



**Kodak**

Premium 1000 Thermal Print Film 1323  
Thermal Print Film KF 1353/2353

D-49

Datasheet  
October 2009

# Kodak Thermal Print Microfilms

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## **Kodak Premium 1000 Thermal Print Film 1323** **Kodak Thermal Print Film KF 1353/2353**

Vesicular films exposed to actinic radiation (UV/violet) generate nitrogen gas within the plastic sensitized layer. These films are heated to development temperature 125°C (257°F) immediately after exposure, softening the plastic layer and expanding the gas to form vesicles. A usable image is produced from these vesicles upon cooling. The unexposed film area should be “cleared” or desensitized after development by reexposure to actinic radiation. This allows residual gas to escape by diffusion.

Unlike silver or diazo images which absorb light, a vesicular image scatters light. The vesicular image of *Kodak* Thermal Print Films has excellent optical density and visual contrast when viewed or printed with optical systems having small apertures, such as the f/4.5 apertures typically used with microfilm readers. Density will be much less with diffuse light, or when viewing the film on a diffuse illuminator. A projection densitometer should be used to measure the density on vesicular films.

### **Product applications**

*Kodak* Thermal Print Films are suitable for generating distribution copies (usually negative-appearing) in fiche or roll format, i.e., clear lines with dark background made from positive-appearing, computer output microfilms (COM) or other camera original films. Reversed-polarity prints can also be made from other microfilm images. A title stripe, if used, facilitates fiche identification.

### **Features**

- Ultraviolet-blue sensitivity
- Dry process — heat alone
- Extremely high resolving power
- Clear polyester base
- Black title stripe available on 105 mm film
- Requires no darkroom
- Image reversing — positives from negatives and negatives from positives
- Not intended for reprinting from itself
- Neutral image tone when viewed in a microfilm reader

#### **Premium 1000/1323**

- Excellent image quality
- High contrast
- Medium printing speed
- For use with dry silver or conventional silver halide masters

#### **KF 1353/2353**

- For use with dry silver masters
- Fast printing speed
- Medium-high contrast

## Physical properties

### Nominal thickness data (mils)

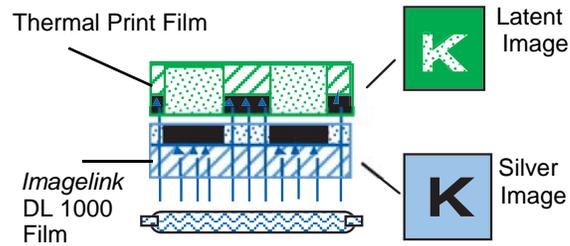
Unprocessed Film	Clear Polyester Base	Total (mils)
1353/1323	4.2	4.4
2353	3.4	3.6

## Duplicating Process overview

### Step 1. Exposure

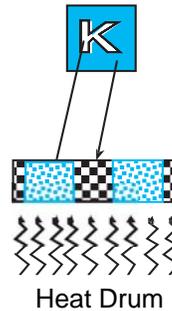
Vesicular film is brought into intimate contact with the silver master.

Ultraviolet light is exposed through the master. The dark characters block the light. The clear areas transmit the light exposing the vesicular film.



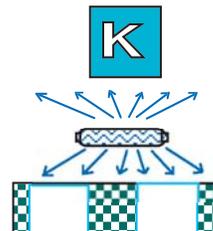
### Step 2. Development

The vesicular film is heated to 127°C (260°F) for several seconds. The areas which were struck by ultraviolet light form vesicles (bubbles).



### Step 3. Clearing

The film is re-exposed to ultraviolet light. The areas which were protected by the characters, and did not form vesicles are cleared away, forming clear characters.



## Before-process handling and storage

### Handling

Handle, expose and process under gold fluorescent lights. Normal room illumination is suitable for short periods. Open the package only when the film is ready to be used, and return the unused film to light-protective storage when duplicating equipment is shut down.

### Storage

Store unopened packages of film at 21°C (70°F) at 50% relative humidity or below. Follow the expiration date printed on the box label.

### Photographic properties

Suitable sources for exposing this film include mercury-arc and xenon-flash lamps (350 to 450 nm range). A typical exposure will yield a net density of about 2.0 with recommended processing. The density is determined in accordance with the method described in ISO 5-2:1991, *Photography — Density Measurements — Part 2: Geometric Conditions for Transmission Density*. Speed and average gradient are measured in accordance with ISO 9378-1993, *Photography — Vesicular Microfilm — Determination of ISO Speed and ISO Range*. This corresponds to conditions in a typical microfilm reader.

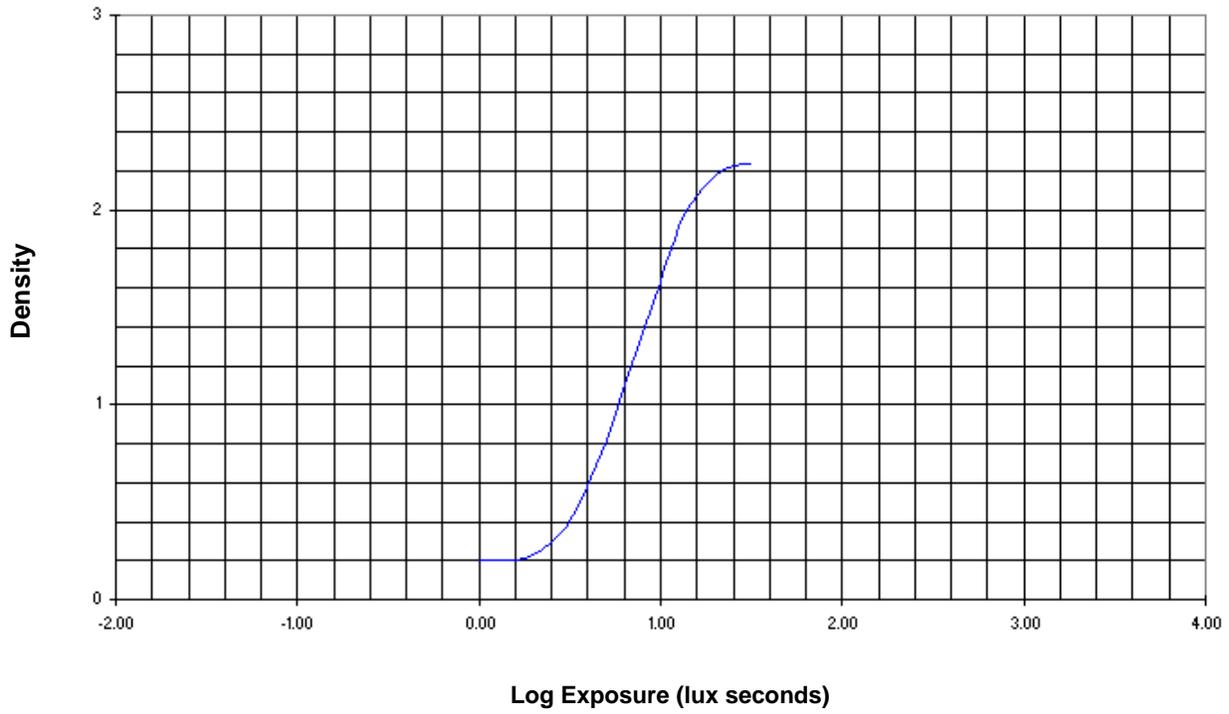
For optimum print quality, exposures should be adjusted to provide the following projection densities:

- **Background density:** 2.20 (approximately)
- **Minimum acceptable background density:** 1.80

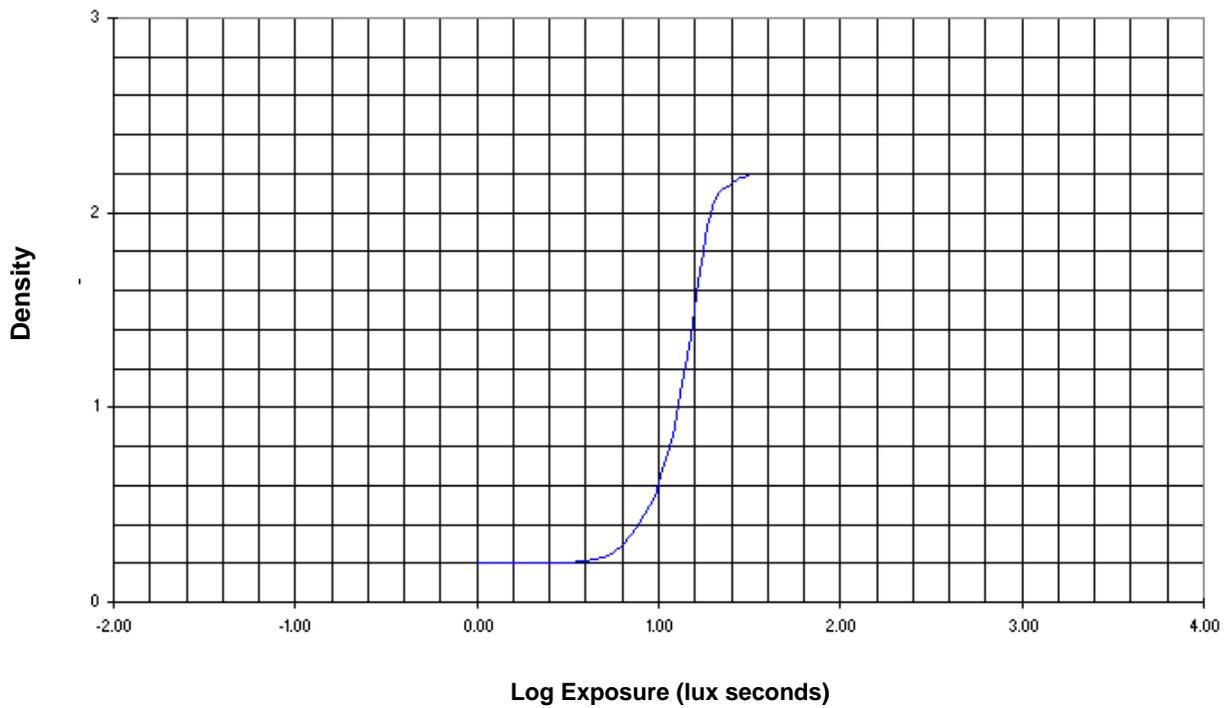
NOTE: It is recommended that the manufacturer of high intensity ultraviolet lamps be consulted for safety information pertaining to ultraviolet radiation and ventilation requirements due to ozone generation.

# Characteristic curves

**Kodak Thermal Print Film KF 1353/2353**  
Kodak Komstar Finisher IV, 127°C (260°F)  
Visual Density (f/4.5 projection)



**Kodak Premium 1000 Thermal Print Film 1323**  
Kodak Komstar Finisher IV, 127°C (260°F)  
Visual Density (f/4.5 projection)



## Image structure

**Resolving power:** Based on recommended process.

Film	Test-Object Contrast	Lines/mm
1353/2353	1000:1 (ISO-RP)	180
1323	1000:1 (ISO-RP)	220

Determined by running an in-line exposure through the *Kodak Komstar* Finisher IV.

## Processing

### Development

To minimize image forming density loss through dissipation of nitrogen gas into the atmosphere, develop 1353/2353 films with heat within 15 seconds of exposure; and develop 1323 films within 8 seconds of exposure, using equipment set to the indicated temperature and time. It is recommended that thermal films be developed in a temperature range of 121°C (250°F) to 132°C (270°F).

When using *Kodak Imagelink* DL 1000 Microfilm/2482, recommended temperature is 125°C (257°F)\* at 1.2 to 1.8 seconds. (Exposure time may vary with other master films.)

\*Primary temperature and time, 105 mm equipment

### Time/Temperature

Temperature	Time
125°C (257°F)*	0.75 to 1.5 seconds
130°C (266°F)**	0.33 to 0.75 seconds

\* Primary temperature and time, 105 mm equipment

\*\* Primary temperature and time, 16 mm equipment

If development is varied within the recommended times at a given temperature, density will not be adversely affected. If a change in image density is desired, it should be accomplished through an exposure adjustment. To determine optimum exposure, an exposure series should be made.

Significant under-development, particularly at low temperatures, can result in low density and a brownish image. Significant over development, particularly at high temperatures, can result in a gray background color and in oversized vesicles leading to a grainy appearance in the viewer or even pinholes in the image.

### Clearing

To desensitize the film within previously unexposed areas and allow the release of nitrogen gas, re-expose the film after development for one to two times the original exposure time. The film can be viewed after several seconds without a significant density increase, even before all nitrogen has escaped by diffusion, provided microfilm readers with normal gate temperatures are used.

## Duplicators

The following equipment is suitable for exposing and processing this film:

Equipment	Film	Starting Temperature
16 mm Thermal Film Duplicator	16 mm rolls	130°C (266°F) with speeds of 150 fpm
<i>Kodak Komstar</i> Finisher IV <i>Kodak Ektafiche</i> Duplicator <i>Kodak Autotouch</i> Duplicator	105 mm rolls	125°C (257°F)

## After-process information

### Handling

As with all photographic products, exercise care to avoid scratches, abrasions and fingerprints when viewing in a reader.

### Viewing

When properly cleared, these films can be viewed for normal periods in microfilm readers with reader-gate temperatures not exceeding 75°C (167°F); unnecessarily long exposure in readers should be avoided.

### Image stability and keeping

The standard ISO 18912:2002, *Imaging Materials — Processed Vesicular Photographic Film — Specifications for Stability*, details processing vesicular film for long-term record keeping. Excellent storage for *Kodak Thermal Print Films* will be obtained within optimum humidity and temperature limits for vesicular microfilms as specified in ISO 5466:1996, *Photography — Processed Safety Photographic Films — Storage Practices*. This specifies storage at 21°C (70°F) or less and 15 to 50% relative humidity. These films are expected to maintain a usable image for at least 100 years when processed as recommended and handled and stored as specified.

Air purity, including freedom from contact with solvents and with industrial gases such as ammonia, must be maintained. Vesicular films should not be interfiled with or stored in the same containers or vaults with other film types such as silver or diazo. Relative to other types of photo images, *Kodak Thermal Print Films* generally are excellent for overall resistance to the effects of light and fungi.

#### NOTES:

- Film and sizes are subject to change or may be discontinued without notice. For specific sizes and formats, contact your Kodak representative.
- Refer to the latest revision of each ANSI or ISO Standard specified.

**Ordering information**  
**Thermal Print**  
**Microfilms**

Contact your Kodak representative if you have any questions.

Code	Mil	Format	Spec	Description	No/Case	CAT No.
1323	5.0	105 mm x 1000 ft	977	Plain	2	139 2034
1353	5.0	105 mm x 1000 ft	977	Plain	2	102 8588
		105 mm x 1500 ft	977	Plain	2	870 3654
		105 mm x 148 mm	-	250 sheets, plain	8	142 1031
2353	4.0	16 mm x 1000 ft	649	Plain	20	830 1841
		16 mm x 2000 ft	649	Plain	14	829 5644
		35 mm x 2000 ft	684	Plain	10	131 4731
		35 mm x 2000 ft	684	Plain	6	137 5245

**Disclaimer**

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 which must be met by Eastman Kodak Company. The company reserves the right to change and improve product characteristics at any time.

# Kodak



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