

HP Latex Inks and print durability





Introduction

The design of wide-format applications requires a good understanding of substrate options, printer and ink capabilities, as well as finishing and display techniques. One key aspect to be considered is the durability of the prints... How long will they last? Will they resist the “wear and tear” to which the application will be subjected? Is lamination required, or will the application be robust enough without lamination?

Of course, wide-format prints are used for an extremely wide range of applications and the sources of potential damage can vary significantly between applications. Vehicle graphics, for example, may be exposed for many months in outdoor locations, and will be subjected to the damaging UV rays in sunlight, regular washing, and occasional vehicle fuel spills—durability requirements in this case are very high. At the other extreme, some event graphics and signs may only be required for a few days. Durability requirements in this case are relatively low—in fact, the question in this case is whether lamination is required at all.

This guide provides:

- An understanding of the different components of durability, and which components should be considered in different environments
- Results from tests conducted on prints produced with HP Latex Inks for each of these different components
- Recommendations to print service providers (PSPs) when producing wide-format applications with HP Latex Inks
- Details of application warranties available from media manufacturers

Join the community, find tools and talk to experts. Visit the HP Latex Knowledge Center at hp.com/communities/LKC

The components of “durability”

Durability is the ability to withstand “wear and tear” from the different sources of potential damage to which wide-format prints may be exposed.

These components can be grouped as follows:



Light-fade resistance



Scratch and abrasion resistance



Water and chemical resistance

Light-fade resistance



Light-fade resistance, sometimes referred to as print permanence, is a measure of how well a print resists fading with exposure to light and other environmental factors such as ozone. The color of an ink comes from its dyes or pigments, and over time these particles will be broken down by UV rays in sunlight, resulting in colors that fade. Prints produced with inks that contain pigments, such as HP Latex Inks, tend to last longer than prints produced with inks that contain dyes, but nonetheless they will start to fade over time depending on the intensity of UV light exposure.

Since the amount of UV light varies greatly between different locations, HP tests light-fade resistance in three different conditions which represent typical display locations for wide-format graphics:



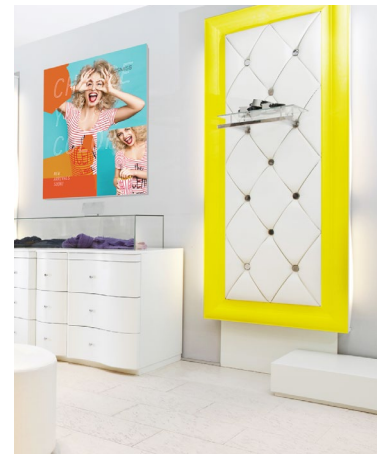
Outdoor display

Test conditions are representative of signs, banners, and other outdoor applications that are subjected to direct sunlight and rain. The testing environment takes into consideration the worst case of direct and indirect sunlight conditions as well as excessive humidity environments which have an aggressive effect on substrates ¹.



Indoor in-window display

Test conditions are representative of prints displayed in a window receiving partial or direct sunlight, for example signage in a retail store window which faces directly onto an outside street ².



Indoor away from direct sunlight

Test conditions are representative of prints installed indoor and away from direct sunlight. A typical application example is a photo or canvas print, installed under common indoor lighting and environmental conditions.

¹ Display permanence is tested according to SAE J2527 in a vertical display orientation in simulated nominal outdoor display conditions for select high and low climates, including exposure to direct sunlight and water. The HP Image Permanence Lab complements lab testing with field testing, placing print samples in real-life conditions at multiple test sites to account for a range of environmental conditions.

² HP in-window test data is generated using Xenon-Arc illuminant and assumes 6,000 Lux/12 hr day.

HP Latex Inks and light-fade resistance

This table shows the expected life of prints produced with HP Latex Inks on different media types and in different display environments based on internal testing by the HP Image Permanence Lab:

	Outdoor, ³ no lamination	Outdoor, ³ with lamination (film)	Indoor in window, ⁴ no lamination	Indoor away from direct sunlight, no lamination
Self-adhesive vinyl	Up to 3 yrs	Up to 6 yrs	Up to 5 yrs	Up to 200 yrs
PVC frontlit banner	Up to 3 yrs	n/a	Up to 5 yrs	Up to 200 yrs
PET backlit film	n/a	n/a	Up to 2 yrs	Up to 60 yrs
Paper, wallpaper	n/a	n/a	Up to 2 yrs	Up to 60 yrs
Canvas, textile	n/a	n/a	Up to 2 yrs	Up to 200 yrs

These results are a summary of testing done across all families of HP Latex Inks (HP 789, 792, LX600, LX610, 831, 871, 881, 891 Latex Inks), on a range of HP and third-party media. Performance may vary as environmental conditions change and results may vary based on specific media performance. Specific test results for the HP large format printing materials portfolio can be viewed at globalBMG.com/hp/printpermanence. Up to 6 years outdoor fade resistance when using specified 3M™ printing films and 3M™ film laminates with select HP Latex Inks and HP Latex Printers.

Note that these results are provided as guidance only. Due to the very high number of media available in the market as well as the number of external factors involved in any application, HP is not able to offer a warranty on light-fade durations. Refer to the “Application warranties” section in this document for warranties from media manufacturers.

Scratch and abrasion resistance



Scratch resistance and abrasion resistance refer to the ability of a print to resist damage from different objects with which it comes into contact. This is a relevant consideration during the finishing, shipping, and installation of a graphic, as well as once it is in its final display position.

Scratch damage refers specifically to damage from sharp or pointed objects—fingernails, for example. This is a very important consideration for high-value prints that will be viewed at short distance, since a single scratch can occur in an instant and permanently damage a print.

Abrasion (also called dry rub) refers to damage caused by repeated rubbing in the same location. This is an important consideration for mid-to long-term graphics that will be exposed to repeated rubbing or scuffing in the same location. For example, graphics applied to the doors of buildings or vehicles will require high abrasion resistance due to repeated touching and pushing around areas with handles. HP tests scratch and abrasion resistance using a Taber tester (Figure 1) and according to industry-standard test methods.

HP tests scratch and abrasion resistance using a Taber tester (Figure 1) and according to industry-standard test methods.⁵



Figure 1
Scratch and abrasion testing are performed using a Taber tester, according to industry-standard test methods.⁵

³ Display permanence is tested according to SAE J2527 in a vertical display orientation in simulated nominal outdoor display conditions for select high and low climates, including exposure to direct sunlight and water. The HP Image Permanence Lab complements lab testing with field testing, placing print samples in real-life conditions at multiple test sites to account for a range of environmental conditions.

⁴ HP in-window test data is generated using Xenon-Arc illuminant and assumes 6,000 Lux/12 hr day.

⁵ Scratch resistance is measured according to test method ISO 15118-2:2011. Abrasion resistance is tested according to ASTM F1571-95 (2008).

Water and chemical resistance



Water resistance and chemical resistance refer to the ability of a graphic to resist water, cleaning products, and other chemicals with which it may come into contact. For example, graphics in some indoor locations may be occasionally cleaned with water and indoor detergents. Vehicle graphics may come into contact with vehicle fuels, especially in the area of the fuel filling cap.

To test performance in this area, HP performs wet rub testing with water, as well as three common cleaning and chemical products—Windex® window cleaner, ethanol, and isopropyl alcohol.⁶



Scratch resistance



Abrasion resistance



Water and chemical resistance

HP Latex Inks and scratch, abrasion, water, and chemical resistance

This table shows the scratch, abrasion, water, and chemical resistance of each of the three generations of HP Latex Inks when printed on self-adhesive vinyl:

	Gen #1 HP Latex Inks 789 / LX600	Gen #2 HP Latex Inks 792 / LX610	Gen #3 HP Latex Inks 831/871/881/891
Scratch ⁷	Low	Low	High
Abrasion (dry rub) ⁷	Medium	Medium	Medium
Water ⁶	Medium	High	High
Windex® window cleaner ⁶	Medium	High	High
Ethanol ⁶	Low	Medium	Medium
Isopropyl alcohol ⁶	Low	Medium	Medium

The addition of an anti-scratch agent to the third-generation HP Latex Inks provides a high level of scratch resistance on smooth, uncoated media—scratch resistance of HP 831/871/881/891 Latex Inks is higher than competitor eco-solvent inks and comparable to hard solvent inks on self-adhesive vinyl and PVC banner (Figure 2).⁸

This high level of scratch resistance significantly reduces the risk of accidental damage during the finishing, installation, and display of unlaminated graphics compared to previous HP Latex Inks and competitor eco-solvent inks.

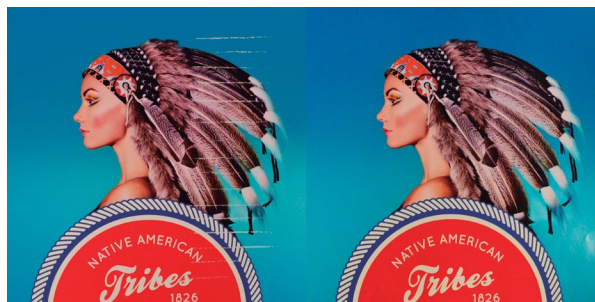


Figure 2

Scratch test prints. Image on the left shows results with eco-solvent inks. Image on the right shows results with HP 831/871/881/891 Latex Inks.

⁶ Wet rub resistance is measured according to the test method ASTM F1571-95 (2008).

⁷ Scratch resistance is measured according to test method ISO 1518-2:2011. Abrasion resistance is tested according to ASTM F1571-95 (2008).

⁸ Scratch resistance testing certified by the agency APPLUS.



Film lamination



Liquid lamination on canvas



Economical liquid lamination on fleet graphics

Lamination techniques

Lamination is a finishing technique in which a transparent film or clear coat is applied on top of a printed graphic. Two main techniques exist—film lamination and liquid (clear coat) lamination.

Reasons for laminating include:

- to increase the durability of the print
- to modify its appearance, such as a gloss or matte finish
- to increase the rigidity of a print, which makes the installation easier on large surfaces

Film lamination is the most common technique used—it provides a high level of protection and the equipment required is relatively simple and affordable. Correctly applied, film lamination can provide long-term protection from scratches and abrasion as well as from water and common chemicals. If the film lamination includes a UV filter, it can also increase the light-fade resistance of the graphic.

Liquid (clear coat) lamination may be used for flexible substrates such as canvas and PVC banner, where film lamination is not a practical solution. Liquid lamination is also used by high-volume vehicle fleet graphics specialist companies who require a more economical solution than film lamination. Liquid lamination is more complex to apply than film lamination since it requires specialist equipment to provide an even, consistent layer. Liquid lamination provides the graphic with additional protection, however not to the level of film lamination.

Due to the wide variety of lamination products available, customers should refer to the media manufacturer for suitable lamination recommendations.

Lamination recommendations

There are no hard-and-fast rules about when lamination should be used, but by understanding the different durability attributes of prints produced with HP Latex Inks, you can be in the best position to design and build appropriate graphics and applications.

General recommendations with HP 831, 871, 881 and 891 Latex Inks:

Duration	Recommendation
Short-term applications (< 1 month)	Lamination not typically required, unless harsh conditions expected
Mid-term applications (1-6 months)	Lamination recommended, especially if graphics are expected to receive repeated rubbing or scuffing (e.g. graphics on doors and near handles)
Long-term applications (> 6 months)	Lamination strongly recommended

HP Latex Inks durability with textiles

Soft signage is a fast-growing application within the broad, digital wide-format signage market. Signage printed on polyester, cotton and other fabrics provides a more high-class appearance than traditional PVC banner, self-adhesive vinyl and paper signage, and it is easier to ship and install. Additionally, the opportunity to choose recyclable fabrics makes soft signage a potentially more environmentally friendly alternative to other types of flexible signage.

PSPs have a number of technology options for printing textiles, including dye-sublimation technology, UV-curable ink technology, as well as HP Latex Technology.

Dye sublimation is a dedicated textile technology. It provides durable results; however, dye-sublimation printers can only be used for printing textiles and an additional investment in a calender (a type of heat press) is also required. The dye sublimation printing process demands a high level of expertise and requires good climate control for consistent results.



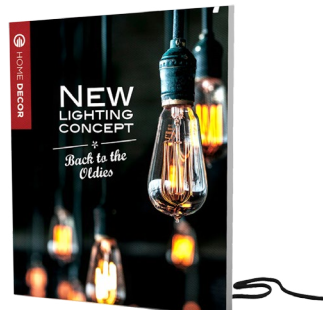
Dye sublimation is a two-step process requires a specialized textile calender

HP Latex Technology can be used for printing on fabrics used for soft signage, mainly for indoor usage. HP Latex Printers and Inks are compatible with a range of textiles, both coated and uncoated, such as polyesters and natural fiber blends, and they do not need any post-processing.⁹ HP Latex prints are odorless and, thanks to the flexibility of the ink, the feel of an un-coated material is maintained.



HP Latex Technology is a single-step process

Backlits and frontlits that are printed on textile rather than vinyl, provide a softer, more premium textile look. Backlits made from textiles have the added advantage of being lighter, which not only facilitates the shipping (more cost effective) but also the mounting of the application. The backlit is less likely to bulge from the weight of the material since textiles are light.



⁹ Performance may vary depending on media—for more information, see hp.com/go/mediasolutionslocator or consult your media supplier for compatibility details. For best results, use textiles that do not stretch. Performance varies by printer. HP Latex 360 and 850 Printers include an ink collector for printing on porous textiles. The HP Latex 3000 Printer requires the optional ink collector for porous textiles. For all other HP Latex printers, print on media that does not let the ink trespass onto the printer.

One important property of printed textiles used in applications like retail PoP and exhibition graphics is their scratch and abrasion resistance. There are new textiles being released into the market with a very good performance from a handleability point of view, making these applications ideal for HP Latex Technology.

In addition to being used for soft signage applications, HP Latex technology is increasingly being used to create “customizable clothing.”

HP Latex Printers can print custom, washable high-quality transfers in any shape or size using standard “heat transfer material” widely available in the market for inkjet printing. This is a material which usually consists of a liner, a heat-sensitive adhesive and the printable material itself, which is usually made of vinyl or polyurethane. Using an “applicator tape”, the finished print is placed upon the fabric and a heat press is used to directly transfer the image. HP Latex Inks can be transferred directly after printing, with no need for drying, and are great for T-shirts, sweatshirts, tote bags, aprons, and more.

Each heat transfer material is suitable for specific fabrics, e.g. polyester, cotton, nylon, etc. and application tapes require different heat settings as specified by the media vendor. Check the corresponding Data Sheets of the material and media, to learn about these compatibilities and specifications.

T-shirts printed with the appropriate heat transfer material can be washed many times with no visual impact.



If in doubt about suitability for a particular application, customers should test first.

Find a comprehensive list of all latex compatible media along with finished color profiles and printing settings at hp.com/go/mediasolutionslocator

Application warranties

All media manufacturers provide a basic product warranty to cover manufacturing defects such as visual defects or adhesive failure, for example.

3M and Avery Dennison go beyond this basic product warranty, and provide application warranties for customers using their products in conjunction with HP Latex printers.

- 3M Performance Guarantee
- 3M™ Matched Component System (MCS™) Warranty
- Avery Integrated Component System (ICS) Performance Guarantee

3M Performance Guarantee

This warranty covers replacement or credit of the 3M products in case of physical defects, printing defects, cutting defects, and graphic appearance defects.

All HP Latex printers and HP Latex Inks are covered by the 3M Performance Guarantee.

The duration of the warranty period depends on the combination of 3M film used, overlamine, ink system, as well as the display conditions (vehicle, outdoor, watercraft, indoor). 3M publishes warranty matrices where the duration for each combination can be checked.



For complete information on the 3M Performance Guarantee terms and conditions, as well as warranty matrices, refer to the 3M documentation available at 3Mgraphics.com (choose your country for more specific warranty information) or consult your local 3M representative.

3M™ Matched Component System (MCS™) Warranty

The 3M™ MCS™ Warranty is available to certified graphics manufacturers (including PSPs). It goes beyond the 3M Performance Guarantee, and covers credit or replacement of all 3M products used in the graphic in case of physical defects, printing defects, cutting defects, graphic appearance defects, as well as ink performance related issues like excessive image fading, image cracking or crazing, image peeling, and gloss changes. Certain fleet and vehicle graphics may also have a labor reimbursement component.

The following HP Latex Inks and HP Latex printers are covered by the 3M™ MCS™ Warranty:

- HP 891 Latex Inks for the HP Latex 3500 Printer
- HP 881 Latex Inks for the HP Latex 1500/3100 Printers
- HP 831 Latex Inks for the HP Latex 365/560/570 Printers
- HP LX610 Latex Inks for the HP Latex 600/820/850 Printers
- HP 792 Latex Inks for the HP Latex 210/260/280 Printers



3M™ MCS™ Warranty

The duration of the warranty period depends on the combination of 3M film used, overlamine, ink system, as well as the display conditions (vehicle, outdoor, watercraft, indoor). 3M publishes warranty matrices where the duration for each combination can be checked. Coverage up to 6 years under the 3M™ MCS™ Warranty with film lamination.

Choose 3M™ Screen Print UV Gloss Clear 9760LX liquid lamination designed specifically for third-generation HP Latex Inks and get coverage up to 5 years under the 3M™ MCS™ Warranty.

For complete information on the 3M™ MCS™ Warranty terms and conditions, as well as warranty matrices, refer to the 3M documentation available at 3Mgraphics.com (choose your country for more specific warranty information) or consult your local 3M representative.

Avery Integrated Component System (ICS) Performance Guarantee



This warranty is written assurance from Avery Dennison that their products perform as expected from production through application and for the life of the graphic.

All HP Latex printers and HP Latex Inks are covered by the Avery ICS Performance Guarantee.

The duration of the warranty period depends on the combination of Avery Dennison film used, overlamine, ink system, as well as the display conditions (outdoor, vehicle, marine, other). Avery Dennison publishes warranty matrices where the duration for each combination can be checked.

For complete information on the Avery ICS Performance Guarantee terms and conditions, as well as warranty matrices, refer to the Avery Dennison documentation available at averydennison.com (choose your country for more specific warranty information) or consult your local Avery Dennison representative.

Learn more at
hp.com/go/latex





HP Latex Inks: Health and environmental advantages

Water-based HP Latex Inks offer health and environmental advantages - compared to eco-solvent, solvent, or UV-curable inks - from the work zone to the point-of-display of finished prints and recycling of consumables.

Introduction

Third-generation HP 831 Latex Inks in the HP Latex 310, 330, and 360 Printers and HP 881 Latex Inks in the HP Latex 3000 Printer include a number of significant innovations that take the benefits of HP Latex Inks to a new level. HP Latex Inks provide outdoor durability and versatility across all common media types used in sign and display applications together with high quality, odorless prints, low maintenance, and the reduced environmental impact of water-based inks.

HP Latex Printing Technologies address environmental and health concerns across a broad range of attributes throughout the entire life cycle of a print from production to disposal. The water-based formulation of HP Latex Inks fundamentally provides healthier print production without trading off performance.

Health and environmental performance and certifications

The water-based formulation of HP 831 and HP 881 Latex Inks and HP Latex Optimizer offers a healthier solution that better meets the health and environmental objectives of both print service providers and their customers.

Performance

No special ventilation is required with HP Latex Inks.¹ HP Latex Inks have no hazard warning labels, contain no Hazardous Air Pollutants (HAPs),² are non-flammable and non-combustible,³ and are nickel-free.⁴ HP Latex Inks allow print service providers to produce odorless prints for indoor display in sensitive environments such as hospitality and healthcare.

Certifications

HP Latex Inks have qualified for certifications that demonstrate they meet some of the world's most rigorous and comprehensive standards for low chemical emissions into indoor air.



¹ Special ventilation equipment (air filtration) is not required to meet U.S. OSHA requirements. Special ventilation equipment installation is at the discretion of the customer—see the Site Preparation Guide for details. Customers should consult state and local requirements and regulations.

² HP Latex Inks were tested for Hazardous Air Pollutants, as defined in the Clean Air Act, per U.S. Environmental Protection Agency Method 311 (testing conducted in 2013) and none were detected.

³ Water-based HP Latex Inks are not classified as flammable or combustible liquids under the USDOT or international transportation regulations. Testing per the Pensky-Martins Closed Cup method demonstrated flash point greater than 110° C.

⁴ Nickel free demonstrated according to testing conducted for HP Latex Inks to achieve UL ECOLOGO® Certification. UL ECOLOGO® Certification to UL 2801 demonstrates that an ink meets a range of stringent criteria related to human health and environmental considerations (see ul.com/EL).

UL ECOLOGO®Certified HP Latex Inks meet a range of stringent human health criteria.⁵ As of January 2014, HP is the only large format digital printing manufacturer to earn UL ECOLOGO®Certification for latex printing inks. HP Latex Inks are GREENGUARD GOLD Certified to standards for low chemical emissions into indoor air.⁶

In addition, prints produced using HP Latex Inks on HP PVC-free Wall Paper meet AgBB criteria for health-related evaluation of VOC emissions of indoor building products.⁷ These prints are rated A+ (very low-emission) according to the *Émissions dans l'air intérieur*.statement on the level of emission of volatile substances in indoor air posing health risks if inhaled.⁸

Recyclability

An important component of total environmental performance is the recyclability of used consumables. All HP 831 printing supplies—including ink cartridges, printheads, and maintenance supplies—as well as HP 881 Latex Printheads are recyclable through the HP Planet Partners program.⁹ HP 881 Latex Inks are supplied in 5-liter ink cartridges, where approximately 70% of the weight of the used ink cartridge is a recyclable cardboard container.

Health and environmental performance compared

The entries in Table 1 on the following page compare HP Latex Ink technology to competitors with leading market share as of December 2013. Entries are based primarily on analysis of published MSDS/SDSs¹⁰ accompanied by HP internal analysis and evaluation where needed. Performance of specific attributes may vary by competitor and variations in ink formulation within a printer product line.

Results

Table 1 clearly demonstrates that HP Latex Inks offer a healthier solution than competing ink technologies in commercial large format print production.

Summary

Compared to other leading inkjet ink technologies used in commercial large format print production, water-based HP Latex Inks offer a healthier solution from the print shop to the customer's point-of-display and the recycling of consumables.⁹ HP Latex Inks meet a range of stringent human health criteria represented by UL ECOLOGO®and GREENGUARD GOLD Certifications.^{5,6}

⁵ UL ECOLOGO®Certification to UL 2801 demonstrates that an ink meets a range of stringent criteria related to human health and environmental considerations (see ul.com/EL).

⁶ GREENGUARD GOLD Certification to UL 2818 demonstrates that products are certified to GREENGUARD standards for low chemical emissions into indoor air during product usage. For more information, visit ul.com/gg or greenguard.org.

⁷ HP WallArt printed on HP PVC-free Wall Paper and other prints on HP PVC-free Wall Paper printed with HP Latex Inks meet AgBB criteria for health-related evaluation of VOC emissions of indoor building products (see umweltbundesamt.de/en/topics/health/commissions-working-groups/ausschuss-zur-gesundheitlichen-bewertung-von).

⁸ *Émissions dans l'air intérieur* provides a statement on the level of emission of volatile substances in indoor air posing health risks if inhaled—on a scale from A+ (very low-emission) to C (high-emission).

⁹ Visit hp.com/recycle to see how to participate and for HP Planet Partners program availability; program may not be available in your area. Where this program is not available, and for other consumables not included in the program, consult your local waste authorities on appropriate disposal.

¹⁰ MSDS is the ink's Material Safety Data Sheet. SDS is the Site Data Sheet.

Table 1 – Attributes of Competing Ink Technologies

Attributes	HP Latex Inks	UV Curable ink	Hard Solvent ink	“Ecosolvent” ink-1	“Ecosolvent” ink-2
Print odor	Odorless	Low odor	Solvent odor	Slight odor	Slight odor
Special ventilation required¹	None	<i>Typically none for this ink category.</i>	<i>Typically required for this ink category.</i>	None	None
Cleaning fluids: health hazards labels	Cautionary statement only: Contact with skin and eyes may result in irritation. No “R” phrases.	Xi; R36/R38 Irritating to eyes and skin.	Xn; Xi; R36/R66/R67. Irritating to eyes. Repeated exposure may cause skin dryness or cracking. Vapors may cause drowsiness and dizziness.	May be harmful if swallowed. Causes skin irritation. Causes serious eye damage.	Cleaning cartridge, Ink cleaning kit: Skin corrosion/ irritation; Hazard category 2
Ink health hazards labels – general handling	Cautionary statement only: Contact with skin and eyes may result in irritation. No “R” phrases.	Xi; R36/R37/R38. Irritating to eyes, respiratory system, skin.	Xi; R36 Irritating to eyes R36. Xn harmful if inhaled or swallowed.	May be harmful if swallowed. Causes skin irritation. Causes serious eye damage. May damage fertility or the unborn child.	Skin corrosion/ irritation; Hazard category 2, CA Prop 65: toluene 108-88-3 <0.03% by weight of proprietary organic materials.
Flammability/ combustibility	FP > 93.3C	White FP > 90C, others > 95C	R10 flammable	FP > 71C	Inks > 74.4C, cleaning kit FP > 70C
HAPs free (inks and maintenance fluids)	None according to EPA Method 311	Claims “UV inks generally do not contain HAPs”	<i>Ink category typically contains HAPs.</i>	<i>Ink category typically contains HAPs.</i>	B, C, M, Y, cleaning cartridge, ink cleaning kit: Section 15 lists 112-36-7 and 1002-67-1 as CAA 112 HAP
VOCs: inks, pre- and post-treatments	231 g/L – 294 g/L	Claims “No VOCs”	<i>Typically above 800 g/L for this category of ink.</i>	C, M, Y, K, Lc, Lm: 920 g/L, White: 800 g/L., Silver: 930 g/L	<i>Typically above 800 g/L for this category of ink.</i>
VOCs: Maintenance fluids	241 g/L	60-100% is 2-(2-ethoxyethoxy)ethyl acetate (112-15-2)	<i>Typically above 800 g/L for this category of printer.</i>	Cleaning fluid > 940 g/L	<i>Typically above 800 g/L for this category of printer.</i>
Waste profile labels for inks	None	R52/53 Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.	<i>Typically hazard labels required for this category of ink.</i>	No information	Copper content < 3,400 ppm
GREENGUARD GOLD	Yes	Yes	No	Yes	No
UL ECOLOGO®	Yes	No	No	No	No
Recyclable consumables	Yes	No	No	No information	No

Legend: Entries in Table 1 are color-coded by relative ranking of health and environmental attributes as follows:

■ Green - highest ■ Yellow - moderate ■ Red - lowest.

Note: Ranking by HP R&D. Cells with *entries in italics* represent the results of HP internal analysis.

