

KODAK Instrumentation Film



KODAK Instrumentation Film is a high-speed, black-and-white, panchromatic camera film for data recording from mechanical instrumentation, mechanical processes, and chemical processes. The film is especially useful for dimly lighted subjects, for extending the distance range for flash pictures, for fast action, and for subjects requiring good depth-of-field and fast shutter speeds where maximum image quality for the speed of the film is required.

Instrumentation Film features high speed (EI 500), very high sharpness, extremely fine grain, high resolving power, and allows a high degree of enlargement. KODAK T-GRAIN emulsion technology allows higher film speeds with finer grain.

Other features include:

- Expose film at EI 800 with normal processing and up to EI 3200 with push processing.
- For exposure in daylight or artificial light.
- Expanded exposure latitude produces quality prints from moderately under- or overexposed negatives.
- KODAK DURAFLO RT Developer is highly recommended for processing this film. KODAK Developer D-76 and KODAK Developer D-96 are also being used successfully by customers.
- EI 500 speed is obtained in normal DURAFLO RT Developer process that is used for test-release processing of film batches in manufacturing.

Base	Size
0.004 inch (0.10 mm) ESTAR Thick	16 mm, 35 mm, 70 mm Rolls

STORAGE AND HANDLING

Store unexposed film at 24°C (75°F), or lower, in the original sealed package.

Store exposed film in a cool, dry place, and process it promptly.

Protect processed film from strong light, and store it in a cool dry place. For more information, see KODAK Publication No. E-30, *Storage and Care of KODAK Films and Papers—Before and After Processing*.

DARKROOM RECOMMENDATIONS

Handle unprocessed film in total darkness.

Process this film in total darkness through the fixing step.

Do not use a safelight. Using any safelight, including the KODAK Safelight Filter No. 3, will result in fogging.

EXPOSURE

Film Speed

Use the Exposure Index (EI) number below with meters and cameras marked for ISO, ASA, or DIN speeds. Do not change the film speed setting when metering through a filter. Metering through filters may affect light meter accuracy; see your meter or camera manual for specific information. For critical work, make a series of test exposures.

Speed	
Arithmetic	Logarithmic
500	29°

The developer you use affects the Exposure Index:

KODAK Developer	Use This Exposure Index
DURAFLO RT	500 / 29°
D-76, D-76 (1:1)	400 / 27°
D-96	400 / 27°

Pushing the Film Speed

Because of its latitude, underexposing the film one stop at EI 800 will produce high quality negatives with normal processing Times. There will be no change in the grain of the final prints, but there may be a slight loss in shadow detail. If a higher speed is needed, expose the film at EI 1600 and increase the development time. At this higher speed, there will be an increase in contrast and graininess with some additional loss in shadow detail.

Expose this film at EI 3200 by push processing in DURAFLO RT, D-76, or D-96 Developers. Three stops underexposure and push processing causes an additional increase in contrast and graininess and loss of shadow detail. Results should be acceptable for many applications.

Daylight Exposure

Use the exposures in the table below (based on EI 400 / 27° for average front-lighted subjects from 2 hours after sunrise to 2 hours before sunset.)

Lighting Conditions	Shutter Speed (second)	Lens Opening
Bright/Hazy Sun on Light Sand or Snow	1/500	f/16
Bright or Hazy Sun, Distinct Shadows	1/500	f/11 ¹
Weak, Hazy Sun, Soft Shadows	1/500	f/8
Cloudy Bright, No Shadows	1/500	f/5.6
Heavy Overcast, Open Shade ²	1/500	f/4

¹Use f/5.6 for back-lighted close-up subjects.

²Subject shaded from the sun but lit by a large area of clear sky

Electronic Flash

Use the appropriate guide number in the table below as a starting point for your equipment. To determine the lens opening, divide the guide number by the flash-to-subject distance.

Guide Number (GN) Table for Distances Measured in Feet or Meters

Unit Output (BCPS/ECPS): ¹	350	500	700	1000	1400	2000	2800	4000	5600	8000
Foot GN:	85	100	120	140	170	200	240	280	340	400
Meter GN:	26	30	36	42	50	60	70	85	100	120

¹BCPS = beam candlepower seconds. ECPS = effective beam candlepower seconds (approximately equal to BCPS).

Filter Factors

KODAK WRATTEN Gelatin Filter	Daylight			Tungsten		
	Increase Lens Aperture By (f-stops)	OR	Increase Exposure By (filter factor)	Increase Lens Aperture By (f-stops)	OR	Increase Exposure By (filter factor)
No. 8 (yellow)	2/3		1.5	1/3		1.2
No. 11 (yellowish green)	1 2/3		3	1 2/3		3
No. 12 (deep yellow)	1		2	1/3		1.2
No. 15 (deep yellow)	1		2	2/3		1.5
No. 25 (red) ¹	3		8	2		4
No. 47 (blue) ¹	3		8	4 2/3		25
No. 58 (green) ¹	2 2/3		6	2 2/3		6
Polarizing Filter	1 1/3		2.5	1 1/3		2.5

¹Filters recommended for making separation negatives.

Note: Filter factors for other black-and-white films are different.

RECIPROCITY

Reciprocity -- Adjustments for Long and Short Exposures

If Indicated Exposure Time Is (Seconds)	Use This Lens-Aperture Adjustment	OR	This Adjusted Exposure Time (Seconds)	AND	Use This Development Adjustment
1/10,000	None		None		None
1/1,000	None		None		None
1/100	None		None		None
1/10	None		None		None
1	+1/3 Stop		Adjust Aperture		None
10	+1/2 Stop		15		None
100	+1 1/2 Stops		300		None

MACHINE PROCESSING

KODAK Instrumentation Film can be processed in continuous processors.

Developers

KODAK DURAFLO RT Developer Starter

KODAK DURAFLO RT Developer Replenisher (Parts A and B)

KODAK Developer D-76 (or equivalent private label brand)

KODAK Developer D-96

Fixer

KODAK Rapid Fixer, Part A

KODAK Rapid Fixer, Part B

Mixing Instructions for DURAFLO RT Chemicals

Percent Concentrate and Percent Water for Mixed Solutions

Duraflo RT Solution	Water	Part A	Part B	Starter
Developer Replenisher	50	25	25	0
Developer (Start-Up)	53.1	22.9	22.9	1.1



Caution

Part A must be diluted with water before Part B is mixed in. This will avoid precipitation of some of the developer components.

Starting Point Recommendations

Developer	Temperature	Time
DURAFLO RT	80°F (26°C)	93 seconds
D-76	80°F (26°C)	93 seconds
D-96	80°F (26°C)	93 seconds
D-96	100°F (38°C)	50 seconds

Replenishment Rates:

Per square foot/square metre: Use a starting point replenishment rate of 29 mL/sq ft (312 mL/sq m).

Per 135-36 roll (or other 80 sq. in. equivalent): Use a starting point replenishment rate of 310 mL/sq m (0.20 mL/sq in), or 16 mL (1/2 oz) of solution for each 135-36, 120 roll, or 8 x 10-inch sheet (or equivalent) of film processed.

Continuous Processing

Nominal development time, using KODAK DURAFLO RT Chemicals, to produce a Contrast Index of 0.56 at 26.5°C (80°F): 93 sec.

When processing this film in the KODAK VERSAMAT Film Processor, Model 11, Model 5, or Model 411, using KODAK DURAFLO RT Chemicals, use the following table.

KODAK VERSAMAT	Contrast Index	Machine Speed Setting (feet per minute)
Model 11	0.56	5.5 fpm
Model 5, Model 411	0.56	2.6 fpm

PUSH PROCESSING

Push processing allows film to be exposed at higher speeds, however, push processing will not produce optimum quality. There will be some loss in shadow detail, an increase in graininess, and an increase in contrast. The degree of these effects varies from slight to very significant depending on the amount of underexposure and push processing. The results are usually excellent with 1-stop and 2-stop push, and acceptable with 3-stop push depending on the lighting and the scene contrast.

Development times for normal exposure (and 1-stop push) that produce a CI of 0.56 are given in the previous processing section. (Due to the excellent latitude of this film, there is no need to increase development time for a 1-stop push with this film.)

If you have tested and determined a “normal” development time for KODAK Instrumentation Film, then calculate 2-stop push-process development times from the table below. Otherwise, use the starting point time table that follows.

If You Know Your Normal Development Time

For film exposed at EI 1600, increase development time by the following factors to produce a 2-stop push (CI of approximately 0.74):

KODAK Developer	Development Time Increase
D-76	+ 20%
D-76 (1:1)	+ 15%
DURAFLO RT (Machine Processing)	+ 20%

IMAGE STRUCTURE

Based on development in KODAK Developer D-76, at 20°C (68°F).

Diffuse RMS Granularity: 10 (Extremely Fine)

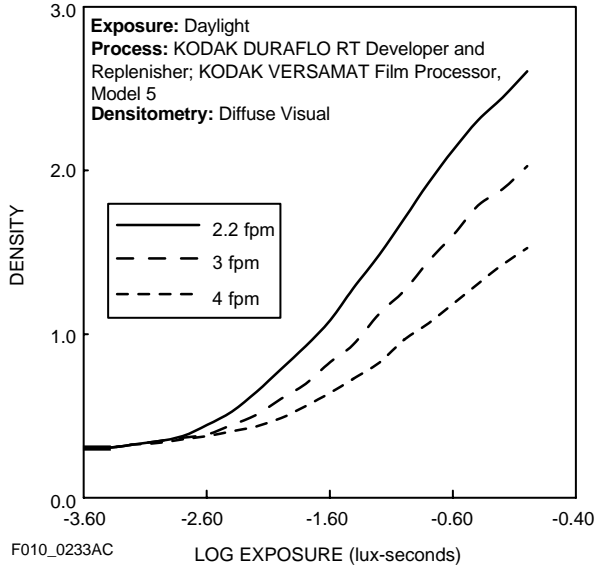
Read at a net diffuse visual density of 1.0, 48 micrometre aperture.

Resolving Power:

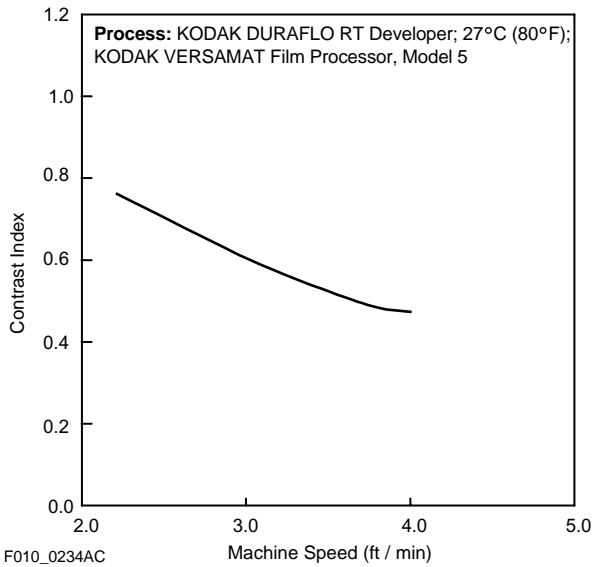
ISO-RPL	TOC 1.6:1	50 lines/mm	
ISO-RP	TOC 1000:1	125 lines/mm	High

CURVES

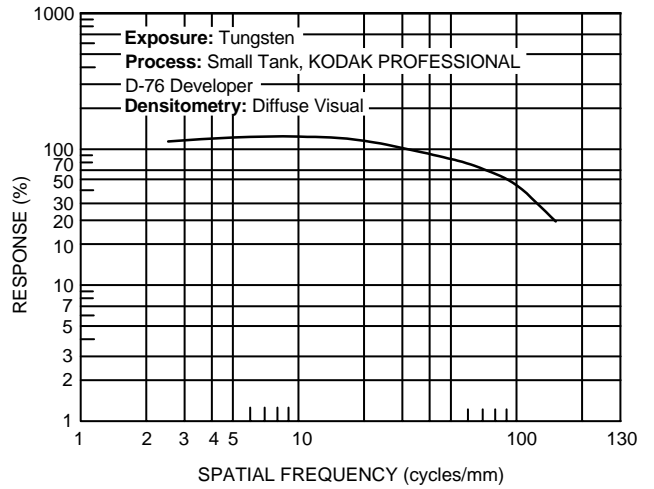
Characteristic Curve



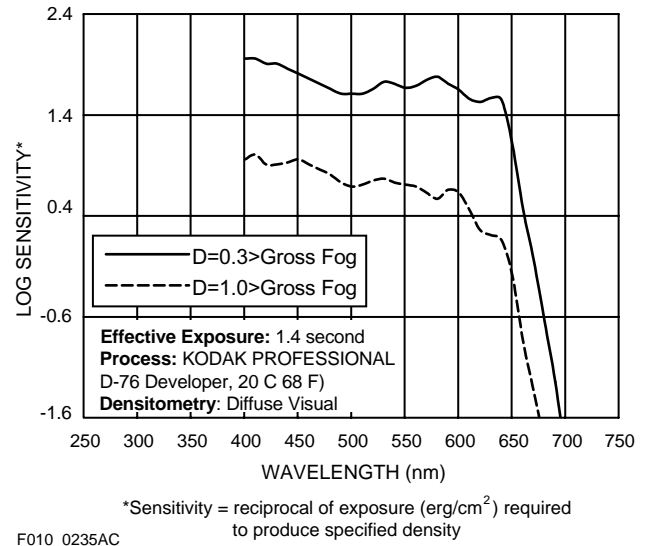
Contrast Index



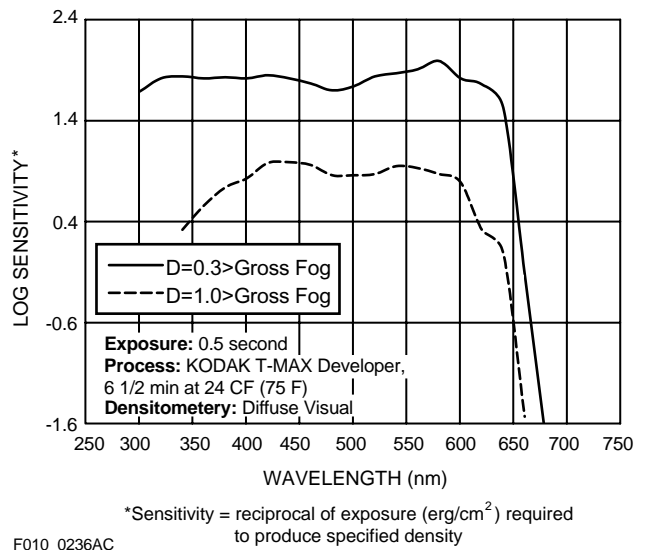
Modulation Transfer Function



Spectral Sensitivity



Spectral Sensitivity: Extended Range for Scientific Applications



KODAK Instrumentation Film

MORE INFORMATION

For the latest version of technical support publications for Kodak products, visit Kodak on-line at:
<http://www.kodak.com/go/SDRproducts>

If you have questions about Kodak products, call Kodak.

In the U.S.A.:

1-800-242-2424, Ext. 19, Monday–Friday
9 a.m.–7 p.m. (Eastern time)

In Canada:

1-800-465-6325, Monday–Friday
8 a.m.–5 p.m. (Eastern time)

From outside the US/Canada: 1-716-724-4000

Note: The Kodak materials described in this publication for use with KODAK Instrumentation Film are available from dealers who supply Kodak products. You can use other materials, but you may not obtain similar results.

NOTICE: The sensitometric curves and data in this publication represent product tested under the conditions of exposure and processing specified. They are representative of production coatings, and therefore do not apply directly to a particular box or roll of photographic material. They do not represent standards or specifications that must be met by Eastman Kodak Company. The company reserves the right to change and improve product characteristics at any time.

Industrial Imaging
EASTMAN KODAK COMPANY • ROCHESTER, NY 14650

