



hp indigo digital printing



hp ElectroInk

**Frequently Asked
Questions**



what is hp ElectroInk® ?

hp ElectroInk is a unique liquid ink that combines the advantages of electronic printing with the qualities of liquid ink. hp ElectroInk contains charged pigmented particles in a liquid carrier, and enables digital printing by electrically controlling the location of these particles.

how does hp ElectroInk support the performance required for high quality, digital color printing?

The small particle size in the liquid carrier enables high resolution, uniform gloss, sharp image edges, and very thin image layers which closely follow the surface topography of the paper resulting in a highly uniform finish.

what is hp ElectroInk's resistance to abrasion?

hp ElectroInk's resistance to abrasion is characterized by utilizing a test procedure for rub-resistance that measures the ink's adhesion to the substrate.

HP Indigo labs utilize two types of measurements that characterize rub resistance:

1. Sutherland abrasion resistance - A standard measurement that provides guidelines
2. GaCat abrasion resistance - A standard measurement that provides guidelines and a semi-quantitative scale.

sutherland measurement results:

No significant difference in abrasion resistance of 100% solids vs. close to 100% halftone gray images was found.

gacat measurement¹ results:

hp ElectroInk performs better than grade 3

0	No damage
10	Completely damaged

¹ The conditions of measurements were as follows: 100% solids test image, receptor C5, frequency 2 sec-1, 120 sec.

do images printed with hp ElectroInk have any degradation of color values?

Images printed with hp ElectroInk were analyzed after a print run of 100,000 impressions, and measured for a change in color. The analysis found no degradation in color values of the xth print compared to the 1st print ($\Delta E^* < 2$)².

does hp ElectroInk that has been stored for a period of time have any degradation of color values?

The hp ElectroInk was analyzed after one year of storage and measured for a change in color. The analysis found no degradation in color values ($\Delta E^* < 3$).

what is hp ElectroInk's ability to withstand exposure to light?

hp ElectroInk's ability to withstand exposure to light is measured by utilizing a test for Light-Fastness.

The lightfastness test measures the print's resistance to ultraviolet light by measuring the change that occurred between the exposed area to the unexposed area.

Two separate tests of lightfastness are shown below.

The first shows results based on a blue wool reference scale, while the second shows results based on percentage of fading (optical density) and deltaE* (color coordinate changes).

lightfastness test 1: Blue Wool

The light fastness test was done using a Xenon UV Lamp according to the British Standard BS 1006B02 for indoor conditions and ISO1134M1 method for outdoor conditions. The result is on a 1-8 blue wool reference scale.

1	Completely faded
8	No fading

² DeltaE* expresses the color change between the X print to the 1st. print at the same Optical density. The optimal result is when DeltaE* is close to zero.

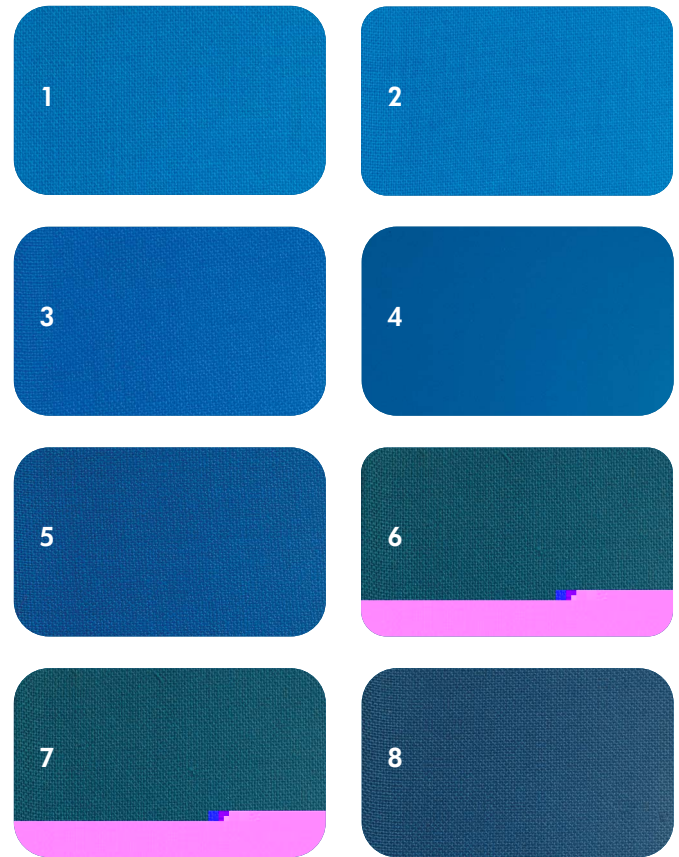


please note that specific papers/substrates may give deviations from the presented test results.

indoor test ISO1006B02								
	hp ElectroInk 3.1				Offset Ink			
	Cyan	Yellow	Magenta	Black	Cyan	Yellow	Magenta	Black
Paper (untreated)	5-7	4-5	5	5	6-7	2-3	1	4
PVC (treated)	6-7	4-6	5-7	4-5				
PET (treated)	6-7	1-2	5-7	3-4				
outdoor test ISO11341M1								
PVC (treated)	6-7	4-6	5-6	3-6				
PET (treated)	6-7	1-2	3-4	3-4				
indoor test ISO105B02								
	hp ElectroInk 3.2				Offset Ink			
	Cyan	Yellow	Magenta	Black	Cyan	Yellow	Magenta	Black
Paper (untreated)	7	6	6	3-4	6-7	2-3	1	4

Blue Wool Scale [BWS]

scale	Days indoors	comments
1	3.75	Very poor
2	6	poor
3	19	fair
4	65	moderate
5	130	good
6	260	Very good
7	520	excellent
8	1100	outstanding



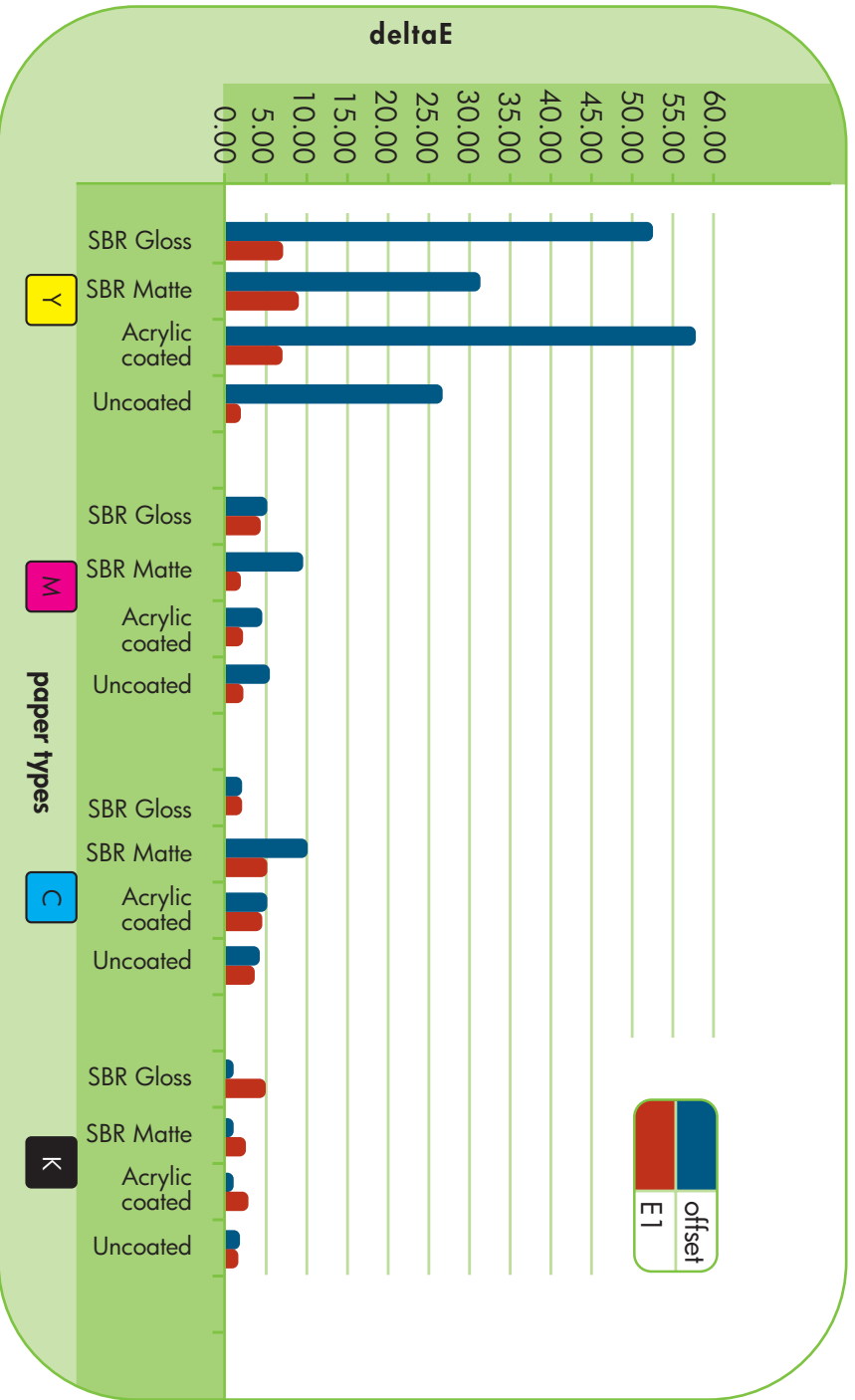
example of a blue wool scale

The blue wool scale is composed of 8 strips of wool fabric, of different standard dyeing. Their chromatic grade goes from the Standard 1, with very scarce light fastness, to the Standard 8 with very elevated light fastness. Every standard is twice more solid than the preceding one.

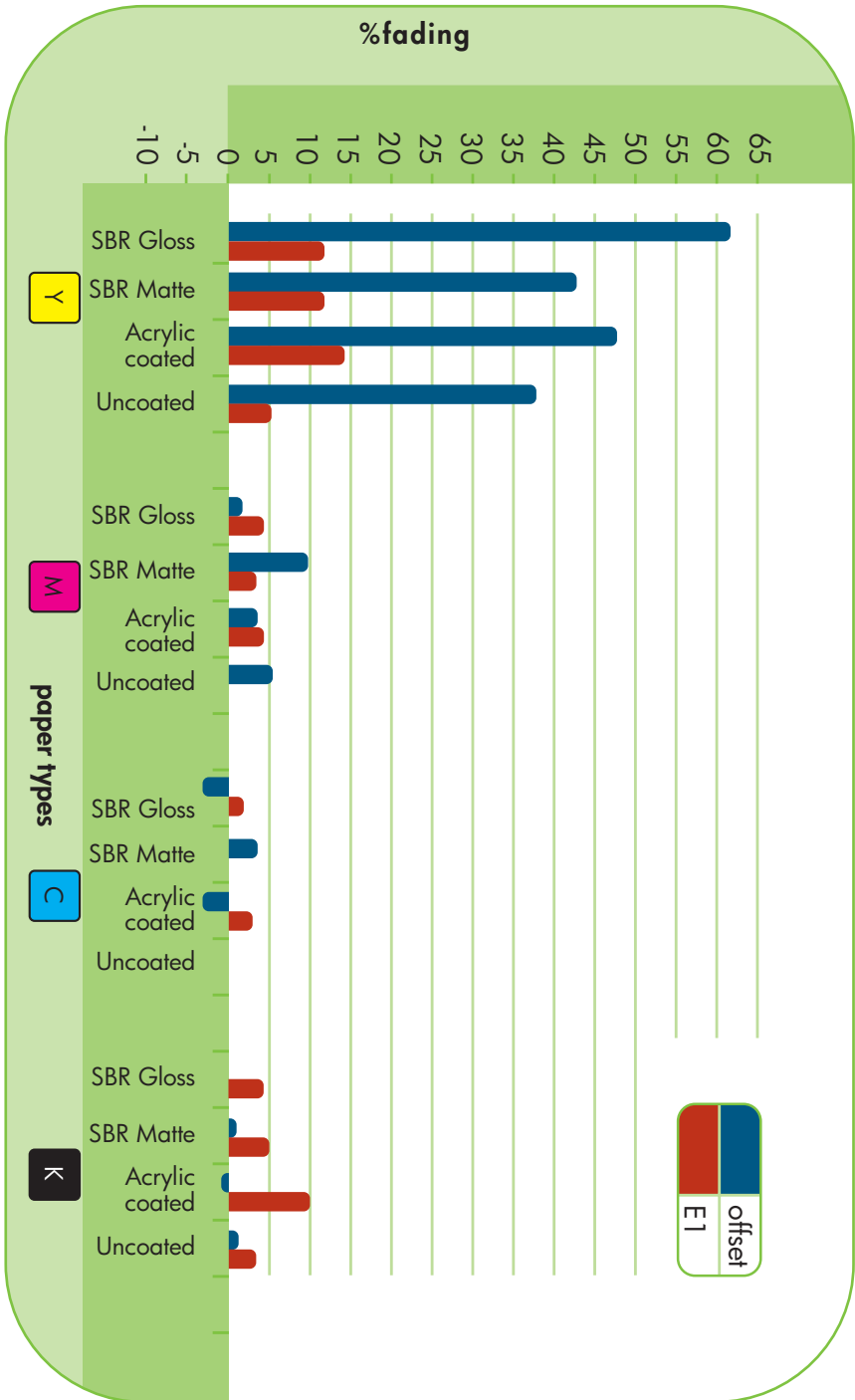
lightfastness test 2: Optical density & Color Coordinates

This lightfastness test was done by exposing test samples for 3-day cycles while monitoring changes in optical density (%fading) and color coordinates (deltaE*). Each 3-day cycle simulates 6 years exposure under the above conditions. Three cycles of six days each, simulates eighteen years. The tests were done using ElectroInks and Offset inks on various types of paper, intended to simulate a variety of typical substrates.

Paper type	Simulated by testing on
SBR coated Gloss	Condat Gloss
SBR coated Matte	Condat Matte
Acrylic coated	BVS
Uncoated	Carnival



lightfastness test 2: change in color coordinates at 3 days exposure (6 years equivalent)

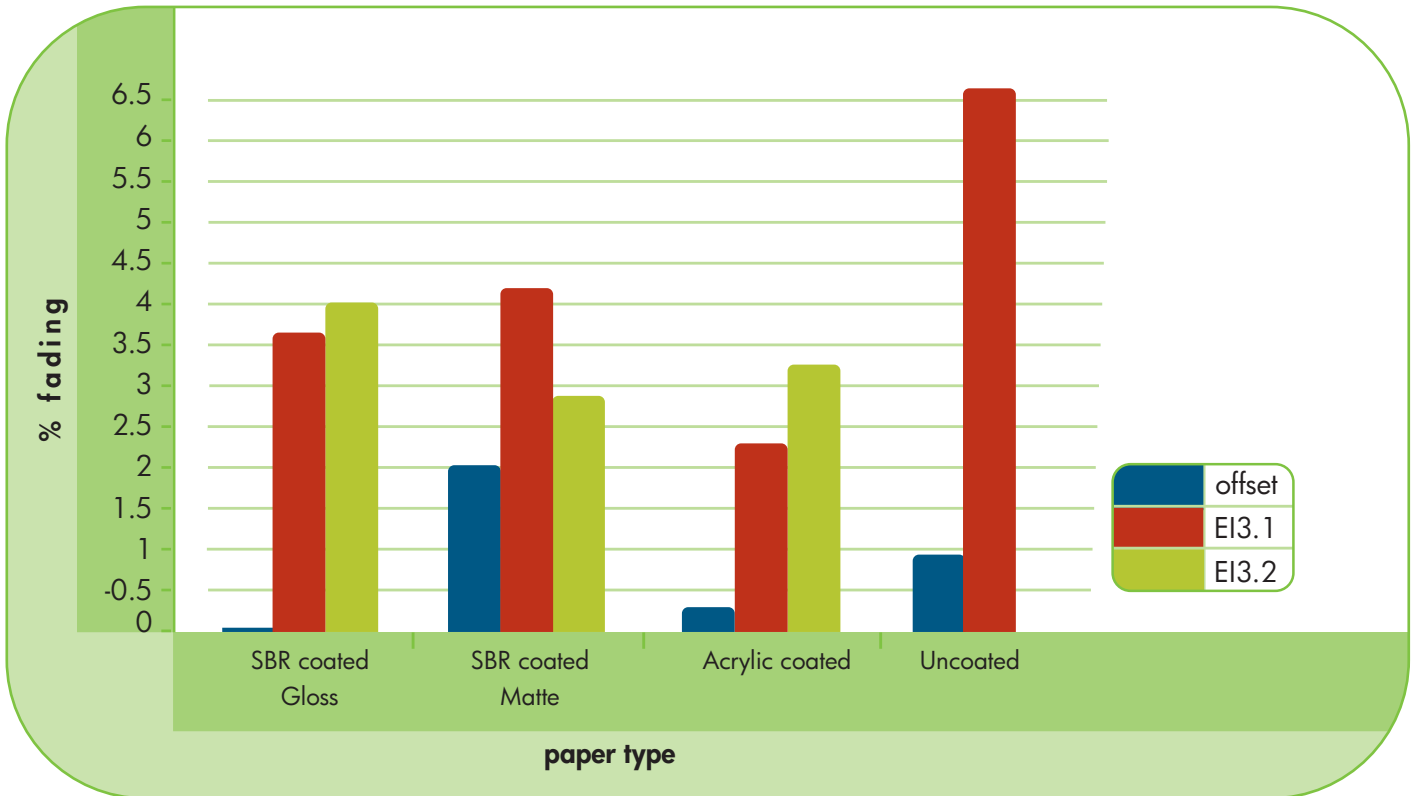


lightfastness test 2: change in Optical Density at 3 days exposure (6 years equivalent)

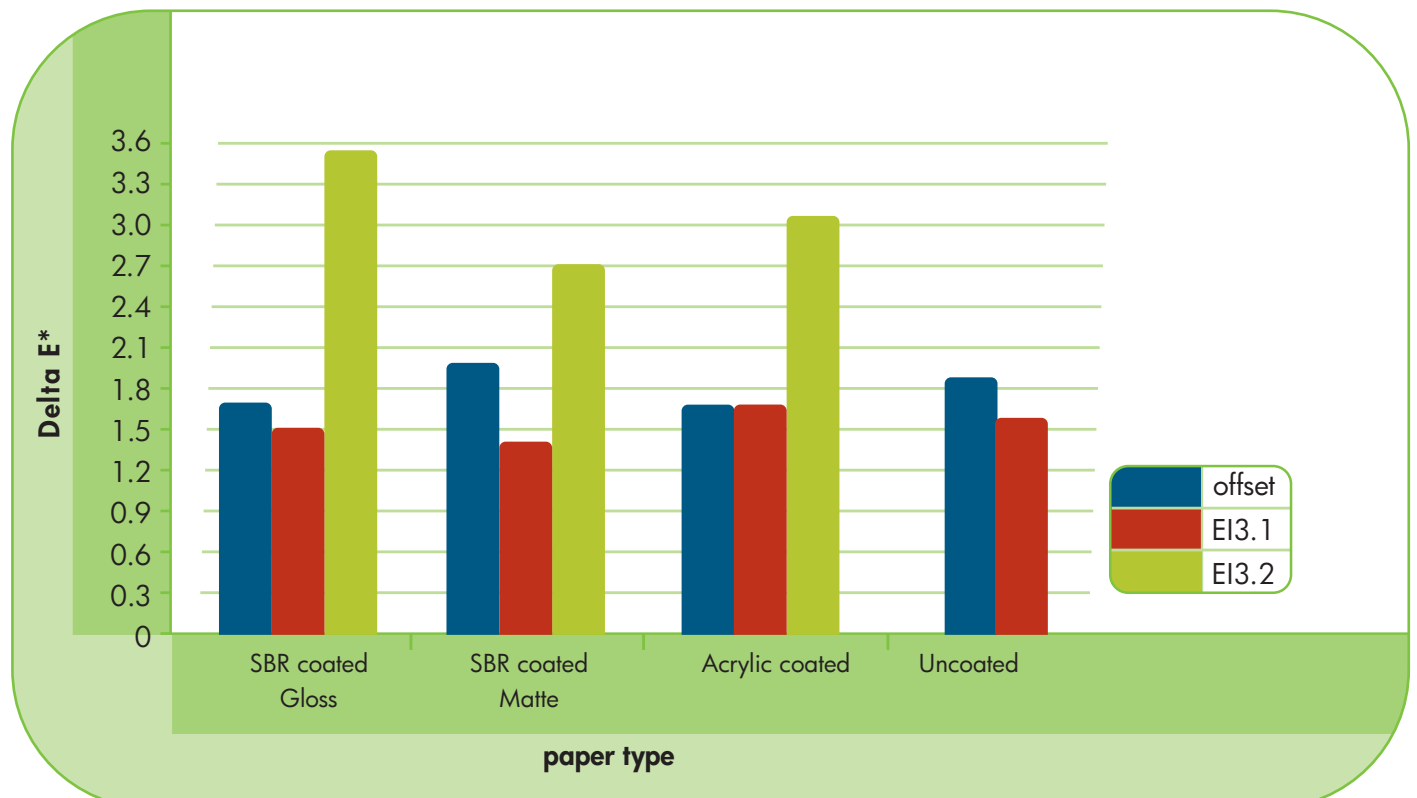
how resistant to heat are substrates printed with hp ElectrolInks?

The test for heat resistance measures the changes in color coordinates and optical density of a printed material which is exposed to heat. Heat resistance was tested by exposing various printed substrates at a temperature of 120° for 30 minutes.

heat resistance test: change in optical density



heat resistance test: change in color coordinates



may hp ElectroInk be used for printing food packaging applications in the United States?

Certain hp ElectroInk products, which are listed in the table below, are compliant with FDA requirements for printing on the non-food contact side of food packaging of an appropriate multiplayer food packaging material.

The material used for the food packaging in conjunction with the approved hp ElectroInk must be comprised of one of the following materials: (1) low density polyethylene (LDPE) that is at least 40 microns thick; (2) polypropylene that is at least 20 microns thick; (3) polyester which is at least 12 microns thick. The resulting packages may be used to hold all types of food at temperatures up to 100 deg C (also known as US FDA's Condition of Use B, "Boiling Water Sterilized", under 21 CFR 176.170).

Series 1 inks	Series 2 inks
Mark 3.1 Cyan	Mark 3.2 Cyan
Mark 3.1 Magenta	Mark 3.2 Magenta
Mark 3.1 Yellow	Mark 3.2 Yellow
Mark 3.1 Black	Mark 3.2 Black
Orange 003	Orange 070
Green 011	Green 072
Blue 013	Violet 071
Violet 065	
Red 006	
Transparent 025	
White	

may hp ElectroInk be used for printing food packaging applications in the European Union?

Certain hp ElectroInk products, which are listed in the table below, are compliant with requirements for printing on the non-food contact side of food packaging of an appropriate multiplayer food packaging material under the German and European food legislation (German Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin (BgVV) and European Union (EU)). The material used for the food packaging in conjunction with the approved

hp ElectroInk must be comprised of one of the following materials:
 (1) low density polyethylene (LDPE) that is at least 40 microns thick;
 (2) polypropylene that is at least 20 microns thick;
 (3) polyester which is at least 12 microns thick.

The resulting packages may be used to hold all types of food at temperatures up to 100 deg C.

We are investigating the status of series 2 inks and expect to have the data available by spring 2003.

Series 1 inks

Mark 3.1 Cyan

Mark 3.1 Magenta

Mark 3.1 Yellow

Mark 3.1 Black

Orange 003

Green 011

Blue 013

Violet 065

Red 006

Transparent 025

are any additional products recommended to enhance the adhesion of hp ElectroInk to the plastic substrates typically used in food packaging?

We recommend the use of a product called Topaz, which is distributed by HP Indigo, and is utilized in coating plastic substrates to enhance their compatibility with hp ElectroInk ink.



can substrates treated with Topaz be used for printing on food-packaging applications?

In the U.S., substrates treated with Topaz can be used for printing on the non-food-contact-side of food packaging when they are composed of any of the following materials: (1) low-density polyethylene (LDPE) that is at least 40 microns thick; (2) polypropylene that is at least 20 microns thick; or (3) polyester which is at least 12 microns thick. The alcohol solvent evaporates after application, leaving the Topaz as a dry layer. Material coated with Topaz on the non-food-contact side, can be employed as food packaging used to hold all types of food at temperatures up to 100 deg C.

Use of Topaz also complies with the applicable provisions of German and European food legislation. (The German Bundesinstitut für gesundheitlichen Verbraucherschutz und Veterinärmedizin (BgVV) and European Union (EU)). Substrates treated with Topaz can be used for printing on the non-food-contact-side of food packaging when they are composed of any of the following materials: (1) low-density polyethylene (LDPE) that is at least 40 microns thick; (2) polypropylene that is at least 20 microns thick; or (3) polyester which is at least 12 microns thick. The alcohol evaporates after application, leaving the Topaz as a dry layer. Material coated with Topaz on the non-food-contact side, can be employed as food packaging used to hold all types of food at temperatures up to 100 deg C.

do hp ElectroInk products contain any chemicals listed on California's Proposition 65 list?

hp ElectroInk products do not contain any substance listed under the California Safe Drinking Water and Toxic Enforcement Act of 1986, (Proposition 65) except for formaldehyde. Fluorescent Yellow contains formaldehyde at a maximum level of 40ppm, and Fluorescent Pink at a maximum level of 120ppm. Proposition 65 has established an NSRL (No Significant Risk Level) for formaldehyde at 4×10^{-5} μg per day.

do hp ElectroInk products contain any substances on the U.S. federal list of Hazardous Air Pollutants?

As of August 1, 2002, none of HP Indigo's process ink colors or other supplies contain substances that are listed on the United States federal list of hazardous air pollutants established under Section 112 of the Federal Clean Air Act. 42 U.S.C.A. §7412. As of August 1, 2002, two of the special colors, fluorescent yellow and fluorescent pink, contain a substance listed on the federal list of hazardous air pollutants. Fluorescent Yellow contains formaldehyde at a maximum level of 40ppm, and Fluorescent Pink at a maximum level of 120ppm.



what is the concentration of heavy metals in hp ElectroInk?

Based on the formulation of our inks and information received from our suppliers, hp ElectroInk® inks do not contain lead, cadmium, mercury and hexavalent chromium in a combined concentration exceeding 100 parts per million by weight of the ink in a dry state.

what is hp ElectroInk's flammability rating?

The solvent in hp ElectroInk has a flashpoint $>64^{\circ}\text{C}$ and is not restricted for any mode of international transport.

According to the Hazardous Materials Identification System (HMIS) and the National Fire Protection Association (NFPA) system, the flammability of HP Indigo ElectroInk, is rated as 2. The HMIS hazard ratings are as follows:

Minimal – 0

Slight – 1

Moderate – 2

Serious – 3

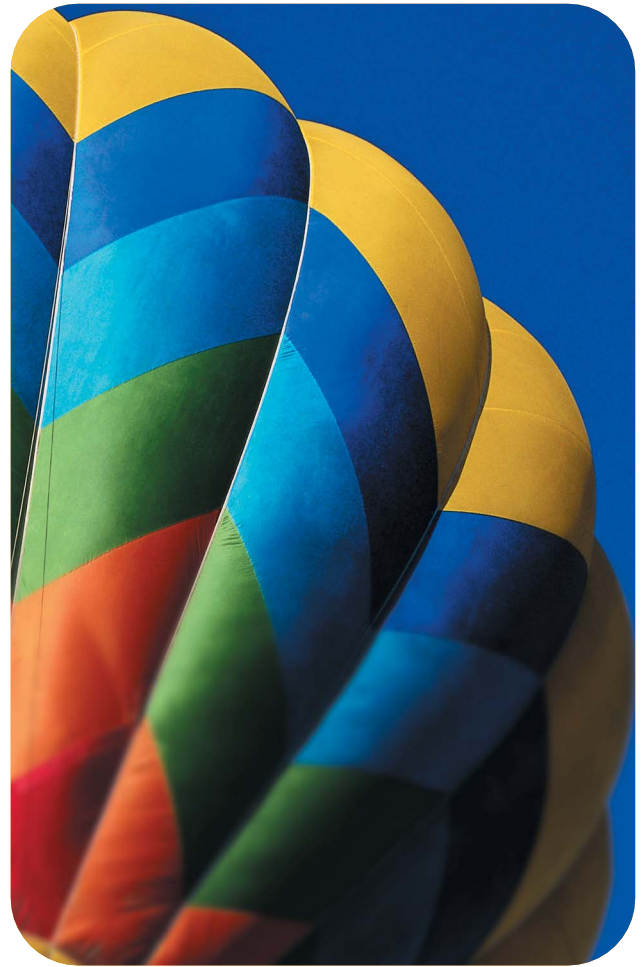
Severe – 4

For any specific workplace hazard warning and labeling requirements for these materials, please consult your local occupational health and safety regulations.

where can I find additional information about ElectroInk products?

Additional information relating to hp indigo Imaging Products and supplies, as well as Material Safety Data Sheets, can be found in the hp indigo customer web portal under "supplies", url:

<http://h21021.www2.hp.com/PORTAL/Categories/supplies/>



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