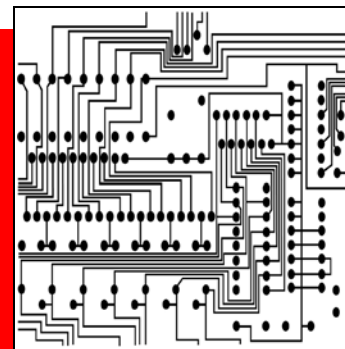


KODAK PRECISION LINE Films LPF4

—High Complexity PCB Starts With the Right Phototools—



February 2004 • TI-1312

These films are well-suited for photoplotter exposure, as well as camera exposure, contact exposure, and step-and-repeat equipment. They demonstrate good line-edge acuity and reciprocity characteristics for photoplotter and high-quality reproduction.

- Moderately high contrast, orthochromatic films
- Projection speed
- Highly versatile imaging properties for use on process cameras, contacting, photoplotters, and other pattern generators and imagesetters
- Low matte level
- Dimensionally stable ESTAR Base
- Excellent scratch and abrasion resistant overcoat
- May be processed in a very wide range of developers

LPF4 Film is designed for use with the following photoplotters:

Manufacturer	Model
CSI	Fire 9000
Dainippon Screen	RG 6500
EIE	8000
Excellon	LPG 2001
Mania Barco (Gerber)	Flat Bed 28
Lavenir	RPG Series, PULSAR 8000
Mivatec GmbH	Miva 1450, 16xx, 25xx, Turbo
Optronics	2000
Orbotech	5008, 5008 XP
Pentax	LPP-3677

SIZES AVAILABLE

The following are commonly available sizes and catalog numbers. Other sizes may be available upon request. Consult your local supplier of Kodak PCB film products.

Rolls

Sizes	Spec	CAT No.
50.8 cm x 61 m (20 in x 200 ft)	351	169 6061
61 cm x 61 m (24 in x 200 ft)		151 3159
76.2 cm x 61 m (30 in x 200 ft)		169 6269
91.4 cm x 61 m (36 in x 200 ft)		169 6368
106.7 cm x 30.5 m (42 in x 100 ft)		169 6541
106.7 cm x 61 m (42 in x 200 ft)		169 6566
121.9 cm x 30.5 m (48 in x 100 ft)		150 9322
88 cm x 61 m (34.6 in x 200 ft)		132 5810

Sheets

Sizes	CAT No.
25.4 x 30.5 cm (10 x 12 in)	197 5028
30.5 x 45.7 cm (12 x 18 in)	127 8779
50.8 x 61 cm (20 x 24 in)	124 1280
55.9 x 71.1 cm (22 x 28 in)	155 4419
61 x 91.4 cm (24 x 36 in)	169 6558
540 x 630 cm (21.26 in x 24.80 in)	872 9774



SUPPORT

Dimensionally stable support.

LPF4	4-mil (0.10 mm)	ESTAR Base
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DARKROOM RECOMMENDATIONS

Use a KODAK 1A Safelight Filter / light red in a suitable safelight lamp equipped with a 15-watt bulb. Keep the film at least 4 feet (1.2 metres) from the safelight.

STORAGE AND HANDLING

Keep unexposed film and processed film in a cool, dry place. Process film as soon as possible after exposure.

EXPOSURE

Photoplotter Exposure

The exposure required is a function of both the photoplotter characteristics and development conditions. Run trials to determine the proper exposure.

Contact Exposures

(Can be processed in both lith and rapid access developers)

Starting-point example when using a variable voltage point source lamp:

Set lamp for 16 volts at 5 feet from the exposure plane—approximately 4 footcandles (43 lumens/sq m).

5 to 10 seconds*

*With KODAK WRATTEN Neutral Density Filter No. 96 (0.6)

Projection Exposures

Trial exposures for line reproduction are listed below:

- Pulsed-Xenon:

10 to 20 seconds at f/22 (exposure to emulsion)

25 to 35 seconds at f/16 (exposure through base)

Trial process camera exposure ranges for a same-size (1:1) line reproduction using two 1500-watt pulsed-xenon lamps at about 3 feet (0.9 metre) from the copyboard.

- Quartz-Halogen 12 to 24 seconds at f/22

Trial process camera exposure range for a same-size (1:1) line reproduction using four 500-watt quartz-halogen lamps at about 3 feet (0.9 metre) from the copyboard.

- Green-Light (10X Reduction): 5 seconds at f/22

Typical camera exposure for a 10X reduction using back (transmission) lighting with a diffuse, cold cathode source having a narrow-band green output such as an Aristo Transilluminator FFG-54.

Relative Exposure Index

(Processed in lith developers)

Indexes are provided primarily as indicators of the relative film speed when compared with other graphic arts materials.

		Pulsed-Xenon	Tungsten or Quartz-Halogen
Emulsion Exposure	ASA System	5	3
	DIN System	8	6
Exposure Through Base	ASA System	2	1
	DIN System	4	1

The pulsed-xenon value indicates the film's relative speed to pulsed-xenon illumination as measured by a light integrator. Index numbers for the other light sources can be used with photoelectric exposure meters to help establish trial exposures; see KODAK Publication Q-2, "KODAK Photographic Materials for Graphic Arts."

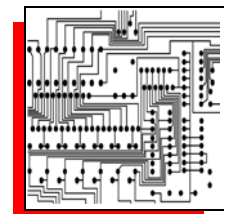
One camera stop increase is indicated in the ASA System by doubling the index number, and in the DIN System by increasing the number by 3.

Filter Factors

When a filter is used, multiply the amount of unfiltered exposure by the filter factor shown in the table below. Because lighting conditions vary, these factors may require adjustments.

Note: It is recommended that the manufacturer of the pulsed-xenon or quartz-halogen lamps be consulted for safety information pertaining to ultraviolet radiation and ventilation requirements due to ozone generation.

Light Source	KODAK WRATTEN Gelatin Filter			
	No. 8	No. 15	No. 47B	No. 58
Pulsed-Xenon	1.5	2.5	10.0	3.0
Tungsten or Quartz-Halogen	1.5	2.0	16.0	3.0



RECIPROCITY

With recommended processing, the reciprocity speed change is negligible (1/3-photographic stop or less) within exposure range of 1/1000 second to 100 seconds; there is no change in contrast.

PROCESSING

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

Use KODAK ACCUMAX Rapid Access Developer and Replenisher (1:4) and KODAK Rapid Fixer and Replenisher (diluted 1:3).

	Size	CAT No.
KODAK ACCUMAX Rapid Access Developer and Replenisher	5 L concentrate	887 5569
KODAK Rapid Fixer and Replenisher	5 L concentrate	174 9839

Recommended Starting Points

Deep-Tank Processors	40-80 seconds at 80°F (26.5°C)
Rapid Access Processors	25-40 seconds at 95°F (35°C)

Replenishment Rates

Developer	Fixer
0.30 mL/sq. in (465 mL/sq m)	0.35 mL/sq. in (540 mL/sq m)

DIMENSIONAL STABILITY

Dimensional stability is an all-inclusive term. In photography, it applies to size changes caused by changes in humidity and in temperature, and by processing and aging. The dimensional properties of ESTAR Base may vary slightly in different directions within a sheet; the differences that may exist, however, are not always equal in both the length and width directions.

Differences in size change between length and width should be within 10 percent of each other.

Thermal Coefficient of Linear Expansion:

Unprocessed or Processed	0.001% per Degree F
	0.0018% per Degree C

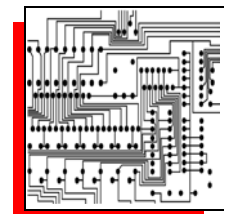
Humidity Coefficient of Linear Expansion:

LPF4 Film	
Unprocessed	0.0019% per % RH
Processed	0.0017% per % RH

Processing Dimensional Change:

Dependent on drying conditions

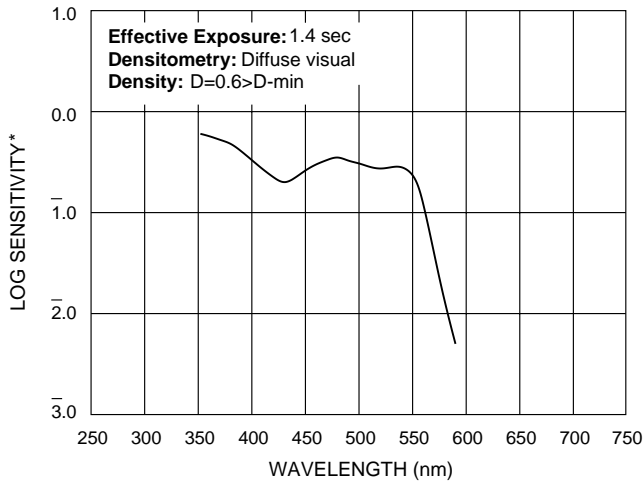
Recommended dryer temperature starting point	35°C (95°F)
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CURVES

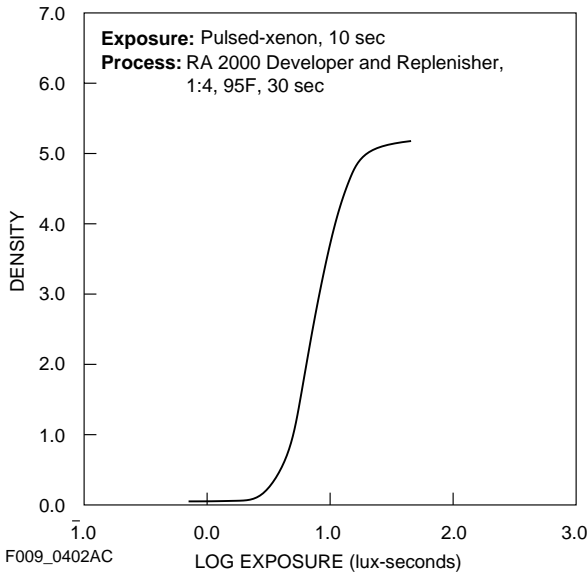
Spectral Sensitivity Curve



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

F009_0403AC

Characteristic Curve



F009_0402AC

MORE INFORMATION

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

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 LPF4 Film are available from dealers who supply KODAK PROFESSIONAL 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.

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