KODAK PROFESSIONAL T-MAX 100 Film

Kodak alaris

TECHNICAL DATA / BLACK-AND-WHITE FILM

June 2018 • F-4016

KODAK PROFESSIONAL T-MAX 100 Film / 100TMX is a continuous-tone panchromatic black-and-white negative film for general outdoor and indoor photography. It is especially useful for detailed subjects when you need maximum image quality. It is also excellent for copying black-and-white photographs, for making black-and-white copies from color transparencies, and for photomicrography. This film features medium speed (ISO 100/21° in most developers), extremely high sharpness, extremely fine grain, and very high resolving power. It allows a very high degree of enlargement.

FEATURES	BENEFITS
• KODAK T-GRAIN Emulsion	• World's finest grain 100-speed black-and-white film.
• Improved sharpness	• Maintains subject detail in prints at higher degrees of magnification than conventional films.
• Expanded exposure latitude	• Greater "forgiveness" with overexposure errors; quality prints from moderately under- or overexposed negatives. • Better highlight separation.
• Improved reciprocity at long and short exposure times	• Less compensation required than with conventional films.
• Excellent for use in copy applications with normal exposure and processing	• No need for contrast adjustment or special processing.

DARKROOM RECOMMENDATIONS

Do not use a safelight. Handle unprocessed film in total darkness. Do not develop these films by inspection.

STORAGE AND HANDLING

Store unexposed film at 75°F (24°C), or lower, in the original sealed package. For protection from heat in areas with temperatures consistently higher than 75°F (24°C), you can store the film in a refrigerator. If film has been refrigerated, allow the package to warm up to room temperature for 2 to 3 hours before opening it.

Load and unload roll-film cameras in subdued light, and rewind the film completely before unloading the camera. Total darkness is required when you remove film from the magazine or load and unload film holders.

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.

EXPOSURE

The nominal speed of KODAK PROFESSIONAL T-MAX 100 Film is EI 100. It was determined in a manner published in ISO standards. Exposing the film at EI 100 should usually lead to the minimum exposure required to produce negatives of very high quality (see the following table). This film has good latitude and responds well to changes in development time. For consistent results, use the rated speed or make tests to determine a speed rating that meets your needs.

Under most conditions, you'll obtain highest quality with normal exposure at the rated exposure index and normal development. For high-contrast scenes, you'll obtain highest quality if you increase exposure by one or two stops and process the film normally.

If normal development produces negatives that are consistently too low in contrast, increase the development time slightly (10 to 15 percent). If negatives are too contrasty, decrease the development time slightly (10 to 15 percent). See "Adjusting Film Contrast."

If your negatives are too thin, increase exposure by using a lower exposure index; if too dense, reduce exposure by using a higher exposure index.

Pushing Exposure* with KODAK PROFESSIONAL T-MAX Developer and KODAK PROFESSIONAL T-MAX RS Developer and Replenisher		
1-Stop Push	**2-Stop Push**	**3-Stop Push†**
EI 200/24° Normal Processing	EI 400/27° 2-Stop Push Processing	EI 800/30° 3-Stop Push Processing

* Pushing exposure results in slight losses of quality compared with normal exposure and normal processing. You can also use other Kodak developers for pushing these films; however, T-MAX Developer and T-MAX RS Developer and Replenisher produce higher-quality tone reproduction (better shadow detail) under these conditions.
For high-contrast scenes, such as spotlighted performers under harsh lighting, expose and process as indicated in the table. However, when detail in the deep-shadow areas is important to the scene, increase exposure by 2 stops and process your film normally.

† Pushing exposure and processing by 3 stops increases contrast and graininess and decreases shadow detail further. Expose and process a test roll to determine if the results are acceptable for your needs.

Adjustments for Long and Short Exposures

At the exposure times in the table below, compensate for the reciprocity characteristics of these films by increasing the exposure as shown.

If Indicated Exposure Time Is (Seconds)	Use This Lens-Aperture Adjustment	OR	This Adjusted Exposure Time (Seconds)
1/10,000	+1/3 stop		Change Aperture
1/1,000	None		None
1/100	None		None
1/10	None		None
1	+1/3 stop		Change Aperture
10	+1/2 stop		15
100	+1 stop		200

Filter Corrections

Increase exposure by the filter factor or the number of stops indicated when you use filters. For greatest exposure accuracy with a through-the-lens meter, take the meter reading without the filter over the lens, and then increase your exposure as shown in the table.

Daylight Illumination

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

Tungsten illumination

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

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

PROCESSING

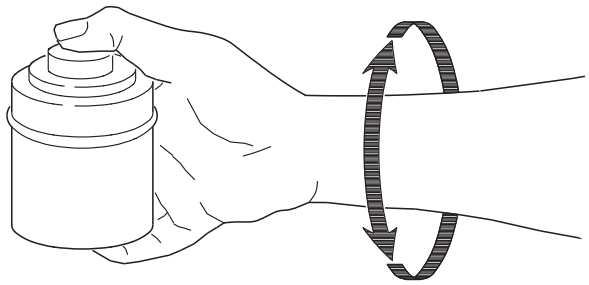
These starting-point recommendations are intended to produce negatives with a contrast appropriate for printing with a diffusion enlarger. To print negatives with a condenser enlarger, you may need to adjust the contrast by reducing your development time; see "Adjusting Film Contrast." Tank development times shorter than 5 minutes may produce unsatisfactory uniformity.

MANUAL PROCESSING

Small-Tank Processing (8- or 16-ounce tank)—Rolls

With small single- or double-reel tanks, drop the loaded film reel into the developer and attach the top to the tank. Firmly tap the tank on the top of the work surface to dislodge any air bubbles. Provide initial agitation of 5 to 7 inversion cycles in 5 seconds, i.e., extend your arm and vigorously twist your wrist 180 degrees.

Then repeat this agitation procedure at 30-second intervals for the rest of the development time.



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Small Tank Processing, (8- or 16-ounce tank)—Rolls

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes				
	65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
T-MAX (1:4)*	NR	7 1/2	7	6 1/2	6 1/4
T-MAX (1:7)†	—	—	—	—	9 1/2
T-MAX (1:9)†	—	—	—	—	13 1/2
T-MAX RS*	NR	8	7 1/2	7	6 1/4
T-MAX RS (1:7)†	—	—	—	—	8 1/2
T-MAX RS (1:9)†	—	—	—	—	12 1/2
XTOL	8 1/2	7 1/2	6 1/2	6	5
XTOL (1:1)†	11 1/2	9 1/2	8 1/2	—	6 1/2
D-76	7 1/2	6 1/2	5 1/2	5	4 1/4‡
D-76 (1:1)	11	9 1/2	8 1/2	7 1/2	6 1/4
HC-110 (B)	6 1/2	6	5 1/2	5	4‡

* The recommended standard dilution is 1:4.
† We do not recommend using more dilute solutions of these developers than indicated in the table. Dilute developers require longer development times; they give slightly higher film speed and a slight increase in graininess.
‡ Development times shorter than 5 minutes may produce unsatisfactory uniformity.

NR = Not Recommended

Note: The development times in the table are suggested starting points.

Large-Tank Processing (1/2- to 3 1/2-gallon tank)—Rolls and Sheets

Agitate continuously for the first 15 to 30 seconds by raising and lowering the basket, rack, or spindle 1/2 inch. Do not agitate the basket, rack, or spindle for the remainder of the first minute. Then agitate once per minute by lifting the basket, rack, or spindle out of the developer, tilting it approximately 30 degrees, draining it for 5 to 10 seconds, and reimmersing it. Alternate the direction of tilting the basket, rack, or spindle.

Large-Tank Processing, (1/2- to 3 1/2-gallon tank)—Rolls

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes				
	65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
T-MAX	NR	8 1/2	8	7 1/2	7
T-MAX RS	NR	8 3/4	8 1/4	7 3/4	7
XTOL	9 1/2	8 1/4	7 1/4	6 1/2	5 1/2
D-76	8 1/4	7 1/4	6 1/2	5 3/4	4 3/4
HC-110 (B)	7 1/2	6 1/2	6	5 1/4	4 1/2

NR = Not Recommended

Note: The development times in the table are suggested starting points.

Large-Tank Processing, (1/2- to 3 1/2-gallon tank)—Sheets

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes				
	65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
T-MAX RS	NR	8 3/4	8 1/4	7 3/4	7
XTOL	9 1/2	8 1/4	7 1/4	6 1/2	5 1/2
D-76	8 1/4	7 1/4	6 1/2	5 3/4	4 3/4
HC-110 (B)	7 1/2	6 1/2	6	5 1/4	4 1/2

Note: Do not use KODAK PROFESSIONAL T-MAX Developer to process sheet films.

NR = Not Recommended

Note: The development times in the table are suggested starting points.

Tray Processing—Sheets

Provide continuous agitation; rotate the sheets 90 degrees as you interleave them. Prewetting sheet film may improve tray process uniformity.

Tray Processing—Sheets

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes				
	65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
T-MAX RS	NR	7 1/4	6 3/4	6 1/4	5 3/4
XTOL	8	6 3/4	6	5 1/4	4 1/2
XTOL 1:1	10 1/2	9	8	7	6
D-76	6 3/4	5 3/4	5 1/4	4 3/4	4
HC-110 (B)	6 1/4	5 1/2	4 3/4	4 1/2	3 3/4

Note: Do not use KODAK PROFESSIONAL T-MAX Developer to process sheet films.

NR = Not Recommended

Note: The development times in the table are suggested starting points.

Rotary-Tube Processing—Rolls and Sheets

Rotary-Tube Processing—Rolls

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes				
	65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
T-MAX (1:4)*	—	7 3/4	7 1/4	6 3/4	6 1/4
T-MAX (1:7)†	—	—	—	—	9 1/2
T-MAX (1:9)†	—	—	—	—	13 1/2
T-MAX RS*	—	7 3/4	7 1/4	6 3/4	6 1/4
T-MAX RS (1:7)†	—	—	—	—	8 1/2
T-MAX RS (1:9)†	—	—	—	—	12 1/2
XTOL	8 3/4	7 1/4	6 1/2	5 3/4	5
XTOL (1:1)†	11 3/4	9 3/4	8 3/4	7 3/4	6 3/4
D-76	7 1/2	6 1/4	5 3/4	5 1/4	4 1/4‡
HC-110 (B)	7	5 3/4	5 1/4	4 3/4‡	4‡

* The recommended standard dilution is 1:4.
† We do not recommend using more dilute solutions of these developers than indicated in the table. Dilute developers require longer development times; they give slightly higher film speed and a slight increase in graininess.
‡ Development times shorter than 5 minutes may produce unsatisfactory uniformity.

Note: Do not use KODAK PROFESSIONAL T-MAX Developer to process sheet films.

Note: The development times in the table are suggested starting points.

Rotary-Tube Processing—Sheets

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes				
	65°F (18°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)
T-MAX RS*	—	7 3/4	7 1/4	6 3/4	6 1/4
T-MAX RS (1:7)†	—	—	—	—	8 1/2
T-MAX RS (1:9)†	—	—	—	—	12 1/2
XTOL	8 3/4	7 1/4	6 1/2	5 3/4	5
XTOL (1:1)†	11 3/4	9 3/4	9	8 1/2	7 3/4
D-76	7 1/2	6 1/4	5 3/4	5 1/4	4 1/4‡
HC-110 (B)	7	5 3/4	5 1/4	4 3/4‡	4‡

* The recommended standard dilution is 1:4.
† We do not recommend using more dilute solutions of these developers than indicated in the table. Dilute developers require longer development times; they give slightly higher film speed and a slight increase in graininess.
‡ Development times shorter than 5 minutes may produce unsatisfactory uniformity.

Note: Do not use KODAK PROFESSIONAL T-MAX Developer to process sheet films.

Note: The development times in the table are suggested starting points.

FINAL STEPS

Rinse at 65 to 75°F (18 to 24°C) with agitation in KODAK Indicator Stop Bath or running water for 30 seconds.

Fix at 65 to 75°F (18 to 24°C) for 3 to 5 minutes with vigorous agitation in KODAK Rapid Fixer. Be sure to agitate the film frequently during fixing.

Note: To keep fixing times as short as possible, we strongly recommend using KODAK Rapid Fixer. If you use another fixer, such as KODAK Fixer or KODAFIX Solution, fix for 5 to 10 minutes or twice the time it takes for the film to clear. You can check the film for clearing after 3 minutes in KODAK Rapid Fixer or 5 minutes in KODAK Fixer or KODAFIX Solution.

Important

Your fixer will be exhausted more rapidly with these films than with other films. If your negatives show a magenta (pink) stain after fixing, your fixer may be near exhaustion, or you may not have used a long enough time. If the stain is slight, it will not affect image stability, negative contrast, or printing times. You can remove a slight pink stain with KODAK PROFESSIONAL Hypo Clearing Agent. However, if the stain is pronounced and irregular over the film surface, refix the film in fresh fixer.

Wash for 20 to 30 minutes in running water at 65 to 75°F (18 to 24°C) with a flow rate that provides at least one complete change of water in 5 minutes. You can wash long rolls on the processing reel. To save time and conserve water, use KODAK PROFESSIONAL Hypo Clearing Agent.

Dry film in a dust-free place. To minimize drying marks, treat the film with KODAK PHOTO-FLO Solution after washing, or wipe the surface carefully with a KODAK Photo Chamois or a soft viscose sponge.

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.

Small Tank Processing, (8- or 16-ounce tank)—Rolls

KODAK Developer or Developer and Replenisher	Development Time in Minutes				
	EI 200		EI 400		EI 800
	68°F (20°C)	75°F (24°C)	68°F (20°C)	75°F (24°C)	75°F (24°C)
T-MAX	7 1/2	6 1/4	12 1/4	10	11 3/4
T-MAX RS	8	6 1/4	12 1/4	10	11 3/4
XTOL	7 1/2	5	9 1/2	6 1/2	7 1/4
XTOL (1:1)	9 1/2	6 1/2	12 1/4	8 1/4	9
D-76	6 1/2	4 1/4*	8 1/4	5 1/2	NR
HC-110 (B)	6	4*	11 1/2	7 3/4	NR

* Development times shorter than 5 minutes may produce unsatisfactory uniformity.

NR = Not Recommended

Note: The development times in the table are suggested starting points.

Large-Tank Processing, (1/2- to 3 1/2-gallon tank)—Rolls

KODAK Developer or Developer and Replenisher	Development Time in Minutes			
	EI 200		EI 400	
	68°F (20°C)	75°F (24°C)	68°F (20°C)	75°F (24°C)
T-MAX RS	8 3/4	7	—	11 1/4
XTOL	—	—	—	7 1/4

Note: The development times in the table are suggested starting points.

Large-Tank Processing, (1/2- to 3 1/2-gallon tank)—Sheets

KODAK Developer or Developer and Replenisher	Development Time in Minutes			
	EI 200		EI 400	
	68°F (20°C)	75°F (24°C)	68°F (20°C)	75°F (24°C)
T-MAX RS	8 3/4	7	—	11 1/4
XTOL	—	—	—	7 1/4

Note: Do not use KODAK PROFESSIONAL T-MAX Developer to process sheet films.

Note: The development times in the table are suggested starting points.

Rotary-Tube Processing—Rolls

KODAK PROFESSIONAL Developer or Developer and Replenisher	Development Time in Minutes						
	EI 200		EI 400				EI 800
	68°F (20°C)	75°F (24°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)	75°F (24°C)
T-MAX	7 3/4	6 1/4	12 1/4	11 1/2	10 3/4	10	11 3/4
T-MAX RS	7 3/4	6 1/4	12 1/4	11 1/2	10 3/4	10	11 3/4
XTOL	7 1/4	5	9 1/2	8 1/2	7 1/2	6 1/2	7 1/4
XTOL (1:1)	9 3/4	7 3/4	12 1/4	—	—	8 1/4	9
D-76	6 1/4	4 1/4*	8 1/4	7 1/2	6 3/4	5 1/2	—
HC-110 (B)	5 3/4	4*	11 1/2	10 1/4	9 1/4	7 3/4	—

* Development times shorter than 5 minutes may produce unsatisfactory uniformity.

NR = Not Recommended

Note: The development times in the table are suggested starting points.

Rotary-Tube Processing—Sheets

KODAK Developer or Developer and Replenisher	Development Time in Minutes						
	EI 200		EI 400				EI 800
	68°F (20°C)	75°F (24°C)	68°F (20°C)	70°F (21°C)	72°F (22°C)	75°F (24°C)	75°F (24°C)
T-MAX RS	7 3/4	6 1/4	12 1/4	11 1/2	10 3/4	10	11 3/4
XTOL	7 1/4	5	9 1/2	8 1/2	7 1/2	6 1/2	7 1/4
XTOL (1:1)	9 3/4	7 3/4	12 1/4	—	—	8 1/4	9
D-76	6 1/4	4 1/4*	8 1/4	7 1/2	6 3/4	5 1/2	—
HC-110 (B)	5 3/4	4*	11 1/2	10 1/4	9 1/4	7 3/4	—

* Development times shorter than 5 minutes may produce unsatisfactory uniformity.

NR = Not Recommended

Note: The development times in the table are suggested starting points.

MACHINE PROCESSING

Large Tank Rack-and-Tank Processors

The development times for large-tank rack-and-tank processors are based on a machine speed that transfers the film every 2 minutes. The times given below are starting-point recommendations for KODAK PROFESSIONAL T-MAX RS Developer and Replenisher and KODAK PROFESSIONAL XTOL Developer. Make tests to determine if results are acceptable for your needs.

Large-Tank Rack-and-Tank Processing		
EI	**KODAK Developer or Developer and Replenisher**	**Time (min) at 72°F (22°C)**
100/21° 200/24°	T-MAX RS or XTOL	6 to 8

Replenishment Rates

T-MAX RS Developer and Replenisher—Add 45 mL (1.5 ounces) of replenisher solution for each 135-36 or 120 roll or 8 x 10-inch sheet of film processed. Stir or recirculate the solution after each addition of replenisher solution.

Note: Do not use T-MAX RS Developer and Replenisher to replenish T-MAX Developer. They are not designed to work together.

XTOL Developer—Add 70 mL (2.4 ounces) of replenisher solution for each 135-36 or 120 roll or 8 x 10-inch sheet of film processed. Stir or recirculate the solution after each addition of replenisher solution.

Push Processing: Large Tank Rack-and-Tank Processors

The development times for these processors are based on a machine speed that transfers the film every 2 minutes. The times given below are starting-point recommendations. Make tests to determine if results are acceptable for your needs.

EI	KODAK Developer or Developer and Replenisher	Time* (min) at 72°F (22°C)
200/24°	T-MAX RS	6 to 8
200/24°	XTOL	6 to 8
400/27°	T-MAX RS	8 to 10
400/27°	XTOL	8 to 10

* Development time depends on agitation and tank size.

CONTRAST ADJUSTMENT

If you want to increase or decrease film contrast from its normal value, you can adjust your standard development time. Your standard development time is the time that produces normal negative contrast based on your processing equipment and conditions, agitation, and processing technique.

The table below provides adjustment factors for several developers. The factors are based on a developer temperature of 75°F (24°C) for KODAK PROFESSIONAL T-MAX Developers and a temperature of 68°F (20°C) for the others. The "standard" for each developer is indicated by 1.0. To increase or decrease film contrast or to use a different developer temperature, find the adjustment factor in the table. Multiply the standard development time by this factor to find the development time to use for a different contrast or developer temperature (or both).

For detailed processing instructions for XTOL Developer, see KODAK PROFESSIONAL XTOL Developer, KODAK Publication No. J-109.

Note: These tables apply to negatives you will print with a diffusion enlarger. If you use a condenser enlarger, shift your selection one column to the left.

Development-Time Adjustment Factors				
Temperature	**20% Less Contrast**	**Normal Contrast**	**20% More Contrast**	**40% More Contrast**
KODAK PROFESSIONAL T-MAX Developer and KODAK PROFESSIONAL T-MAX RS Developer and Replenisher				
68°F (20°C)	0.9*	1.2	1.4	NR
72°F (22°C)	0.8*	1.1	1.3	1.7
75°F (24°C)	0.7*	**1.0**	1.2	1.5
KODAK PROFESSIONAL Developer D-76				
65°F (18°C)	1.0*	1.2	1.4	1.6
68°F (20°C)	0.8*	**1.0**	1.2	1.4
70°F (21°C)	0.7*	0.9	1.1	1.3
72°F (22°C)	0.7*	0.8	1.0	1.2
75°F (24°C)	0.6*	0.7	0.9	1.0
KODAK HC-110 Developer Replenisher (Dilution B)				
65°F (18°C)	0.7*	1.2	1.6	2.1
68°F (20°C)	0.6*	**1.0**	1.4	1.8
70°F (21°C)	0.6*	0.9	1.3	1.6
72°F (22°C)	0.5*	0.8	1.2	1.5
75°F (24°C)	0.4*	0.7	1.0	1.3

* If you select one of these factors, add one stop to your camera exposure.

NR = Not recommended

RETOUCHING

You can retouch KODAK PROFESSIONAL T-MAX 100 Film in 120 and sheet sizes by applying liquid dyes to the base or emulsion side.

IMAGE STRUCTURE

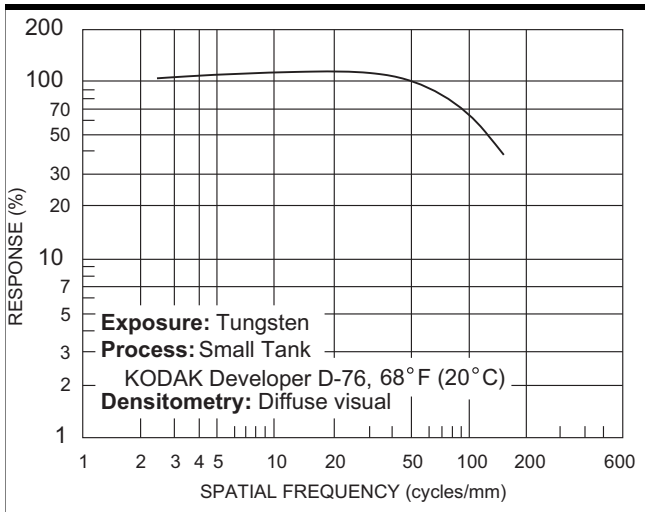
The data in this section are based on development in KODAK Developer D-76, at 68°F (20°C).

KODAK PROFESSIONAL Film	Resolving Power*	Diffuse rms Granularity†
T-MAX 100	63 lines/mm (TOC 1.6:1)	8
	200 lines/mm (TOC 1000:1)	

* Determined according to a method similar to the one described in ISO 6328, Photography—Determination of ISO Resolving Power.
† Read at a net diffuse density of 1.00, using a 48-micrometre aperture, 12X magnification.

CURVES

Modulation Transfer Curves



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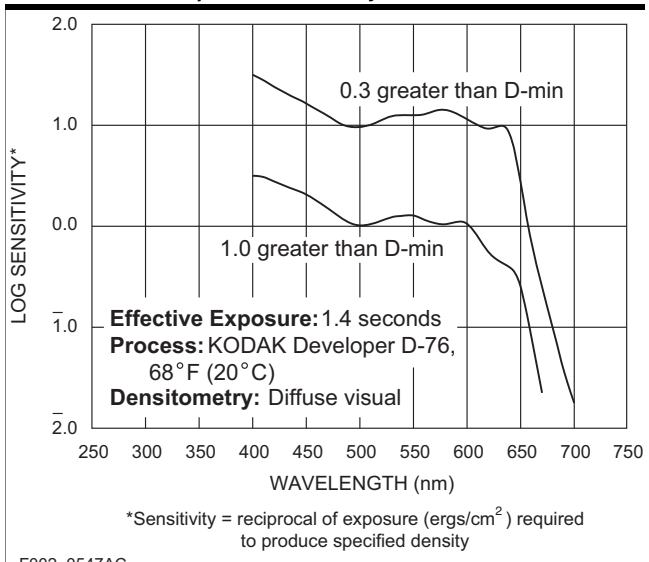
Spectral Sensitivity Curves*



*Sensitivity = reciprocal of exposure (ergs/cm^2) required to produce specified density

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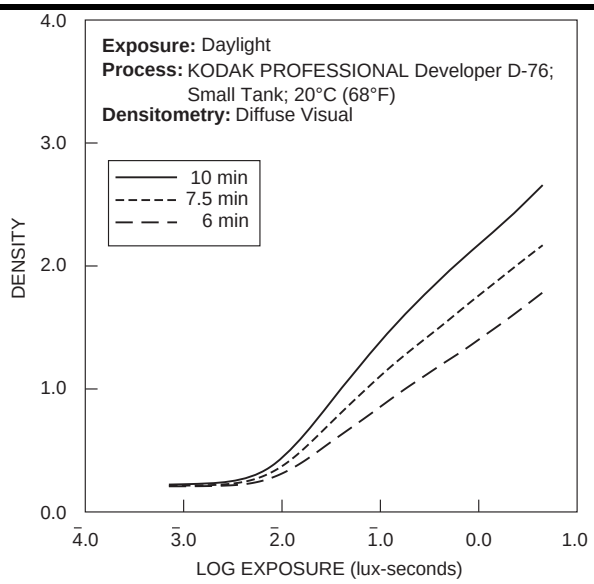
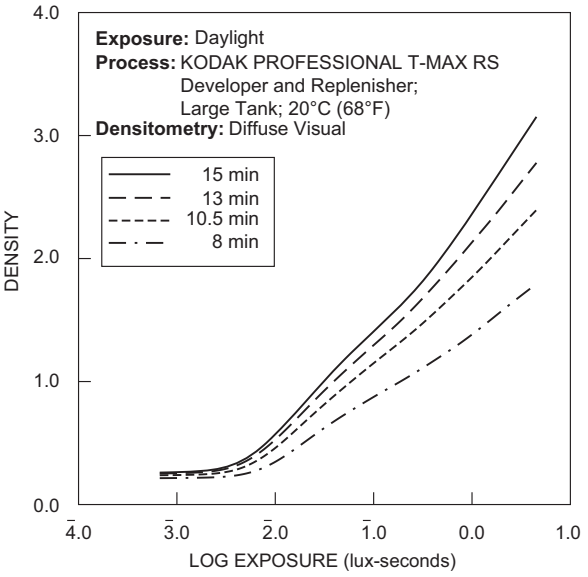
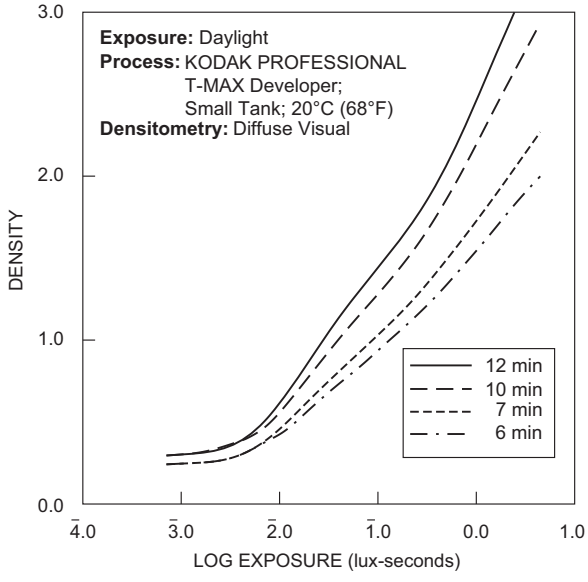
Characteristic Curves

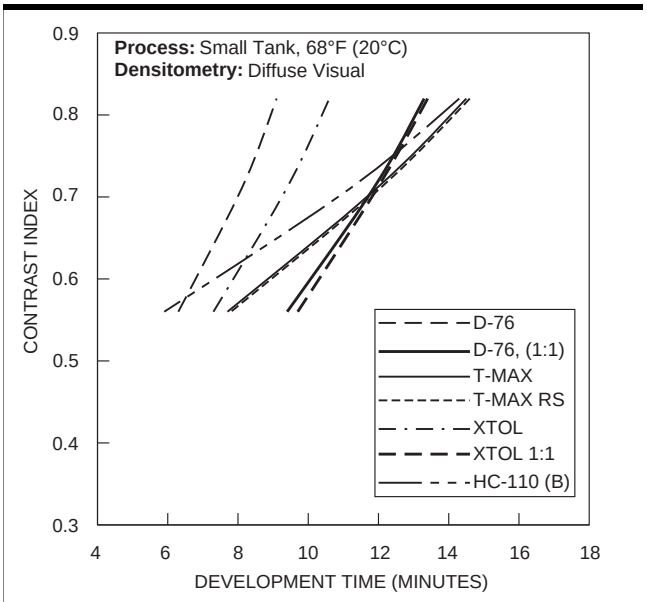


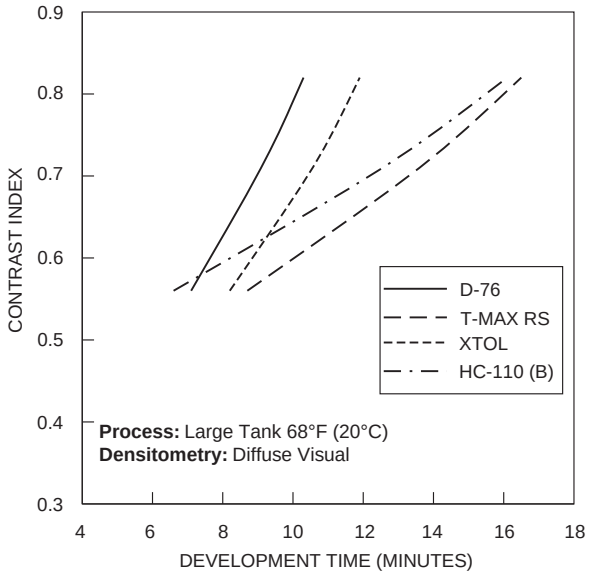


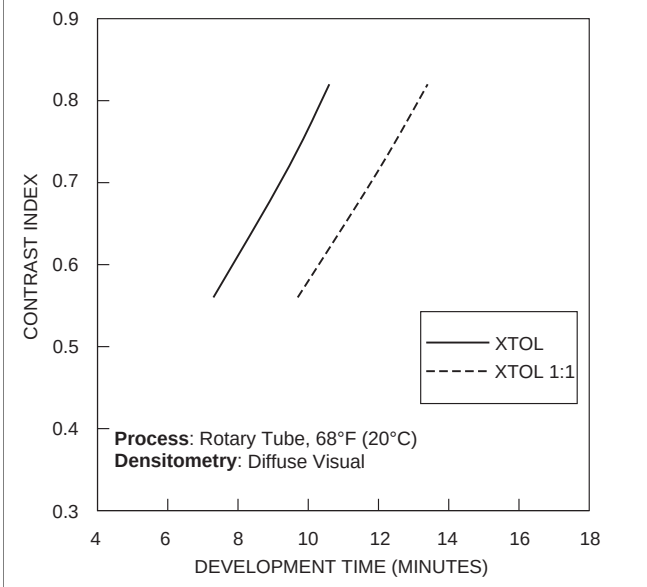


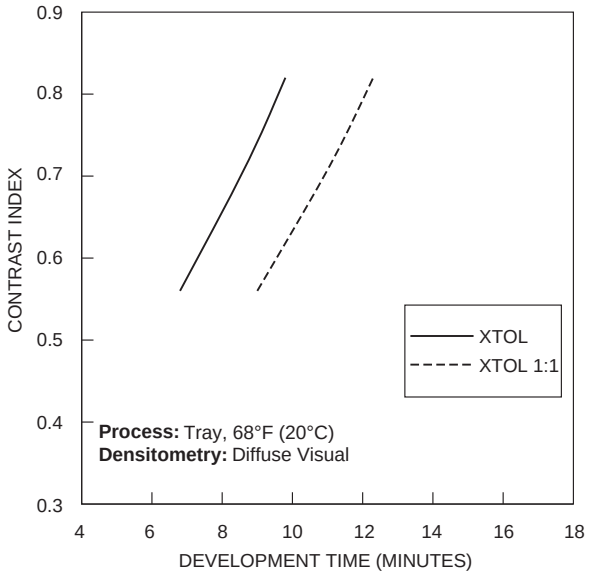
KODAK PROFESSIONAL T-MAX 100 Film

Contrast Index Curves









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