



KODAK MIN-R 2000 Film / 4316

1) Description

KODAK MIN-R 2000 Film / 4316 is a medium-speed, single coated, ortho-sensitive medical x-ray film for mammographic use with green-emitting intensifying screens. It is coated on a blue, 7-mil ESTAR Base support that has a base density of approximately 0.19, with a dyed pelloid backing which affords anti-halation protection. MIN-R 2000 Film exhibits significantly higher contrast and is the same speed as KODAK MIN-R M Film/4515 when used with KODAK MIN-R Screens. In order to orient the film properly, the film is emulsion side up when the notch is at the right-hand side of the top edge of the film. A double V notch is used. It is processable in existing automated processing cycles.

KODAK MIN-R 2000 Film is intended for use with KODAK MIN-R or KODAK MIN-R 2000 Screens. When used with a KODAK MIN-R 2000 Screen, the system has a speed of 150.

2) Safelight

Use a KODAK GBX-2 Safelight Filter with a frosted 7.5-watt bulb located in a ceiling fixture at least four feet from the film.

3) Storage and Handling

Handling -

Single emulsion film is extremely sensitive and prone to handling artifacts. Hands must be clean, dry and free of lotions, etc. Film should be handled carefully by the edges to avoid physical strains such as pressure, creasing, or buckling.

Storage -

Store unexposed film at 50 to 70°F (10 to 20°C), at 30 to 50 percent RH, and properly shielded from x-rays, gamma rays, or other penetrating radiation. Keep exposed film in a cool, dry place that is properly shielded from penetrating radiation. Process as soon as possible after exposure. Processed film should be stored at 60 to 80°F (16 to 27°C), at 30 to 50 percent RH.

4) Relative Film Systems Speed

Screen	Film	Relative Speed	Recommended Application
MIN-R	MIN-R 2000	100	Routine Mammography
MIN-R 2000	MIN-R 2000	150	Routine Mammography
MIN-R 2190	MIN-R 2000	190	Special Application

Screen-Film Characteristics

KODAK Screen	KODAK Film	Relative Processing Cycle	Relative Speed		Contrast		D-Max
			RP	EX II	RP	EX II	
MIN-R 2000	MIN-R 2000	Standard	150	150	3.60	3.80	>4.0
MIN-R 2190	MIN-R 2000	Standard	190	190	3.60	3.80	>4.0
MIN-R	MIN-R 2000	Standard	100	100	3.60	3.80	>4.0

5) Sensitometric Parameters

Relative Speed:	Measured at a density of 1.00 above gross fog.
Contrast:	Measured as slope of the line between densities of 0.25 and 2.00 above gross fog.
Gross Fog:	Density of film base plus processing fog.

6) Process Variations

Changes to speed, contrast, and fog as a result of temperature variation from normal are included in GRAPHS Section.

7) Intermix

This film can be processed with intermixes of common medical x-ray films. Higher bromide levels that are optimum for MIN-R 2000 Film may adversely affect other films in the intermix.

Variations of bromide ions in KODAK RP X-OMAT Developer cause sensitometric speed effects. With KODAK MIN-R 2000 Film, these changes are similar to those for T-MAT Films; included in GRAPH Section.

8) Automated Processing

Note: For low use rates, if sensitometry does not stay within control limits, flooded replenishment may be needed. Flooded replenishment is intended to maintain the developer solution at a continuously fresh chemical activity. This is accomplished by replenishing not only when film is fed, but also on the basis of processor on time.

For KODAK MIN-R 2000 Film ONLY, KODAK RP X-OMAT Developer Starter is added to the replenishment tanks at the rate of 4 fl oz. per gallon, or 118 mL per gallon, or 43 mL per litre. (Use KODAK RP X-OMAT Developer Starter only.) Fill the processor tanks with the solution from the replenishment tank. However, do not add extra starter to the processor developer tank.

For more detailed information on how to set up each processor for Flooded Replenishment, see the Installation or Service manual for each processor and Service Bulletin 30. Qualified service personnel should perform the setup.

Notice: Observe precautionary information on product labels on the Material Safety Data Sheets.

Fixer Retention -

The ability to maintain a quality image over several years is dependent on the stability of the image you produce. Image stability begins in the processing cycle. A high level of residual fixer (hypo) in processed film indicates insufficient washing, and this can significantly impact the stability of the film. Insufficient washing can be caused by improper wash flow rates, loss of fixer temperature control, inactive fixer, or improper film storage conditions. An analysis of fixer retention in film should be performed quarterly.

Drying -

Use the lowest possible dryer temperature that will maintain proper film drying. The dryer temperature will vary depending on the processing cycle, the relative humidity, the environmental temperature, and should be adjusted to meet individual conditions. Different processing cycles will require different dryer temperatures to compensate for varying times that the film is in the dryer section. Refer to the Operator Manual for dryer temperature adjustment instructions.

For dryer information see KODAK Publication *Dryer Venting Requirements - All KODAK X-OMAT Processors*, Service Bulletin 101.

9) Image Structure

Diffuse rms Granularity -

GRAPH included; read at net diffuse visual densities from 0.5 to 2.0, 48-micrometre aperture.

10) Graphs¹

Characteristic:

- A) KODAK RP X-OMAT Chemicals (2-02)
- B) KODAK X-OMAT EX II Developer (2-02)

Process Variations from Normal Processing Temperature:

- D) Speed (2-02)
- E) Contrast (2-02)
- F) Fog (2-02)

rms Granularity:

- G) (2-02)

Safelight Sensitivity:

- H) (4-02)

Bromide Effects:

- I) (2-02)

Spectral Sensitivity:

- J) (2-02)

MTF:

- L) (2-02)

Reciprocity:

- M) (2-02)

Inverse/Squared Sensitometry:

- N) RP X-OMAT Chemicals (4-02)
- O) X-OMAT EX II Chemicals (4-02)

¹NOTICE: The 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 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.

Note: The Kodak materials described in this publication for use with KODAK MIN-R 2000 Film / 4316 are available from dealers who supply Kodak products. You can use other materials, but you may not obtain similar results.

The contents of this publication are subject to change without notice.

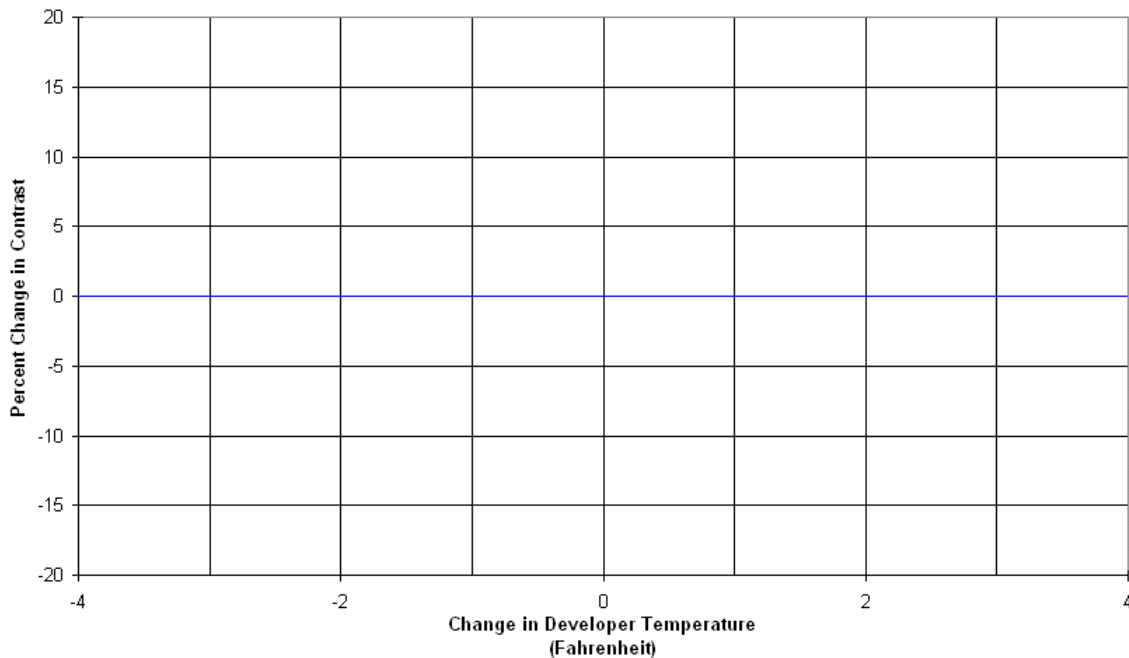
Kodak, Eastman, Min-R, X-Omat, T-Mat, and Estar are trademarks.

Health Imaging
EASTMAN KODAK COMPANY - Rochester, NY 14650

End of Data Sheet

TI2291E 3-02
TEMPERATURE VARIATION, For Publication

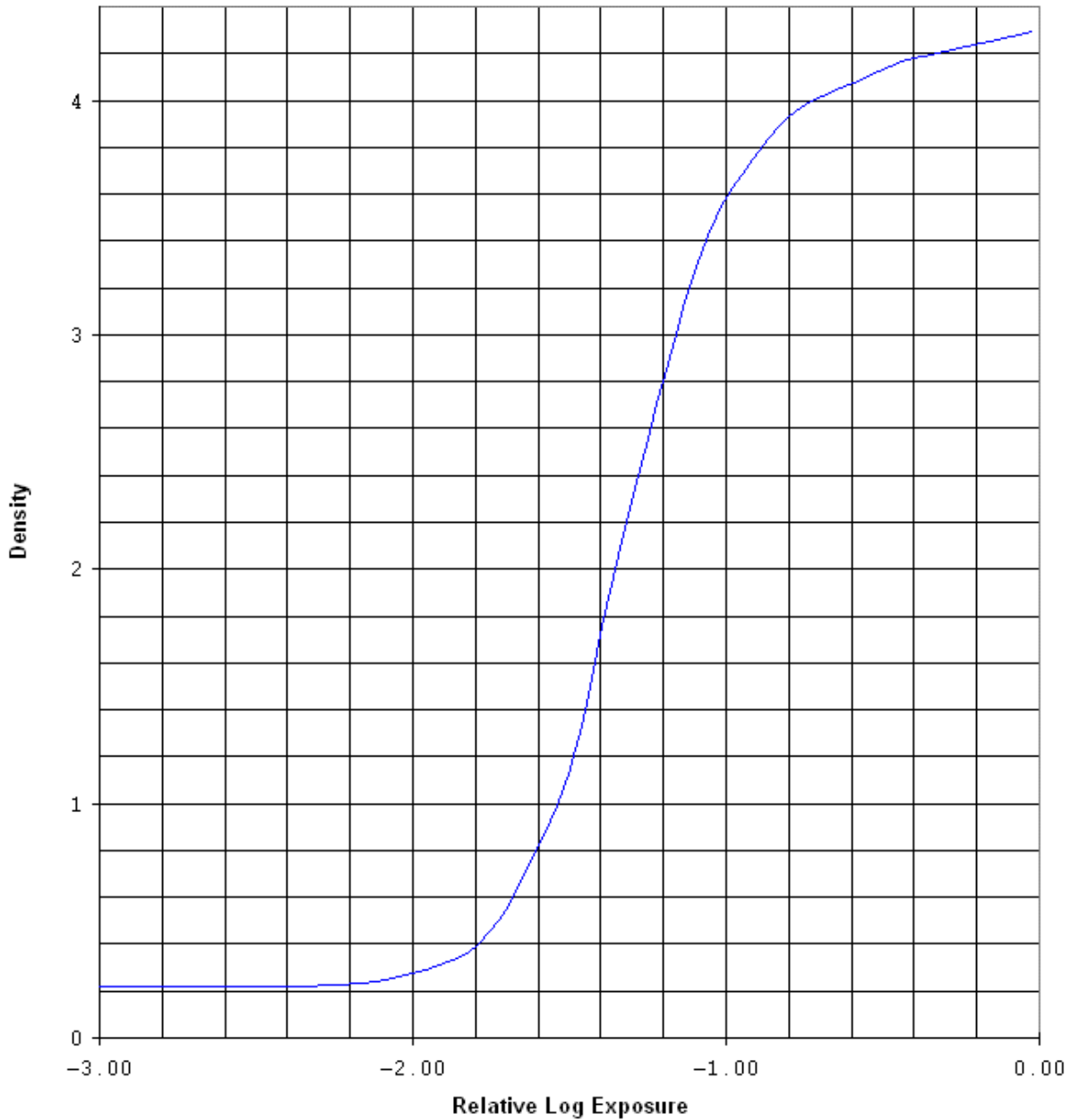
KODAK MIN-R 2000 Film / 4316
Percent Change in Contrast
KODAK RP X-OMAT Chemicals, KODAK X-OMAT 460 RA Processor, 95 F (35 C);
(Reference: Normal Temp. = 0% Change)
(4 F= 2.2C)



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

TI2291A 2-02
CHARACTERISTIC, For
Publication

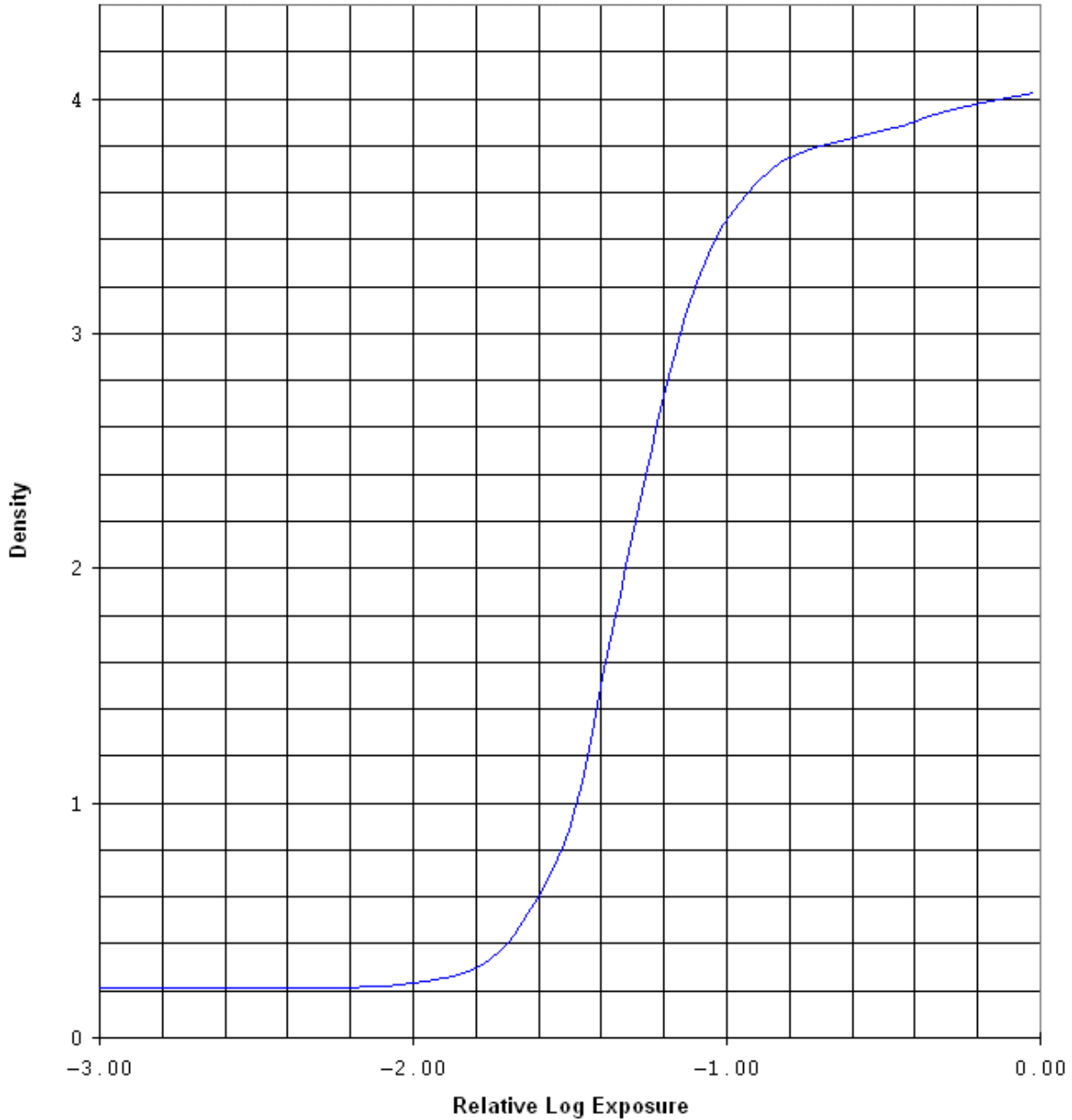
KODAK MIN-R 2000 Film / 4316
1/2 second simulated Green Screen Exposure,
KODAK RP X-OMAT Chemicals, 95 F (35 C), KODAK X-OMAT 460 RA Processor;
Diffuse Visual Densitometry



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI2291B 2-02
CHARACTERISTIC, For
Publication

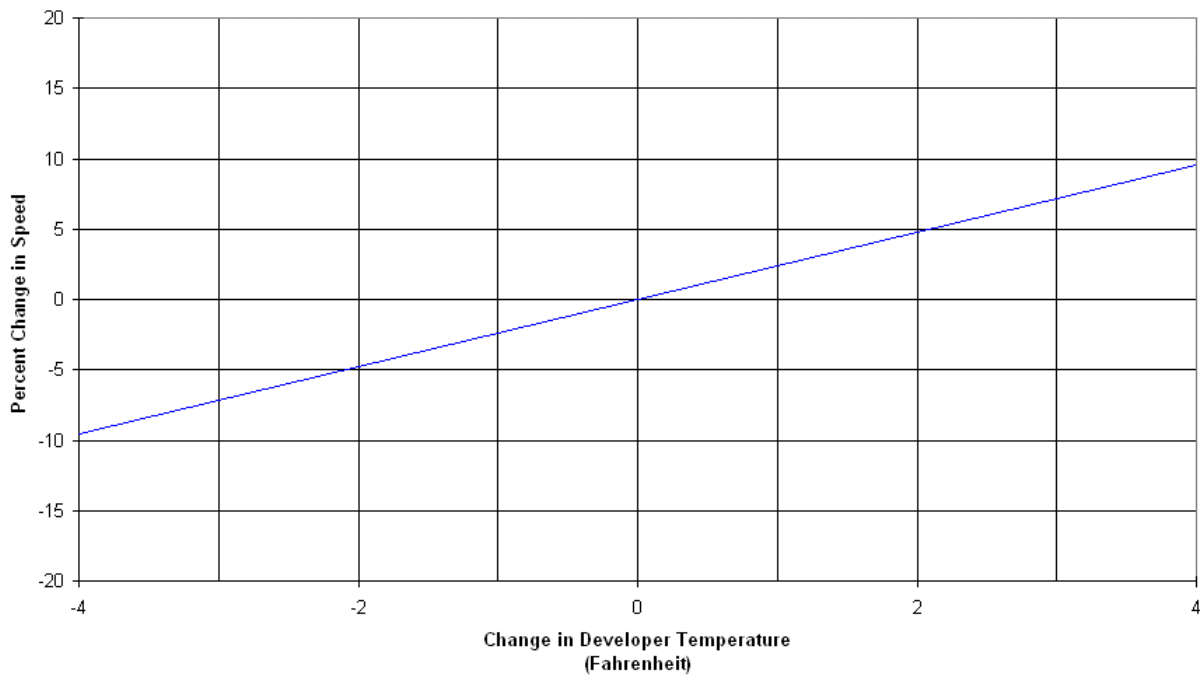
KODAK MIN-R 2000 Film / 4316
1/2 second simulated Green Screen Exposure,
KODAK X-OMAT EX II Chemicals, 95 F (35 C), KODAK X-OMAT 460 RA Processor;
Diffuse Visual Densitometry



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI2291D 3-02
TEMPERATURE VARIATION, For Publication

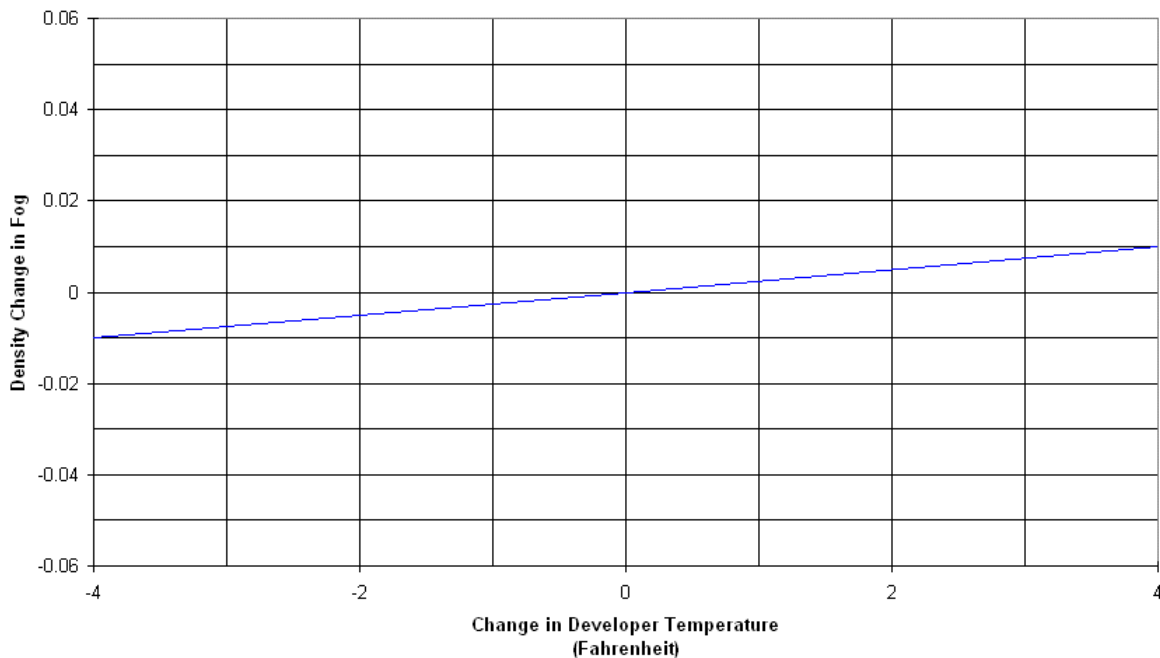
KODAK MIN-R 2000 Film/4316
Percent Change in Relative Speed
KODAK RP X-OMAT Chemicals, KODAK X-OMAT 460 RA Processor, 95 F (35 C);
(Reference: Normal Temp. = 0% Change)
(4 F = 2.2 C)



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

TI2291F 3-02
TEMPERATURE VARIATION, For Publication

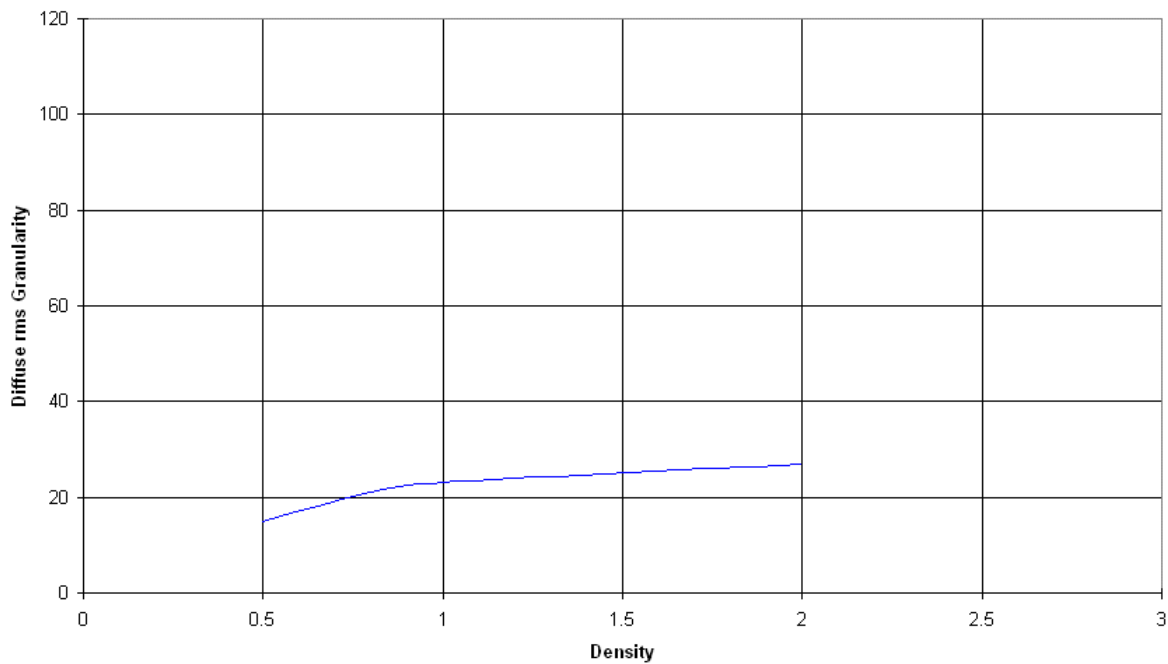
KODAK MIN-R 2000 Film / 4316
Density Change in Fog
KODAK RP X-OMAT Chemicals, KODAK X-OMAT 460 RA Processor, 95 F (35 C);
(Reference: Normal Temp. = 0)
(4 F = 2.2 C)



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI2291G 2-02
GRANULARITY, For Publication

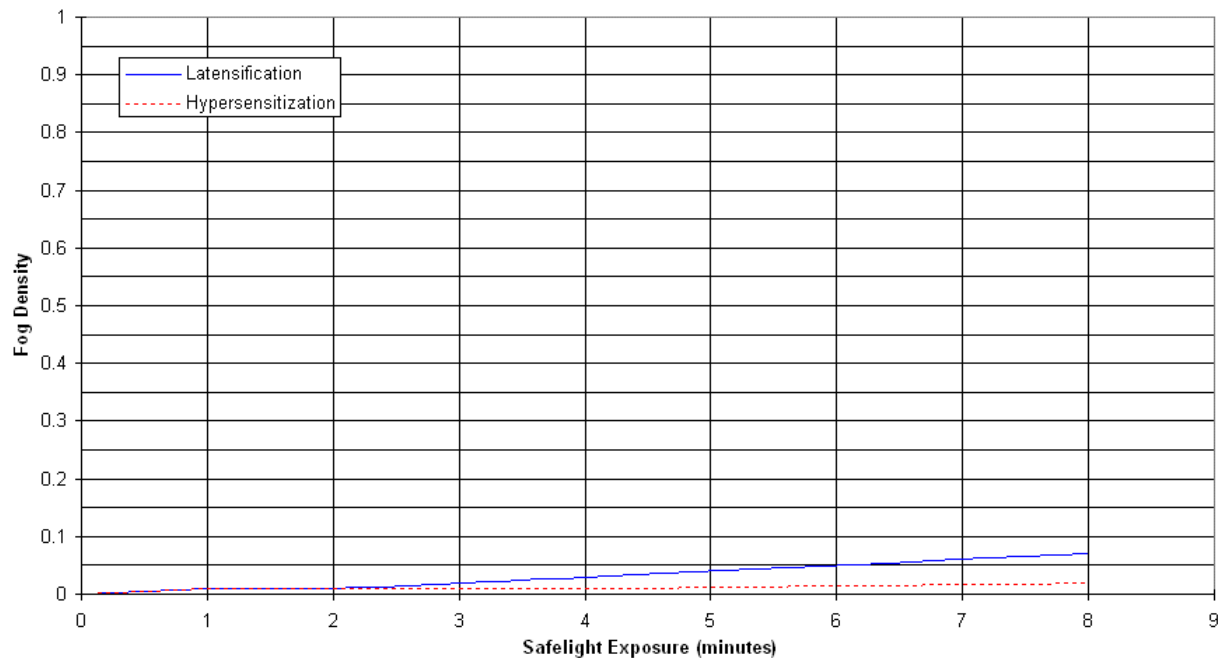
KODAK MIN-R 2000 Film / 4316
KODAK RP X-OMAT Chemicals, 95 F (35 C)
KODAK X-OMAT 460 RA Processor



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

TI2291H 4-02
SAFELIGHT SENSITIVITY, For Publication

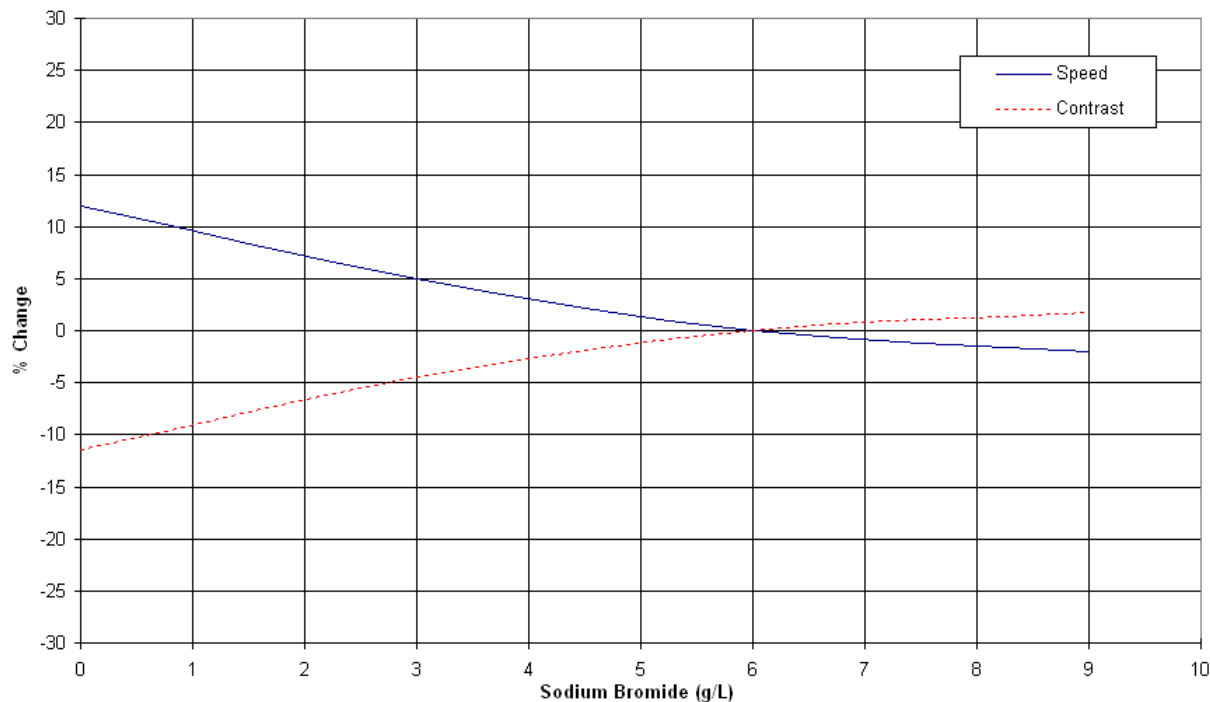
KODAK MIN-R 2000 Film / 4316
KODAK GBX-2 Safelight Filter, 7.5 watt lamp, located 4 feet from film;
KODAK X-OMAT 480 RA Processor; KODAK RP X-OMAT Chemicals, 95 F (35.5 C);
(Fog Growth with Increasing Safelight Exposure)



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

TI2291 3-02
BROMIDE EFFECTS, For Publication

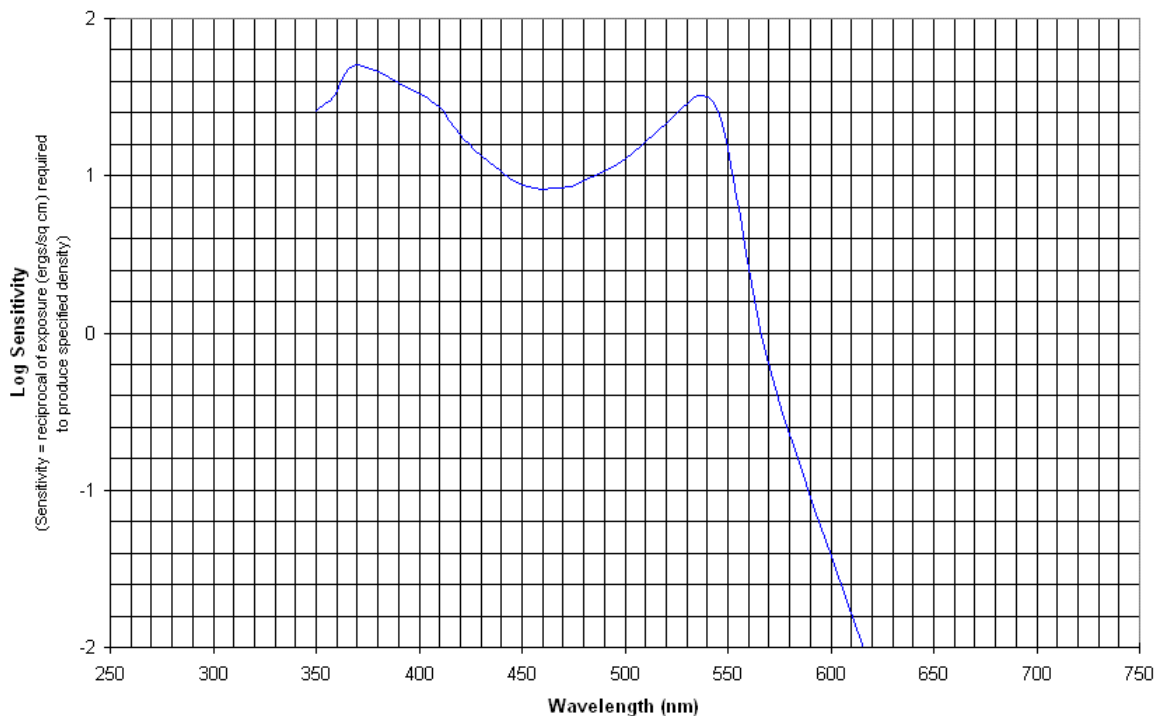
KODAK MIN-R 2000 Film / 4316
KODAK X-OMAT 480 RA Processor, Seasoned KODAK RP X-OMAT Chemicals, 95 F (35.5 C);
Normal Level is 6.0 g/L



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

TI2291J 2-02
SPECTRAL SENSITIVITY, For Publication

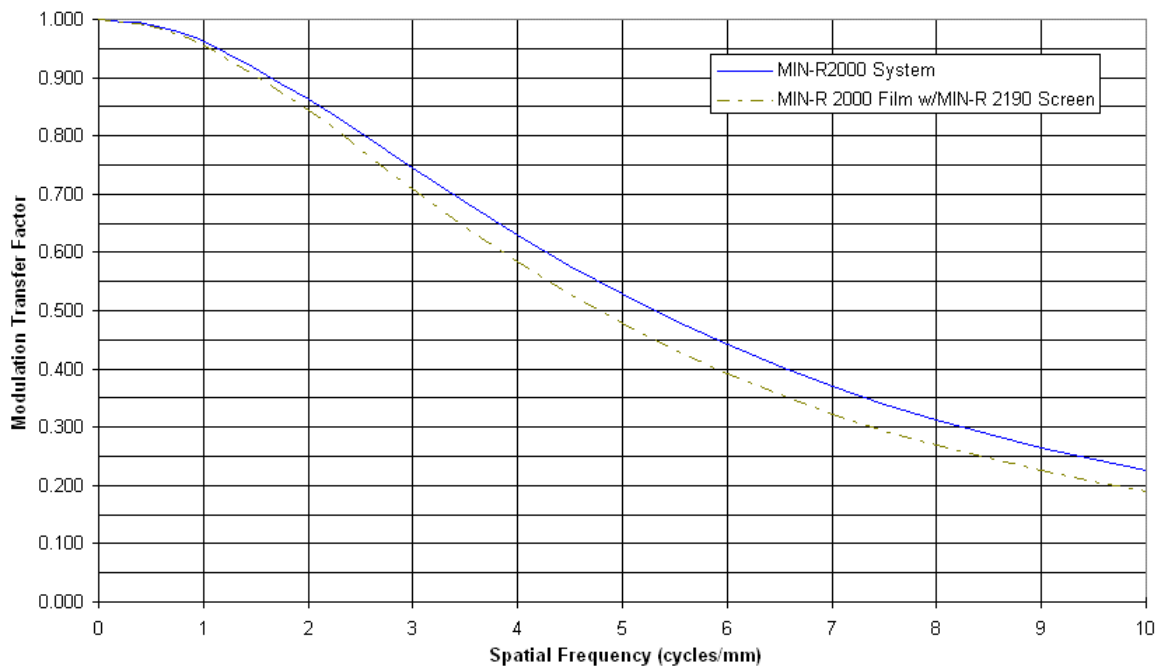
KODAK MIN-R 2000 Film/4316
Effective Exposure 1.4 sec; Seasoned KODAK RP X-OMAT Chemicals,
KODAK X-OMAT 460 RA Processor, 95 F (35 C);
Diffuse Visual Densitometry, 1.0>Gross Fog



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

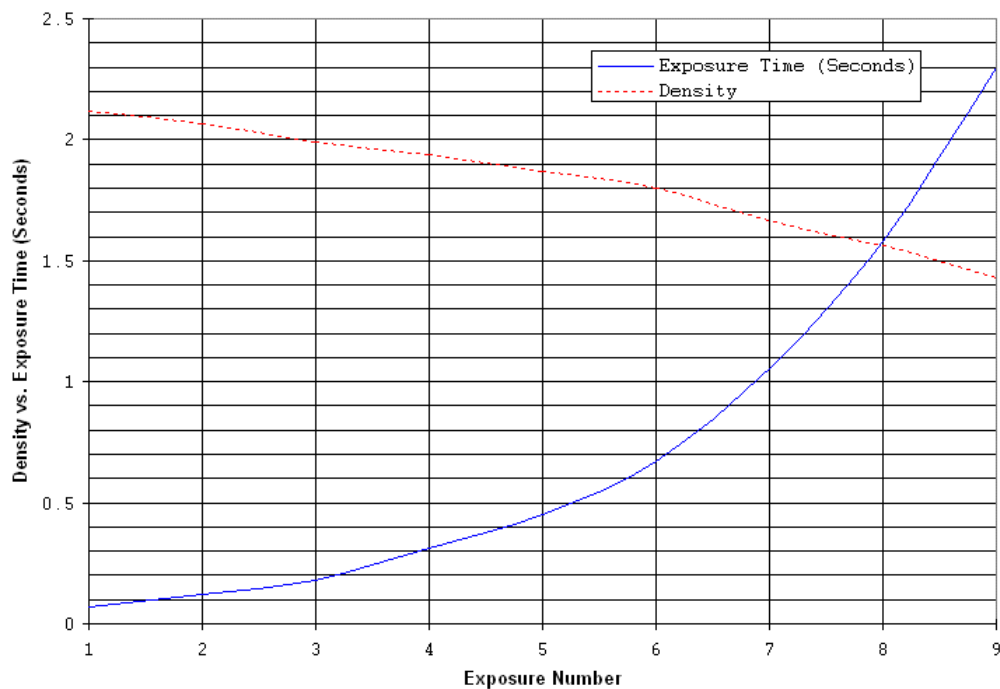
TI2291L 02-02
MTF, For Publication

KODAK MIN-R 2000 Film / 4316
Exposure: 28 kVp; KODAK RP X-OMAT Chemistry



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure and processing conditions will affect results. The company reserves the right to change and improve product characteristics at any time.

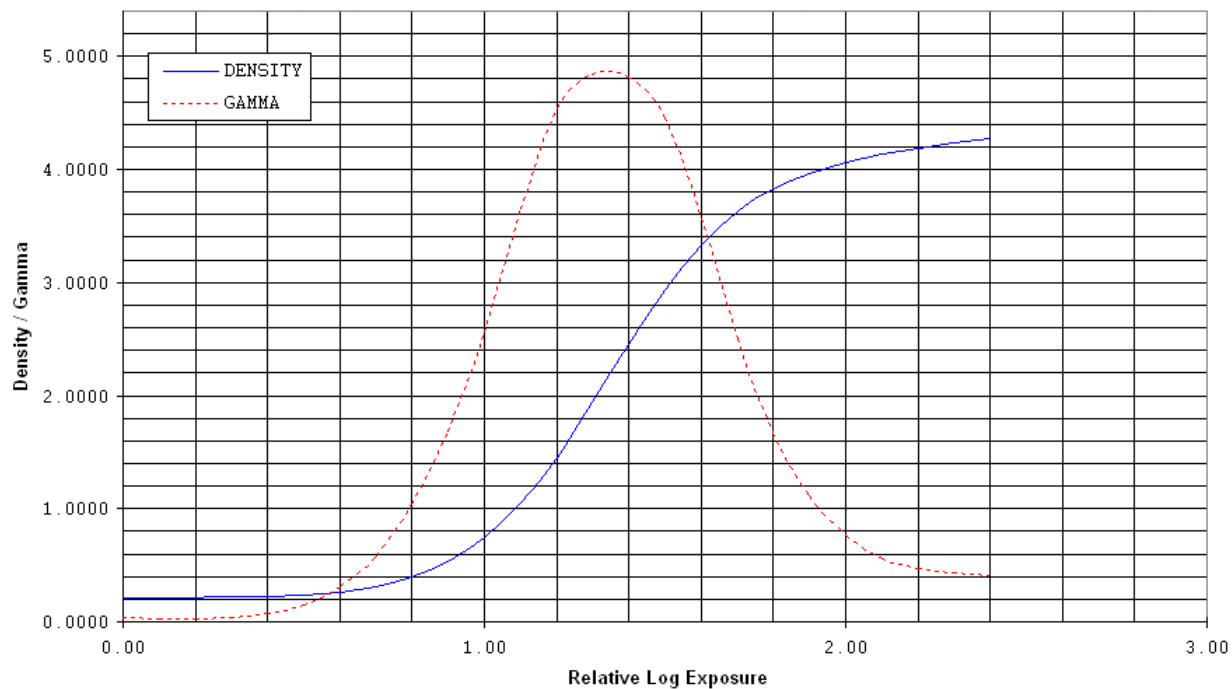
TI2291M 4-02
RECIPROCALITY, For Publication
KODAK MIN-R 2000 Film / 4316
KODAK RPX-OMAT Chemicals, 95 F (35 C),
KODAK X-OMAT 460 RA Processor



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI2291H 4-02
INVERSE/SQUARED SENSITOMETRY, For Publication

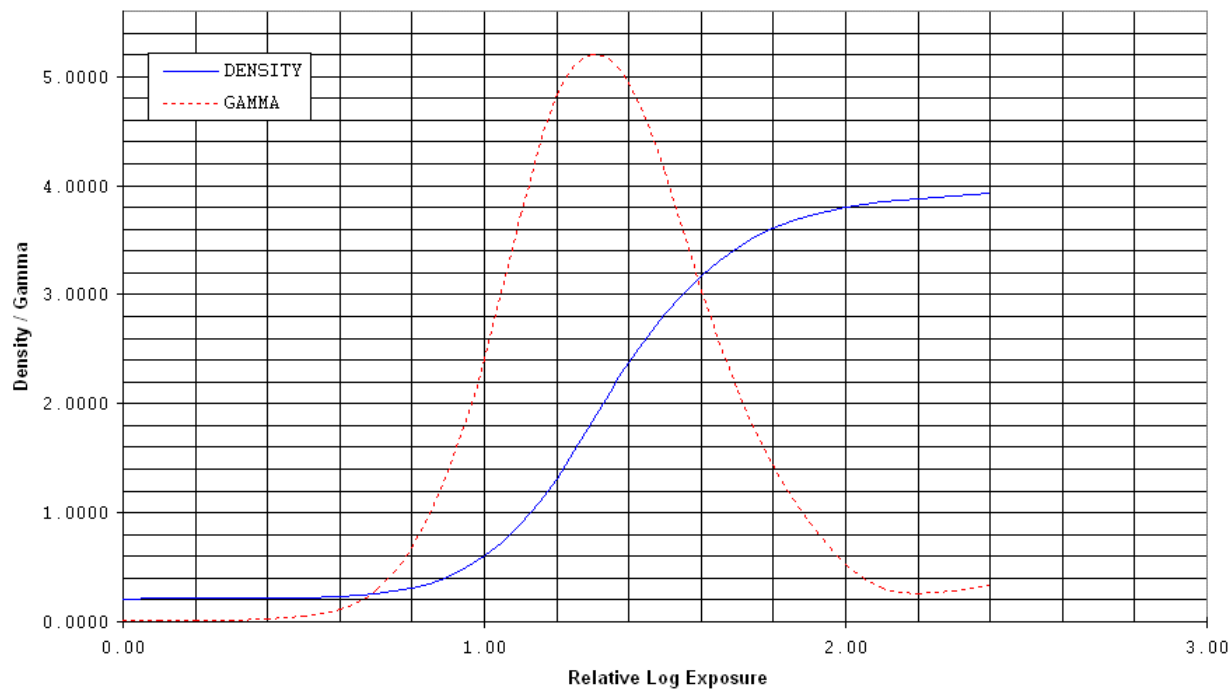
KODAK MIN-R 2000 Film / 4316
Fresh flooded KODAK RP X-OMAT Chemicals, 95F (35C);
KODAK X-OMAT 480 RA Processor



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.

TI22910 4-02
INVERSE/SQUARED SENSITOMETRY, For Publication

KODAK MIN-R 2000 Film / 4316
Fresh flooded KODAK X-OMAT EX II Chemicals, 95F (35C);
KODAK X-OMAT 480 RA Processor



Notice: While the data presented are typical of production coatings, they do not represent standards which must be met by Eastman Kodak Company. Varying storage, exposure, and processing conditions will affect results. The company reserves the right to change and improve the product characteristics at any time.