
 48μm in diameter  
 Sample Density:1.0

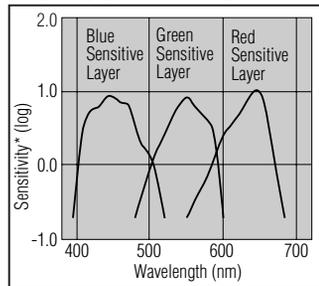
• **RESOLVING POWER**

Chart Contrast 1.6:1 - 60 lines/mm  
 Chart Contrast 1000:1 - 140 lines/mm

**FUJICHROME ASTIA 100F Professional [RAP100F]**

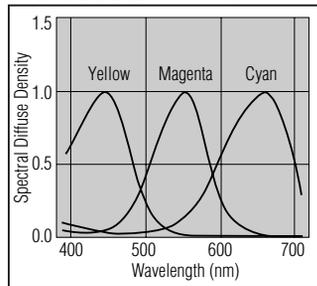
ISO 100/21°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



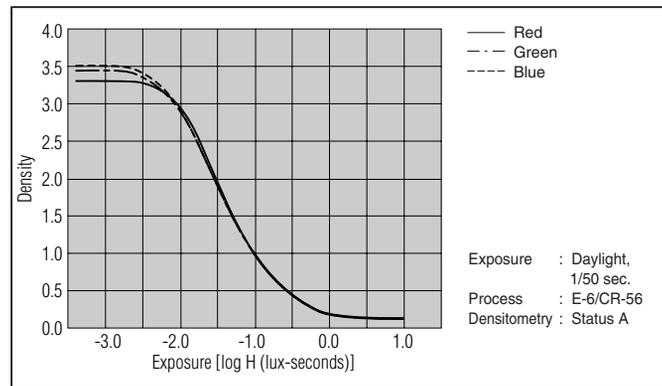
Process : E-6/CR-56  
Densitometry : Status A  
Density : 1.0 above D-min  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



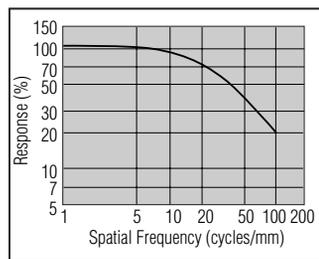
Exposure: Daylight  
Process : E-6/CR-56

• **CHARACTERISTIC CURVES**

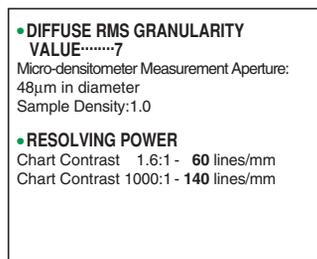


Exposure : Daylight,  
1/50 sec.  
Process : E-6/CR-56  
Densitometry : Status A

• **MTF CURVE**



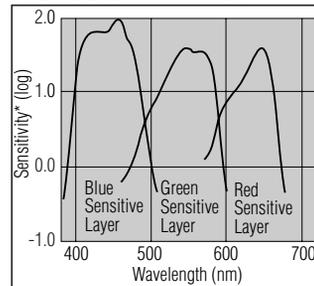
Exposure: Daylight  
Process : E-6/CR-56



**FUJICHROME PROVIA 400F Professional [RHP111]**

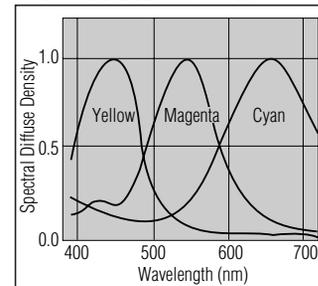
ISO 400/27°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



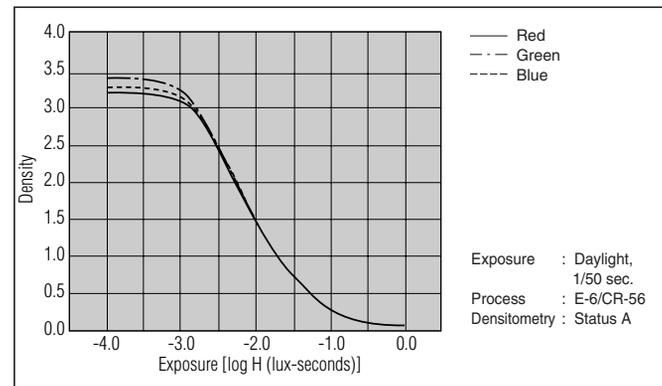
Process : E-6/CR-56  
Densitometry : Status A  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



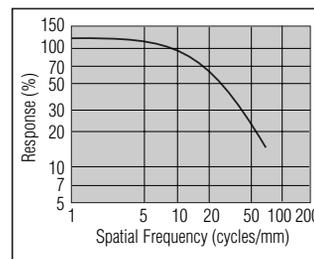
Exposure: Separated Light  
Process : E-6/CR-56

• **CHARACTERISTIC CURVES**

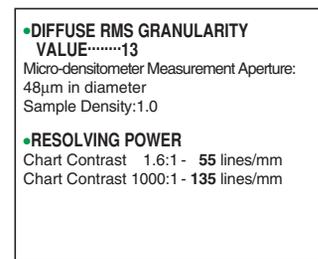


Exposure : Daylight,  
1/50 sec.  
Process : E-6/CR-56  
Densitometry : Status A

• **MTF CURVE**

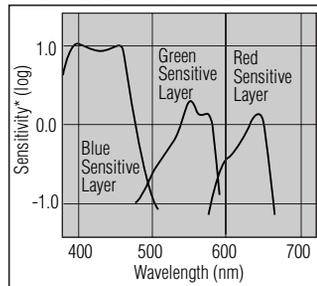


Exposure: Daylight  
Process : E-6/CR-56



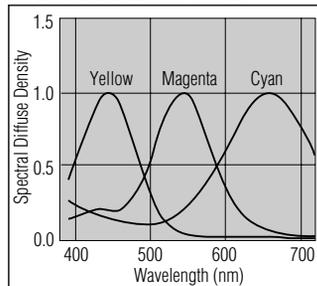
**FUJICHROME 64 T TYPEII Professional [RTP11]**  
ISO 64/19°, Tungsten Type

• **SPECTRAL SENSITIVITY CURVES**



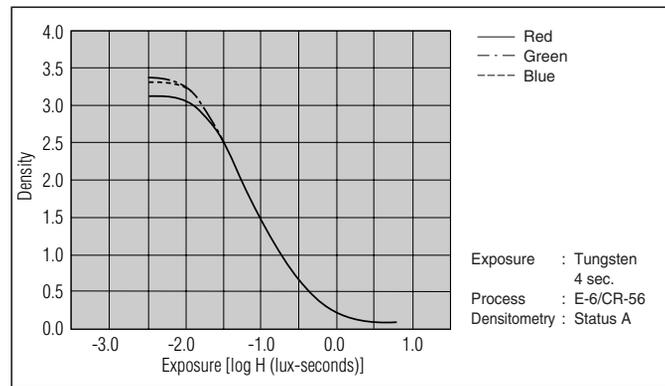
Process : E-6/CR-56  
Densitometry : Status A  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



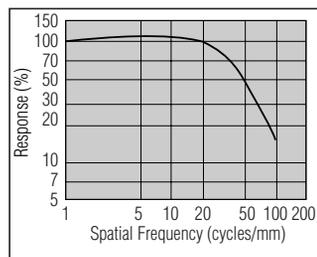
Exposure: Separated Light  
Process : E-6/CR-56

• **CHARACTERISTIC CURVES**



Exposure : Tungsten  
4 sec.  
Process : E-6/CR-56  
Densitometry : Status A

• **MTF CURVE**



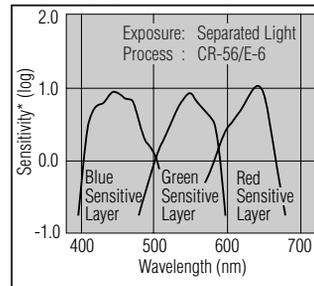
Exposure: Tungsten  
Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY**  
VALUE.....10  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Sample Density:1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - 55 lines/mm  
Chart Contrast 1000:1 - 135 lines/mm

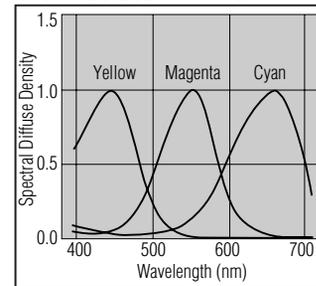
**FUJICHROME Sensia 100 [RA]**  
ISO 100/21°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



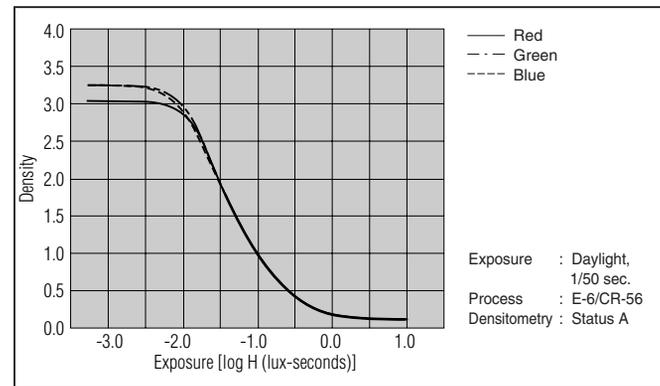
Exposure: Separated Light  
Process : CR-56/E-6  
Process : E-6/CR-56  
Densitometry : Status A  
Density : 1.0 above D-min  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



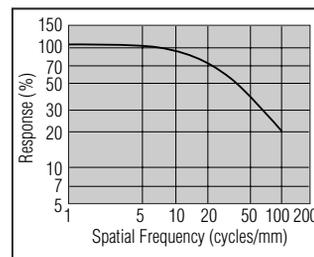
Exposure: Daylight  
Process : E-6/CR-56

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
1/50 sec.  
Process : E-6/CR-56  
Densitometry : Status A

• **MTF CURVE**



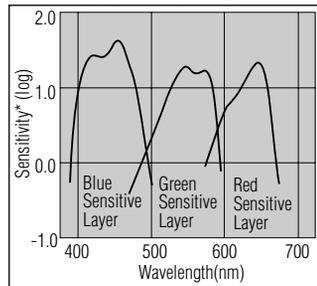
Exposure: Daylight  
Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY**  
VALUE.....8  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Sample Density:1.0

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - 60 lines/mm  
Chart Contrast 1000:1 - 140 lines/mm

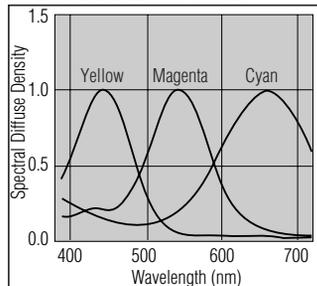
**FUJICHROME Sensia 200 [RM]**  
ISO 200/24°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



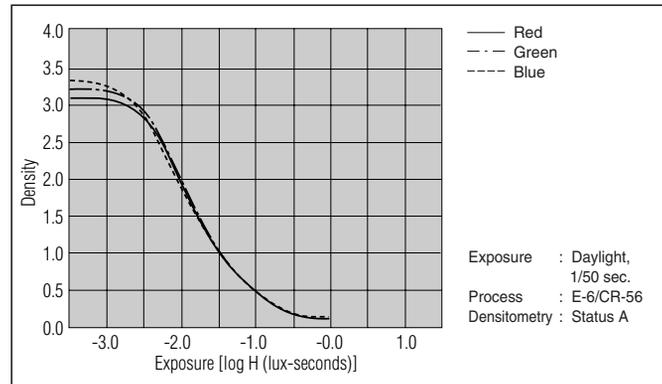
Process : E-6/CR-56  
Densitometry : Status A  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



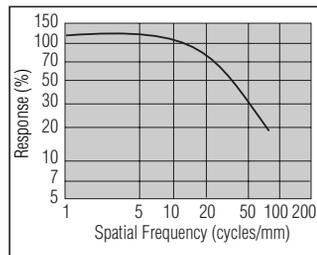
Exposure: Separated Light  
Process : E-6/CR-56

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
1/50 sec.  
Process : E-6/CR-56  
Densitometry : Status A

• **MTF CURVE**



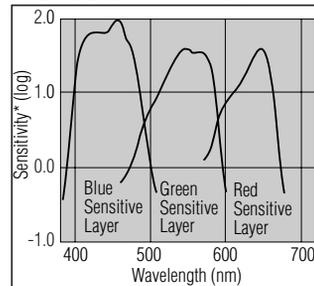
Exposure: Daylight  
Process : E-6/CR-56

• **DIFFUSE RMS GRANULARITY**  
VALUE.....13  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Sample Density:1.0

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - 60 lines/mm  
Chart Contrast 1000:1 - 140 lines/mm

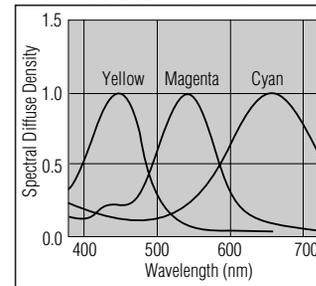
**FUJICHROME Sensia 400 [RH]**  
ISO 400/27°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



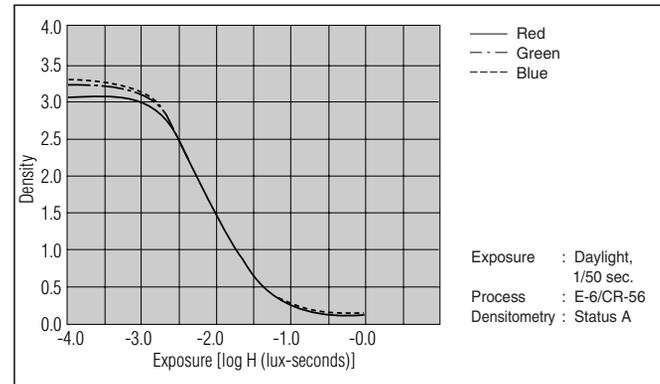
Process : E-6/CR-56  
Densitometry : Status A  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



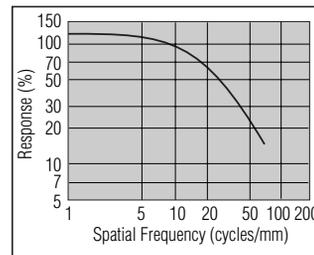
Exposure: Separated Light  
Process : E-6/CR-56

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
1/50 sec.  
Process : E-6/CR-56  
Densitometry : Status A

• **MTF CURVE**



Exposure: Daylight  
Process : E-6/CR-56

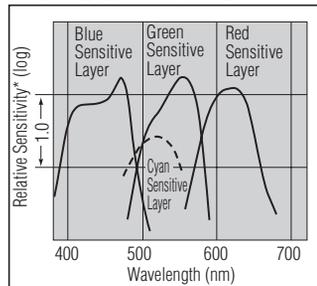
• **DIFFUSE RMS GRANULARITY**  
VALUE.....13  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Sample Density:1.0

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - 55 lines/mm  
Chart Contrast 1000:1 - 135 lines/mm

**FUJICOLOR PRO 160S PROFESSIONAL [PRO 160S]**

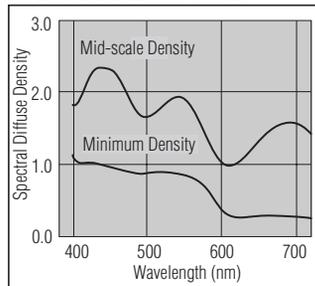
ISO 160/23°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



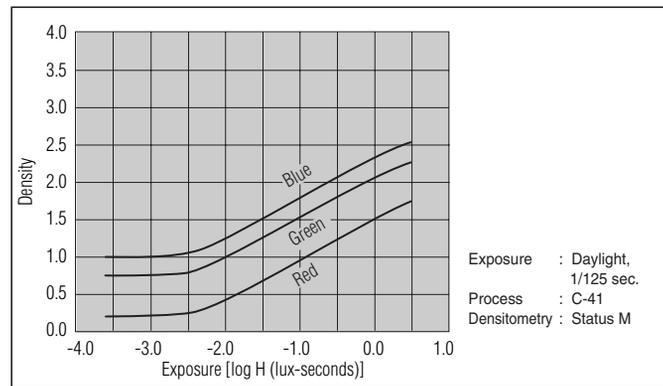
Process : C-41  
Densitometry : Status M  
Density : 1.0 above D-min.  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



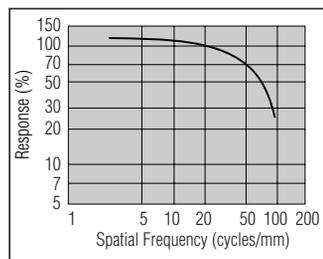
Typical densities for a mid-scale neutral subject and for D-min.

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
1/125 sec.  
Process : C-41  
Densitometry : Status M

• **MTF CURVE**



Exposure: Daylight  
Process : C-41

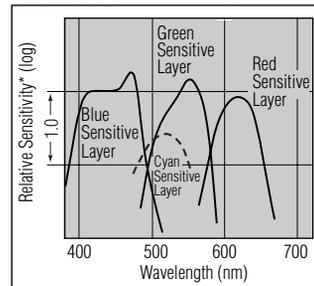
• **DIFFUSE RMS GRANULARITY**  
VALUE.....3  
Micro-densitometer Measurement Aperture:  
48µm in diameter  
Magnification: 12 ×  
Sample Density: 1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - **63** lines/mm  
Chart Contrast 1000:1 - **125** lines/mm

**FUJICOLOR PRO 160C PROFESSIONAL [PRO 160C]**

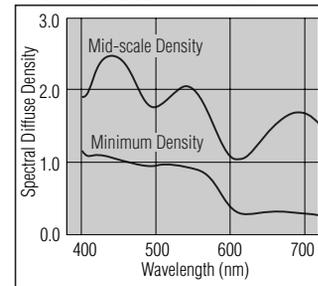
ISO 160/23°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



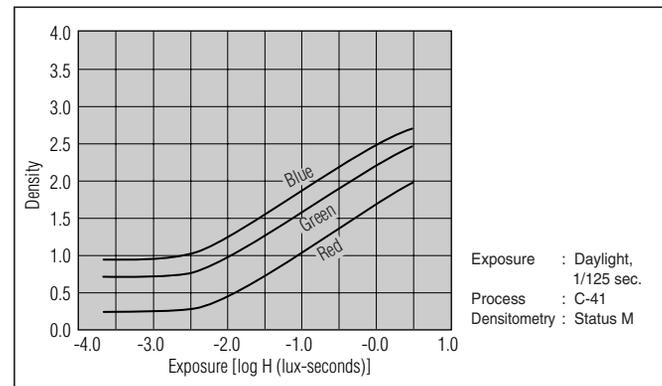
Process : C-41  
Densitometry : Status M  
Density : 1.0 above D-min.  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



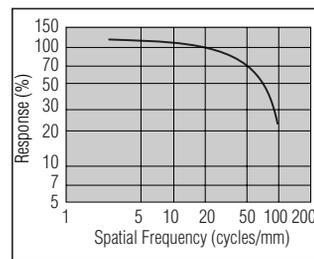
Typical densities for a mid-scale neutral subject and for D-min.

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
1/125 sec.  
Process : C-41  
Densitometry : Status M

• **MTF CURVE**



Exposure: Daylight  
Process : C-41

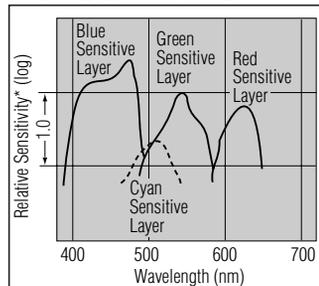
• **DIFFUSE RMS GRANULARITY**  
VALUE.....3  
Micro-densitometer Measurement Aperture:  
48µm in diameter  
Magnification: 12 ×  
Sample Density: 1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - **50** lines/mm  
Chart Contrast 1000:1 - **125** lines/mm

**FUJICOLOR NPL 160 PROFESSIONAL [NPL]**

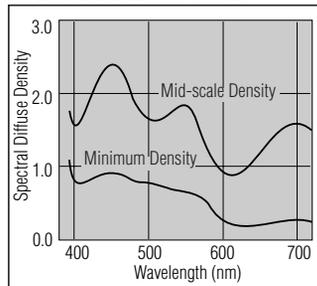
ISO 160/23°, Tungsten Type

• SPECTRAL SENSITIVITY CURVES



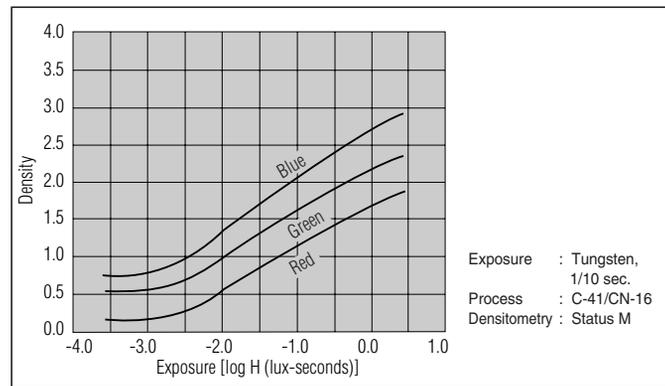
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• SPECTRAL DYE DENSITY CURVES



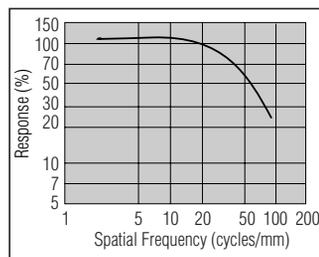
Typical densities for a mid-scale neutral subject and for minimum density.

• CHARACTERISTIC CURVES



Exposure : Tungsten,  
1/10 sec.  
Process : C-41/CN-16  
Densitometry : Status M

• MTF CURVE



Exposure: Tungsten  
Process : C-41/CN-16

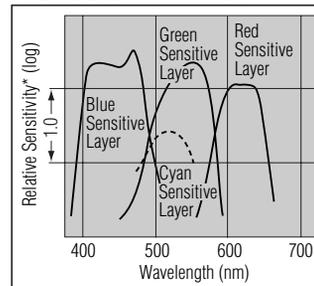
• DIFFUSE RMS GRANULARITY  
VALUE.....4  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12 ×  
Sample Density: 1.0 above minimum density

• RESOLVING POWER  
Chart Contrast 1.6:1 - 63 lines/mm  
Chart Contrast 1000:1 - 125 lines/mm

**FUJICOLOR PRO 400H PROFESSIONAL [PRO 400H]**

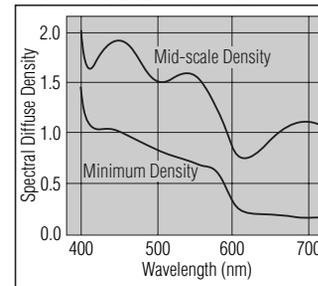
ISO 400/27°, Daylight Type

• SPECTRAL SENSITIVITY CURVES



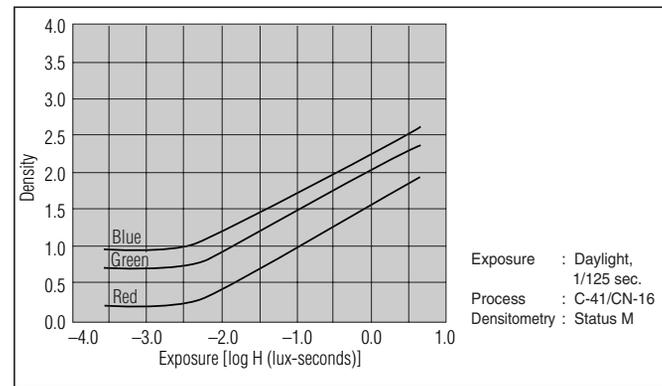
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• SPECTRAL DYE DENSITY CURVES



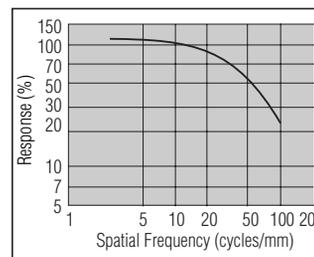
Typical densities for a mid-scale neutral subject and for minimum density.

• CHARACTERISTIC CURVES



Exposure : Daylight,  
1/125 sec.  
Process : C-41/CN-16  
Densitometry : Status M

• MTF CURVE



Exposure: Daylight  
Process : C-41/CN-16

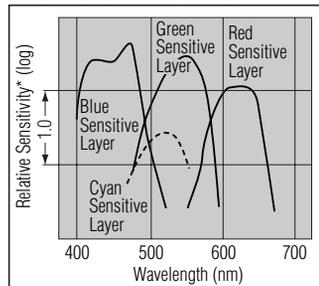
• DIFFUSE RMS GRANULARITY  
VALUE.....4  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12 ×  
Sample Density: 1.0 above minimum density

• RESOLVING POWER  
Chart Contrast 1.6:1 - 50 lines/mm  
Chart Contrast 1000:1 - 125 lines/mm

**FUJICOLOR PRO 800Z PROFESSIONAL [PRO 800Z]**

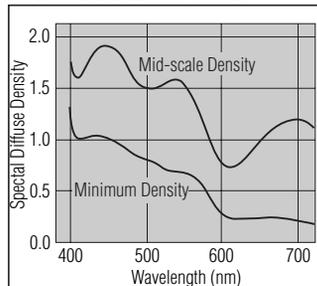
ISO 800/30°, Daylight Type

• SPECTRAL SENSITIVITY CURVES



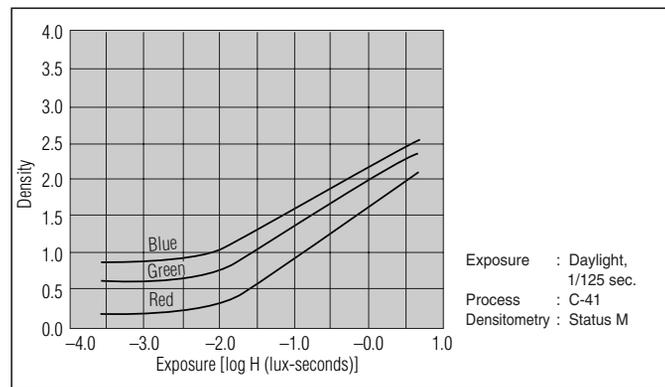
Process : C-41  
 Densitometry : Status A  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• SPECTRAL DYE DENSITY CURVES



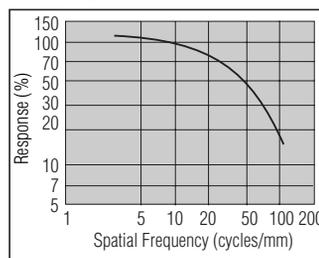
Typical densities for a mid-scale neutral subject and for minimum density.

• CHARACTERISTIC CURVES



Exposure : Daylight,  
 1/125 sec.  
 Process : C-41  
 Densitometry : Status M

• MTF CURVE



Exposure: Daylight  
 Process : C-41

• DIFFUSE RMS GRANULARITY VALUE.....5

Micro-densitometer Measurement Aperture:  
 48μm in diameter  
 Magnification: 12×  
 Sample Density: 1.0 above minimum density

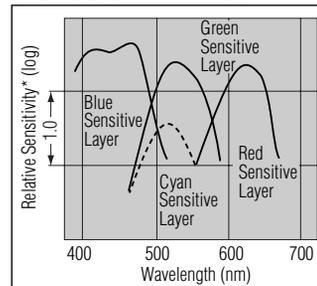
• RESOLVING POWER

Chart Contrast 1.6:1 - 50 lines/mm  
 Chart Contrast 1000:1 - 115 lines/mm

**FUJICOLOR SUPERIA REALA [CS]**

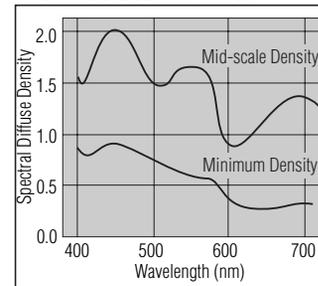
ISO 100/21°, Daylight Type

• SPECTRAL SENSITIVITY CURVES



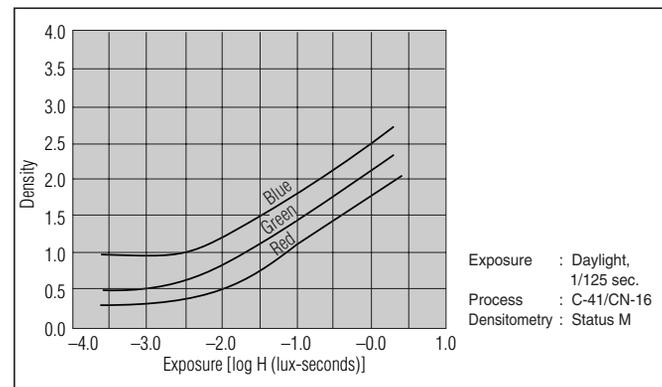
Process : C-41/CN-16  
 Densitometry : Status M  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• SPECTRAL DYE DENSITY CURVES



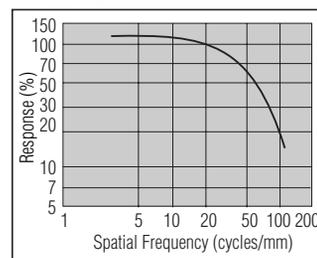
Typical densities for a mid-scale neutral subject and for minimum density.

• CHARACTERISTIC CURVES



Exposure : Daylight,  
 1/125 sec.  
 Process : C-41/CN-16  
 Densitometry : Status M

• MTF CURVE



Exposure: Daylight  
 Process : C-41/CN-16

• DIFFUSE RMS GRANULARITY VALUE.....4

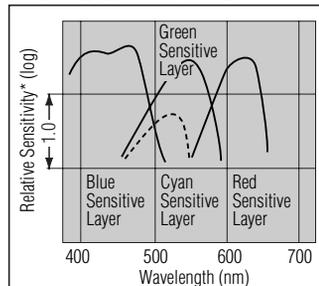
Micro-densitometer Measurement Aperture:  
 48μm in diameter  
 Magnification: 12×  
 Sample Density: 1.0 above minimum density

• RESOLVING POWER

Chart Contrast 1.6:1 - 63 lines/mm  
 Chart Contrast 1000:1 - 125 lines/mm

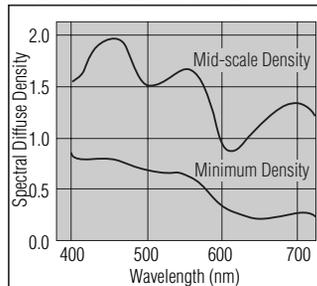
**FUJICOLOR SUPERIA 100 [CN]**  
ISO 100/21°, Daylight Type

• SPECTRAL SENSITIVITY CURVES



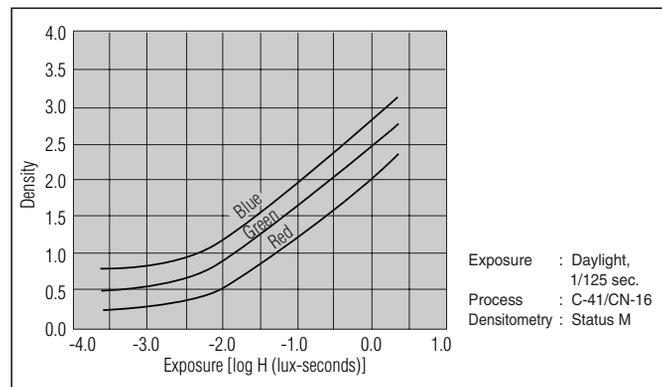
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• SPECTRAL DYE DENSITY CURVES



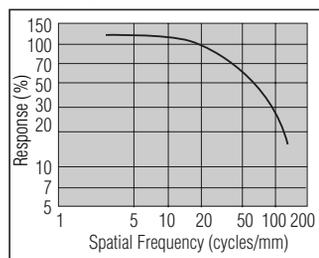
Typical densities for a mid-scale neutral subject and for minimum density.

• CHARACTERISTIC CURVES



Exposure : Daylight,  
1/125 sec.  
Process : C-41/CN-16  
Densitometry : Status M

• MTF CURVE



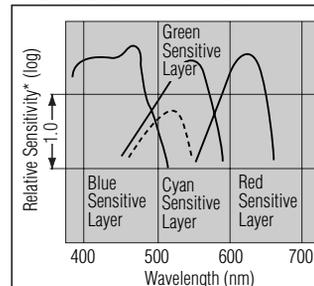
Exposure: Daylight  
Process : C-41/CN-16

• DIFFUSE RMS GRANULARITY  
VALUE.....4  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12 ×  
Sample Density:1.0 above minimum density

• RESOLVING POWER  
Chart Contrast 1.6:1 - 63 lines/mm  
Chart Contrast 1000:1 - 125 lines/mm

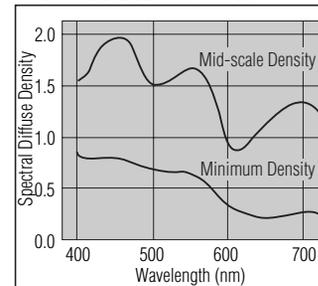
**FUJICOLOR SUPERIA 200 [CA]**  
ISO 200/24°, Daylight Type

• SPECTRAL SENSITIVITY CURVES



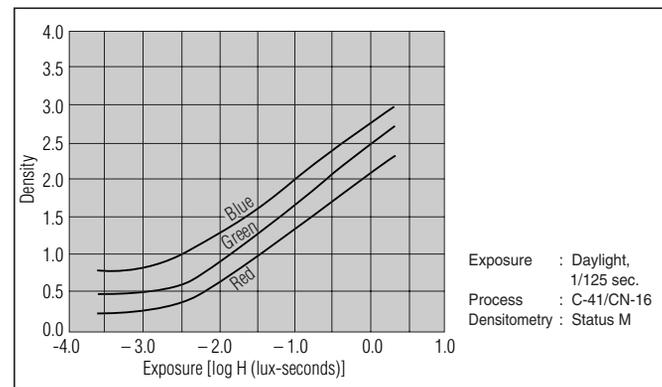
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• SPECTRAL DYE DENSITY CURVES



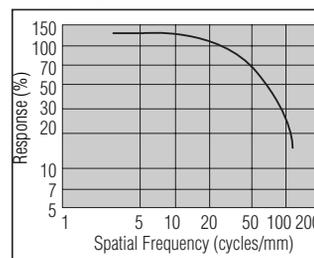
Typical densities for a mid-scale neutral subject and for minimum density.

• CHARACTERISTIC CURVES



Exposure : Daylight,  
1/125 sec.  
Process : C-41/CN-16  
Densitometry : Status M

• MTF CURVE



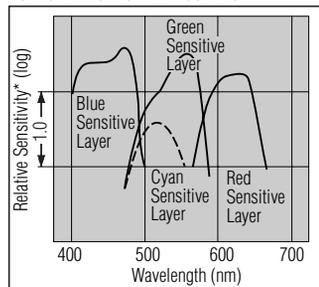
Exposure: Daylight  
Process : C-41/CN-16

• DIFFUSE RMS GRANULARITY  
VALUE.....4  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12 ×  
Sample Density:1.0 above minimum density

• RESOLVING POWER  
Chart Contrast 1.6:1 - 50 lines/mm  
Chart Contrast 1000:1 - 125 lines/mm

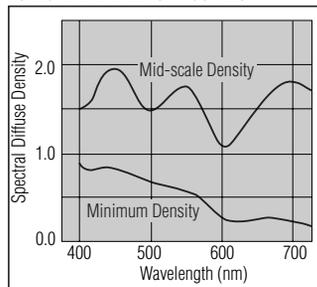
**FUJICOLOR SUPERIA X-TRA 400 [CH] ISO 400/27°, Daylight Type**  
**FUJICOLOR PRESS 400 [CH]**

• **SPECTRAL SENSITIVITY CURVES**



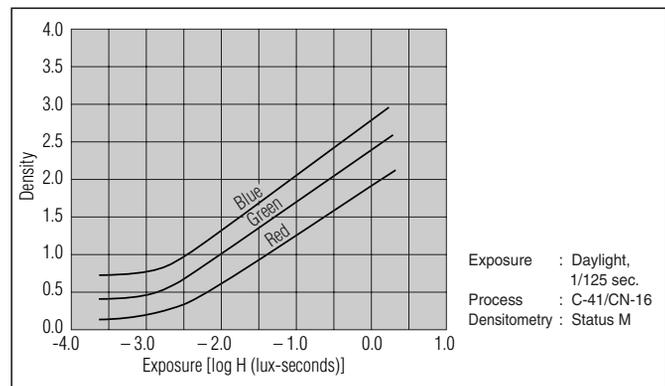
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**

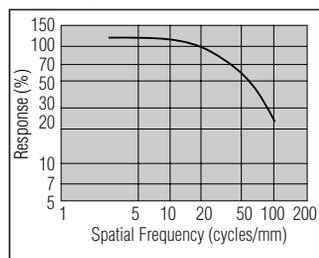


Typical densities for a mid-scale neutral subject and for minimum density.

• **CHARACTERISTIC CURVES**



• **MTF CURVE**



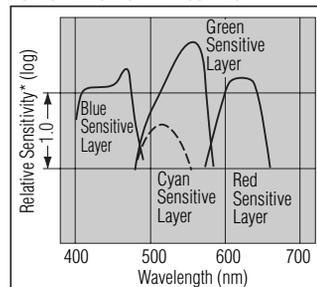
Exposure: Daylight  
Process : C-41/CN-16

• **DIFFUSE RMS GRANULARITY**  
**VALUE.....4**  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12×  
Sample Density: 1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - **50** lines/mm  
Chart Contrast 1000:1 - **125** lines/mm

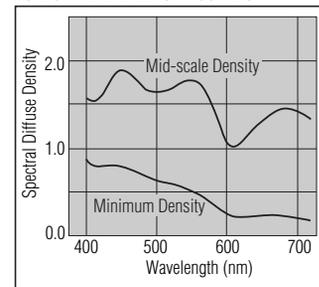
**FUJICOLOR TRUE DEFINITION 400 [CH]**  
**ISO 400/27°, Daylight Type**

• **SPECTRAL SENSITIVITY CURVES**



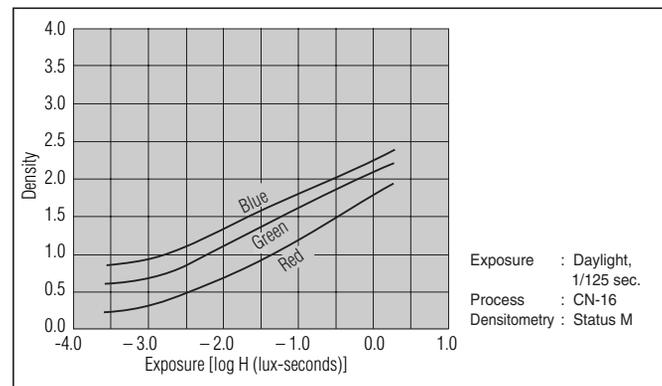
Process : CN-16  
Densitometry : Status M  
Density : 1.0 above D-min.  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**

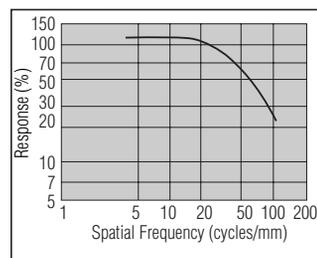


Typical densities for a mid-scale neutral subject and for D-mini.

• **CHARACTERISTIC CURVES**



• **MTF CURVE**



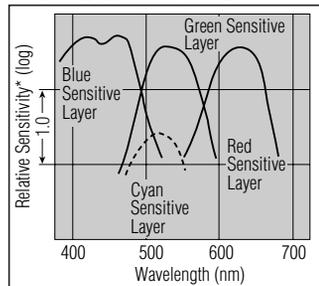
Exposure: Daylight  
Process : CN-16

• **DIFFUSE RMS GRANULARITY**  
**VALUE.....5**  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12×  
Sample Density: 1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - **50** lines/mm  
Chart Contrast 1000:1 - **125** lines/mm

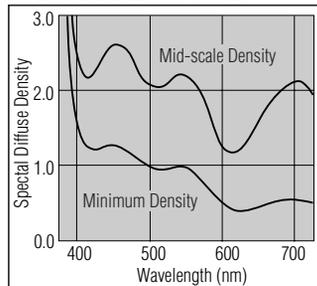
**FUJICOLOR SUPERIA X-TRA 800 [CZ]** ISO 800/30°, Daylight Type  
**FUJICOLOR PRESS 800 [CZ]**

• **SPECTRAL SENSITIVITY CURVES**



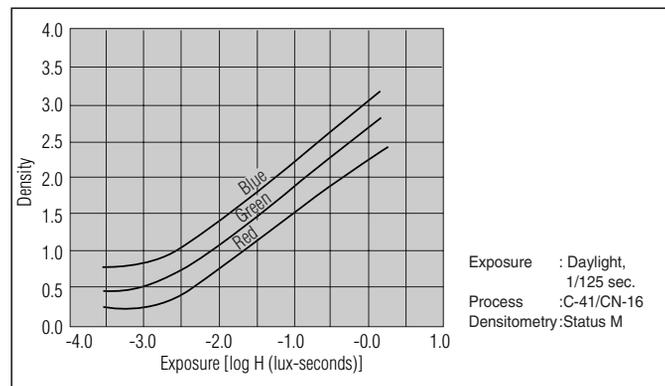
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**

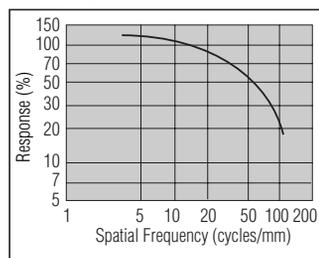


Typical densities for a mid-scale neutral subject and for minimum density.

• **CHARACTERISTIC CURVES \***



• **MTF CURVE**



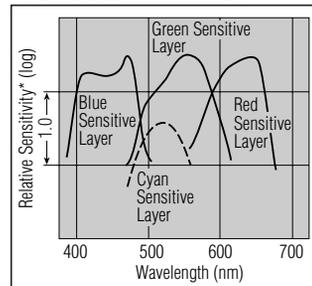
Exposure: Daylight  
Process : C-41/CN-16

• **DIFFUSE RMS GRANULARITY**  
VALUE:.....5  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12 ×  
Sample Density:1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - 50 lines/mm  
Chart Contrast 1000:1 - 125 lines/mm

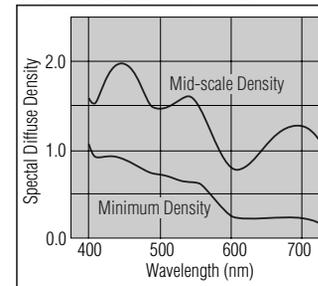
**FUJICOLOR SUPERIA 1600 [CU]**  
ISO 1600/33°, Daylight Type

• **SPECTRAL SENSITIVITY CURVES**



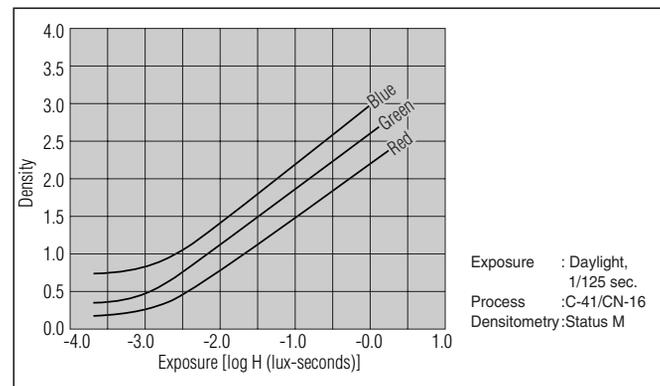
Process : C-41/CN-16  
Densitometry : Status M  
Density : 1.0 above minimum density.  
\*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**

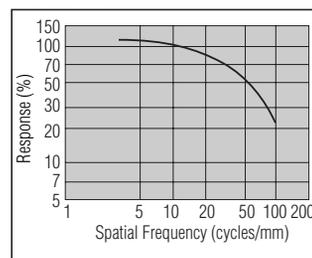


Typical densities for a mid-scale neutral subject and for minimum density.

• **CHARACTERISTIC CURVES**



• **MTF CURVE**



Exposure: Daylight  
Process : C-41/CN-16

• **DIFFUSE RMS GRANULARITY**  
VALUE:.....7  
Micro-densitometer Measurement Aperture:  
48μm in diameter  
Magnification: 12 ×  
Sample Density:1.0 above minimum density

• **RESOLVING POWER**  
Chart Contrast 1.6:1 - 50 lines/mm  
Chart Contrast 1000:1 - 125 lines/mm

## 2. INSTANT FILMS

### 2-1. FILMS FOR INSTANT PHOTOGRAPHY

There are three types of FUJI instant films: New FP-100C/FP-100C SILK, FP-100B SUPER, and FP-3000B SUPER SPEEDY. All are peel-apart instant pack films with the photo size being 85×108 mm (except for FP-100C4×5 with a photo size of 102×131 mm), and are designed for use with instant pack film cameras or instant pack film holders.

FP-100C is an ISO 100 instant color film with unsurpassed color reproduction which makes it especially suited for identification photography and commercial test imaging applications.

FP-100B SUPER, and FP-3000B SUPER SPEEDY are black-and-white instant films having respective speeds of EI 100 and EI 3200 and the highest levels of grain quality and tone reproduction smoothness within its class.

Because each film has a different development time, the table on the next page serves as a guide in providing optimum performance.

### 2-2. TECHNICAL DATA

#### Development Times and Temperatures

Unit: sec.

Film Type	Temperatures					
	15-17°C	18-19°C	20-23°C	24-27°C	28-31°C	32-35°C
New FP-100C/ FP-100C SILK	180		120	<b>90</b>	75	60
FP-100B SUPER	60	50	40	<b>30</b>	30	
FP-3000B SUPER SPEEDY	30	25	20	<b>15</b>	15	

↑ Standard Development Times

#### Reciprocity Characteristics (For FP-100C)

Exposure Time (second)	Exposure Correction	Color Balance Correction
1/1000	—	—
1/100	—	—
1/10	+1/3 stop	5Y
1	+1 1/3 stops	20Y

### INSTANT FILMS

Film Name	Speed	Color Sensitivity	Film Sizes	Features and Uses
<b>FUJI INSTANT COLOR FILM</b> New FP-100C/ FP-100C SILK	ISO 100/21°		Regular Size: Photo Size: 85 × 108 mm Prints /Pack: 10 4 × 5 Size: Photo Size: 102 × 131 mm Prints /Pack: 10	<ul style="list-style-type: none"> <li>• Peel-apart type ISO 100 instant color film for daylight / electronic flash use in a convenient 10-exposure pack.</li> <li>• Suited to very wide range of photographic applications including commercial, fashion, portrait, identification and diagnostic photography, as well as CRT photography.</li> <li>• Provides superb fine-grain image quality, improved gradation balance, faithful reproduction and features extended low-temperature use, and reduced peel-time-induced color variations.</li> </ul>
<b>FUJI INSTANT BLACK &amp; WHITE FILM</b> FP-100B SUPER	EI 100	Panchromatic	Photo Size: 85 × 108 mm Prints /Pack: 10	<ul style="list-style-type: none"> <li>• Peel-apart type instant black-and-white film in a convenient 10-exposure pack.</li> <li>• Suited for identification photography, commercial photo proofs, photo-micrography and other specialized applications.</li> <li>• Provides rich tonal gradation, fine grain quality and an easy-to-use ISO 100 speed rating for exposures using both daylight and tungsten light source.</li> </ul>
<b>FUJI INSTANT BLACK &amp; WHITE FILM</b> FP-3000B SUPER SPEEDY	EI 3200	Panchromatic	Regular Size: Photo Size: 85 × 108 mm Prints /Pack: 10 4 × 5 Size: Photo Size: 102 × 131 mm Prints /Pack: 10	<ul style="list-style-type: none"> <li>• Ultrahigh-speed peel-apart-type black-and-white instant film in a convenient 10-exposure pack.</li> <li>• Suited for identification photography, ultrasonic diagnostics, photo-micrography and other specialized applications.</li> <li>• Provides rich tonal gradation, excellent resolution in exposures using both daylight and tungsten light sources and convenient 15-second development, which significantly boosts handling efficiency.</li> </ul>

### 3. BLACK-AND-WHITE FILMS

#### 3-1. FILMS FOR BLACK-AND-WHITE PHOTOGRAPHY

Black-and-white negative films are used for the production of black-and-white prints. These films can be processed in the many conventional black-and-white negative film developers presently available. By using different developer type and development condition (time and/or temperature) combinations, the film speed, contrast and granularity can be varied to a considerable extent.

NEOPAN Professional films are marketed by the Fuji Photo Film Company.

#### BLACK-AND-WHITE NEGATIVE FILMS

Film Name	Film Speed		Color Sensitivity	Film Sizes	Features and Uses
	Daylight	Tungsten			
<b>NEOPAN 100 ACROS</b>	ISO 100/21°	ISO 100/21°	Panchromatic	135 (36-exp.) 120,	<ul style="list-style-type: none"> <li>• Medium speed, super fine grain, black-and-white negative film featuring Super Fine-Σ Grain Technology.</li> <li>• Suited to all normal indoor and outdoor photography as well as long exposure applications.</li> <li>• Provides outstanding sharpness, rich gradation, wide exposure latitude and excellent reciprocity characteristics.</li> </ul>
<b>NEOPAN 400 Professional</b>	ISO 400/27°	ISO 400/27°	Panchromatic	135 (24-and 36-exp.) 135 (36-exp. 20-roll packs) 35mm 30.5m (100ft) 120, 120 (5-roll packs)	<ul style="list-style-type: none"> <li>• Professional-quality, high-speed, fine-grain black-and-white negative film.</li> <li>• Suited to rapid-action subjects, telephotography, available-light photography, long-distance flash situations, and pull-/ push-processing to exposure indices between EI 200 and EI 3200.</li> <li>• Provides enhanced sharpness and excellent tonal gradation.</li> </ul>
<b>NEOPAN 1600 Professional</b>	EI 1600/33° Multi-speed Film	EI1600/33° Multi-speed Film	Panchromatic	135 (24-and 36-exp.) 135 (36-exp. 20-roll packs) 35mm 30.5m (100ft)	<ul style="list-style-type: none"> <li>• Professional-quality, very-high-speed black-and-white negative film.</li> <li>• Suited to available-light photography such as in night games and stage productions, while allowing pull-/ push-processing to exposure indices between EI 400 and EI 3200.</li> <li>• Provides enhanced sharpness and rich gradation.</li> </ul>

## 3-2. PROCESSING BLACK-AND-WHITE FILMS

Suggested development times for NEOPAN 100 ACROS, NEOPAN 400 Professional and NEOPAN 1600 Professional films are indicated below.

### NEOPAN 100 ACROS [135 Size]

Unit: minutes

Developer	Temp. EI	18°C	20°C	22°C	24°C	26°C
		(64°F)	(68°F)	(72°F)	(75°F)	(79°F)
Microdol-X	100	13½	11½	9¾	8¼	7
D-76	100	8½	7¼	6¼	5¼	4½
	200	12	10	8½	7	6
D-76 (1:1)*	100	13	10½	8¾	7¼	6¼
T-MAX Developer	100	6½	5½	4¾	4	3½
	200	9½	8	6½	5½	4¾
T-MAX RS Developer	100	6¼	5¼	4½	3¾	3¼
X tol	100	9½	8	6¾	5½	4¾
HC-110 (Dil.B)	80	5½	4½	3¾	3¼	NR
ID-11	100	8	6¾	5¾	4¾	4
Perceptol	100	15½	12½	10	8	6½

NR: Not recommended

\*Normally, developer stock solution does not require diluting. However, in this case above \*(1:1), one part water is to be added to one part developer.

### Development Conditions

Developing Tank : Small tank

Agitation : Continuous agitation for the first minute and for 5 seconds every minute thereafter.

### NEOPAN 100 ACROS [120 Size]

Unit: minutes

Developer	Temp. EI	18°C	20°C	22°C	24°C	26°C
		(64°F)	(68°F)	(72°F)	(75°F)	(79°F)
Microdol-X	100	13½	11½	9¾	8¼	7
D-76	100	8½	7¼	6¼	5¼	4½
	200	12	10	8½	7	6
D-76 (1:1)*	100	13	10½	8¾	7¼	6¼
T-MAX Developer	100	6½	5½	4¾	4	3½
	200	9½	8	6½	5½	4¾
T-MAX RS Developer	100	6¼	5¼	4½	3¾	3¼
X tol	100	9½	8	6¾	5½	4¾
HC-110 (Dil.B)	80	5½	4½	3¾	3¼	NR
ID-11	100	8	6¾	5¾	4¾	4
Perceptol	100	15½	12½	10	8	6½

NR: Not recommended

\*Normally, developer stock solution does not require diluting. However, in this case one part water is to be added to one part developer.

**Development Conditions**

Developing Tank : Small tank

Agitation : Continuous agitation for the first minute and for 5 seconds every minute thereafter.

**NEOPAN 400 Professional [135 Size]**

Unit: minutes

Developer	Temp. EI	18°C	20°C	22°C	24°C	26°C
		(64°F)	(68°F)	(72°F)	(75°F)	(79°F)
D-76	400	9 1/4	7 1/2	6 1/4	5	4 1/4
	800	10 3/4	8 3/4	7 1/4	5 3/4	4 3/4
	1600	16 1/2	13 1/2	11	9 1/4	7 3/4
D-76 (1:1)*	400	10 3/4	9 1/2	8 1/2	7 1/2	6 1/2
	800	15	13	11	9 3/4	8 1/2
Microdol-X	200	9 1/2	8 1/2	7 3/4	7	6 1/4
	320	11 1/4	10	9	8	7
HC-110 (Dil. B)	400	6	5	4 1/4	3 1/2	3
	800	8 1/2	7 1/4	6	5	4 1/4
	1600	14 1/2	12	10	8 1/4	7
T-MAX Developer	400	7	6	5	4 1/2	3 3/4
	800	8 3/4	7 1/2	6 1/2	5 1/4	4 3/4
	1600	11 1/4	10	9	8	7
T-MAX RS Developer	400	6 1/2	5 1/2	4 1/2	3 3/4	3 1/4
	800	7 3/4	6 1/2	5 1/2	4 3/4	4
	1600	11	9 1/2	8	7	6
Microphen	400	5	4 1/4	3 1/2	3	NR
	800	7	5 3/4	5	4 1/4	3 1/2
	1600	10	8 1/2	7 1/4	6 1/4	5 1/4
	3200	19	16	13 3/4	11 3/4	10
ID-11	400	8	7	6 1/4	5 1/2	5
	800	9 1/2	8 1/2	7 1/2	6 3/4	6 1/4
	1600	14	12 1/2	11	9 3/4	8 3/4
Acufine	400	3 3/4	3 1/4	NR	NR	NR
	800	5 1/2	4 1/2	3 3/4	3 1/4	NR
	1600	8 1/4	7	6	5	4 1/4

NR: Not recommended

\*Normally, developer stock solution does not require diluting. However, in this case one part water is to be added to one part developer.

**NOTE** To prevent development marks and assure uniform finish, agitate the developer continuously for the first minute and for five seconds every minute thereafter. This applies especially when the development time is shorter than 5 minutes.

**NEOPAN 400 Professional [120 Size]**

Unit: minutes

Developer	Temp. EI	18°C	20°C	22°C	24°C	26°C
		(64°F)	(68°F)	(72°F)	(75°F)	(79°F)
D-76	250	7 3/4	6 1/2	5 1/2	4 1/2	3 3/4
	400	9 1/4	7 1/2	6 1/4	5 1/4	4 1/2
	800	11 1/2	9 1/2	7 3/4	6 1/2	5 1/2
	1600	16 1/2	13 1/2	11 1/2	9 1/2	8
D-76 (1:1)*	400	11 1/2	9 3/4	8 1/4	7	6
	800	16	13 1/2	11 1/2	9 3/4	8 1/2
Microdol-X	200	10	8 1/2	7 1/4	6	5 1/4
	320	12	10	8 1/2	7	6
HC-110 (Dil. B)	400	6 1/4	5 1/4	4 1/2	3 3/4	3 1/4
	800	9	7 1/2	6 1/4	5 1/4	4 1/2
	1600	14 1/2	12	10	8 1/2	7 1/4
T-MAX Developer	400	6 3/4	6	5 1/4	4 3/4	4 1/4
	800	8 1/2	7 1/2	6 1/2	5 3/4	5 1/4
	1600	11 1/2	10	8 3/4	7 3/4	7
T-MAX RS Developer	400	6 1/2	5 1/2	4 3/4	4	3 1/2
	800	8 1/4	7	6	5 1/4	4 1/2
	1600	11 1/2	10	8 1/2	7 1/2	6 1/2
Microphen	400	5	4 1/4	3 1/2	3	NR
	800	7	5 3/4	5	4 1/4	3 1/2
	1600	10	8 1/2	7 1/4	6 1/4	5 1/4
ID-11	400	8	7	6 1/4	5 1/2	5
	800	9 1/2	8 1/2	7 1/2	6 3/4	6 1/4
	1600	13 1/2	12	10 3/4	9 1/2	8 1/2
Acufine	400	4	3 1/4	NR	NR	NR
	800	6	4 3/4	4	3 1/4	NR
	1600	8 1/4	7	6	5	4 1/4

NR: Not recommended

\*Normally, developer stock solution does not require diluting. However, in this case one part water is to be added to one part developer.

### Development Conditions

Processing Tank : Small tank

Agitation : Continuous agitation for the first minute and for 5 seconds every minute thereafter.

### NEOPAN 1600 Professional

Unit: minutes

Developer	EI	Temp.				
		18°C (64°F)	20°C (68°F)	22°C (72°F)	24°C (75°F)	26°C (79°F)
D-76	400	4 3/4	4	3 1/4	NR	NR
	800	6	5	4 1/4	3 1/2	NR
	1600	9	7 1/2	6	5	4
	3200	NR	15	12	10	8
D-76 (1:1)*	400	6 1/2	5 1/2	4 3/4	4	3 1/2
	800	8	7	6	5	4 1/4
	1600	11	9	7 1/2	6 1/2	5 1/2
D-76 (1:3)*	800	13	11 1/2	10	9	8
	1600	17	15 1/4	13 1/2	12	10 1/2
Microdol-X	400	8	6 1/2	5 1/4	4 1/4	3 1/2
	800	10	8 1/4	6 3/4	5 1/2	4 1/2
	1600	13	10 1/2	8 1/2	7	5 3/4
HC-110 (Dil. B)	800	5 1/2	4 3/4	4	3 1/2	NR
	1600	8 1/4	7	5 3/4	5	4 1/4
T-MAX Developer	1600	5 1/2	4 1/2	4	3 1/2	3
	3200	12	10	8 1/2	7 1/2	6 3/4
T-MAX RS Developer	1600	5 3/4	5	4 1/2	3 3/4	3 1/4
	3200	10 1/2	9 1/2	8 1/2	7 3/4	7
Microphen	1600	4	3 1/4	NR	NR	NR
	3200	7	5 3/4	4 3/4	4	3 1/4
ID-11	800	5 1/4	4 1/2	3 3/4	3 1/4	NR
	1600	8	6 1/2	5 1/2	4 1/2	3 3/4
ACU-1 (1:5)*	1600	7	5 3/4	4 3/4	4	3 1/4

NR: Not recommended

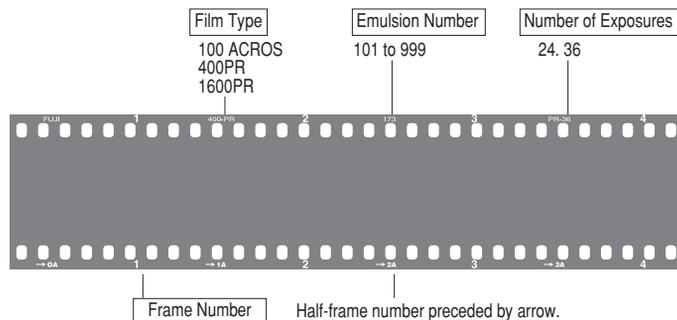
\*Normally, developer stock solution does not require diluting. However in, one (1:1), three (1:3) or five (1:5) parts water are to be added to one part developer, respectively.

## 3-3. FILM IDENTIFICATION EDGE MARKINGS

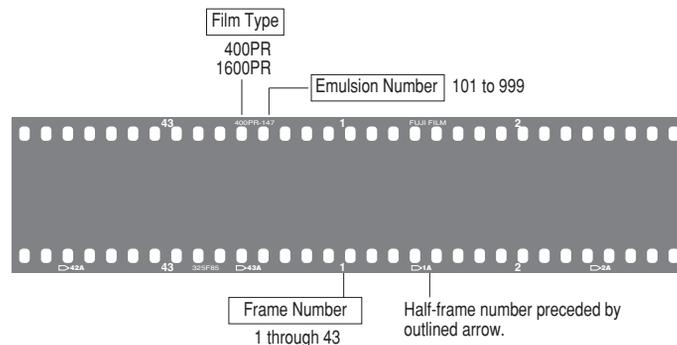
NEOPAN film types are distinguishable by the edge markings indicated below.

### NEOPAN Films

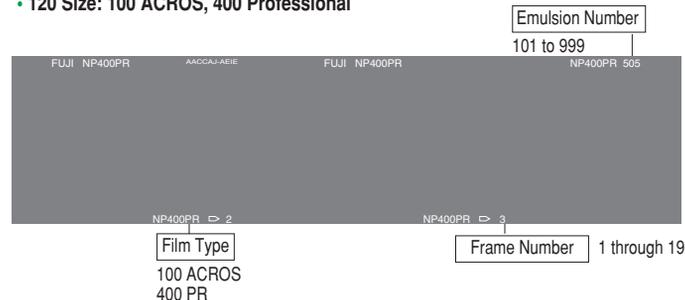
- 135 Size: 100 ACROS, 400 Professional, 1600 Professional



- 35mm Size: 400 Professional, 1600 Professional



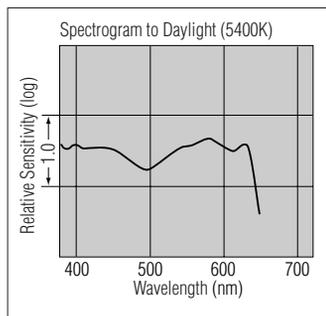
- 120 Size: 100 ACROS, 400 Professional



### 3-4. TECHNICAL DATA

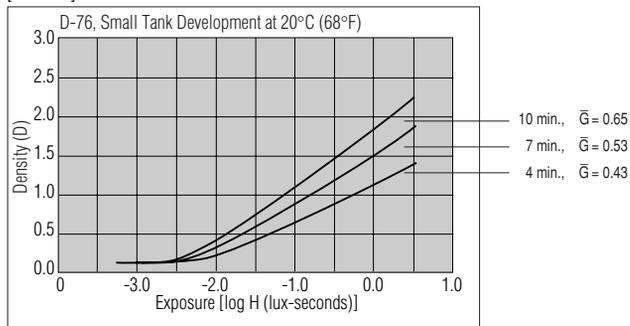
NEOPAN 100 ACROS ISO 100/21°

#### • SPECTRAL SENSITIVITY CURVE

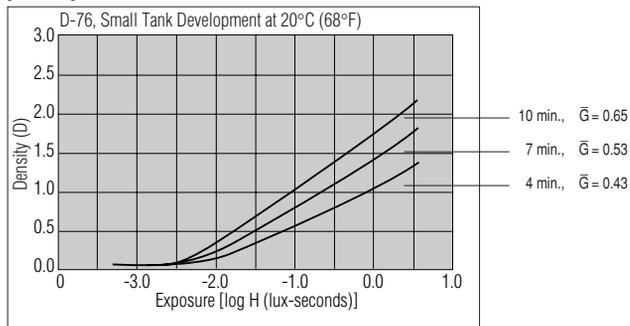


#### • CHARACTERISTIC CURVES

[135 Size]

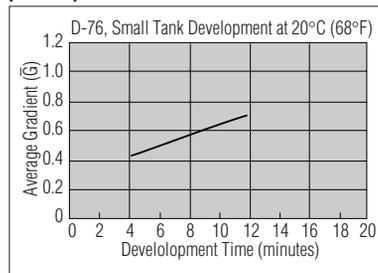


[120 Size]

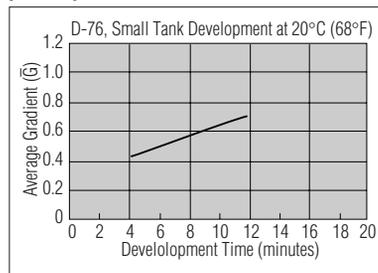


#### • TIME-G CURVE

[135 Size]

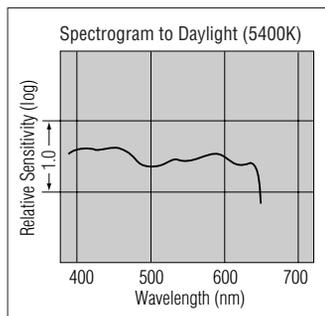


[120 Size]



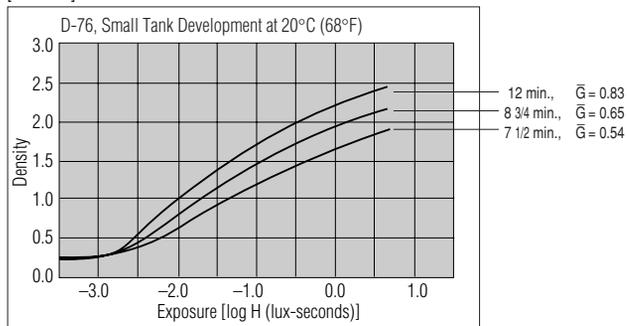
NEOPAN 400 Professional ISO 400/27°

• SPECTRAL SENSITIVITY CURVE

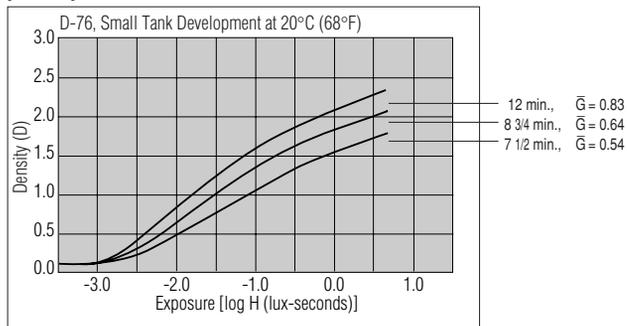


• CHARACTERISTIC CURVES

[135 Size]

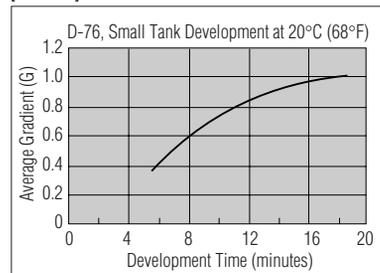


[120 Size]

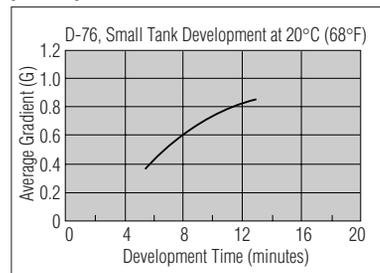


• TIME- $\bar{G}$  CURVE

[135 Size]

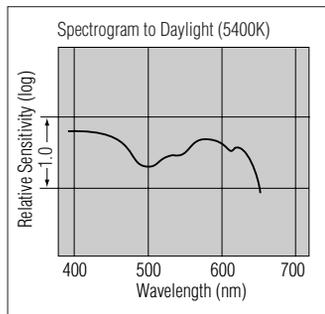


[120 Size]

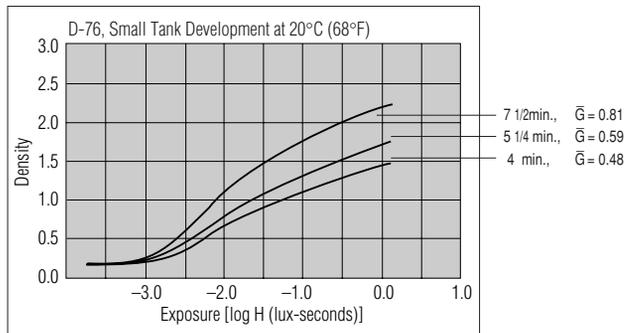


**NEOPAN 1600 Professional EI 1600/33°**

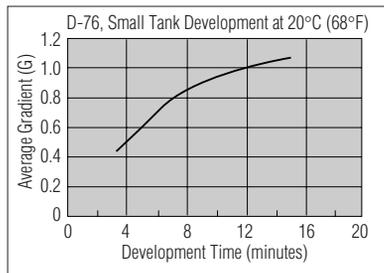
• **SPECTRAL SENSITIVITY CURVE**



• **CHARACTERISTIC CURVES**



• **TIME- $\bar{G}$  CURVE**



## 4. GENERAL INFORMATION

### Film and Paper Handling and Storage

#### 1. Film Handling

- Be sure to expose and process film before the expiration date indicated on the film package.
- Films stored under cold conditions (in a freezer or refrigerator) should be allowed to warm to room temperature prior to being opened. Opening the film while it is still cold may cause condensation to form, rendering it unusable.
- Camera loading or removal of roll films should be done quickly and away from direct sunlight.
- Sheet films should be handled in total darkness, with care taken not to touch emulsion surfaces.
- Film loaded into cameras should be exposed and processed as promptly as possible.
- At airport and other terminals, unprocessed film should be kept away from X-rays used to inspect checked-in baggage. Strong X-rays can cause fogging of unprocessed film. Always place such film in your carry-on baggage. (It is recommended that film be placed in transparent plastic bags through which the film is visible.) The majority of X-ray machines used for inspecting carry-on baggage have been shown to be safe for most films. However, film which may be subjected to multiple X-ray inspections or film with an extremely high speed rating (ISO 1000 or higher) should be removed from carry-on baggage for visual (manual) inspection instead.
- Film fogging may occur in hospitals, factories, laboratories, and other locations using X-rays and other radiation sources. Always keep film away from possible sources of radiation.

#### 2. Paper Handling

- Be sure to use paper on a First in, First out (FIFO) basis, in emulsion number sequence.
- Raw paper stored under cold conditions (in a freezer or refrigerator) should be kept in its moisture-proof wrapper and allowed to warm to room temperature prior to being opened. If the paper is taken out of its wrapper immediately after being removed from refrigerated storage, condensation will form on the paper surfaces, resulting in color changes and easily damaged surfaces.
- Leaving exposed paper unprocessed in a room for a long time or putting it where it is subject to high temperatures or humidity may adversely affect the color balance and other properties of the print.
- The time between exposure and development should be fixed in order to obtain consistent quality. Avoid waiting until the next day to develop exposed paper. Rather than holding the paper for processing the next day, initiate processing as soon as possible. If paper cannot be immediately processed after exposure, it should be stored at below 10°C. Even if kept in cold storage, paper should be returned to room temperature and processed at the first opportunity.

### 3. Film and Paper Storage

#### Unprocessed Film and Paper

The higher the temperature and humidity, the more film or paper, whether exposed or not, is susceptible to adverse changes in speed, color balance (in the case of color film and color paper), physical characteristics and other properties. Unprocessed film and paper are best stored at low temperatures. Specifically, the following conditions should be used for film and paper storage.

	Negative/Black-and-white Negative/Instant Films	Color Reversal Films	Color Papers/ Black-and-white Photo Paper
Normal or short-term storage	Store at a location away from direct sunlight, high temperatures and high humidity.	Below 15°C	Store at a location (cool and dark) away from direct sunlight, high temperatures and high humidity.
Long-term storage	Below 10°C	Below 0°C	Below 10°C

- Harmful gases from new building materials, new furniture, paint, or adhesives, etc. can adversely affect the photographic properties of film. Raw film, boxed film (in lightproof boxes), and film loaded in cameras or film holders should be kept away from these vapor sources.
- Films and papers stored under cold conditions should be allowed to warm to room temperature prior to being opened (a least 3 hours for refrigerated storage and at least 6 hours for freezer storage). A longer time is needed in the case of roll papers or wide-width papers. Opening the film or paper while it is still cold may cause condensation to form, rendering it unusable.

#### Processed Film and Paper (Prints)

As with materials used in other products, the materials used in photographic products will change over time. Since prints and film are usually used for the long-term recording of memorable events, as much effort as possible is made to use materials that exhibit the least amount of change over time, but the effects of light, heat, oxygen in the air, humidity and mold cannot be completely avoided. It is possible, however, to minimize the change in the photographic image or base material<sup>1</sup> by maintaining the appropriate storage conditions for prints and films, such as those used by museums and art galleries. Temperature and humidity control is the most important key to minimizing the changes that occur in film and paper. Prints stored in the dark under the following conditions<sup>2</sup> may be expected to show almost no change over time.

Storage Period with Almost No Change	Temperature	Relative Humidity
More than 20 years	Below 10°C	30%-50%
10-20 years	Below 25°C	30%-50%

\*1 For color prints, base material consisting of paper laminated with polyethylene resin (WP base) and coated with a gelatin layer containing photosensitive materials is used. For color negative films and color reversal films, a plastic base is used instead of a WP base. In the case of black-and-white photographic paper and black-and-white film, images are formed by silver grains instead of color dyes.

Changes in the photographic image or base material generally take the form of reduced image quality (color fading). In some cases, however, damage to the base material may be caused by chemical changes that occur in the product when placed in a closed environment under hot and humid conditions.

\*2 For the conditions indicated above, a well-ventilated place is the ideal; however, since containers prevent the passage of air, it is recommended that films and papers be removed from containers and ventilated about once a year. Ventilation should be done during seasons in which the air is dry.

- In the marketplace, lifespans of more than 100 years are sometimes claimed for color prints. Such claims, however, allow for image deterioration to a level at which viewing is still tolerable. If such allowance is presumed, longer storage periods than those indicated in the table above are possible.
- Freezer storage or other measures are sometimes used for the long-term storage of film. Such measures, however, require complicated handling and cannot be generally recommended. For this reason, they have been omitted here.

### ● Notes on Storage

① When storing color negatives or black-and-white film, insert them into sleeves\*4 prior to storage. Color reversal film should either be mounted\*4 or inserted into sleeves.\*4 Prints should be mounted or placed in a plastic bag\*4 designed for photographs.

\*4 Made of polyester, polystyrene, polyethylene or polypropylene plastic.

② Even during normal storage, it is recommended that prints be stored at a place not subject to hot and humid conditions, and away from direct sunlight and other strong light or from direct illumination. The following examples are of conditions that are unsuitable for print storage. These conditions should not be used for long-term storage of prints.

- Storage in a room closet facing a wall exposed to cold outside air (condensation may form).
- Storage in a place near the ceiling, such as an attic, a closet, or the top of a cupboard (high temperatures may arise).

③ Storing prints with their front surfaces facing each other may result in unexpected problems. For this reason, prints should be stored with their front surfaces facing away from each other. If the front surfaces of two prints become stuck to each other, it may be necessary to insert a piece of paper in between to separate them.

### ● On the Display of Photographic Prints

Framed photographic prints should not be displayed at places subject to direct sunlight. Also, when placed in a very humid place, the print may become stuck to the surface of the glass, making it impossible to remove. To prevent this, a thick mat board should be used between the print and the glass. The use of non-glare glass in the frame is also recommended. Regardless of whether a frame is used or not, when displaying a print (for example, on a wall), the amount of time-induced image deterioration that occurs will vary according to the strength of the light that falls on the print, the temperature and the humidity, and the presence of gas in the atmosphere. For this reason, a general determination of storage period cannot be made.

### ● Note on the Handling of Photographic Prints

Since the back surface of photographic prints made on Fujicolor papers, etc. is waterproof, it will not accept water-based adhesives or ink.

**FUJI and Kodak Filter Correspondence Tables (1)**

**■ Color Compensating Filter (CC Filter)**

	Fuji	Kodak
<b>Yellow</b>	CC-1.25Y	–
	CC-2.5Y	CC025Y
	CC-5Y	CC05Y
	CC-7.5Y	–
	CC-10Y	CC10Y
	CC-20Y	CC20Y
	CC-30Y	CC30Y
	CC-40Y	CC40Y
	CC-50Y	CC50Y
<b>Magenta</b>	CC-1.25M	–
	CC-2.5M	CC025M
	CC-5M	CC05M
	CC-7.5M	–
	CC-10M	CC10M
	CC-20M	CC20M
	CC-30M	CC30M
	CC-40M	CC40M
CC-50M	CC50M	
<b>Cyan</b>	CC-1.25C	–
	CC-2.5C	CC025C
	CC-5C	CC05C
	CC-7.5C	–
	CC-10C	CC10C
	CC-20C	CC20C
	CC-30C	CC30C
	CC-40C	CC40C
CC-50C	CC50C	

	Fuji	Kodak
<b>Blue</b>	CC-1.25B	–
	CC-2.5B	CC025B
	CC-5B	CC05B
	CC-7.5B	–
	CC-10B	CC10B
	CC-20B	CC20B
	CC-30B	CC30B
	CC-40B	CC40B
	CC-50B	CC50B
<b>Green</b>	CC-1.25G	–
	CC-2.5G	CC025G
	CC-5G	CC05G
	CC-7.5G	–
	CC-10G	CC10G
	CC-20G	CC20G
	CC-30G	CC30G
	CC-40G	CC40G
CC-50G	CC50G	
<b>Red</b>	CC-1.25R	–
	CC-2.5R	CC025R
	CC-5R	CC05R
	CC-7.5R	–
	CC-10R	CC10R
	CC-20R	CC20R
	CC-30R	CC30R
	CC-40R	CC40R
CC-50R	CC50R	



○FUJI CC Filter Exposure Factors  
(Lens Diaphragm Factors)

	Y	M	C	B	G	R
1.25	0					
2.5	0					
5	+1/4		+1/3			
7.5	+1/3					
10	+1/3		+1/2			
20	+1/2		+2/3			
30	+2/3		+2/3			
40	+2/3		+1			
50	+1		1 1/3			

**■ Infrared Filter (IR Filter)**

Fuji	Kodak
IR-76	88A
IR-78	87
IR-80	–
IR-82	–
IR-84	–
IR-86	–
IR-88	–
IR-90	–
IR-92	–
IR-94	87B
IR-96	–

**■ Sharp-cut Filter**

Fuji	Kodak
SC-37	–
SC-38	1
SC-39	–
SC-40	2C
SC-40M	1A
SC-41	2B
SC-42	2A
SC-46	3
SC-46G	3N5
SC-48	8
SC-48G	–
SC-50	9
SC-50A	–
SC-50G	–
SC-52	12
SC-52G	–
SC-54	16
SC-56	21
SC-58	3A
SC-60	25
SC-62	29
SC-64	92
SC-66	–
SC-68	70
SC-70	–
SC-72	–
SC-74	–

**FUJI and Kodak Filter Correspondence Tables (2)**

■ **Light Balancing Filter**

Fuji	Kodak
LBA-1	81
LBA-2	81A
LBA-3	81B
LBA-4	81D
LBA-6	—
LBA-8	85C
LBA-12	85B
LBA-16	—
LBA-20	—
LBB-1	82
LBB-2	82A
LBB-3	82B
LBB-4	82C
LBB-6	—
LBB-8	80C
LBB-12	80A
LBB-16	—
LBB-20	—



○ **FUJI Light Balancing Filter  
Exposure Factors (Lens  
Diaphragm Factors)**

	LBA	LBB
1	—	—
2	+1/3	+1/3
3	+1/3	+1/2
4	+1/3	+2/3
6	+1/2	+2/3
8	+2/3	+1
12	+2/3	+1 2/3
16	+1	+2
20	+1	+2 1/3

■ **Band Pass Filter (BP Filter)**

Fuji	Kodak
BPB-42	35
BPB-45	47
BPB-50	—
BPB-53	58
BPB-55	—
BPB-60	—
BPN-42	—
BPN-45	48A
BPN-50	65
BPN-53	61
BPN-55	—
BPN-60	—
BPM-42	—
BPM-45	50
BPM-50	—
BPM-53	74
BPM-55	53
BPM-60	—

■ **Special Purpose Filter**

Fuji	Kodak
SP-1	—
SP-2	—
SP-3	—
SP-4,4A,4M	—
SP-5	—
SP-6	—
SP-7	—
SP-8	—
SP-9	—
SP-10	—
SP-11	—
SP-12	30
SP-13	—
SP-14	35
SP-15	57
SP-16	—
SP-17	—
SP-18	—
SP-19	—
SP-20	72B

■ **Neutral Density  
Filter (ND Filter)**

Fuji	Kodak
ND-0.1	0.1
ND-0.2	0.2
ND-0.3	0.3
ND-0.4	0.4
ND-0.5	0.5
ND-0.6	0.6
ND-0.7	0.7
ND-0.8	0.8
ND-0.9	0.9
ND-1.0	1.0
ND-1.2	—
ND-1.5	—
ND-1.8	—
ND-2.0	2.0
ND-3.0	3.0
ND-4.0	4.0

**ISO/ASA/DIN Film Speed Conversion Table**

ISO	ASA	DIN
4/7°	4	7
6/9°	6	9
10/11°	10	11
12/12°	12	12
16/13°	16	13
20/14°	20	14
25/15°	25	15
32/16°	32	16
40/17°	40	17
50/18°	50	18
64/19°	64	19
80/20°	80	20
100/21°	100	21
125/22°	125	22
160/23°	160	23
200/24°	200	24
250/25°	250	25
320/26°	320	26
400/27°	400	27
500/28°	500	28
640/29°	640	29
800/30°	800	30
1000/31°	1000	31
1600/33°	1600	33
3200/36°	3200	36

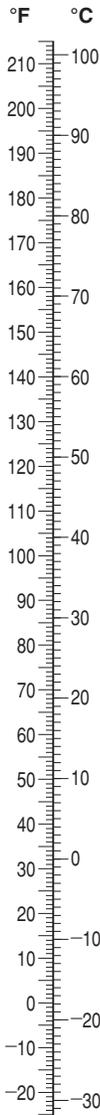
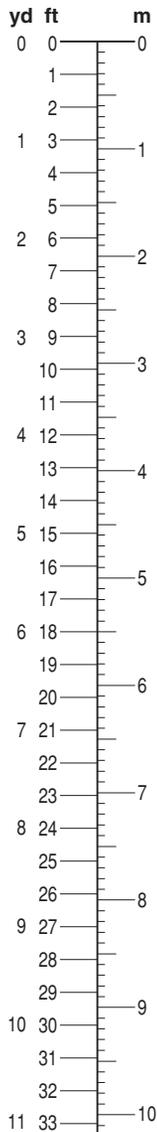
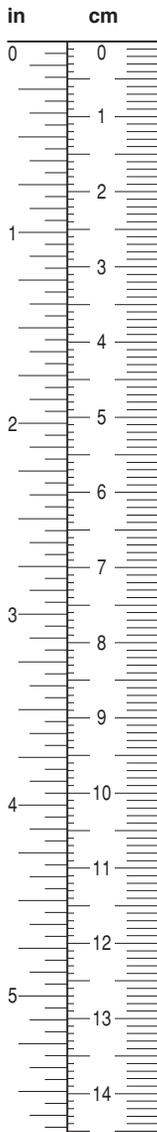
Diagrammatic connections in the table:  
 - 25/15° to 32/16°: × 1/2  
 - 32/16° to 40/17°: × 1/4  
 - 40/17° to 50/18°: × 1.6  
 - 50/18° to 64/19°: × 2  
 - 64/19° to 80/20°: × 4  
 - 80/20° to 100/21°: × 16  
 - 100/21° to 125/22°: × 1.6  
 - 125/22° to 160/23°: × 2  
 - 160/23° to 200/24°: × 4  
 - 200/24° to 250/25°: × 16  
 - 250/25° to 320/26°: × 1.6  
 - 320/26° to 400/27°: × 2  
 - 400/27° to 500/28°: × 4  
 - 500/28° to 640/29°: × 16  
 - 640/29° to 800/30°: × 1.6  
 - 800/30° to 1000/31°: × 2  
 - 1000/31° to 1600/33°: × 4  
 - 1600/33° to 3200/36°: × 16

**Color Temperature/Mired Value Conversion Table**

Color Temperature (K)	Mired (M)	Color Temperature (K)	Mired (M)
1,500	667	4,600	217
1,600	625	4,700	213
1,700	588	4,800	208
1,800	556	B 4,874	205
1,900	526	4,900	204
2,000	500	5,000	200
2,100	476	5,100	196
2,200	456	5,200	192
2,300	435	5,300	189
2,400	417	5,400	185
2,500	400	5,500	182
2,600	385	5,600	179
2,700	370	5,700	175
2,800	353	5,800	172
A 2,855	350	5,900	169
2,900	348	6,000	167
3,000	333	6,100	164
3,100	323	6,200	161
3,200	313	6,300	159
3,300	303	6,400	156
3,400	294	6,500	154
3,500	286	6,600	152
3,600	278	6,700	149
3,700	270	C 6,774	148
3,800	263	6,800	147
3,900	256	6,900	145
4,000	250	7,000	143
4,100	244	7,100	141
4,200	238	7,200	139
4,300	233	7,300	137
4,400	227	7,400	135
4,500	222	7,500	133

A in the table indicates the CIE Standard Illuminant A color temperature, B the Standard Illuminant B, and C the Standard Illuminant C.

**Conversion Scales**



**Conversion Tables**

• **Linear Measure**

Meter* (m)	Inch (in)	Foot (ft)	Yard (yd)	Kilometer (km)	Mile (mile)	Nautical Mile* (M)
1	39.37	3.281	1.0936	1	0.6214	0.5400
0.0254	1	0.0833	0.0278	1.6093	1	0.8690
0.3048	12	1	0.3333	1.852	1.151	1
0.9144	36	3	1	—	—	—

• **Area**

Square Meter* (m <sup>2</sup> )	Square Inch (in <sup>2</sup> )	Square Foot (ft <sup>2</sup> )	Square Yard (yd <sup>2</sup> )	Square Kilometer* (km <sup>2</sup> )	Acre (acre)	Square Mile (mile <sup>2</sup> )	Hectare* (ha)
1	1,550	10.764	1.1960	1	247.1	0.3861	100
0.0006	1	0.0069	0.0008	0.0040	1	0.0016	0.4047
0.0929	144	1	0.1111	2.590	640	1	259.0
0.8361	1,296	9	1	0.01	2.471	0.0039	1

• **Volume**

Cubic Meter (m <sup>3</sup> )	Liter* (ℓ)	Cubic Foot (ft <sup>3</sup> )	Cubic Yard (yd <sup>3</sup> )	Liter* (ℓ)	US Gallon (gal.)	UK Gallon (gal.)	Cubic Inch (in <sup>3</sup> )
1	1,000	35.31	1.308	1	0.2642	0.2200	61.02
0.001	1	0.0353	0.0013	3.7854	1	0.8327	231.00
0.0283	28.32	1	0.0370	4.5465	1.2011	1	277.45
0.7646	764.5	27.00	1	0.0164	0.0043	0.0036	1

• **Pressure**

Hectopascal (hPa)	Kilogram* (kg/cm <sup>2</sup> )	Atmospheric Pressure* (atm)	Mercurial Column Centimeter* (mmHg 15°C/59°F)
1	0.001020	0.000987	0.75
981	1	0.968	735.5
1,013	1.033	1	760
1.333	0.00136	0.001316	1

\*The meter is the basic unit of length established by the International System of Units (le Système International d'Unités), the square meter, cubic meter, kilogram, atmospheric pressure and mercurial column millimeter based units and the nautical mile, hectare, liter and hectopascal being auxiliary units.

## 5. FUJIFILM OVERSEAS SUBSIDIARIES AND LIAISON OFFICES

### ● Overseas Subsidiaries

#### **FUJI PHOTO FILM U.S.A. INC.**

200 Summit Lake Drive Valhalla NY 10595-1356, U.S.A.  
Tel: 1-914-789-8100

#### **FUJI PHOTO FILM CANADA INC.**

600 Suffolk Court, Mississauga, Ontario, L5R 4G4, Canada  
Tel: 1-905-890-6611

#### **FUJI PHOTO FILM HAWAII, INC.**

94-468 Akoki Street Waipahu, Hawaii 96797, U.S.A.  
Tel: 1-808-677-3854

#### **FUJI PHOTO FILM (EUROPE) G.m.b.H.**

Heesenstrasse, 31, 40549 Dusseldorf, Germany  
Tel: 49-211-50890

#### **FUJIFILM France SAS**

Parc d'Activites du Pas-du-Lac-2  
Avenue Franklin, 78186 St., Quentin en Yvelines Cedex, France  
Tel: 33-1-3085-6404

#### **FUJI PHOTO FILM (U.K.) LTD.**

Fuji Film House, 125 Finchley Road, Swiss Cottage, London NW3 6HY, England  
Tel: 44-20-7586-5900

#### **FUJIFILM ESPANA, S.A.**

Aragon, 180, 08011-Barcelona, Spain  
Tel: 34-93-4511515

#### **FUJIFILM ITALIA S.p.A.**

Via Della Unione Europea Palazzo Beta N.4  
Quartiere Affari  
20097 San Donato Milanese (MI)  
Italy  
Tel: 39-02-895821

#### **FUJI PHOTO FILM DO BRASIL LTDA.**

Avenida Vereador Jose Diniz 3400,  
Campo Belo, Sao Paulo CEP 04604-901 SP, Brasil  
Tel: 55-11-5091-4181

#### **FUJIFILM REGIONAL SERVICES (SINGAPORE) PTE LTD.**

10 New Industrial Road, Singapore 536201  
Tel: 65-6383-9933

#### **FUJI PHOTO FILM (THAILAND) LTD.**

S.P. Building, 8th Floor, 388 Phaholyothin Road, Bangkok 10400, Thailand  
Tel: 66-2-273-0254

#### **FUJI PHOTO FILM (MALAYSIA) SDN. BHD.**

Letter Box 1, Level 10, 11, & 12  
Menara Axis, No.2, Jalan 51A/223  
46100 Petaling Jaya Selangor Darul Ehsan Malaysia  
Tel: 60-3-79584700

#### **FUJI PHOTO FILM (CHINA) INVESTMENT CO., LTD.**

31st Floor, Hong Kong New World Tower  
No.300 Huai Hai Zhong Road  
Shanghai China  
Tel: 86-21-3302-4655

#### **FUJIFILM AUSTRALIA PTY LTD.**

114 Old Pittwater Road  
Brookvale, N.S.W. 2100  
Australia  
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#### **FUJI PHOTO FILM CO., LTD. HONG KONG OFFICE**

Room 2208, Tower 6, The Gateway Harbour City, 9 Canton Road Tsim Sha Tsui, Kowloon, Hong Kong  
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505-19, Kasan-Dong, Kumchon-Gu, Seoul 152-020, Korea  
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#### **FUJI PHOTO FILM CO., LTD. TAIPEI OFFICE**

Rm. 601 Hung Chong Bldg. No.38, Sec.6 Min Chuan E. Road, Taipei 11453, Taiwan  
Tel: 886-2-2793-4858

#### **FUJI PHOTO FILM CO., LTD. DUBAI OFFICE**

P.O. Box 17212, LOB16-320, Jabel Ali Dubai, U.A.E.  
Tel: 971-4881-5752

#### **FUJI PHOTO FILM CO., LTD. NEW DELHI OFFICE**

Le Meridian Commercial Tower 8F Janpath, New Delhi 110001, India  
Tel: 91-11-2335-5396

#### **FUJI PHOTO FILM CO., LTD. MANILA OFFICE**

c/o YKL Development & Trading Corporation, 24 Sto. Domingo St.,  
Quezon City, Metro Manila, Philippines  
Tel: 63-2-414-5267

#### **FUJI PHOTO FILM CO., LTD. MEXICO OFFICE**

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Col Granada 11520  
Mexico D.F.  
Mexico  
Tel: 52-55-5254-6656

#### **FUJI PHOTO FILM CO., LTD. JOHANNESBURG OFFICE**

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South Africa  
Tel: 27-11-883-1955

### ● Head Office

#### **FUJI PHOTO FILM CO., LTD.**

26-30, Nishiazabu 2-chome, Minato-ku, Tokyo 106-8620, Japan  
Tel: 03-3406-2111



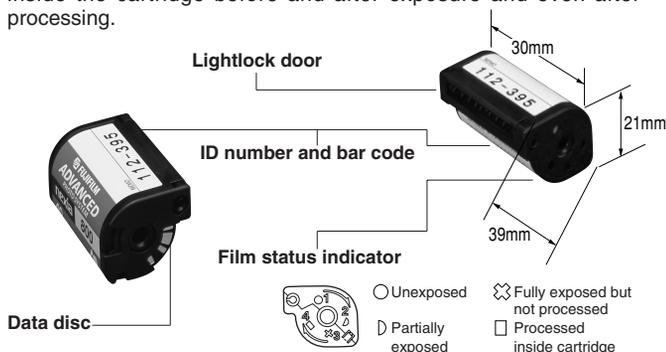
## 6-2. MAIN CHARACTERISTICS OF THE ADVANCED PHOTO SYSTEM

### ① A Worldwide Photographic Standard

The remarkable convenience and versatility of the Advanced Photo System and the world-class imaging expertise of Fujifilm-together they expand the possibilities of photography into new realms.

#### ① A Smaller, more advanced film cartridge

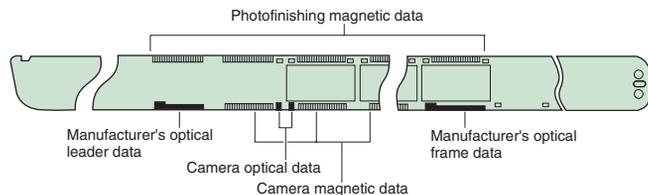
The heart of the Advanced Photo System is its specially designed film cartridge. It is smaller than a conventional 35mm film magazine and has no protruding film leader. The film always remains safely inside the cartridge before and after exposure and even after processing.



#### ② Smarter film for better photos

The Advanced Photo System uses a new "smart" film: in addition to recording photographic images, it also has magnetic and optical data tracks. These record the user's choice of format for each shot, together with date, time, and comprehensive shooting information such as flash and lighting data. Through a process called Information Exchange (IX), this data is automatically read by photofinishing equipment and used for backprinting, optimizing image quality, and assuring reprints of consistent quality.

**NOTE:** Data encoded on the track may vary according to the type of camera used.

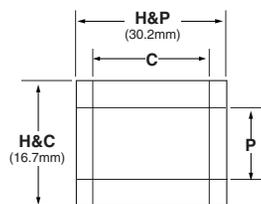


#### ③ A choice of three print formats

The new system offers three print formats: C (Classic) which corresponds to conventional 35mm prints; H (HDTV) for a wider view; and P (Panorama) for popular panoramic prints. While images are always recorded on the film in the full-frame H format, any of the three formats can be chosen for each shot.

The choice is recorded on the film and then read and automatically printed by the photofinishing equipment.

**Frame Size**



**Print Size**

	8.9cm (3-1/2in.) width	10.2cm (4in.) width
<b>C</b>	8.9 x 12.7 cm (3-1/2 x 5 in.)	10.2 x 15.2 cm (4 x 6 in.)
<b>H</b>	8.9 x 15.8 cm (3-1/2 x 6-1/4 in.)	10.2 x 17.8 cm (4 x 7 in.)
<b>P</b>	8.9 x 25.4 cm (3-1/2 x 10 in.)	10.2 x 25.4 cm (4 x 10 in.)

#### ④ The index print: – photos at a glance

With each processed film cartridge the customer receives an index print showing all the photos it contains. This makes it easy to order reprints and enlargements, without having to compare prints against negatives. Each index print includes:

- Sequential, thumbnail views of all photos in the cartridge
- Frame number of each shot
- Format designation for each shot
- Cartridge ID number and bar code



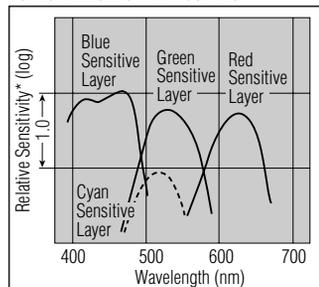
## Lineup of APS Films

Film Name and Processing	Type and Speed	Number of Exposures	Features and Uses
<b>FUJICOLOR nexia A200 [DA]</b>  Process C-41/CN-16/ CN-16Q/CN-16FA/CN-16L/ CN-16S	Daylight ISO 200/24°	25 and 40	<ul style="list-style-type: none"> <li>• All-round, medium-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer, for use with Advanced Photo System (APS) cameras.</li> <li>• Suited to the same wide variety of photographic situations as standard film.</li> <li>• Provides great vividness and enhanced color realism across the entire spectrum, beautiful and natural skin tones, great sharpness, wide exposure latitude, extremely fine grain for high-quality enlargements, and accurate reproduction of difficult colors, such as certain violets and greens, even under fluorescent lighting*.</li> </ul>
<b>FUJICOLOR nexia 400 [DH]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/CN-16S	Daylight ISO 400/27°	25 and 40	<ul style="list-style-type: none"> <li>• High-speed, daylight-type, fine-grain color negative film incorporating a 4th color layer, for use with Advanced Photo System (APS) cameras.</li> <li>• Suited to a very wide variety of shooting conditions and photographic applications including sports and other fast moving action shots, as well as work under low light and variable weather conditions.</li> <li>• Provides extremely vivid and highly realistic colors across the entire spectrum, beautifully textured natural-looking skin tones, great sharpness, wide exposure latitude, fine grain for big enlargements, and accurate reproduction of difficult colors, such as certain violets and greens, even under fluorescent lighting*.</li> </ul>
<b>FUJICOLOR nexia 800 [DZ]</b>  Process C-41/CN-16/CN-16Q/ CN-16FA/CN-16L/ CN-16S	Daylight ISO 800/30°	25 and 40	<ul style="list-style-type: none"> <li>• Very-high-speed, daylight-type, fine-grain, highly durable, color negative film incorporating a 4th color layer, for use with Advanced Photo System (APS) cameras.</li> <li>• Suited to all types of shooting conditions, especially high-speed action situations such as field sports and racing, low-light scenes and weather-induced changes in light levels.</li> <li>• Provides great vividness and enhanced color realism, even under fluorescent lights*, across the entire spectrum including brilliant reds, bright blues and strong yellows, plus accurate rendition of hard-to-reproduce colors such as certain violets and greens thanks to Fujifilm's 4th color layer technology, as well as natural-looking face tones and extremely sharp images for big enlargements.</li> </ul>

\*When the proper color compensation filters are used.

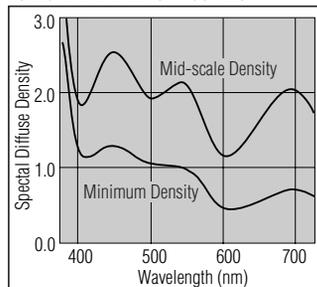
**FUJICOLOR nexia A200 [DA] ISO 200/24°, Daylight Type**

• **SPECTRAL SENSITIVITY CURVES**



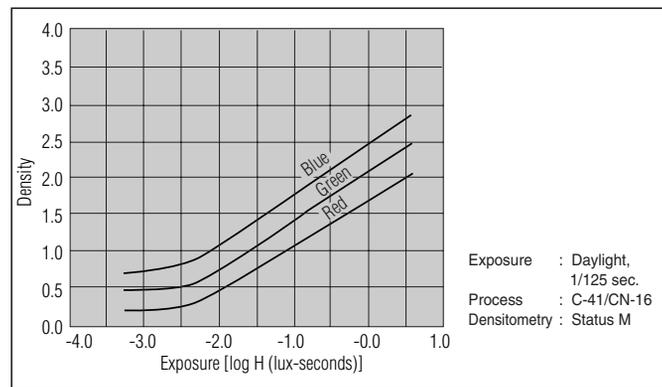
Process : C-41/CN-16  
 Densitometry : Status M  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**

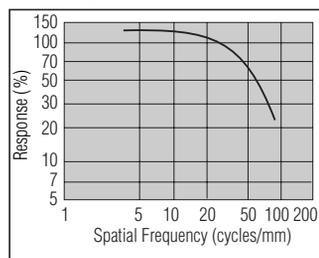


Typical densities for a mid-scale neutral subject and for minimum density.

• **CHARACTERISTIC CURVES**



• **MTF CURVE**



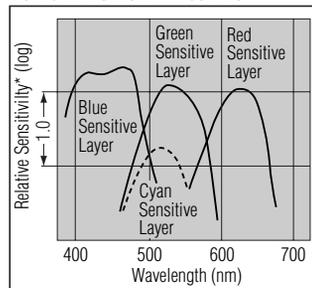
Exposure: Daylight  
 Process : C-41/CN-16

• **DIFFUSE RMS GRANULARITY VALUE.....4**  
 Micro-densitometer Measurement Aperture: 48μm in diameter  
 Magnification: 12×  
 Sample Density: 1.0 above minimum density

• **RESOLVING POWER**  
 Chart Contrast 1.6:1 - **50** lines/mm  
 Chart Contrast 1000:1 - **160** lines/mm

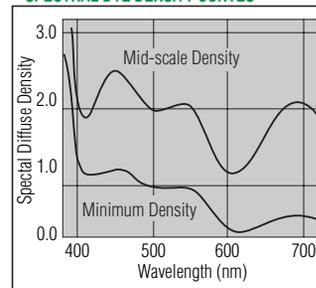
**FUJICOLOR nexia 400 [DH] ISO 400/27°, Daylight Type**

• **SPECTRAL SENSITIVITY CURVES**



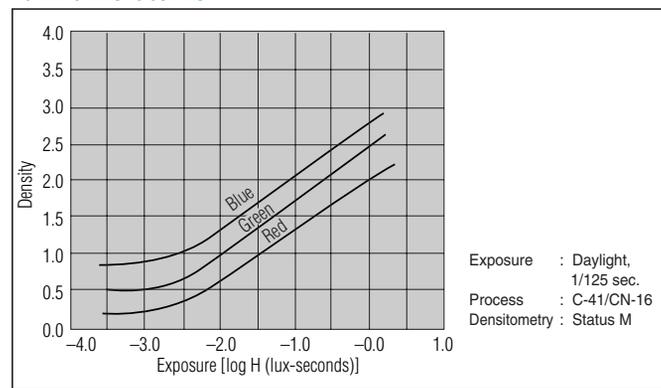
Process : C-41/CN-16  
 Densitometry : Status M  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**

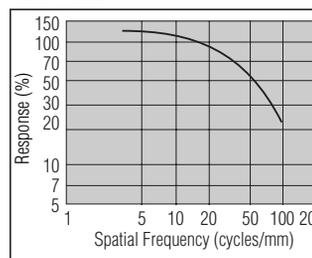


Typical densities for a mid-scale neutral subject and for minimum density.

• **CHARACTERISTIC CURVES**



• **MTF CURVE**



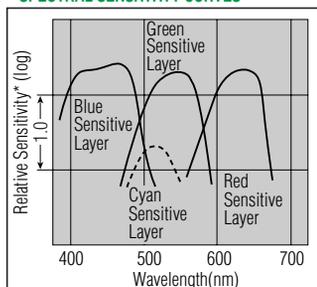
Exposure: Daylight  
 Process : C-41/CN-16

• **DIFFUSE RMS GRANULARITY VALUE.....4**  
 Micro-densitometer Measurement Aperture: 48μm in diameter  
 Magnification: 12×  
 Sample Density: 1.0 above minimum density

• **RESOLVING POWER**  
 Chart Contrast 1.6:1 - **50** lines/mm  
 Chart Contrast 1000:1 - **125** lines/mm

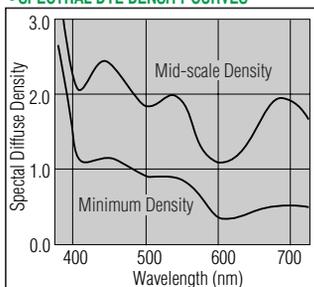
**FUJICOLOR nexia 800 [DZ] ISO 800/30°, Daylight Type**

• **SPECTRAL SENSITIVITY CURVES**



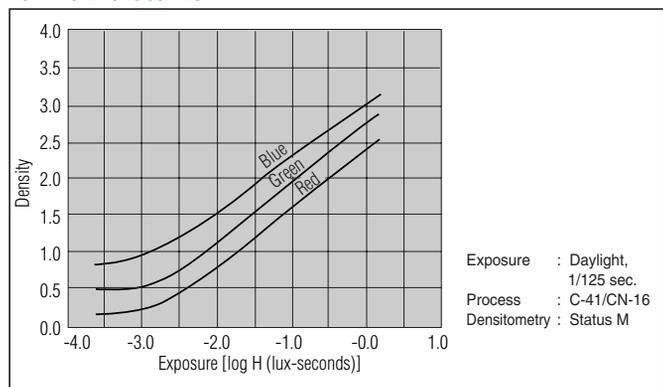
Process : C-41/CN-16  
 Densitometry : Status M  
 Density : 1.0 above minimum density  
 \*Sensitivity equals the reciprocal of the exposure (J/cm<sup>2</sup>) required to produce a specified density

• **SPECTRAL DYE DENSITY CURVES**



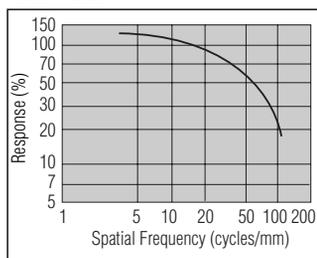
Typical densities for a mid-scale neutral subject and for minimum density.

• **CHARACTERISTIC CURVES**



Exposure : Daylight,  
 1/125 sec.  
 Process : C-41/CN-16  
 Densitometry : Status M

• **MTF CURVE**



Exposure: Daylight  
 Process : C-41/CN-16

• **DIFFUSE RMS GRANULARITY VALUE.....5**

Micro-densitometer Measurement Aperture:  
 48μm in diameter  
 Magnification: 12 ×  
 Sample Density: 1.0 above minimum density

• **RESOLVING POWER**

Chart Contrast 1.6:1 - 50 lines/mm  
 Chart Contrast 1000:1 - 125 lines/mm

## 6-3. IMAGE SIZES OF CAMERA-USE NEGATIVE/REVERSAL FILMS

### ① Roll Film

Type	Width	Image Sizes	Number of Exposures
120	61.5 mm	4.5 x 6 cm (Semi), 6 x 6 cm, 6 x 7 cm, 6 x 8 cm, 6 x 9 cm, 6 x 17 cm and various other panorama sizes.	16 (or 15), 12, 10, 9, 8 and 4.
220	61.5 mm	Same as above	32 (or 30), 24, 20, 18, 16 and 8.

**NOTE** Universally known sizes are given for the above films, but actual measurements may be slightly different according to equipment used (camera, roll holder, etc. ). In the past, roll film came in many different widths, ranging from less than 10 mm up to 254 mm (10-inch-wide film for the "Cirkut" camera), but now only the two sizes listed above are in general use. 127-size roll film is sometimes available in shops selling early cameras, along with 620-size roll film (120-size re-spooled). Other rare sizes are occasionally made by using standard-size film cut down to the required width and wound on old spools.

### ② Cartridge/Cassette Type

Type	Width	Image Sizes	Number of Exposures
135	35 mm	17 x 24 mm (half-frame), 24 x 36 mm (full-frame), 23 (or 24) x 24 mm (stereo Robot), 13 x 36 mm (new Panorama) and full-width (24 mm) panorama of various lengths	Varies according to length of film
APS	24 mm	16.7 x 20.2 mm (used in 3 types of print / slide formats.)	15, 25 and 40
Minox	9.3 mm	8 x 11 mm	36
110	16 mm	13 x 17 mm	12
126	35 mm	28 x 28 mm	24

### ③ Disc System Film

Type	Dia.	Image Sizes	Number of Exposures
Disc	65 mm	8 x 10 mm only (other sizes have been discontinued.)	15

### ④ Sheet Film

Type	Sheet Size	Image Size	Number of Exposures
Sheet	4" x 5"	Generally same as sheet format, but other configurations are possible (e. g., multiple frames on a single sheet).	1 (normal)
Sheet	8" x 10"	Same as above	1 (normal)
Sheet	11" x 14"	Same as above	1 (normal)

**NOTE** The above three sizes of sheet film are still stocked by suppliers, but 11"x14" sheet film is not normally stocked by photographic film suppliers. It is, however, available as a special order product.

### ⑤ Instant Film (Cassette Type)

Type	Width	Image Sizes	Number of Exposures
35	35 mm	24 mm x 36 mm (normal)	12

### Instant Film (Pack Type)

Type	Film Size	Image Sizes	Number of Exposures
Pack	83 mm x 86 mm	69 mm x 72 mm	10
"	4" x 5"	89 mm x 118 mm	8 / 10

### Instant Film (Sheet Type)

Type	Film Size	Image Sizes	Number of Exposures
Sheet	4" x 5"	89 mm x 114 mm	1 (normal)
"	8" x 10"	190 mm x 240 mm	1 (normal)

## 6-4. PHOTOGRAPHIC TECHNIQUES

### 1. DETERMINING EXPOSURE SETTINGS

#### ●High-contrast situations

While the human eye can adjust to extreme differences in brightness, even when the ratio between the highest and lowest luminance levels is as much as 400:1, film is unable to cope with such extremes. Both shadow detail and bright highlights cannot be accurately reproduced at the same time. One or the other (or both) will have to be sacrificed, according to the way the photographer wants the scene to look. In such situations, it is best to take separate readings of the bright, mid-tone and dark areas, preferably with a spotmeter, in order to determine the best exposure to suit the purpose.

#### ●Low-contrast situations

When the setting is of low contrast, that is, free of extremes in brightness levels, an average overall incident or reflected light reading by an ordinary light meter will provide a reliable basis for exposure calculation.

#### ●Controlled situations

In controlled situations, such as in the studio, extreme contrast levels can be avoided through the use of balanced lighting. Here, a normal meter reading of a standard gray card, placed next to the subject, will show the correct exposure setting. A lesser or greater exposure time may be desired and/or required according to the effect desired or the brightness of the subject in comparison to that of the gray card. Other factors, such as bellows extension and image enlargement (macro-photography), must be taken into consideration.

#### ●Electronic flash situations

To obtain a precise reading of electronic flash light output, use a flashmeter set to the ISO rating of the film being used. An incident light reading, taken from the subject's position, will show the correct f-stop to use. With certain older-type flash meters, the meter has to be readied and set near to the subject and the electronic flash triggered manually. More advanced versions are connected by sync cables to the electronic flash unit and triggering of the flash is done by pressing a button on the meter. Usually, this type of meter can be used to obtain accumulated readings of flash output in the case of repeated (multiple) flashes.

### 2. BASIC STUDIO LIGHTING TECHNIQUES

#### (1) Product Photography

**Introduction:** Soft, almost shadowless lighting is generally employed in present-day product photography. The following items are required for this type of lighting:

- A large softbox (light dome) in which a tungsten-type or electronic flash head is fitted.
- A counterbalanced boom to support the softbox.
- Diffusion screens (such as frames covered with double-thickness tracing paper).
- Soft reflectors, photofloods.

Whether the item to be photographed is small or large, the lighting procedure is essentially the same :

- (a) The object is placed on a prepared surface, either on a table or the studio floor. Usually this surface is curved up at the back to fill the image frame. The softbox is suspended directly over and as close as possible to it (usually just outside the image frame). This softbox can be either tilted or partly blocked off with black paper to create a graded background. If the object being photographed is thin and flat, often this single light source will be all that is required.
- (b) If the front of the product is too dark, a reflector should be positioned just below camera level and to one side. This is then angled to reflect the overhead light onto the product.
- (c) Should more light be required, instead of the reflector, a diffusion screen with a photoflood (or electronic flash head) set behind it should be used. The intensity of this diffused fill-in light should be weaker than the main source.
- (d) A low-power reflector (such as a white card) may be required to supply additional fill-in light from the opposite side.

**NOTE** Soft lighting generally works well for color, regardless of background brightness, but for black & white, backgrounds which are either brighter or darker than the product are required for separation.

## (2) Portrait and Full-figure Studio Lighting for Advertising Work

**Introduction:** As with product lighting, the current trend favors the softest lighting possible and lets color provide the necessary impact. The basic equipment needed for such lighting is as follows:

- A powerful highly-diffused top light (sometimes called the area light).
- A large softbox with a high-power light source fitted inside.
- Two or three hinged white reflector boards (approx.2.5 meters in height).
- Various tungsten or electronic flash heads.

A typical lighting setup would be as follows:

- (a) The top (or area) light is positioned high above, mainly to light the background. It is then tilted to provide the background with the degree of gradation required.
- (b) Then the large softbox, for lighting the model, is positioned above and to the side of the camera.
- (c) Reflector boards are set up as desired and lights are shone directly onto them. The light reflected from these screens is very soft and judicious placement of these reflectors and lights will result in almost shadowless lighting.

## (3) General Portraiture Lighting

**Introduction:** Unlike the soft lighting used in advertising photography, traditional, highly dramatic lighting, as seen in old master paintings, is still popular for general portrait work. A basic set of equipment needed for portrait photography is as follows :

- A strong main light (called the key-light), preferably with a focusing fresnel lens.
- A more powerful fresnel or plain-lens light for use as a backlight.
- One or two scoops, or other diffused lighting units, for use as fill-in lights.
- One or two adjustable lights for lighting the background and various elements in the picture to add greater dimension.

The following steps are for a typical studio portrait lighting set-up:

- (a) The key-light is positioned approximately 45 degrees above and to one side of the model.
- (b) Well out of the frame, a strong backlight is positioned above and behind the model to highlight hair and shoulders. Normally, this backlight is at least 1.5 times brighter than the key-light.
- (c) One or more lights are then used to light the background. With certain spotlights it is possible to project patterns onto the background.
- (d) A scoop(s) or other diffused light source(s) is used to soften facial and body shadows.

**NOTE** With older male subjects, lighting is generally kept quite dramatic, while with female models, children and young adults (of both sexes), the key-light should be slightly diffused and the fill light increased.  
Usually the lighting used for portraits is fine for both color and black & white work.

## 3. HAND-HELD EXPOSURE METERS

### Introduction

The function of the hand-held exposure meter is to convert the response to light falling onto a light-sensitive cell into a reading or another form of visual indication that enables the correct shutter speed and/or lens aperture to be set.

The following are the different types of hand-held exposure meters usually employed :

### (1) Reflected-light Meter

This type of meter provides a general reading of the light being reflected from a scene. It can also be used to measure separate parts of the image, such as a subject's face or shadow areas, thus enabling more precise exposure settings to be determined.

### (2) Incident-light Meter

This meter measures the overall light falling directly on a scene without being influenced by the brightness of the subject being photographed, and is thus the best type of meter for fast work. Like the reflected-light meter, it can also be used to measure various levels of light falling on separate parts of a scene for more precise calculation.

**NOTE** Many light meters allow both reflected and incident light readings to be taken.

### (3) Spotmeter

This special type of meter provides the most precise readings of all, as its narrow field of view allows light reflected from a 1-degree circle within the targeted subject to be accurately measured. Any number of areas can be read to create a set of values for a particular scene, which then enables the photographer to determine the most suitable exposure setting.

### (4) Flashmeter

This meter measures the short-duration light discharged by electronic flash sources and displays the correct working aperture. This type of meter normally measures the incident light falling on a subject, but some meters are equipped to measure reflected light as well.

## 4. COLOR TEMPERATURE METER

### (1) General Description

A color temperature meter is a precision instrument which is used by photographers to measure the color quality of ambient light, the light from electronic flash, or a combination of both.

It analyzes the color characteristics of light striking three photo cells contained in its light-receptor head, and then displays the required filtration, if any, as well as the photographic color temperature in degrees Kelvin. (See "Color Temperature" on page 105.)

Most color temperature meters have the following three film settings;

- 3200K-balanced, type-B tungsten light film (still / cine use)
- 3400K-balanced, type-A tungsten light film (cine use only)
- 5500K-balanced, daylight film (still / cine use)

**NOTE** FUJICHROME 64T TYPEII Professional [RTPII] is designed to produce the best results at 3100K.

### (2) General Applications

#### (a) Measurement of Ambient Light

Ambient light refers to a continuous source of light falling on the subject, such as daylight or light from photospots, photofloods and other lamps.

If the ambient light originates from only one source such as the sun or a single lamp (or from lamps of the same color temperature), accurate measurements are easily made. However, if the ambient light is not all of the same color temperature or is combined with light from an electronic flash, color temperature measurements are more complicated.

The following methods for determining color temperature and filtration should be used according to the respective lighting conditions.

- If the ambient light consists of a single color temperature, the meter should generally be held facing the main light source, and in the case of artificial light, close to it if possible. If only bounce lighting is used, the meter should face either the surface which is reflecting the light, or towards the camera from the position of the subject.
- When the ambient light comes from multiple light sources with different color temperatures, each light source should be measured and various gelatine filter sheets used to standardize the overall color temperature.

If this method cannot be used under the given condition, then with the meter facing the camera, the overall light illuminating the subject should be measured and the recommended filter fitted on the camera lens.

- When the ambient light and the light from an electronic flash are used together, the meter should be pointed at the flash. If any filtration is required for the combined lighting, it will be indicated. If the photographer changes the effective ratio between the two light

sources by selecting a different shutter speed which is lower than the X-setting, the modified filtration will be shown when this information is entered into the meter.

#### (b) Measurement of Light from a Studio-type Flash

Measuring the color quality of the light emitted by studio electronic flash units is very simple. The meter should be positioned near the subject and pointed towards the light source(s). A sync cable is usually attached to the meter and then plugged into the main unit, making the triggering of the flash easy. When light-balancing filtration is indicated, it is preferable to use gelatin-type filters in front of the flash head(s) rather than a filter or filters on the lens. Keeping the optical path free of filtration avoids problems caused by dust, etc. on the filter(s). Another important advantage of directly filtering the light source(s) is that filter factors need not be taken into account when reading the light level with a flash meter. However, as the range of gelatine filter sheets for lighting units is not as extensive as that of light-balancing and color compensating filters for lenses, it may not always be possible to obtain precise results by filtering the light unit(s).

### (3) Special Applications / Conditions

#### (a) Color Meter Readings

Most color meters give readings for both LB (light-balancing) filters and CC (color-compensating) filters (see pages 80 and 82). The majority of applications involve LB filters which decrease or increase the color temperature of the light illuminating the subject, but sometimes a color meter is also used to indicate the filter required for adjusting a specific color filter, such as red, blue or green. It does this by displaying the required density of the green (G) filter or magenta (M) filter, the two filter colors that are used to adjust the level of green. Other CC filters are not indicated because the level of red and blue in the light is controlled by LB filters.

#### (b) Special Light Sources

While a color meter will provide accurate reading for electronic flash and common ambient light sources, this may not be the case for difficult-to-analyze light from sodium vapor lamps, metal-halide lamps, mercury-vapor lamps, and the three-narrow-band fluorescent lamps. Color-bracketed test exposures are therefore recommended to verify that the indicated filtration is correct. Some color meters have a memory function which is very useful for storing data on complex light sources and for retrieving the data when an identical light source is later encountered.

**NOTE** Under special light sources, the accurate reproduction of all colors may not be possible, regardless of the filter(s) used.

## 6-5. GLOSSARY OF PHOTOGRAPHIC TERMS

### ●Contents

1) FUJICHROME FILM Push-/Pull-Processing	120
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7) Circle of Confusion / Depth of Field	129
8) Depth of Focus	130

## 1) FUJICHROME FILM Push-/Pull-Processing

(Increasing or decreasing the effective speed of a film through push-/pull-processing.)

To get the most out of your Fujichrome film, you should set the exposure meter to the ISO rating marked on the box. However, there may be times when you need to set the film speed higher to suit certain photographic conditions. For example, you could use FUJICHROME PROVIA 400F Professional (RHPIII) at an exposure index (EI) of 800 and have it push-processed by the laboratory. Push-processing can also be used to compensate for accidental underexposures. If you have underexposed a roll of film because of an incorrect ISO setting or other reason, have your lab push-process it. As FUJICHROME films have been designed to the highest quality standards, they can be safely push- or pull- processed according to the table below.

Film	Useable Exposure Indices (Effective working aperture increases*1 / exposure corrections*2)
RVP (ISO 50)	EI 35 to 100 (-1/2 to +1)
RVP100F (ISO 100)	EI 70 to 200 (-1/2 to +1)
RDPIII (ISO 100)	EI 70 to 400 (-1/2 to +2)
RAP100F (ISO 100)	EI 70 to 400 (-1/2 to +2)
RHPPIII (ISO 400)	EI 280 to 4800 (-1/2 to +3 1/2)
RTPII (ISO 64)	EI 45 to 125 (-1/2 to +1)

\*1 To effectively increase or decrease the speed of a film, manually set the ISO rating to the new exposure index required and then expose the entire roll of the film to be used at that exposure index. After removing the exposed film, mark it clearly for push- or pull-processing.

\*2 For exposure correction, the amount the film can be push-/pull-processed is shown.

### Precautions:

Because film exposed in this way requires special processing, ascertain that your film processors can provide this service.

## 2) Color Temperature

When a piece of metal (specifically a black body radiator) is subjected to a progressive rise in temperature, it goes from dull black, through orange and red, to a state what is called "white heat". The light quality emitted depends on the temperature of this specimen and is expressed in degrees Kelvin.

In photography, this Kelvin scale is used to describe, in terms of color temperature, the quality of a light source. Almost every light source, be it direct or reflected, radiates in the visible region light which has its equivalent in the quality of light radiated by a "black body" heated to a specific temperature (i.e., degrees Kelvin). In the strictest sense, color temperature applies only to light sources which are full radiators, but in practice, it includes sources which are close to being full radiators, such as tungsten filament lamps. Exceptions are fluorescent lamps whose spectra and resulting photographic effects can differ greatly from those of full or near radiators.

In color photography, the color temperature of the light source should match that for which the film is intended. The maximum permissible deviation from this would be about 100K for color photography using reversal film and more for negative material because prints can be adjusted for color balance. Mixed lighting of different color temperatures can pose problems. When daylight is the main source, however, electronic flash may be successfully used to cancel out light of the wrong color temperature falling on the subject by providing a properly balanced fill-in light.

For precise control, a color temperature meter, which gives a direct reading of the light source's color temperature, and the recommended color-correction filter(s) should be employed.

### 3) Mired

The term mired (micro-reciprocal-degree) applies to the reciprocal measurement of color temperature. The mired value is derived by dividing one million by the color temperature (degrees Kelvin) .

$$\text{Mired Value} = 10^6 / \text{color temperature}$$

Any difference in a mired value has a corresponding difference in a visible change in color. Mired values, being reciprocal, grow smaller as the degrees Kelvin increase. They are very useful because of the nearly linear relationship between a light source's color temperature and the effect produced. In the case of color temperature (degrees Kelvin), however, the changes in the visual or photographic effects do not have a linear relationship with the light source.

Mired values, being additive, are most applicable to the rating of light sources, filters and films. For example, a new mired value results when the mired values of a light source and a filter are added together. By using the mired values of filters, the change in color quality which will result can be easily determined regardless of the color temperature of the light source.

The mired scale is most often applied when color-compensating filters are used to change the effective color of a light source to match the response of a color film. To illustrate this, let us use a case in which a daylight color film balanced for 5500K, is used with a tungsten light source of 3200K. For proper color balance, color correction is required. To determine the mired shift, the following equations are applied:

$$\text{Mired value of film} = 1/5500 \times 10^6 = 182$$

$$\text{Mired value of source} = 1/3200 \times 10^6 = 313$$

By subtracting the mired value of the light source from that of the film, we get minus 131. By using data sheets provided by filter makers, the appropriate filter can then be determined.

### 4) Modulation Transfer Function (MTF)

#### Sharpness

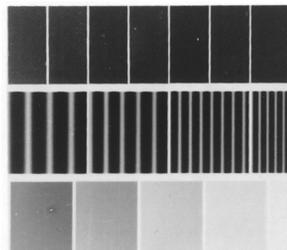
The sharpness of a photograph refers to its ability to reproduce clear details between areas of different densities.

#### Definition of the Modulation Transfer Function

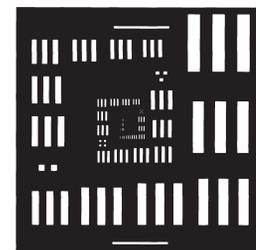
There are various response functions of photosensitive systems, such as the Optical Transfer Function (OTF) , the Contrast Transfer Function (CTF) and as explained below the Modulation Transfer Function (MTF) .

The MTF, generally applied to lenses, is also used as a method for measuring the sharpness of photosensitive materials using physical means.

MTF refers to the sharpness over an entire range of spatial frequencies, while resolution is limited to the maximum spatial frequency by which image sharpness is obtained.



Sine Wave Chart (Sine Pattern Co.)

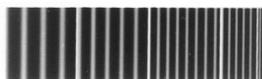


Resolution Test Chart (ISO)

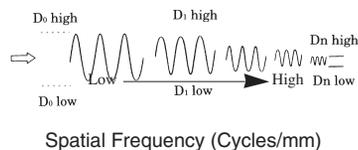
### How the MTF is Measured

Spatial frequency is an indication of the number of times a regular pattern repeats itself over a given distance, e.g., 100 cycles per mm. In determining the MTF, sinusoidal frequency patterns of varying density and contrast are used. A pattern of precisely divided black-and-white patterns representing various spatial frequency values are contact-printed onto the photosensitive material to be assessed. The material is processed under standard conditions to obtain the charts shown on the preceding page (sine wave chart with 60% variation). A micro-densitometer (visual filter) is then used to obtain density measurements, which are in turn used to calculate the modulation (M) value of each frequency. The M values are then used to calculate the MTF.

Sine Wave Pattern



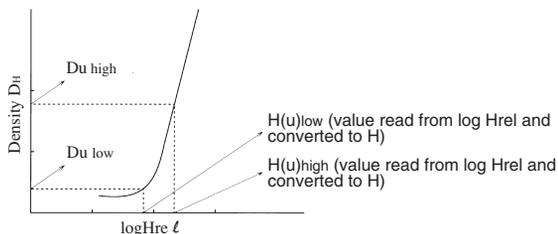
### Graph of calculation results



### Density measurement for each spatial frequency

Density profiles are derived using a micro-densitometer.

### Variations in Effective Exposure on the Basis of Density



### Calculating Modulation

Using the  $H(u)_{high}$  and  $H(u)_{low}$  values stated above,  $M(u)$  is derived for each spatial frequency using the following equation:

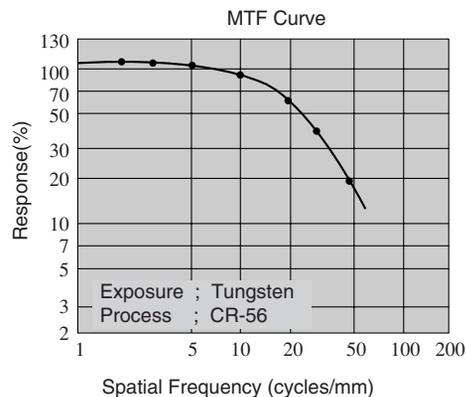
$$M(u) = \frac{H(u)_{high} - H(u)_{low}}{H(u)_{high} + H(u)_{low}}$$

### Deriving an MTF Curve

An MTF curve is derived by dividing (normalizing) the modulation  $M(u)$  for each spatial frequency by the modulation  $M(0)$  for a spatial frequency of 0 cycle/mm.

### Graphing the MTF

Responses (%) derived for the various spatial frequencies are then plotted on a graph.



### Interpreting the Curve

For any given frequency range, higher values indicate higher sharpness.

## 5) Root Mean Square (RMS) Granularity

### Granularity

With large prints, the granular structure of the negatives used becomes noticeable, a condition not obvious in prints of more normal size. This observable grainy quality is referred to as print graininess. While individual crystals of a photographic emulsion would require magnification of about 50 times to be seen by the naked eye, a grainy pattern is often detected at much lower magnifications due to what is called "clumping", a phenomenon caused by the way the grains are unevenly distributed in the emulsion. This produces, in the viewer's consciousness, a sensation which is termed "graininess". Graininess is expressed as a statistical numerical value obtained a psycho-physical technique that determines the granular fluctuation among the micro-densities of an evenly exposed and processed area of photosensitive material. RMS granularity, Selwyn granularity, Q coefficient, and other means are used to assess granularity. Of these, RMS granularity is widely used because of its simplicity and good correspondence with visual graininess.

### Definition of RMS Granularity

Used as standard deviation in statistics, the RMS (Root Mean Square) expresses the disparity within a group of measured values as the square of the fraction  $\delta -$ . A lower RMS therefore indicates lower disparity (granularity) in density values, which is desirable.

### How RMS Granularity is Measured

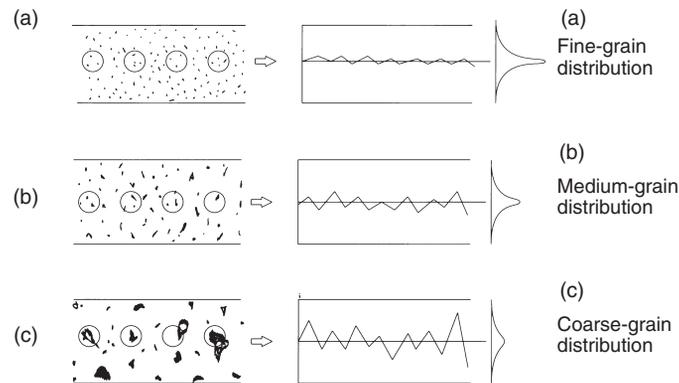
The photosensitive material to be measured is exposed evenly and processed. A sample (with a visual diffusion density of 1.0) is then scanned with an extremely small aperture opening ( $48 \mu \phi$ ), and the RMS is determined by calculating the standard deviation for the variations in the minute densities of silver halide grains or dye clouds. As an average value, the distribution of density values roughly corresponds with the normal distribution.

The standard deviation for densities expressed as  $\delta - (D)$  is the root mean square of the individual deviation values.

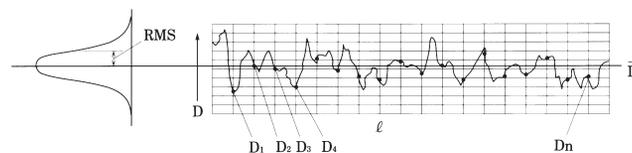
The value thus obtained is then multiplied by 1,000 to obtain the diffusion RMS granularity value.

### ●Outline of the RMS Measurement Process

Distribution of silver halide grains or dye clouds within film      Change and distribution on scan graph based on micro-densitometer measurements



### ●Graphing of Measurement Results



- **Calculation of RMS** ... The RMS is calculated using the following equation:

$$\text{RMS} = \sqrt{\frac{(D_1 - \bar{D})^2 + (D_2 - \bar{D})^2 + \dots + (D_n - \bar{D})^2}{n - 1}}$$

$n$  : Total number of measured densities  
 $\bar{D}$  : Mean value (=  $\frac{\text{added density values}}{n}$ )  
 $D_n$  : Individual density value

\*Results will differ depending on the aperture size, thus changing the evaluation criteria. The measurement conditions must therefore always be stated clearly.

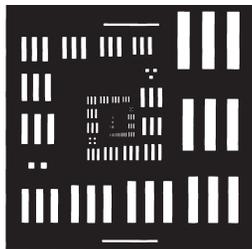
## 6) Resolving Power

The ability of the various system components (film, camera lens, printing material, etc.)— individually or in combination – to show separation between closely spaced lines and other elements is called "resolving power" and is measured in lines per millimeter. The resolving power of a film refers to its ability to distinguish fine details, and is thus an expression of a film's technical limitations.

### Measuring Resolving Power of Films

In order to measure the resolving power of a certain film, a photographic image is first taken of a test chart (such as the one shown on the right) using a camera fitted with a lens which has a high resolving power.

- A test chart typically consists of many groups of alternating black and white lines. The width of the lines is equal within the same group, but differs from group to group.



### Evaluating Resolving Power

The photograph (negative or transparency) of the test chart is exam-

ined under a microscope to determine how many lines can be distinguished per millimeter.

- The resolving power is indicated on the data sheet for two types of test charts : a low-contrast chart with a luminance ratio of 1.6:1 and a high-contrast chart with a luminance ratio of 100:1.
- The higher the number of lines distinguished per millimeter, the higher the resolution.

### System Resolving Power

The resolving power of a system can never exceed the lowest resolving power among the components that comprise the system. In fact, the system value is actually lower.

For example, if a lens with a resolving power of 200 lines/mm were used with a film with a resolving power of 50, the combined system resolving power would be 40.

To accurately determine the resolving power of a system, use the following equation :

$$1/R = 1/r_1 + 1/r_2 + 1/r_3$$

(where "R" is the resolving power of the system and each "r" represents that of each component)

## 7) Circle of Confusion / Depth of Field

When a lens is focused exactly on a certain part of the subject (or object), the light rays reflecting from it, and everything else on the same plane, will be concentrated as points on the film, which represents perfectly sharp focus. On both sides of this plane, however, the light rays no longer form points but discs (circles), whose size is proportional to their distance from the plane. These discs are known as "circles of confusion".

If these discs have a diameter of less than 0.25 mm, the parts of the image they comprise are still considered, for most purposes, to be in sharp focus. For detailed, big enlargements, however, much smaller discs are required.

Depth of field is the distance between the points in front and in back of the subject between which the subject remains in sharp focus at one setting of the lens. Normally, two-thirds of the depth of field lies behind the subject and one-third in front. The depth of field can be increased by reducing the size of the lens aperture.

Because depth of field is proportional to the focal length of a lens, wide angle lenses have great depth of field and telephoto lenses shallow depth.

## **8) Depth of Focus**

Sometimes confused with depth of field, depth of focus is the distance on either side of true focus that the film can be moved without having an appreciable effect on image focus, even with the lens (aperture) wide open.

Most cameras are designed to maintain the film at the position of optimal focus, but with certain instant films and easy-to-use film holders, the film position may shift beyond the depth of focus when the lens (aperture) is opened wide.