KODAK PROFESSIONAL ULTRA ENDURA Paper

Kodak

TECHNICAL DATA / **COLOR PAPER**

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KODAK PROFESSIONAL ULTRA ENDURA Paper is a resin-coated, silver halide color paper which is optimized for commercial applications. It can be exposed both digitally and optically. It is designed for all types of equipment from digital (CRT, LED, and laser) exposing devices to optical enlargers and automatic printers.

KODAK PROFESSIONAL ULTRA ENDURA Paper features higher contrast and color saturation than KODAK PROFESSIONAL SUPRA ENDURA Paper. It is an ideal choice for commercial and industrial applications such as point-of-purchase, trade show, decor, and product photography.

ULTRA ENDURA Paper is available in E (fine lustre), F (glossy), and N (matt) surfaces. The F and N surfaces are available both with and without a watermark on the back.

Process it in KODAK EKTACOLOR Chemicals for Process RA-4 including KODAK EKTACOLOR Digital Developer Replenisher RT.

FEATURES	BENEFITS
• State-of-the-art image stability	• Significant improvement in high-intensity image stability • Superior performance—average 20 months for high-intensity commercial reflection display under 5000 lux
• Advanced color coupler technology	• Brighter, more saturated colors • Neutral tone scale from highlights to shadows • High D-max • More accurate colors • Blacker blacks without text fringing
• Unique high-intensity reciprocity characteristics	• Exceptional exposure range of 50 nanoseconds to 10 minutes • One paper for all exposing devices from digital (CRT, LED, and laser) exposing devices to optical enlargers and automatic printers • Consistent results and easier print matching across digital and optical systems • Simplified inventory (easy ordering, stocking, and handling)
• Robust processing characteristics	• Less sensitivity to process variations caused by image-density variations, bleach-fix contamination, and changes in product mix or processor utilization • Greater consistency in prints • Simple calibration and less waste • Cleaner running performance; reduced tendency for calcium buildup • Cleaner process; reduced processor maintenance • Reduced operating costs
• Reduced developer replenishment rates	• Less effluent produced • Less frequent mixing/replacement of replenisher containers • Lower environmental impact • Lower costs

STORAGE AND HANDLING

Store unprocessed paper between 40 and 75°F (4 and 24°C) in the original sealed package. High temperatures or high humidity may produce unwanted print quality changes.

To avoid moisture condensation on unexposed paper that has been refrigerated, allow the paper to warm up to room temperature before opening the package. For best results, remove the paper from cold storage the day before you use it, or allow the paper to warm up for the appropriate time from the following table:

Warm-Up Time (Hours) to Reach Room Temperature of 70°F (21°C)			
Size	From a Storage Temperature of		
	-18°C (0°F)	2°C (35°F)	13°C (55°F)
8 x 10-inch (100-sheet box)	4 hours	3 hours	2 hours
16 x 20-inch (50-sheet box)	3 hours	2 hours	2 hours
20 x 24-inch (50-sheet box)	3 hours	2 hours	2 hours
3 1/2-inch x 775-foot roll	8 hours	6 hours	4 hours
8-inch x 575-foot roll	10 hours	7 hours	4 hours
20-inch x 50-foot roll	6 hours	5 hours	3 hours
30-inch x 100-foot roll	8 hours	6 hours	4 hours
40-inch x 100-foot roll	9 hours	7 hours	5 hours

Handle the paper carefully by the edges. The paper is packaged with the emulsion side of all sheets facing in the same direction. For complete light and moisture protection, use the inner bag *and* the two-part cardboard box to store the paper.

DARKROOM RECOMMENDATIONS

Handle unprocessed paper in total darkness. Be sure that your darkroom is lighttight. Eliminate stray light from enlarger heads, timers, LEDs, etc.

Note: Using a safelight *will* affect your results. If *absolutely necessary*, you can use a safelight equipped with a KODAK 13 Safelight Filter (amber) with a 7 1/2-watt bulb. Keep the safelight at least 1.2 metres (4 feet) from the paper. Keep safelight exposure as short as possible. Run tests to determine that safelight use gives acceptable results for your application.

EXPOSURE

Digital Printing

You can expose KODAK PROFESSIONAL ULTRA ENDURA Paper with many types of digital printers. For up-to-date starting values for Kodak digital printers and other manufacturers' equipment, refer to KODAK Publication CIS-242, *Digital Printer Aims for KODAK PROFESSIONAL ULTRA ENDURA Paper*.

Optical Printing

Expose KODAK PROFESSIONAL ULTRA ENDURA Paper in automatic printers and enlargers equipped with tungsten or tungsten-halogen light sources or photo enlarger lamps. Set up and balance the printer or enlarger according to manufacturer's instructions.

Do not use fluorescent lamps to expose this paper. Use a heat-absorbing glass to remove infrared radiation. Because voltage changes affect light output and color quality, use a voltage regulator.

Keep negatives and the equipment optical system clean. Mask negatives to eliminate stray light. You can use the white-light or tricolor exposure method.

Printer Setup

Update your printers by running your normal and slope printer control negatives to adjust printer slope. (See "Printer Control Tools.") This will optimize the print quality due to the improved reciprocity of these papers.

White-Light Exposure Method

Control color balance with dichroic filters built into the printer or enlarger, or with KODAK Color Printing (CP) Filters (Acetate) placed between the lamp and the negative. You can use any number of filters between the light source and the negative. If you use cyan filtration, use filters with the suffix "-2," (e.g. "CP10C-2").

1. Start with a filter pack of 40M + 50Y to make a test print.
2. Evaluate the test print under the appropriate lighting. (See "Illumination for Evaluation of Prints.")
3. Judge print density first. If necessary, make another print by adjusting the exposure as recommended in the following table.

If your print is	Do this	OR	Do this
TOO LIGHT	Open the lens aperture to increase the light level		Increase the exposure time
TOO DARK	Close the lens aperture to decrease the light level		Decrease the exposure time

4. Then judge the color balance.

If your print is	Subtract these filters	OR	Add these filters
CYAN	Magenta + Yellow (Red)		Cyan
MAGENTA	Cyan + Yellow (Green)		Magenta
YELLOW	Magenta + Cyan (Blue)		Yellow
RED	Cyan		Magenta + Yellow
GREEN	Magenta		Cyan + Yellow
BLUE	Yellow		Cyan + Magenta

5. Remove neutral density from your filter pack. For example, if you determine that a filter pack of 40R + 10Y + 10C will give you a pleasing print:
   a. Convert any primary filters (R, G, B) to their subtractive equivalents (C, M, Y): 40R = 40M + 40Y.
   b. Add filters of the same color: 10Y + 40Y = 50Y.
   c. If the new filter pack has all three subtractive colors, cancel the neutral density by subtracting the smallest density value from all three densities:

10C	40M	50Y		
-10	-10	-10		
	30M	40Y	=	filtration without neutral density

6. Adjust the exposure for the new filter pack. An exposure time that produced a print of satisfactory density may not produce an acceptable density when you change the filter pack. The following table gives filter factors for calculating exposure adjustments when you use KODAK Color Printing (CP) Filters.

Filter Factors for CP Filters			
Filter	Factor	Filter	Factor
05Y	1.1	05R	1.2
10Y	1.1	10R	1.3
20Y	1.1	20R	1.5
30Y	1.1	30R	1.7
40Y	1.1	40R	1.9
50Y	1.1	50R	2.2
05M	1.2	05G	1.1
10M	1.3	10G	1.2
20M	1.5	20G	1.3
30M	1.7	30G	1.4
40M	1.9	40G	1.5
50M	2.1	50G	1.7
05C	1.1	05B	1.1
10C	1.2	10B	1.3
20C	1.3	20B	1.6
30C	1.4	30B	2.0
40C	1.5	40B	2.4
50C	1.6	50B	2.9

To use the factors, *divide* the old exposure time by the factor for any filter you *remove*. If you add a filter, *multiply* the time by the factor. If you add or remove two or more filters, multiply the individual factors and use the result as your factor. You may need to modify these factors for your equipment.

Note: The filter factors listed in the table take into account the effects of filter surfaces.

When you adjust the filtration in equipment that has built-in dichroic filters, any noticeable differences in density are due to differences in the color density of the print. For example, you have a print with acceptable density, but a magenta balance. When you add magenta filtration to correct the color balance, the print will become too light, so you must use a longer exposure time.

A rule of thumb for magenta dichroic filtration is to change the exposure time by one percent for every unit of change in filtration. For example, if you increase the magenta filtration by 20M, increase the exposure time by 20 percent. Changes in yellow dichroic filtration do not usually affect the apparent print density. If you use cyan dichroic filtration, use the filter factors in the table above as starting points for adjusting exposure.

Tricolor Exposure Method

Use KODAK WRATTEN Gelatin Filters No. 25 (red), No. 99 (green), and No. 47B (blue) to give the paper three separate exposures. Do not move the paper or the enlarger until you have made all three exposures. Typical exposure times for making an enlargement from a normally exposed negative are given in the table below.

Filter	Times for an Aperture Setting of f/8* (8x Enlargement of a KODAK PROFESSIONAL PORTRA Film Negative)
Red	2.4 seconds
Green	3.3 seconds
Blue	4.9 seconds

* For an enlarger equipped with a Photo Enlarger Lamp No. 212 or No. 302; the setting may vary with other types of lamps.

Evaluate the test print under the appropriate lighting. (See "Illumination for Evaluation of Prints.")

Judge the print density first. If necessary, make another print by adjusting the exposure as recommended in the table below.

If your print is	Do this	OR	Do this
TOO LIGHT	Open the lens aperture to increase the light level		Increase all exposure times proportionally
TOO DARK	Close the lens aperture to decrease the light level		Decrease all exposure times proportionally

Then judge color balance.

If your print is	Subtract these filters	OR	Add these filters
CYAN	Red		Blue + Green
MAGENTA	Green		Red + Blue
YELLOW	Blue		Red + Green
RED	Blue + Green		Red
GREEN	Red + Blue		Green
BLUE	Red + Green		Blue

LATENT-IMAGE KEEPING

This paper features improvements in the stability of the latent image. Under normal conditions, you should not notice shifts in the latent image with keeping times from 5 seconds to 24 hours. Therefore, you do not need to change your printing procedures to compensate for latent-image shifts under normal temperature and handling conditions.

PROCESSING

Use KODAK EKTACOLOR RA Chemicals for Process RA-4, including KODAK EKTACOLOR Digital Developer Replenisher RT. Use KODAK PROFESSIONAL Pro Strips Color Negative Paper Control Strips / for Process RA-4. (See "Process Control.")

Although Kodak does not recommend Process RA-2SM for professional media, some customers may judge the results acceptable for certain applications. Customers should test the media to determine acceptability, as this process may provide warmer results than desired.

For detailed information on replenishment rates and processing this paper in continuous or roller-transport processors, see KODAK Publication No. Z-130, *Using KODAK EKTACOLOR RA Chemicals*. For information on processing this paper in trays or rotary-tube and drum processors, see KODAK Publication No. J-39, *Tray, Drum, and Rotary-Tube Processing with KODAK EKTACOLOR RA Chemicals*. Both publications are available through our website at www.kodak.com/go/photochemicals.

Do not use drying temperatures above 93°C (200°F) to avoid damage to prints.

Underdrying can produce tackiness that tends to make paper stick when it is wound into rolls before cutting. *Overdrying* can cause curl and complicate transport in print finishing.

Do not ferrotype this paper—its surface dries to a natural gloss without ferrotyping.

ILLUMINATION FOR EVALUATION OF PRINTS

Evaluation of prints for color and density requires higher illumination levels than those used in normal display conditions. A good average condition for evaluation is a light source with a color temperature of 5000 K ± 1000, a Color Rendering Index of 85 to 100, and an illuminance of at least 50 footcandles (538 lux). Fluorescent lamps such as cool white deluxe (made by several manufacturers) meet these conditions.

You can also use a mixture of incandescent and fluorescent lamps. For each pair of 40-watt cool white deluxe fluorescent lamps, use a 75-watt frosted, tungsten bulb.

Viewing conditions should meet ANSI Standard PH2.30-1989.

RETOUCHING

If possible, do any required retouching on color negatives before you make prints—especially if you plan to make more than one print from each negative. For information on retouching negatives, see KODAK Publication No. E-71, *Retouching Color Negatives*.

If the negative image is small, you can make corrections much more easily by applying dry or liquid dyes to small or large areas of the enlarged print. Although you'll probably do most retouching with dyes, you may sometimes want to use black lead, colored pencils, or opaque. Because color prints have separate dye layers, you can't use an etching knife to reduce density as you can with black-and-white materials. For information on retouching prints, see KODAK Publication No. E-70, *Retouching Prints on KODAK EKTACOLOR and EKTACHROME Papers*.

POST-PROCESS TREATMENTS

Mounting Prints

You can mount prints with dry mounting tissue. The temperature across the heating platen should be 82 to 93°C (180 to 200°F). Preheat the cover sheet that you use over the face of the print to remove moisture. Apply pressure for 30 seconds, or up to 3 minutes in the case of a thick mount.

Caution

Temperatures above 93°C (200°F) for long periods of time may cause physical and color changes in prints. Excessive moisture may also cause color shifts. Mounting at the lowest temperature at the shortest time will reduce these changes.

Note: KODAK PROESSIONAL ULTRA ENDURA Paper may shift towards a pink balance when heated to excessive temperatures, but will return to normal when fully cooled to room temperature.

You can also use a contact-type adhesive or cement for cold-mounting.

For information on lacquering and other post-process treatments, see KODAK Publication No. E-176, *Post-Processing Treatment of Color Prints—Effects on Image Stability*, available through our website at www.kodak.com/go/professional.

STORAGE AND DISPLAY OF PRINTS

KODAK PROFESSIONAL ULTRA ENDURA Paper has been formulated to provide improved dye stability and print longevity for prints displayed under typical home lighting conditions (i.e., 120 lux for 12 hours a day), and typical home dark storage conditions (i.e., 20 to 23°C [68 to 73.4°F] and 50% relative humidity).

Photographic dyes, like all dyes, can change with time and exposure to sunlight, ultraviolet radiation, excessive heat, and high humidity. To help prevent changes in photographic dyes, follow these guidelines:

- Illuminate prints with tungsten light whenever possible.
- Display prints in the lowest light level consistent with your viewing needs.
- If a print is exposed to direct or indirect sunlight or fluorescent light, use an ultraviolet-absorbing filter (such as glass) between the light source and the print.
- If prints are displayed behind glass, maintain a slight separation between the print and the glass.
- Keep the temperature and humidity as low as possible.
- Use album materials described in KODAK Publication No. E-30, *Storage and Care of KODAK Photographic Materials—Before and After Processing*.

PROCESS CONTROL

To produce high-quality color prints consistently and with a minimum of waste, you need to match your process to a standard for density, color, and contrast each time you process paper. In addition to monitoring process parameters such as solution times, temperature, replenishment rates, solution concentrations, etc., you should regularly run control strips to ensure best results.

KODAK PROFESSIONAL Pro Strips Color Negative Paper Control Strips / for Process RA-4 (CAT 129 8587) are designed specifically for use with KODAK PROFESSIONAL Papers and KODAK PROFESSIONAL Print and Display Materials in professional labs. These control strips are designed to detect process conditions that can degrade the quality of your finished prints. They are better able to track the papers that are processed in professional finishing laboratories.

For more information, see KODAK Publication No. Z-130, *Using KODAK EKTACOLOR RA Chemicals*, section 7a.

SCANNER TOOLS

The KODAK Q-60 Color Input Targets are available on KODAK EKTACHROME Professional Film in both 35 mm and 4 x 5 inch formats and on KODAK EKTACOLOR Paper. Developed primarily for use by prepress houses in the printing industry, this target can also be used by professional photographers, desktop publishers, and in the emerging hybrid imaging area.

The target is designed for use in the commercial and desktop arenas as a comparative control tool to help customers calibrate their input product to the final output. This target maps the gamut of color space that KODAK EKTACHROME Film and EKTACOLOR Paper can reproduce.

When used properly, customers will be able to compare their output—whether it is separations for the printed page and four-color printing or second generation originals from a film recorder—to the original. This will help customers optimize the capabilities of their system for color reproduction of an extreme range of color gamut

Scanner color characterization targets produced in accordance with ANSI IT8.7/1 (transmission) and IT8.7/2 (reflection) Standards (or ISO 12641) are available from Kodak.

The KODAK PROFESSIONAL Q-60 Color Input Target/Q-60R2 is manufactured on KODAK PROFESSIONAL ENDURA Paper, and is likewise identified by a watermark with a single grey dot under PAPER. This target can be used with both the newer ENDURA Papers and older papers. The older Q-60R1 target, which has the same two-dot watermark as the older papers, can be used with the newer papers.

PRINTER CONTROL TOOLS

The following tools are manufactured by Kodak for optimization of printer balance and slope controls of KODAK PROFESSIONAL PORTRA Films printed on KODAK PROFESSIONAL Paper.

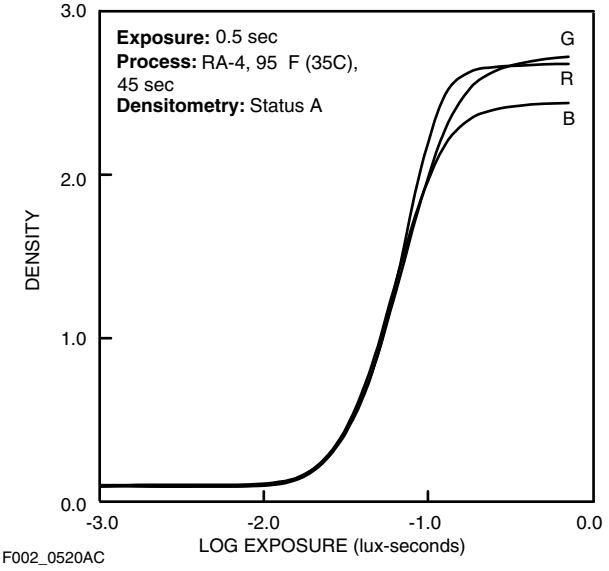
Product	Features / Description	CAT No.
KODAK PROFESSIONAL PORTRA Printer Control Negative Set / Size 135	Includes one each: very under, under, normal, over, and very over on a single strip of film	179 8511
KODAK PROFESSIONAL PORTRA Printer Control Negative Normal / Size 120	Size 120 Film	846 0958
KODAK PROFESSIONAL PORTRA Printer Control Negative Very Under / Size 120	Size 120 Film	107 1398
KODAK PROFESSIONAL PORTRA Printer Control Negative Under / Size 120	Size 120 Film	841 1902
KODAK PROFESSIONAL PORTRA Printer Control Negative Over / Size 120	Size 120 Film	177 1302
KODAK PROFESSIONAL PORTRA Printer Control Negative Very Over / Size 120	Size 120 Film	144 5741

The following tools are manufactured by Kodak for optimization of printer balance and slope controls of KODAK PROFESSIONAL PORTRA 400BW Film printed on KODAK PROFESSIONAL Paper.

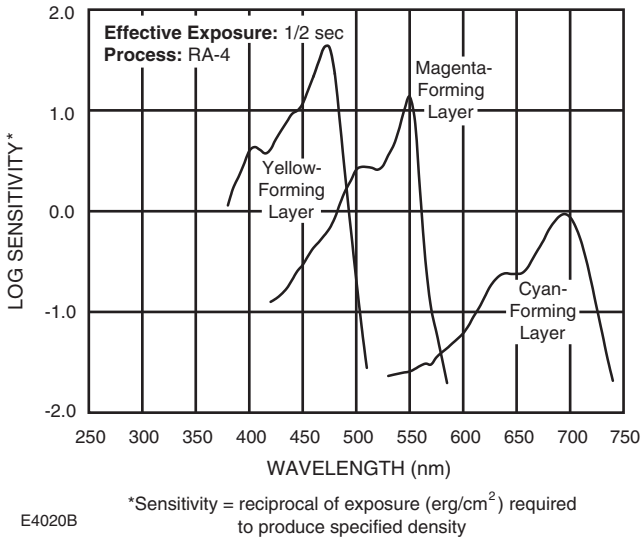
Product	Features / Description	CAT No.
KODAK PROFESSIONAL PORTRA 400BW Printer Control Negative Set / Size 120 Five Negative Set	This set includes one each: very under, under, normal, over, and very over negatives on a single strip of size 120 film	114 4419

CURVES

Characteristic Curves

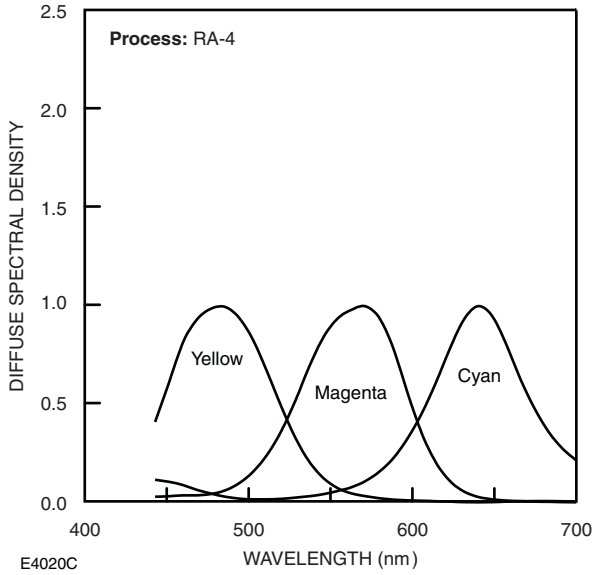


Spectral-Sensitivity Curves



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

Spectral-Dye-Density Curves



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.

SIZES AVAILABLE

KODAK PROFESSIONAL ULTRA ENDURA Paper is available in a variety of roll and sheet sizes.

Sizes and catalog (CAT) numbers may differ from country to country. See your dealer who supplies KODAK PROFESSIONAL Products.

MORE INFORMATION

Kodak has many publications to assist you with information on Kodak products, equipment, and materials.

E-30	*Storage and Care of KODAK Photographic Materials—Before and After Processing*
E-70	*Retouching Prints on KODAK EKTACOLOR and EKTACHROME Papers*
E-4040	*KODAK PROFESSIONAL PORTRA Films*
E-71	*Retouching Color Negatives*
E-176	*Post-Processing Treatment of Color Prints—Effects on Image Stability*
J-39	*Tray, Drum, and Rotary-Tube Processing with KODAK EKTACOLOR RA Chemicals*
K-4	*How Safe is Your Safelight?*
Z-130	*Using KODAK EKTACOLOR RA Chemicals*

For the latest version of technical support publications for KODAK PROFESSIONAL Products, visit Kodak on-line at:
http://www.kodak.com/go/professional

If you have questions about KODAK PROFESSIONAL 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)

Note: The Kodak materials described in this publication for use with KODAK PROFESSIONAL ULTRA ENDURA Paper are available from dealers who supply KODAK PROFESSIONAL Products. You can use other materials, but you may not obtain similar results.

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