



## Technical backgrounder HP 564 ink cartridge printing technology

### The next generation of versatile home printing

In fall 2008, HP is launching its next generation of printing technology—an innovative 5-ink printing system that delivers enhanced image quality, permanence, versatility and convenience, and leverages the value of individual ink cartridges. This new HP printing system, debuting in the new HP Photosmart D5400 printer, offers customers image quality comparable to 6-ink printing systems with the rich black graphics and text that are a hallmark of HP three- and four-ink systems. HP has incorporated several innovations into this next-generation printing system, including:

- Pigment black ink for laser-quality text
- Color and photo black dye-ink printheads with dual-drop-volume technology and scalable printing technology for fine detail up to 9600 x 2400-optimized dpi resolution<sup>1</sup>
- Specially formulated HP inks for outstanding quality and permanence
- Affordable, high-capacity cartridge options ideal for frequent printing



### Lab-quality photos and laser-quality documents

The new HP Photosmart D5400 printer uses five individual ink cartridges and a single, 5-ink, dual-drop-volume print head. Four dye ink cartridges—cyan, magenta, yellow, and photo black—deliver vivid color and black for lab-quality photos. A fifth cartridge contains pigment black inks for rich black graphics and laser-quality text. Innovative HP technologies built into these cartridges work together to deliver finely-detailed, long-lasting photos and laser-quality text.

#### Scalable Printing Technology

Scalable Printing Technology, an innovative approach to printing-system development, allows HP to tailor inkjet writing systems to ensure brilliant lab-quality photos, plus fast everyday document printing in one easy-to-use, versatile printer. Scalable Printing Technology encompasses virtually every aspect of the printing system, from robust printhead design to ink formulation, ink delivery and writing systems. The new

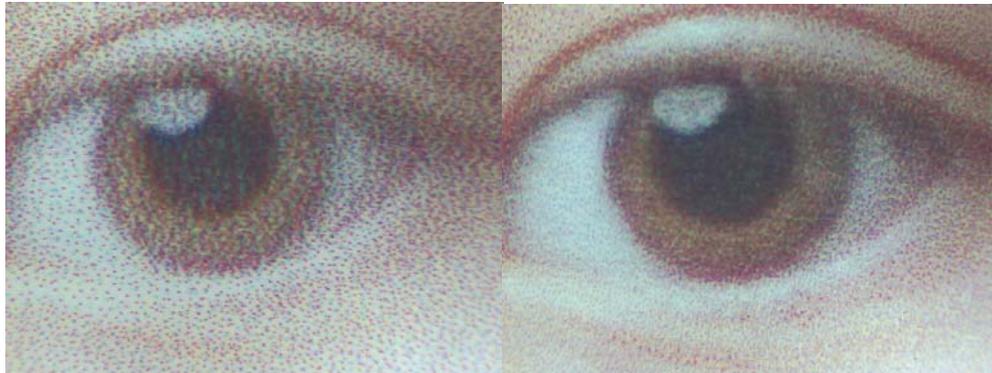
<sup>1</sup> Up to 9600 x 2400-optimized dpi color when printing from a computer on select photo papers and 1200-input dpi.



implementation of Scalable Printing Technology is featured in the new HP Photosmart D5400 series printing systems. This system extends the flexibility of this innovative technology with new dual-drop-volume printheads for the color and photo black dye inks, allowing a wide range of ink drop volumes for high-quality prints on a range of applications.

### Dual-drop-volume technology

HP's new dual-drop-volume cartridge technology eliminates the need for lighter, photo dye-load inks, reducing image grain and increasing the available color gamut for photos. With HP dual-drop-volume cartridge technology, customers can get photo quality comparable to six-color inkjet printers with a five ink printing system. Dual-drop-volume printing offers customers exceptional versatility by allowing the printer to produce light color shades and rich photographic black essential for lab-quality photos and vibrant color for graphics—all from a single set of ink supplies. In dual-drop-volume modes, the printer can eject color and photo black ink droplets as small as 1.3 pl and as large as 5.2 pl. About 3.8 billion of these 1.3 picoliter droplets would fit in a teaspoon. The printer can fire any combination of these small or large ink droplets on a given print position—small and large droplets together, just small drops or just large. The size and combinations of ink droplets are determined by the printer in order to provide the optimum print quality and speed. Dual-drop-volume printing is used when printing photos and color graphics in Normal, Best and Maximum-dpi print modes on select HP photo and brochure papers.<sup>2</sup>



Micrograph of single-drop-volume image

Micrograph of dual-drop-volume image

### Printing at up to 9600 dpi

The smaller drop volumes used in the new ink cartridge delivery system of the HP Photosmart D5400 printer enable print resolutions of up to 9600 x 2400-optimized dpi color<sup>1</sup> when printing in Maximum dpi mode on HP Advanced Photo Paper. Customers can enable the Maximum dpi setting under Printing Defaults in the "Advanced" tab of the printer driver software.

Previous HP inkjet products offered up to 4800-optimized dpi color printing. This enhanced, 9600 x 2400-optimized dpi<sup>1</sup> setting offers customers an alternative photo mode that provides benefits when printing very high resolution source images (e.g., higher than

<sup>2</sup> HP Brochure and Flyer Paper, HP Premium Paper, HP Everyday Photo Paper and HP Advanced Photo Paper.



600 dpi) from digital cameras or scanners. But, using this mode dramatically increases the amount of data the system must process, which results in slower print speeds. Because the majority of digital source files are well under 600 dpi, the maximum dpi setting is generally not needed to improve output quality for most photo printing. In almost all instances, the default print mode will provide the best combination of image quality and speed.

### Halftoning

The HP Photosmart D5400 printer uses high-quality, high-resolution halftoning to deliver enhanced gradient tones for smooth, uniform color output. Halftoning is the process used by inkjet printing systems to lay down different combinations of ink droplets and create the range of colors seen on the printed page. Generally speaking, color print quality is improved as halftoning is performed—distributing small ink drops evenly, with minimal overlap between ink dots. The HP Photosmart D5400 printer achieves these optimal dot-placement patterns using improved halftoning algorithms, updated for optimal performance with new HP dual-drop-volume technology. The result is virtually the same large color gamut, accurate colors and smooth transitions available with HP 6-color inkjet printing systems, but with fewer inks and no need for optional photo cartridges. Previously, advanced halftoning was available only when using the Maximum dpi setting, but now customers benefit from HP advanced halftoning methods in all print modes.

### New, specially formulated inks for photos and documents

The new 5-ink printing system leverages ink chemistry used in compact-photo-printer ink cartridges and optimizes it for both photo printing and plain paper printing. Customers get fast-drying prints with improved water and smudge resistance, using one recommended photo media—HP Advanced Photo Paper. They'll also get the exceptional image quality and long-lasting fade resistance they expect from HP.<sup>3</sup> With the addition of pigment black inks, customers will also enjoy laser-quality black text on plain paper, and enhanced document quality when using papers with the ColorLok logo. Papers with the ColorLok logo deliver bolder blacks, improve contrast, sharpen text and ensure colors are uniform and vivid for vibrant graphics. Please refer to the technology backgrounder on the newest HP porous-optimized inks for details.

#### **New HP Vivera inks and HP Advanced Photo Paper deliver:**

- 65 years of light-fade resistance under glass<sup>3</sup>
- 11 years of ozone-fade resistance<sup>3</sup>
- Scratch and water resistance

### The versatility and value of five inks

The HP 5-ink printing system offers exceptional versatility and convenience and delivers impressive results comparable to a 6-ink printing system. With five individual ink cartridges, customers get the right ink combination for each printing project, from photos to presentations.

<sup>3</sup> Based on preliminary display-permanence testing under glass by Wilhelm Imaging Research. For details, visit <http://hp.com/go/printpermanence>.



## Designed for quick print speeds

The new printing system includes a resistor innovation that enables the 36kHz high-frequency firing speed. This resistor innovation also enables a high nozzle count—720 for black and 672 for each color—for a total of 3,408 nozzles. These tightly compacted nozzles (1,200 per inch) are capable of firing at 122 million drops per second, and delivering efficient speeds for photos—as fast as 18 seconds for a 4 x 6-inch print<sup>4</sup>—and versatile, everyday printing.

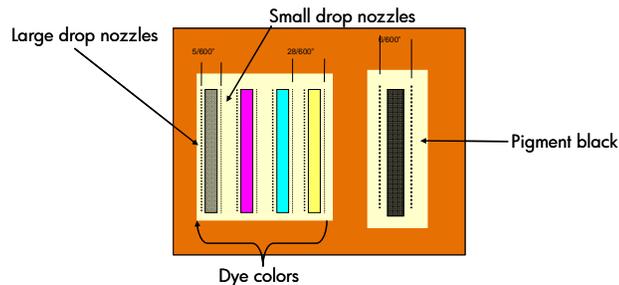


Diagram of dual-drop-volume printhead nozzles, which fire 5.2 and 1.3 pl ink droplets.

## Economical printing

Customers will enjoy affordable printing with low-cost, individual ink cartridges, letting them replace each ink cartridge separately when it's needed. For fewer cartridge changes and a better value for frequent printing, customers can choose high-capacity Original HP ink cartridges that offer three times more black printed pages and 2.5 times more color printed pages than standard Original HP ink cartridges. For more information about HP ink cartridges and page yields, please visit: [www.hp.com/go/learnaboutsupplies](http://www.hp.com/go/learnaboutsupplies). HP 564 Photo Value Packs, which include all the ink and photo paper customers need to print 150 lab-quality photos at home, offer a convenient, affordable photo-printing solution.<sup>5</sup>



564 standard cartridges



564 high-capacity XL cartridges



564 photo value pack

## Printhead lasts virtually a lifetime

The HP Photosmart D5400 printer uses a long-lasting, dual-drop-volume print head in a new, integrated design. The print head is built on silicon wafers using photolithography to maintain accuracy and alignment throughout the entire system. Closely integrated

<sup>4</sup> After first page; see [www.hp.com/go/inkjetprinter](http://www.hp.com/go/inkjetprinter) for details.

<sup>5</sup> Average based on HP testing methodology and continuous printing. Actual yield varies considerably based on content of printed pages and other factors. For details see [www.hp.com/go/learnaboutsupplies](http://www.hp.com/go/learnaboutsupplies). HP 564 Black Ink Cartridge for text printing not included; installation necessary for printer operation.



components enable precise, accurate drop placement for fast, high-quality printing and consistent, reliable results over the life of the product. Using Original HP ink cartridges and other innovations help ensure reliable operation by preventing particles and air bubbles from entering the print head.

Additionally, the print head features a new use for HP's recycled plastic. The HP Photosmart D5400 series printhead uses 55 percent recycled content plastic (RPET), which is derived from Original HP ink cartridges collected from customers through HP's Planet Partners return and recycling program and other sources, such as water bottles.

### Optimized media performance

This new printing system adds a pigment black ink cartridge optimized for plain paper printing, delivering enduring documents with laser-quality text and sharp edges around graphics. Customers will get documents and photos with outstanding image quality and rich grayscale graphics. And with HP Advanced Photo paper, customers will receive prints with enhanced durability, water- and smear-resistance and speed for lower cost, when compared to printing with HP Premium Plus Photo paper.

## The convenience and ease of five individual inks

From convenient ink supply monitoring to hassle-free reordering—this 5-ink system features technology that makes supplies management easy.

### Self-regulating system with Smart Printing Technology

The HP Photosmart D5400 printer uses new HP ink supplies that incorporate HP Smart Printing technology. HP Smart Printing technology allows Original HP ink supplies to communicate directly with the printer, and ensures the cartridges receive the exact amount of energy required to fire the resistors. These precise adjustments in energy levels help prolong printhead life and maintain great print quality.

HP Smart Printing technology makes it easy for customers to monitor ink supplies with estimated ink-level status information and low-ink alerts. Using their printer software, customers can view graphical representations of ink levels in installed cartridges, displayed in 10-percent increments. Low-ink alerts enable customers to plan ahead and have replacement cartridges on hand.

### Easy cartridge replacement

When it's time to order replacement ink cartridges, HP SureSupply makes it easy to find the cartridges that work with a customer's installed printer. Customers simply access HP SureSupply from convenient ink alerts, and then view a list of compatible HP ink cartridges and shop from a variety of online sources.<sup>6</sup> Installing ink cartridges is also quick and easy. Cartridge design ensures that customers load the right color of ink into the right spot.

## Environmental responsibility

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<sup>6</sup> Program features and availability may vary by country. For more information, visit [www.hp.com/learn/suresupply](http://www.hp.com/learn/suresupply).



HP offers free and easy cartridge recycling through the HP Planet Partners program, available in 47 countries and territories around the world.<sup>7</sup> HP ensures that all collected HP print cartridges are recycled responsibly. HP never refills them, resells them or sends them to a landfill.

## Lab-quality prints and laser-quality documents with low-cost individual ink cartridges

Together, HP advancements and innovative features ensure this new printing system will deliver:

- Vibrant, lab-quality photos—New dual-drop-volume technology delivers microscopic ink drops, as small as 1.3 picoliters, for smooth transitions and reduced image grain.
- Convenience—5-ink printing for brilliant, true-to-life photos and laser-quality text with a single set of supplies—there's no need to swap ink cartridges or manage six or more individual inks.
- Laser-quality documents—Pigment black ink delivers laser-quality black text and graphics for impressive documents.
- Fast, instant-dry, durable photo prints—New inks specially formulated for porous photo media deliver vibrant, durable prints that last for generations when using HP Advanced Photo Paper.<sup>8</sup>
- Low-cost supplies—Individual, low-cost HP ink cartridges allow customers to replace only the color that runs out, and optional HP high-capacity supplies provide three times more black and 2.5 times more color pages than standard supplies.<sup>9</sup>

With the combined benefits normally only available in separate printing systems—lab-quality prints, laser-quality text, plus low-cost cartridges—HP customers can now turn to a single printing solution for their photo and document printing projects.

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<sup>7</sup> HP ink cartridge return and recycling is available in 42 countries and territories around the world, covering 88% of the addressable market; see [www.hp.com/recycle](http://www.hp.com/recycle) for details.

<sup>8</sup> Based on preliminary display-permanence testing under glass by Wilhelm Imaging Research. For details, visit <http://hp.com/go/printpermanence>.

<sup>9</sup> Compared with HP ### Black/Color Ink Cartridges. [Regions: Please update ink cartridge number for your region.]