Technical brief

HP PageWide Technology: quality and speed

Balancing speed, quality, and cost in printing applications once meant sacrificing one benefit for another. Today, HP PageWide Technology overcomes these trade-offs with revolutionary and scalable designs that deliver quality and speed together—at a significant cost advantage—based on the latest HP printing innovations built on proven technologies.

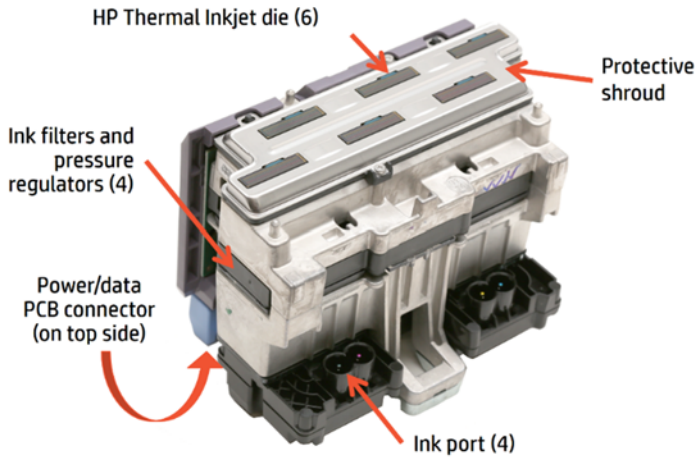
Outstanding quality and high productivity

A common expectation for digital printing is that you can't have it all: if you need to print faster, then you should expect lower quality; if you need the highest quality, then you must accept lower productivity. Nearly a decade ago, HP's investments in printing technology began to challenge that expectation with the introduction of HP Scalable Printing Technology ("HP SPT"). HP SPT includes printhead technologies, advanced inks, materials, design rules, and precision production methods based on integrated circuit manufacturing. HP SPT accelerated the pace of HP printing innovation by delivering printheads that are scalable in size, features, and performance while leveraging proven designs into new applications. HP PageWide Technology is the latest HP printing innovation powered by HP SPT.

By moving only the paper under a page-wide, stationary printhead, HP PageWide Technology overcomes the trade-offs between quality and speed in traditional inkjet printers. The benefits are speed and quality together with lower costs and higher energy efficiency.[1,2,3] Today, HP PageWide Technology underlies the performance of HP Inkjet Web Presses, HP X-series business printers, and HP PageWide large-format printers.

Figure 1 shows an HP printhead module used in HP's new PageWide large-format printers. The S-shape of the modules allows them to be stacked seamlessly across the width of the paper to build printers in different formats. For example, eight modules are used in D-size (A1) HP PageWide large-format printers. Each module can print four colors of HP Pigment Ink in a print swath 5.08 inches (129 mm) wide. The module has on-board ink filters, pressure regulators and connectors for power, data, and ink. Used modules are easily removed and replaced by the user.[4]

Figure 1. Printhead module used in HP PageWide large-format printers

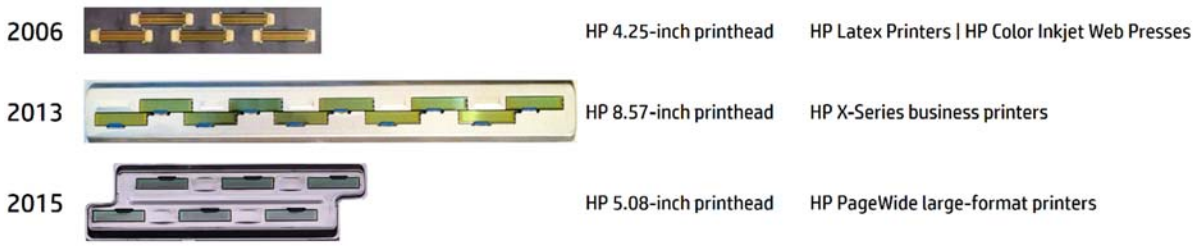


This printhead is built from six (6) precision-aligned HP Thermal Inkjet silicon chips—called "die"—protected by a stainless steel shroud.[5] Each die has 6,336 nozzles for a total of 25,344 nozzles on the module. Unlike other inkjet technologies, HP SPT allows nozzles to be placed at high density—1,200 nozzles per inch—for speed and quality.

The evolution of HP PageWide innovation

Figure 2 shows the evolution of HP PageWide printheads. In 2006, the first application of HP PageWide Technology used 4.25-inch wide bi-color printheads in the HP CM8060 MFP—a workgroup multifunction color printer. This printhead has two independent ink supplies and two columns of 5,280 nozzles at 1,200 nozzles per inch (10,560 total nozzles). It can be used as a bi-color printhead or as a single-color printhead. For high-speed commercial applications served by HP's Color Inkjet Web Presses, using one color of ink in both columns provides "4-times" nozzle redundancy: four nozzles can print in each 600 dpi dot row down the web. In 2008, the HP T300 Color Inkjet Web Press was introduced using 140 of these printheads to print both sides of a 30-inch web at up to 400 feet/minute. Today, the HP T400 family of inkjet web presses use 200 4.25-inch printheads to print duplex at up to 800 feet/minute on a 42-inch web. In 2013, the HP Latex 3000 Printer was introduced using seven (7) 4.25-inch printheads on a scanning carriage to produce a wide print swath.

Figure 2. Three generations of printheads used in HP PageWide Technology



Based on technology proven in HP Inkjet Web Presses—printing 4 billion pages per month[6] under demanding commercial printing conditions—HP's next generation of HP PageWide Technology was introduced for office applications in 2013 with the HP X-Series business printers. This printhead incorporates significant technology advances: four colors of ink with 10,560 nozzles per color at 1,200 nozzles per inch for a total of 42,240 nozzles on the printhead.

In 2015, HP will introduce a new generation of high-productivity large-format printers using the printhead module shown in Figure 1. And, in 2016, HP will introduce High Definition Nozzle Architecture (HDNA) for HP Inkjet Web Presses. HDNA uses the high-definition capabilities of HP SPT to place low drop weight nozzles between existing nozzles on the 4.25-inch printhead. This provides low and high drop weight printing with twice the number of nozzles—21,120 at 2,400 nozzles per inch—for a breakthrough in quality and performance in high-speed production printing.

HP manufactures printheads in its own factories around the world. Vertical-integration of research, product development, and manufacturing allows HP to monitor and control quality from silicon wafers through finished printheads. This gives HP an edge in innovating new solutions that support ever-expanding opportunities for HP's customers.

Reliable one-pass printing

HP PageWide Technology gets its speed by printing in a single pass, but achieving reliable quality requires innovation and advanced technologies in printheads, printhead service stations, inks, and paper transport.

To precisely place a dot of ink, each nozzle must eject a drop when it is required and within tight tolerances on speed, direction, and drop weight. A service station in the printer checks each nozzle's performance and determines if it is operating properly. Using HP's optical drop detectors—which can see individual drops in-flight—1000's of nozzles can be checked every second. The service station cleans, wipes, and caps the printhead, and it can restore nozzles to operation. But if a nozzle cannot be recovered immediately, then HP PageWide Technology uses both passive and active methods to substitute good nozzles for bad ones suppressing artifacts such as white streaks down the page.

HP develops advanced pigment inks in its own laboratories to meet the unique requirements of HP PageWide Technology. HP Pigment Inks produce high black density and a wide gamut of vivid, saturated colors in a single pass. Prints are dry and ready to use right out of the printer. Compared to dye-based inks on plain and low-cost papers, HP Pigment Inks offer superior durability: resistance to damage from water, highlighters, dry smudge, and light fade.[7]

Inks are an essential part of reliable drop ejection. Whenever a printhead is uncapped and exposed to air, water in the ink quickly evaporates from nozzles that are about one-fifth the diameter of a human hair. If the printhead is left uncapped for more than a few seconds, the ink thickens in the nozzles making it difficult to eject a drop. Business printers and large-format printers using HP PageWide Technology can eject a few drops between pages (or large-format sheets of paper) to refresh the ink in the nozzles. However, they still must print every drop reliably for several seconds while uncapped. HP Inkjet Web Presses eject drops from every nozzle every fraction of a second on the web in the space between image frames. This technique both services the nozzles and allows built-in vision systems to evaluate nozzle performance.

In HP PageWide Technology, the accuracy of dot placement across the paper is built-in by nozzle placement on the printhead. Properly placing dots along the page requires precision mechanics to load and transport paper and sensors to coordinate drop ejection with paper motion.

HP PageWide Technology has proven reliability in the office. In two separate tests, Buyers Laboratory, Inc. found that business printers using HP PageWide Technology outperformed competitive products in reliable operation.[3,8] According to the independent-testing company, the HP Officejet Enterprise X585dn MFP printed more than 200,000 pages without failure.

Proven technologies – built to perform and last

Introducing a new technology into a business is both an investment in the future and an expression of confidence in the technology and the company that provides it. For more than three decades, HP has delivered printing solutions businesses can depend on. And, new applications of HP PageWide Technology are based on proven, reliable designs and technologies.

With fewer moving parts and simple user-replacement of printheads,[4] printers using HP PageWide Technology are designed and built to be robust. They provide easy maintenance and can support high-duty print cycles— HP Officejet Enterprise X585dn MFP printers have a recommended monthly page volume of 2,000 to 6,000 pages.[9] HP X-series business printers and HP PageWide large-format printers reduce the amount of user intervention with large ink and paper supplies, automatic printhead servicing, automatic closed-loop printhead alignment, and automatic color calibration. Precision paper handling delivers both speed and quality with reliability users can count on during unattended operation.

Competitive costs that support your bottom line

Regardless of performance or durability, cost can often stand in the way of adopting a new technology. HP PageWide Technology eliminates this barrier by delivering low costs-per-page for both black and color printing by using low-cost papers specific to each application. For example, HP PageWide Technology and HP Pigment Inks support plain papers and ColorLok® papers in the office, coated and uncoated standard offset papers in commercial web printing, and uncoated papers and vellum in large-format printing.

Because HP PageWide Technology is scalable in width and performance, it can support a versatile range of media types, sizes, and weights to meet a variety of applications and printing cost requirements. And, total cost-per-page is kept low because the printheads are designed to deliver a long service life.

Solutions to your business needs

Here are some key features of HP PageWide Technology in HP X-series business printers and HP PageWide large-format printers:

Breakthrough speed and professional quality in the office

HP X-series business printers using HP PageWide Technology deliver

- Up to 75 black or color pages per minute, up to two times faster than laser printers[10]
- Substantial cost savings—up to 50% lower costs-per-page than color laser printers[1]
- Up to 84% less energy consumption per page than lasers and ENERGY STAR® certification[2,3]
- Compatibility with corporate enterprise networks for management and workflow solutions.
- More reliable operation compared to competitive printers and high-volume printing without failure.[8]

High-productivity production printing

HP PageWide large-format printers provide

- Up to 30 D/A1 pages/minute and 1500 D/A1 pages/hour in monochrome and color
- Monochrome and color at speeds up to 60% faster than the fastest monochrome LED printer[11]
- Durable, moisture- and fade-resistant prints—even on uncoated bond paper[12]
- Print on a wide range of media up to 40 in/1 m—covering ISO/US technical and offset standards
- Simple printer management with built-in, automatic, closed-loop alignment and color calibration.

Powering the future of printing

Because of its scalability, broad media versatility, and ability to provide reliable quality and speed together at competitive costs, HP SPT and HP PageWide Technology have the potential to transform a wide range of printing applications in both HP's current and future businesses.

Today, printing solutions based on HP PageWide Technology offer businesses the opportunity to take their printing expectations to higher levels and move beyond the trade-off of quality and speed imposed by traditional inkjet printing solutions.

Tomorrow, HP Scalable Printing Technology will advance printing off the page into the realm of 3D manufacturing enabling the production of components with properties and features practically unavailable—and even unimaginable—with current machining methods.

Learn more about how HP PageWide Technology can work for your business:

Business printers
hp.com/go/officejetprox

Large-format printing
hp.com/go/largeformatpagewide

High-speed production solutions
hp.com/go/inkjetwebpress

3D printing solutions
hp.com/go/3Dprinting

Learn more at
hp.com/go/pagewide

1) For HP Officejet Enterprise Color MFP X585-series, cost-per-page (CPP) is based on the majority of color laser MFPs ≤$3,000 USD as of December 2013, based on market share as reported by IDC as of Q3 2013. ISO yield is based on continuous printing in default mode. CPP comparisons for laser supplies are based on published specifications of the manufacturers' highest-capacity cartridges. For details, see hp.com/go/officejet. CPP based on HP 980 ink cartridges' estimated street price. For more information, see hp.com/go/learnaboutsupplies.

2) As of September 2014, based on the HP PageWide Technology printhead life cycle assessment (LCA) results. LCA of HP PageWide Technology printhead commissioned by HP and conducted by PE International.

3) "Comparative Reliability, Energy Consumption, Image Quality and Waste Evaluation: HP Officejet Pro X551dw vs. Competitive Laser Models," Buyers Laboratory, Inc, July 2014.

4) Printheads in HP Inkjet Web Presses and large-format PageWide printers are user-replaceable with a simple unlatch/pull-out/snap-in/latch operation. No tools, handling of electrical and ink connections, or mechanical alignment are required. PageWide printheads in HP Officejet Enterprise Color MFP X585-series are not user-serviceable and are designed for the life of the printer. Where available, used HP printheads can be recycled through the HP Planet Partners Program. For more information, see hp.com/recycle.

5) The term "die" comes from integrated circuit manufacturing and refers to a silicon "chip". The shroud protects the die from mechanical damage and provides a sealing surface for the cap in the printhead service station.

6) Based on customer use data compiled by HP Inkjet High-speed Productions Solutions as of 2014.

7) Fade resistance based on paper industry predictions for acid-free papers and Original HP inks; colorant stability data at room temperature based on similar systems tested per ISO 11798 and ISO 18909. Water resistance based on HP internal testing, using paper with the ColorLok® logo.

8) BLI Custom Test Report HP Officejet Pro X551dw vs. Competitive Laser Models, Sales Battlecard, U140801959. For more information, see www.hp.com/united-states/campaigns/media/bli-report.pdf

9) HP recommends that the number of pages per month of imaged output be within the stated range for optimum device performance, based on factors including supplies replacement intervals and device life over an extended warranty period.

10) Page per minute specification is for HP Officejet Enterprise Color MFP X585 series. Comparison based on manufacturers' published specifications of fastest available color mode (as of December 2013) and includes color laser MFPs ≤$3,000 USD, based on market share as reported by IDC as of Q3 2013 and HP internal testing of printer in fastest available color mode (sample 4-page category documents tested from ISO 24734). See hp.com/go/printerspeeds.

11) With a maximum linear speed of 23 meters/minute (75 feet/minute), an HP PageWide large-format printer is 60% faster than the KIP 9900 printer which, at 14 meters/minute (47 ft/minute), is the fastest rated LED printer as of March, 2015.

12) Based on HP internal testing. Evaluation of prints produced with HP PageWide large-format printers and HP DuraTone pigment ink shows equivalent or better results compared to prints produced with HP 970/971/980 inks that are fade and moisture resistant per ISO 11798 Permanence and Durability Methods certification.

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