KEYPOINT INTELLIGENCE Buyers Lab

Custom Test Report

KPI Comparative Lab Test Report

SEPTEMBER 2018

Canon imagePROGRAF TM-200

vs. HP DesignJet Z6

Advantage ✔	Canon imagePROGRAF TM-200	HP DesignJet Z6
Image Quality	✔	
Print Productivity	✔	
Ink Consumption	✔	
Direct Print Submission Functionality	=	=
Device Feature Set	=	=
Print Driver Feature Set	✔	
Printhead Reliability/Cleaning Routines	✔	

TEST OBJECTIVE

Keypoint Intelligence - Buyers Lab was commissioned by Canon Europe to conduct confidential document imaging device performance testing on the Canon imagePROGRAF TM-200 and the HP DesignJet Z6, and produce a report comparing the relative strengths and weaknesses of the two printers in terms of image quality, productivity, ink consumption, direct print submission functionality, device feature set, driver functionality, and printhead stability and cleaning routines. All testing was performed in Buyers Lab's European test facility in Wokingham, UK.

Executive Summary

The Canon imagePROGRAF TM-200 outshone the HP DesignJet Z6 in most areas during Buyers Lab's graphic arts lab evaluation, with its superior productivity performance, lower ink consumption, and better image quality overall. The TM-200's productivity performance, in particular, was outstanding, with a clear speed advantage in all tested modes, making it the more productive choice for high-resolution environments such as photographic studios as well as being well suited for medium-resolution work such as signs and posters. It also features a significant productivity-boosting hot-swap ink tank design, which lets users replace empty inks while the device is still actively printing. In contrast, when the HP Z6 runs out of ink, printing has to stop for the cartridge to be replaced, which leads to operator downtime.

Image quality delivered by both 24-inch printers was entirely congruous with the standard expected of models that are designed for technical and graphical printing applications. Both devices delivered highly accurate colour reproduction, consistent skin tone colours and smooth halftone coverage in both colour and black. However, the Canon model delivered superior image quality, overall. It had larger colour gamuts on plain and matte coated media overall, better fine detailing in dark contrast areas, more vibrant colours, higher solid densities for CMY, and it exhibited less colour drift when FOGRA39 colour patches were compared before and after the ink consumption test, with a lower mean Delta E drift of 2.1 compared with 6.1 for the HP device. Text and fine line reproduction surpassed that of the HP model, as well, exhibiting none of the bleed that was observed on the HP unit's output. The Canon TM-200 also delivered lower ink consumption across two different test scenarios, when printing three 50-page runs using an ISO Office Poster and a GIS Map test target.

Both models' printheads performed reliably throughout the evaluation. However, while the Canon model's printhead did not experience nozzle clogging issues when powered off over a weekend, the HP model's printhead did suffer issues, and it required more than one clean cycle to rectify.

In terms of device and driver feature sets, the HP model offers some noteworthy features; its HP Professional PANTONE Emulation feature allows users to create and print a swatchbook of multiple PANTONE colours and see how the printer will reproduce them on selected media. It also comes with a 500-GB hard drive (not available with the Canon TM-200) and higher memory, to aid job processing and job storage. In addition to the aforementioned hot-swap ink tanks, the Canon model consumes less energy while printing—69 W compared with 100 W with the HP unit. The Canon model offers a richer driver feature set. It comes with a unidirectional print driver option to eliminate banding on image output even when printing in Fast mode, greater number of media profiles, and a flexible layout nesting option to help users save on paper. While the HP model offers a similar nesting feature, jobs are positioned automatically and it doesn't support the same flexibility and control over image placement. For added flexibility and convenience for workers who travel between sites or work remotely, both printers offer robust direct print submission functionality and support for mobile printing.

With its faster productivity, superior image quality, and lower use of ink overall, the Canon imagePROGRAF TM-200 proved the stronger model in Buyers Lab's large-format evaluation.

Image Quality

Advantage ✔	Canon imagePROGRAF TM-200	HP DesignJet Z6
Text	✔	
Fine Lines	✔	
1x1 Pixel Grid	✔	
Halftone Range	=	=
Halftone Fill	=	=
Solid Density	✔	
Colour Drift across FOGRA39	✔	
Consistency of three skin tones	=	=
Consistency of neutral grey	=	=
Photographic Images	✔	
Colour Gamut (Plain paper, Fast)		✔
Colour Gamut (Plain paper, Standard/Normal)	✔	
Colour Gamut (Plain paper, High/Best)	✔	
Colour Gamut (Matte Coated, High/Best)	✔	

+, — and O represent positive, negative and neutral attributes, respectively.

O Buyers Lab's image quality test evaluation was conducted using Canon Standard Plain Paper 2 and HP Universal Bond.

\+ In terms of colour reproduction, both models delivered a very high standard of output in colour appropriate for any poster printing customer. However, the Canon TM-200 delivered superior quality overall, with finer detailing in dark contrast areas.

\+ The Canon model produced clearly formed and pin-sharp serif and sans serif fonts in both black and colour down to the smallest 3-pt. type size with no bleed observed. The HP model delivered dark well-formed sans serif and serif fonts in colour and in black that were legible from the 6-pt. to the 3-pt. type size, although with minimal bleed when viewed under magnification.

\+ Both models produced the 1x1 pixel grid in CMY in High/Best quality mode with no quality issues. The Canon TM-200 delivered a consistent dot laydown in the 1x1 black-on-white pixel grid, while the HP model delivered an intact 2x2 pixel grid with dots that varied slightly in size.

\+ The Canon TM-200 delivered excellent vertical and horizontal fine lines down to 0.1-pt size in both black and colour; fine lines produced by the HP model displayed minimal bleed and were rated very good. Circles produced by the Canon model were smooth and clean, and judged excellent. Circles produced by the HP unit were well formed and smooth with no line break-up, but showed slight bleed in black. Both models delivered smooth white-on-black circles and fine lines at the 0.25-pt.level, but those produced by the Canon model were more distinct.

O Both models delivered colour and black halftone output across the full range—from the 10% to the 100% dot-fill levels—with distinct transitions between all levels.

O Both models delivered an impressive range of halftone fills in colour mode, with no banding or graininess issues. Neutral greyscale halftone coverage was equally good from both units.

+ The Canon device produced higher optical densities for three colours compared with those produced by the HP unit, while black optical density was comparable.

O The production of three different skin tone colours yielded fairly consistent results for each model. Although the HP unit displayed a slightly greater variance with one skin shade, it was not considered significant and would not be discernible to the naked eye.

O Neutral grey consistency was maintained well by both models, with an equally low variance across the page indicated by low Delta E values.

+ During Buyers Lab's colour drift analysis, in which the FOGRA39 media wedge is submitted to print before and after productivity and ink consumption tests, and measured using EFI Color Verifier software, the Canon TM-200 displayed a lower mean Delta E drift than the HP device—2.1 versus 6.1.

+ When printing on plain media in highest quality settings, the Canon TM-200 delivered a larger (by 7.3%) colour gamut than the HP Z6 model, with a CIE volume of 322,698 versus 300,750 for the HP Z6.

+ Buyers Lab technicians analyzed a wide range of colour and greyscale images output by both devices and found them to be of an exceptionally high standard. However, the Canon TM-200 delivered more vibrant colours and superior fine detailing in dark contrast areas, while output from the HP Z6 was slightly darker and therefore some details in dark contrast areas weren't reproduced as well.

+ The Canon TM-200 produced very good natural-looking skin tones in photographic images, with good definition in the light contrast areas; whilst the HP unit also produced natural-looking skin tones they were slightly flat in comparison.

Print Productivity

Advantage ✔	Canon imagePROGRAF TM-200	HP DesignJet Z6
First Print Out From Ready State Portrait Printing	✔	
First Print Out From Ready State Retail Poster Printing	✔	
Throughput Speed Portrait Printing (Fastest mode)	✔	
Throughput Speed Portrait Printing (Default mode)	✔	
Throughput Speed Portrait Printing (Highest-quality mode)	✔	
Throughput Speed Retail Poster (Fastest mode)	✔	
Throughput Speed Retail Poster (Default mode)	✔	
Throughput Speed Retail Poster (Highest-quality mode)	✔	

+ When printing a single high-resolution portrait, the Canon model was faster than the HP model in terms of speed of the first-print-out from ready state across all tested modes. In Fast and Standard/Normal modes, the TM-200 was 21.8% and 43.3% faster, respectively, and in High/Best mode, the Canon unit was 57.5% faster when compared with the HP model.

+ The Canon TM-200 displayed a speed advantage over the HP model with faster first-print-out times from ready state when printing a single medium-resolution retail poster on plain media. The Canon unit delivered its output with speeds that were faster by 22.7% in Fast mode, 42.6% in Standard/Normal mode, and 50.5% in High/Best quality mode when compared with the HP device.

+ When printing five copies of a single-page A1-size high-resolution portrait test document, the Canon model displayed a speed advantage over the HP model, with per-page speeds that were 62.3% faster in Fast mode, 61.5% faster in Standard/Normal mode and 63.8% faster in High/Best quality mode.

+ When printing five copies of a single-page A1-size medium-resolution retail poster test document, the Canon model delivered its output with speeds that were faster by 56.6% in Fast mode, 49.9% in Standard/Normal mode, and 61.7% in High/Best quality mode when compared with the HP Z6.

Ink Consumption

Buyers Lab technicians observed that, owing to the vagaries of inkjet technology (for example, head flushing and calibration routines can occur at any time during testing), the same test can produce different results at different times. Although Buyers Lab makes every effort to ensure that devices are tested on a level playing field, the test results should be regarded as an indicator of likely performance and not as a prediction of actual ink consumption in a real-world environment.

Overall Weight of Ink Used (in Grams)

	Canon imagePROGRAF TM-200	HP DesignJet Z6
ISO Office Poster	40.4	51.7
GIS Map	29.5	83.1

Results are averaged across three sets of 50-page A1 printing in Standard/Normal mode.

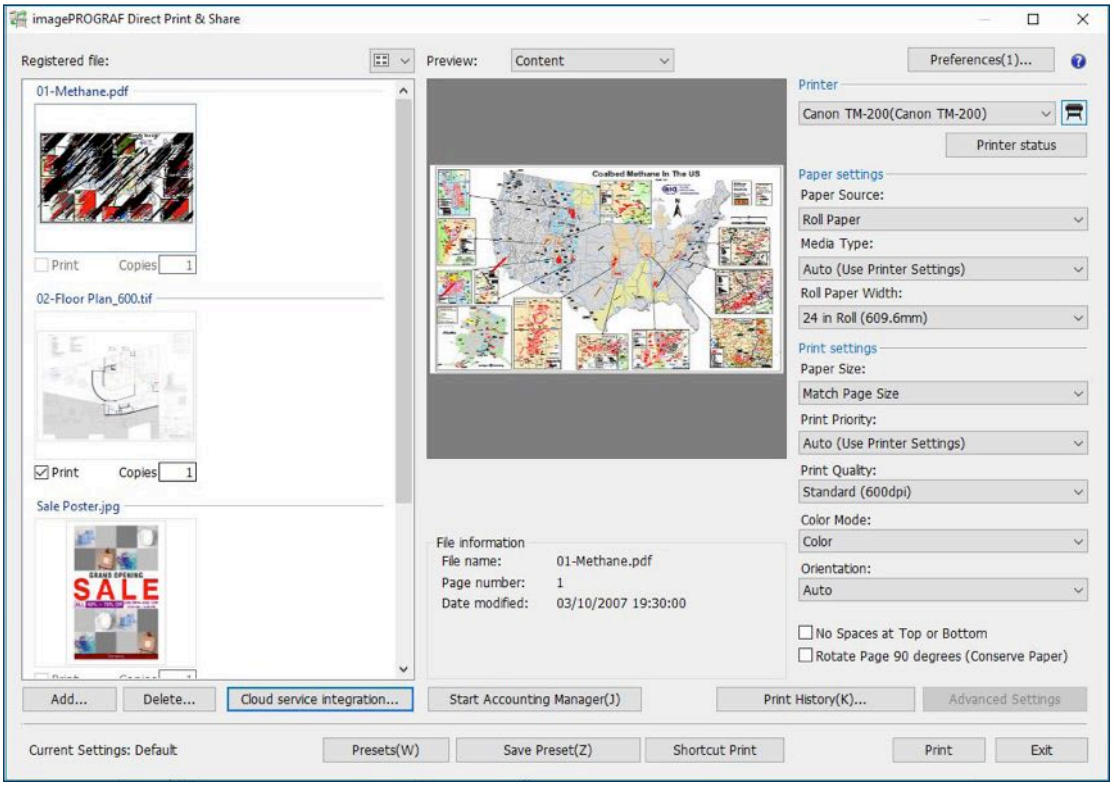
+ When printing 50 copies of an ISO Poster in Standard/Normal mode on matte coated media, the Canon TM-200 used 21.8% less ink in terms of net weight than the HP Z6.

+ When printing a GIS Map in Standard/Normal mode on plain media, the Canon unit used 64.5% less ink than the HP Z6 did.

Direct Print Submission Functionality

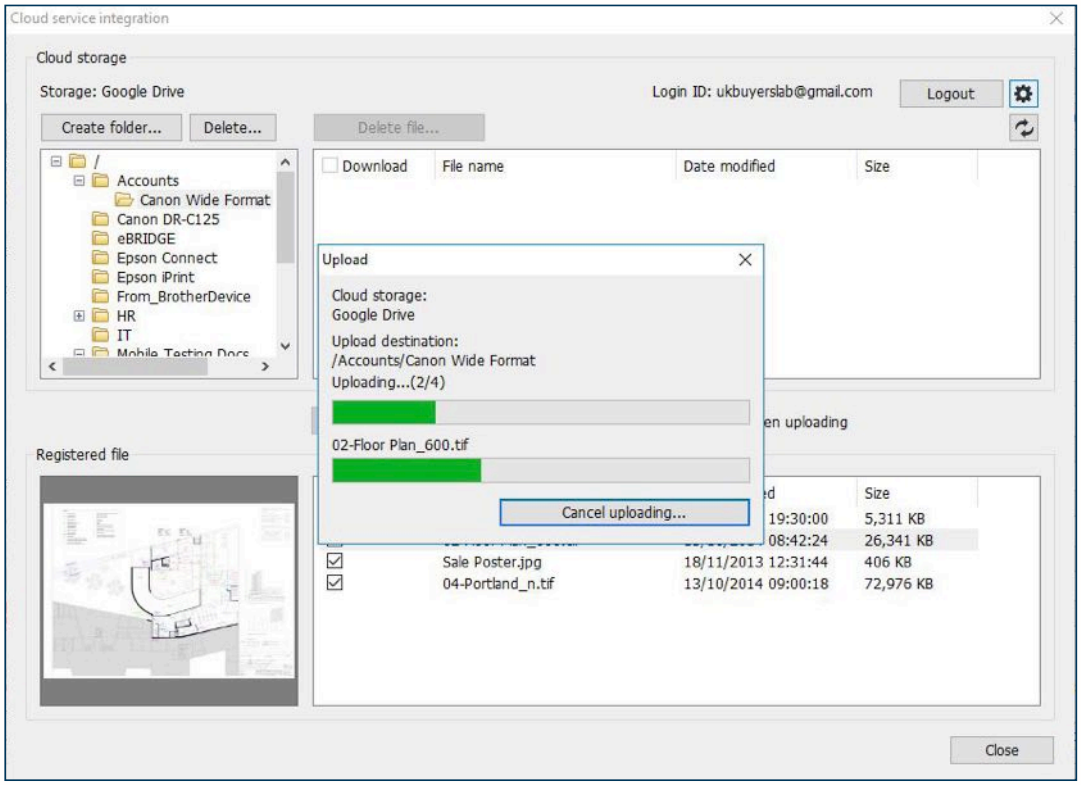
Advantage ✔	Canon imagePROGRAF TM-200	HP DesignJet Z6
Ease of Use	=	=
Direct Print Submission Functionality	=	=
Mobile App Integration	=	=

○ Available as a free download from Canon's website, the newly enhanced imagePROGRAF Direct Print & Share utility enables the direct printing of PDF, JPEG, TIFF and HPGL/2 files without the need for native applications or print drivers. Via the utility, users can preview print layouts and select print settings without the need to open up the driver properties. For added convenience, the utility provides thumbnail previews of multiple print jobs and users can modify and print multiple files simultaneously.

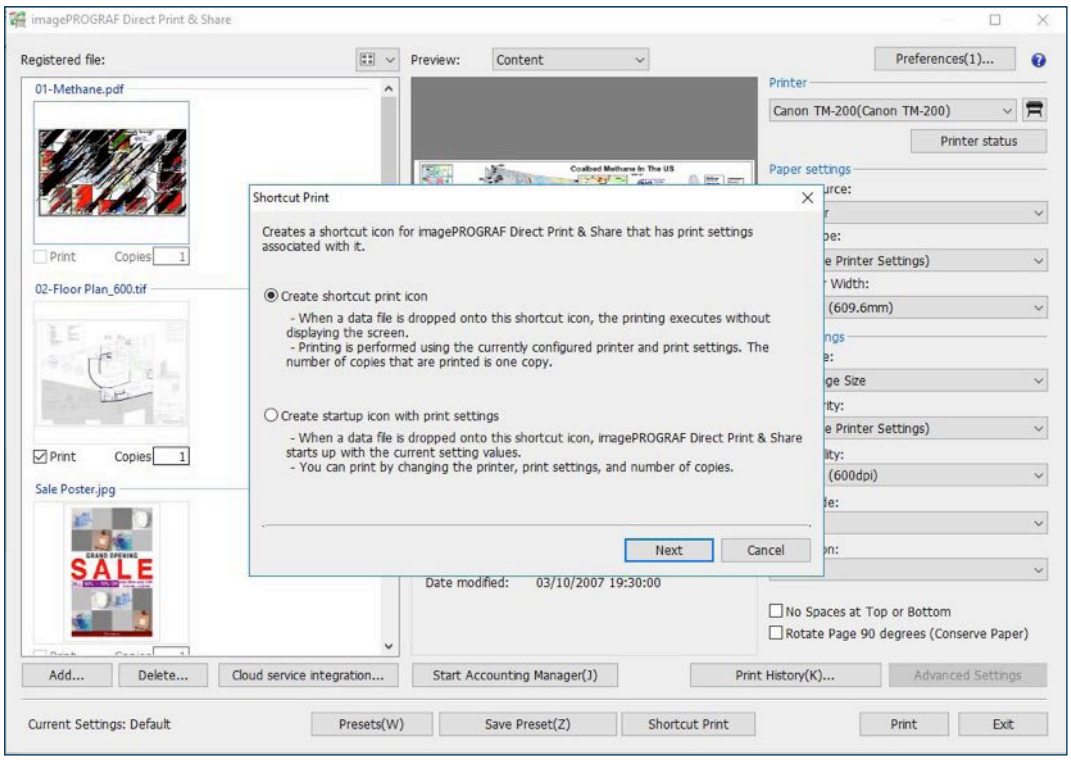


Canon's imagePROGRAF Direct Print & Share utility provides users with an image preview. Users can maximize the utility's window to obtain a larger preview, which enhances usability.

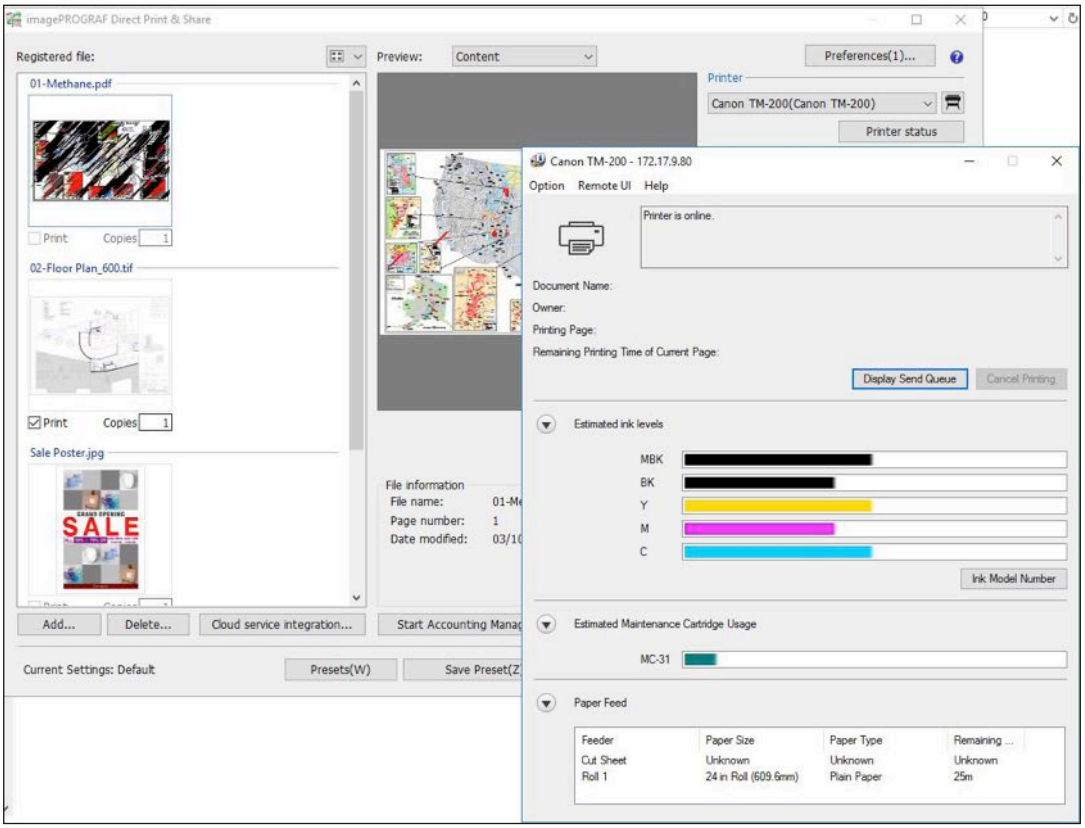
O The imagePROGRAF Direct Print & Share utility supports "Shortcut Print" functionality, enabling users to create a desktop shortcut that includes commonly used print settings, including output printer, print quality, paper type and paper size. Akin to a hot folder workflow, files are automatically printed with the predefined settings when users drag-and-drop the files to the desktop icon. Multiple desktop icons can be created for different print settings or combinations of print settings. In addition, users can register and save new job presets in the utility to expedite daily routine workflows.



imagePROGRAF Direct Print & Share lets users retrieve files from as well as upload files to Google Cloud for easier collaboration.



To help standardize and streamline common print workflows, users can register and save job profiles in the utility as well as create desktop shortcuts that allow drag and drop automatic file printing with predefined print settings.

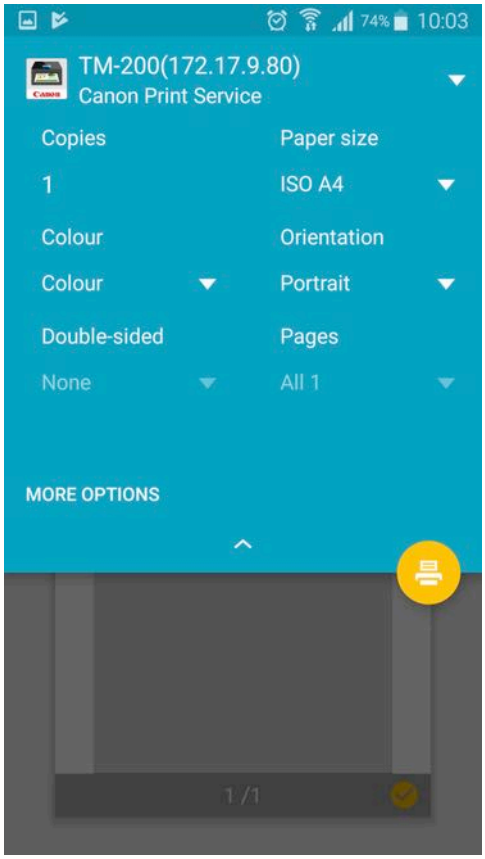


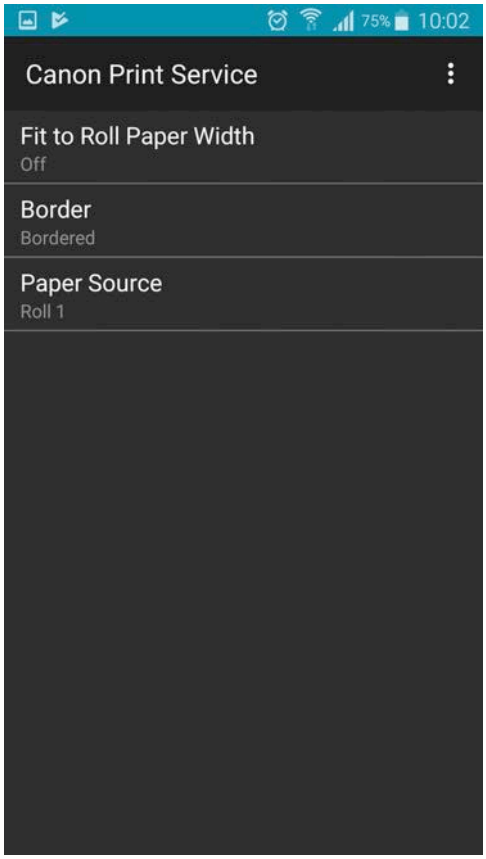
Conveniently, users can view device and consumables status via the utility before sending jobs to print.

- Users can download stored files from Google Drive and AutoCAD 360 cloud storage services for printing via the imagePROGRAF Direct Print & Share utility. Files can be uploaded directly to cloud storage as well. For added convenience and collaboration, the utility offers the option to share files simultaneously with one or more users (via Google Drive only), who will receive an email notification with a link to download the shared file without the need to log in.

- Additional benefits provided by imagePROGRAF Direct Print & Share include quick and easy printing of jobs selected from the print history log using the same settings as before; the ability to view device and consumables status via a link to Status Monitor; and the option to insert a divider sheet in between jobs when outputting multiple files simultaneously for easier identification.

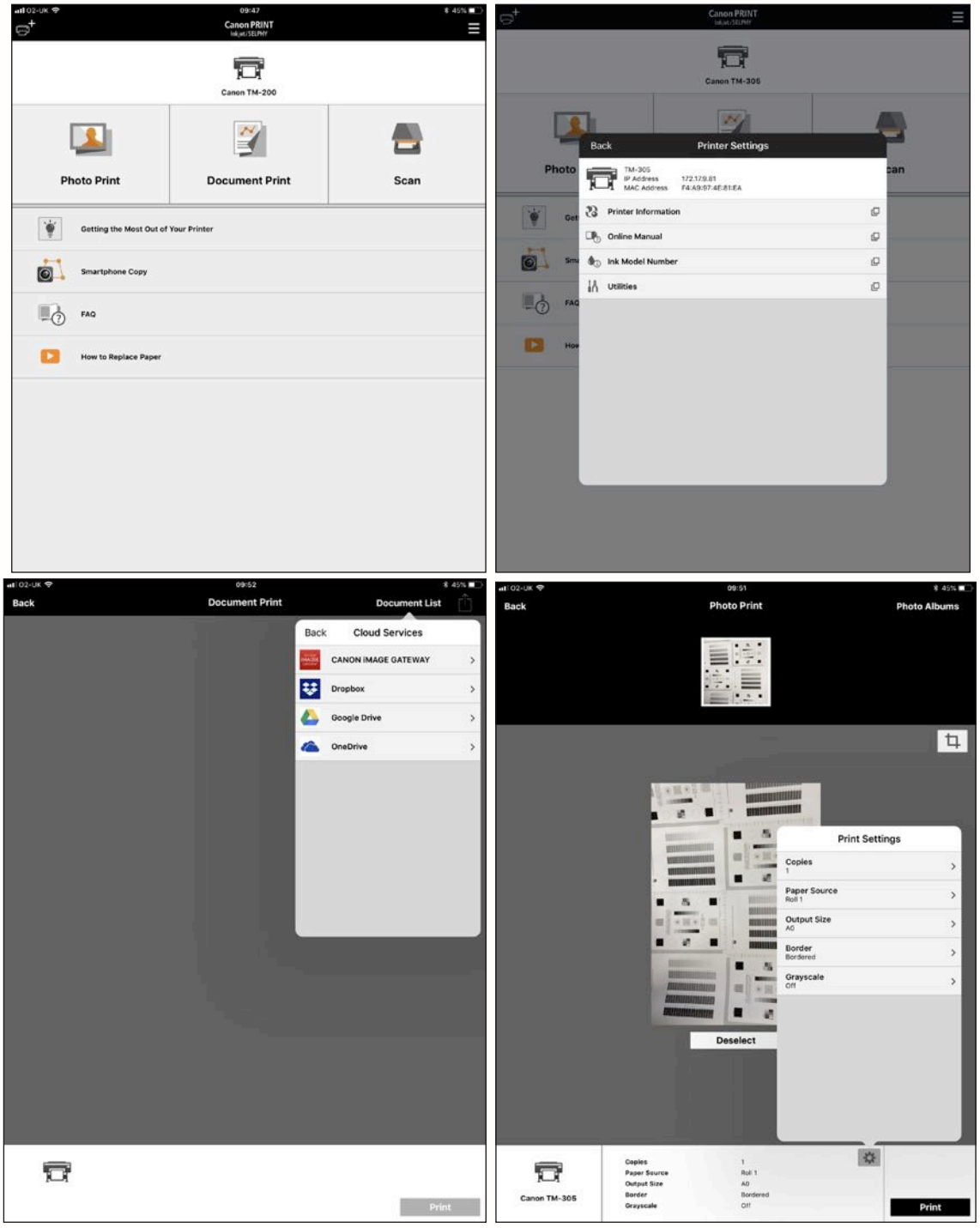
- The free Canon Print Service (CPS) mobile print plugin lets Android users print wirelessly to the TM-200 and other compatible Canon printers on the same WiFi network. The service automatically detects compatible Canon printers, offers a broad range of print settings, and is very straightforward to use.





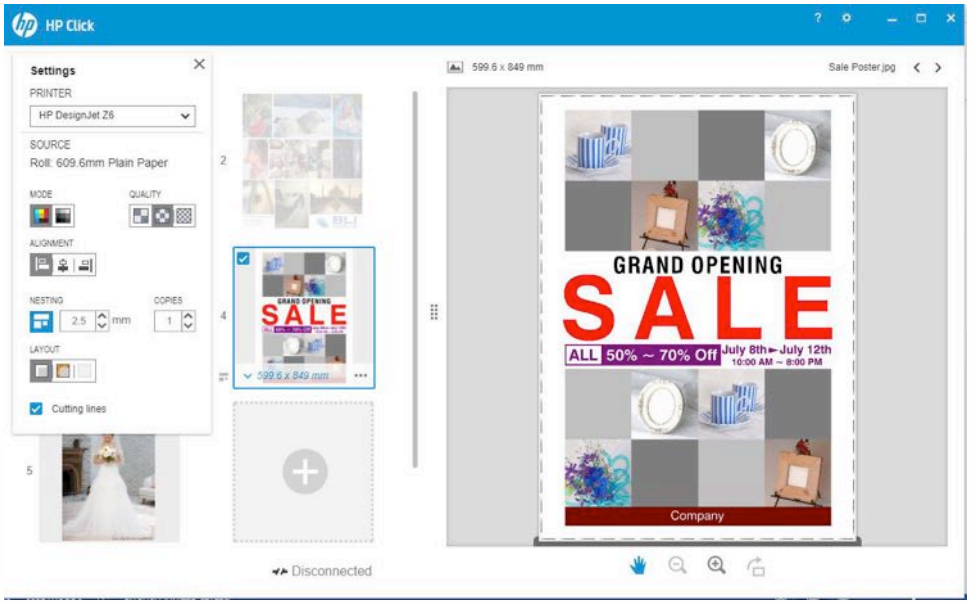
The Canon Print Service mobile print plugin is an easy way for Android users print to the TM-200, and it offers a broad range of print settings, including colour, orientation, and borderless printing.

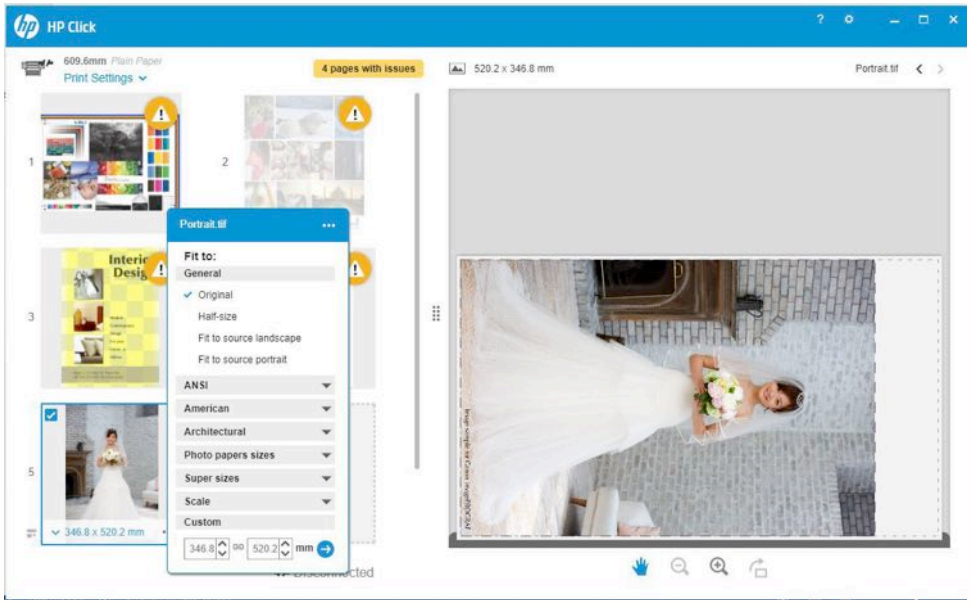
- Canon's TM large-format series also supports the versatile Canon Print Inkjet SELPHY app, which can be downloaded for free on Apple iOS and Android mobile devices. This mobile printing app lets users print PDFs, Microsoft Office documents and JPEG images, access and print files stored in cloud services, view device and consumables status via a link to the device's embedded web page, and stay informed when their jobs have been printed (or not) via push notification alerts. The app's user-friendly interface offers a broad range of print settings, as well as the ability to print multiple files at once.



Canon's imagePROGRAF TM series supports mobile printing via the Canon Print Inkjet SELPHY app. Android and iOS users can easily preview and print documents (including Microsoft Office files), and images stored on their mobile devices or from cloud accounts such as Dropbox or OneDrive, as well as view printer status, and select basic print settings.

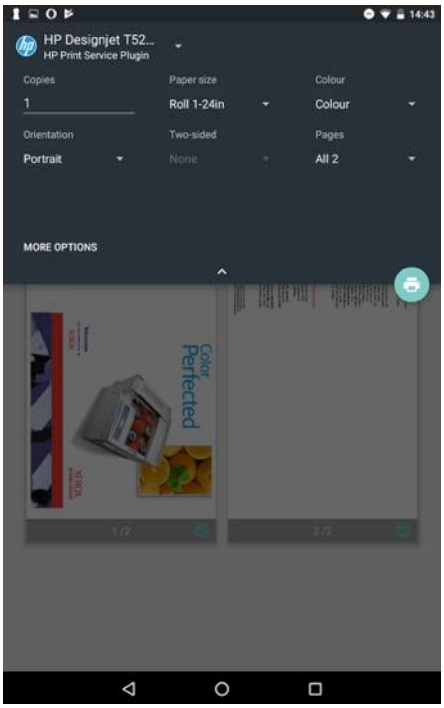
O Similar to Canon's utility, HP Click printing software, which is also available as a free download, enables direct printing of PDF, JPEG, TIFF and HPGL/2 files from the PC desktop, without the need for native applications or print drivers. Here, users can preview, resize and align images without the need to open up the driver properties. The utility also has an automatic nesting feature to reduce waste, and with select printers, users can access printer and print job status information via a link to the printer's embedded web server.





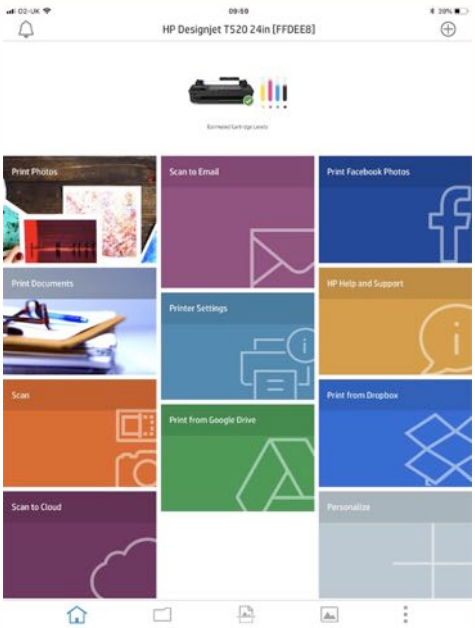
Via HP Click, users can select basic print settings, preview images, manipulate images as well as utilize the automatic nesting feature to reduce paper waste.

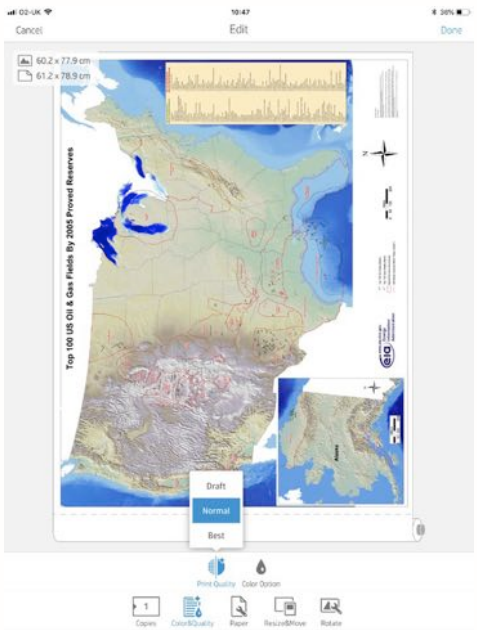
O The HP Mobile Printing service allows users to print directly from an iOS or Android smart device to a compatible HP large-format device. Unlike the previous version (ePrint & Share), users do not need to create an account in order to access direct print functionality, instead, the mobile device quickly pairs with the printer via a wireless network connection or by Wi-FI Direct for direct job submission. Android users have an added step, however, of downloading and enabling the free HP Print Service Plugin app, which is available from Google Play, before being able to access the HP Printing service. Users can print a wide selection of file formats such as Microsoft Office documents, as well as PDF, JPEG and TIFF files. Whether a file is stored locally on the device, in a cloud service account, or sent as an email attachment, the user just needs to open the file and select the Share option, which then allows them to send the job to their preferred HP printer.



The HP Mobile Printing service enables Android (shown left) and iOS mobile devices to pair with the HP Z6 and other compatible HP devices easily. Users can retrieve files from cloud storage, preview images and perform image adjustments.

O Users also have the option of printing from their Apple iOS and Android smartphones and tablets via the HP Smart mobile app (formerly known as HP All-in-One Printer Remote app). This free mobile printing app lets users scan documents directly to their mobile device; retrieve, print, or upload files to a variety of cloud storage services such as Dropbox, Box, Google Drive and Evernote; and monitor printer status. A broad range of document editing options are available through the Preview function, as are a multitude of print settings.





The HP Smart App (formerly known as HP All-in-One Printer Remote app) is a free mobile printing app that allows users to print, scan, share and store documents from their device to compatible HP output devices.

O In addition, the HP Z6 supports HP ePrint functionality, whereby users are able to send print jobs remotely by email either via a workstation PC or a mobile device; PDF, TIFF and JPEG files (up to 10 MB) are supported.

Device Feature Set

O The Canon TM-200 offers two ink cartridge capacity options—130 ml and 300 ml—for all colours, whilst the HP Z6 offers 300 ml for all colours.

\+ Canon's ink cartridges are replaceable during operation, which helps reduce downtime for Canon users. HP's cartridges cannot be replaced during operation.

\+ The Canon unit's ink delivery system dispenses a 5-picoliter drop size for all colours, while the HP Z6 model dispenses two drop sizes: 7/3-picoliter dual drop weight (M, C, PK) and a 6-picoliter drop size for yellow, chromatic red and matte black.

\+ The Canon TM-200 supports borderless printing regardless of what roll media is being used, whilst the HP Z6 only supports this feature only with select media.

O Both units utilize user-replaceable printheads, which take less than five minutes to replace on both models.

O Both models support Gigabit Ethernet connectivity.

– The HP Z6 has a USB port located to the right of the control panel that enables users to print from USB flash drives and helps aid document portability; although the Canon TM-200 does not offer this capability, its sister model the TM-205 does.

– The Canon model offers a standard, non-upgradable RAM capacity of 2 GB, while the HP unit has a standard non-upgradable RAM capacity of 4 GB (includes virtual memory).

– The HP Z6 comes with a standard built-in 500-GB hard drive, which allows for the storage of commonly used documents and aids spooling workflow. The Canon TM-200 does not offer this, even as an option.

O Both models offer easy and quick roll paper loading with auto paper feed—once the user loads paper on the device, alignment and width adjustments are automatically carried out without further user intervention.

O The output catch baskets of both models are very simple designs which collect output from media rolls in a random order.

O The catch trays of both models enable most printed sheets to be stacked neatly. However, when media rolls approached their end, the tightly curled output had a tendency to spill out of both trays.

O The Canon TM-200 comes with strong security features, including protocol locking to prevent unauthorised access to the device; it also supports SNMP v3 (secure network protocol) and IPsec which provides further security by authenticating and encrypting data over the network. The HP Z6 has Secure Disk Erase, (which lets users choose whether to erase particular files or the whole hard drive), HP Secure Boot, whitelisting and a self-encrypted hard drive, to help protect the device and data from unauthorised access.

– The Canon model is slightly heavier (69 kg versus 66 kg) than the HP unit.

O Both models offer a colour touchscreen user interface, both of which are similarly responsive and intuitive to navigate.

\+ The Canon TM-200's power consumption while active is lower—69 watts versus 100 watts—than that of the HP model.

O Rated noise emissions while the devices are printing are comparable: 44 dB for the Canon model (44 dB) compared to 42-45 dB for the HP unit.

Print Driver Feature Set

*Note KPI usually tests HP models using the HPGL/2 driver, which was not available at the time of testing; the PCL3 driver was used instead.

+ The Canon TM-200 has five speed settings (Fast 300, Standard 600, Fast 600, High 600 and High 1200), although not all speed settings are available with all media types. In contrast, the HP device has three settings (Fast, Normal and Best).

○ Both the Canon imagePROGRAF Printer Driver and the HP PCL 3 driver provide a useful overview of the settings for predefined profiles.

– Six predefined profiles are available with the Canon driver, while the HP driver offers seven settings.

+ The Canon driver includes 50 media profiles, plus 10 user-customizable special options versus 40 for the HP driver.

+ The Canon driver includes a watermark capability; the HP driver does not.

+ The Canon driver offers N-up printing (up to 16), which is not supported by the HP unit.

+ Poster printing capability (2 x 2) is offered only by the Canon model, as is page-stamping (date, time, user-name and page number); neither feature is available with the HP driver.

+ The Canon imagePROGRAF Printer Driver offers a broad range of built-in adjustments for CMY balance, brightness and contrast, while the HP Z6's PCL driver does not offer the same adjustment settings, which are typically available with other HP DesignJet large-format printers.

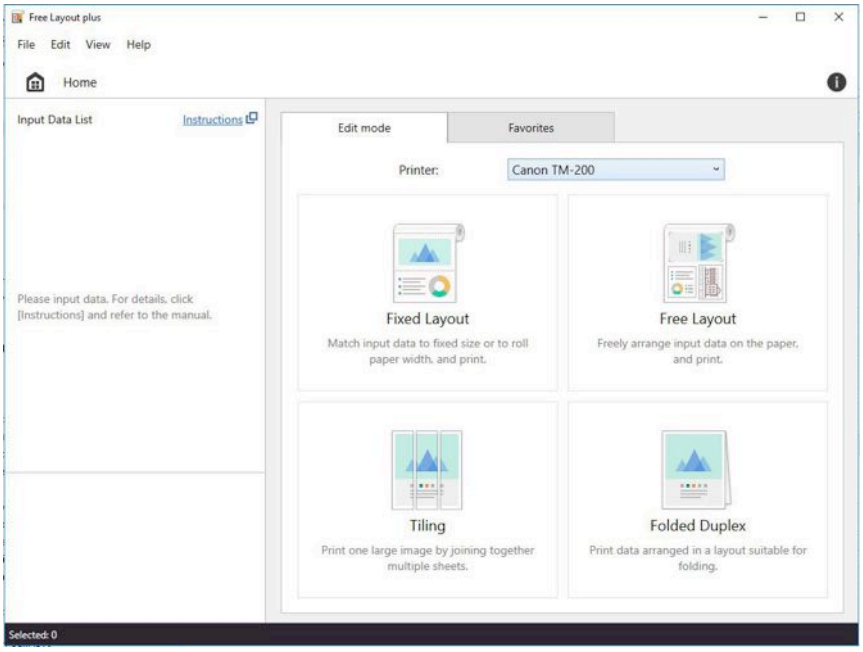
○ The Canon driver includes advanced colour-matching capabilities, including the ability to match ICC profiles and select the rendering intent based on different elements in the document. The HP Color Center Utility offers 'Paper Preset Management', which offers users the ability to create, install and export media ICC profiles.

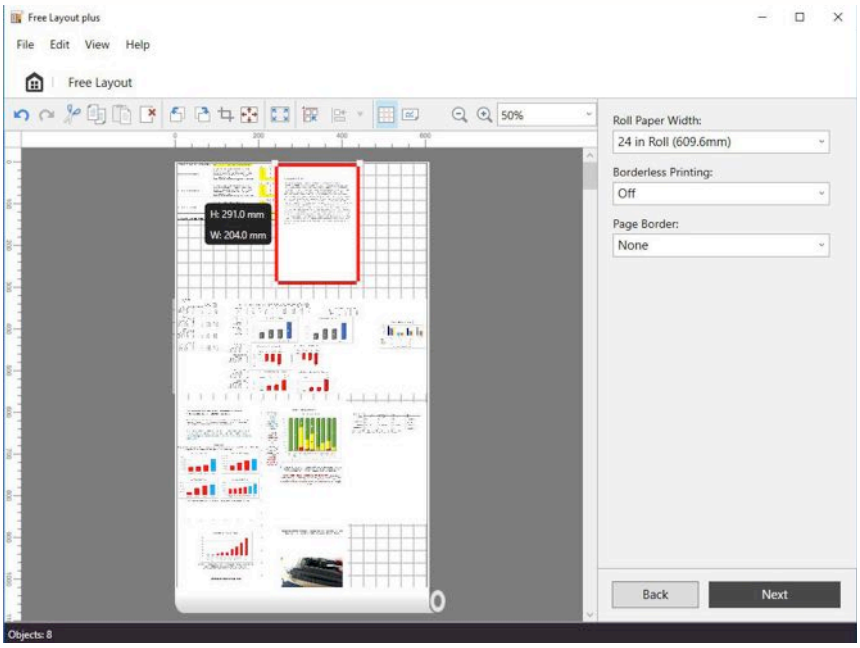
– HP Professional PANTONE Emulation is a noteworthy feature that allows users to create and print a swatchbook of multiple PANTONE colours and see how accurately the printer will reproduce them on selected media.

+ The Canon driver offers the option of unidirectional printing, even in Fast mode, which helps to eliminate banding across output because the printhead travels in only one direction to create the desired image. The HP driver does not offer this feature.

○ The Canon driver includes the Color imageRUNNER Enlargement Copy Mode utility, which is standard with the 32-bit version of the driver and available as a download for the 64-bit version of the driver via the Printer Driver Extra Kit. It enables users to integrate a Canon small-format MFP device with the TM-200, whereby documents scanned at the MFP are automatically routed to a hot folder that is monitored by the TM-200 driver. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users.

+ Canon's Free Layout plus software enables files—even those created with different applications—to be scaled, resized, or grouped together as a single job from the printer driver. Images can be dragged and dropped to the desired locations and printed together on a single page, helping to save on paper. The HP unit offers a similar nesting feature, which can be activated directly on the control panel or from the print driver utility, or when using HP Click. However, unlike the Canon tool, it does not allow users to have precise control over the positioning of jobs, rather it will randomly position jobs to print across the width of a page, either in the order they were submitted or in 'optimized' layout order.





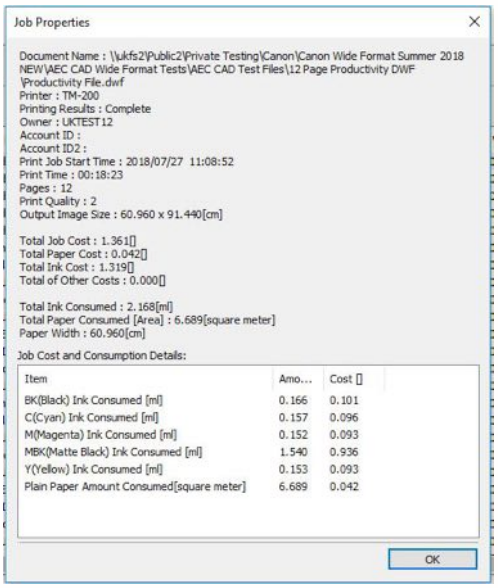
Canon's Free Layout plus allows users to arrange documents from different applications on a page so as to use paper more efficiently. Within the utility, any two pages can be arranged on the layout so that they can be back-to-back when folded over after printing.

+ The Canon model also offers a plug-in for printing from Microsoft Office applications, which includes useful tools for automatic media resizing, nesting and borderless printing. No such plug-in is available to HP users.

○ The Canon model includes PosterArtist Lite, Canon's software for creating posters and signage in simple steps. The full version of Canon PosterArtist, available as an option, offers more advanced features such as auto design, variable data printing, in-application editing features, plus additional templates, photos and clip art. HP users can create posters via a redesigned poster application in the HP Applications Center (which also includes creative tools such as Adobe Stock, Unsplash, Vecteezy, and Pattern Design) and print them via HP Click.

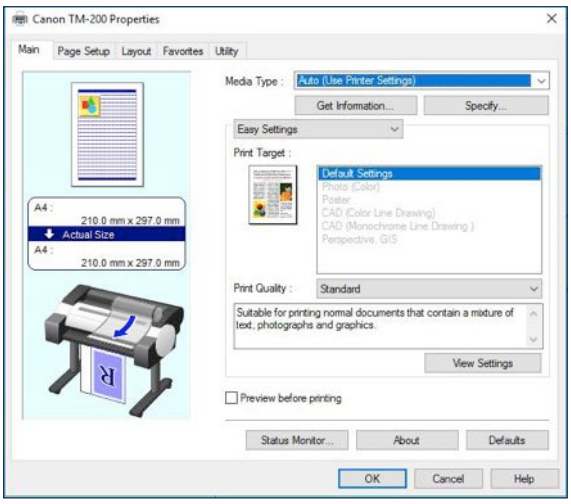
Canon's PosterArtist Lite is an easy-to-use poster creation tool; newly-enhanced, it provides additional templates to create multi-language versions of a poster, 900 common expressions in 10 languages and a wide range of pictographic icons.

+ Available for the TM series, Canon's Accounting Manager can be downloaded for free from Canon's website and offers comprehensive accounting management for all print jobs. Users enter the actual costs for individual inks and media types, and the cost per job is calculated automatically and displayed. For each job, the media type, area, ink used and total print time are listed, and more detailed cost and consumption information can be obtained by double-clicking on an individual job name or by highlighting a range of different jobs. Job cost information can then be saved in .CSV format and opened in Excel. There is no equivalent tool for the HP Z6.

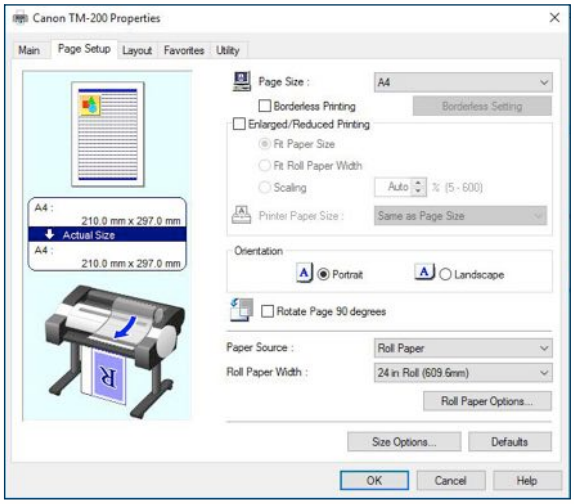


Canon Accounting Manager; users can double click on a job to view a breakdown of the individual costs.

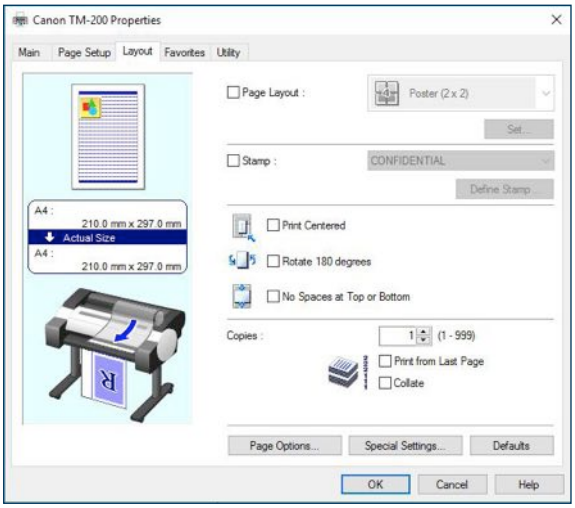
Test Models' Print Driver Screenshots



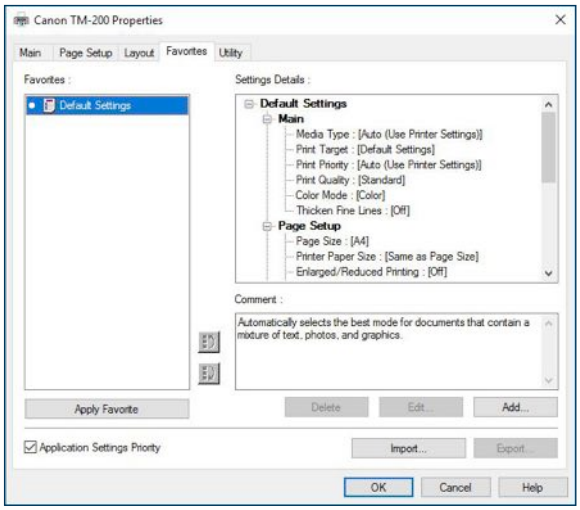
Canon imagePROGRAF TM-200 Main Tab



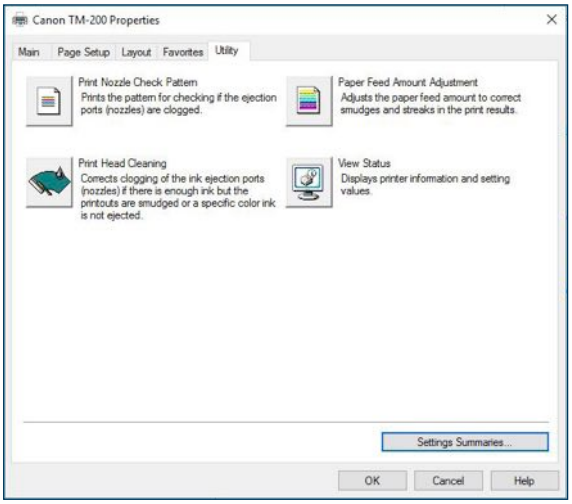
Canon imagePROGRAF TM-200 Page Setup Tab



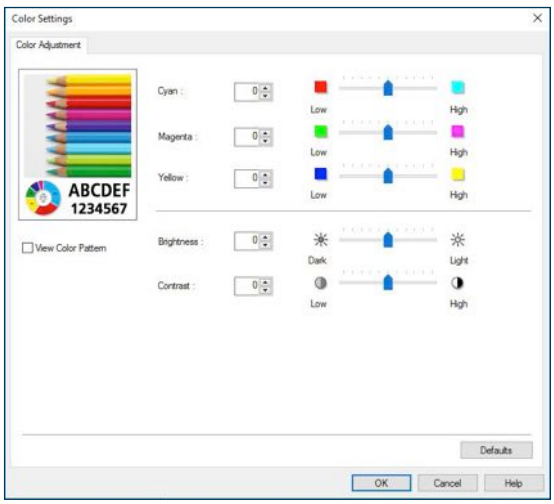
Canon imagePROGRAF TM-200 Page Setup Tab



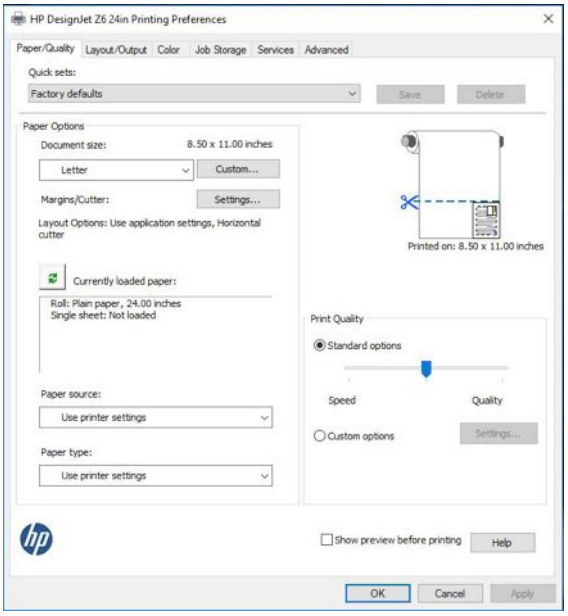
Canon imagePROGRAF TM-200 Favourites Tab



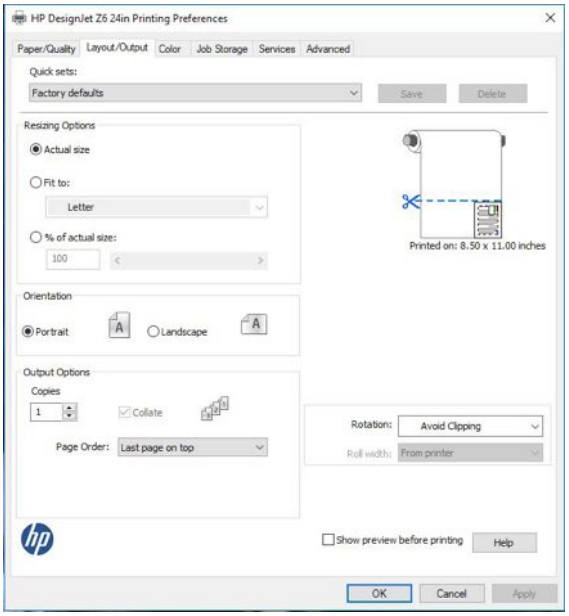
Canon imagePROGRAF TM-200 Utility Tab



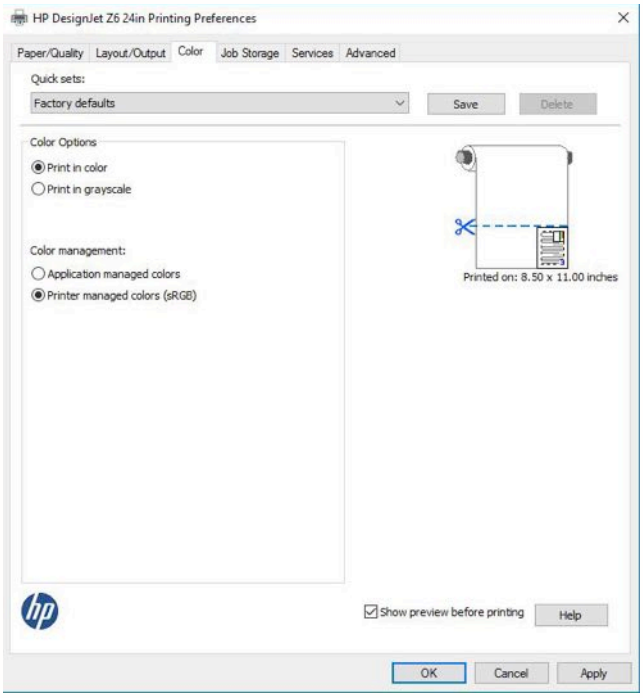
Canon imagePROGRAF TM-200 Colour Adjustment Settings



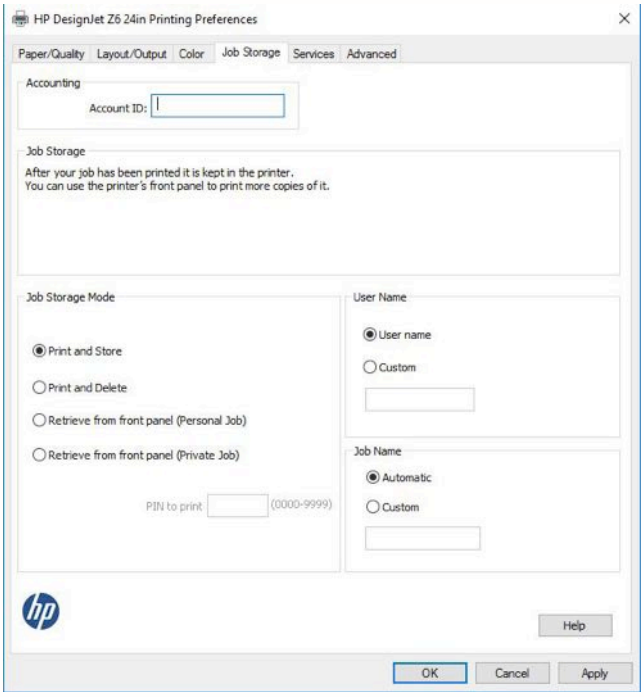
HP DesignJet Z6 Paper/Quality Tab



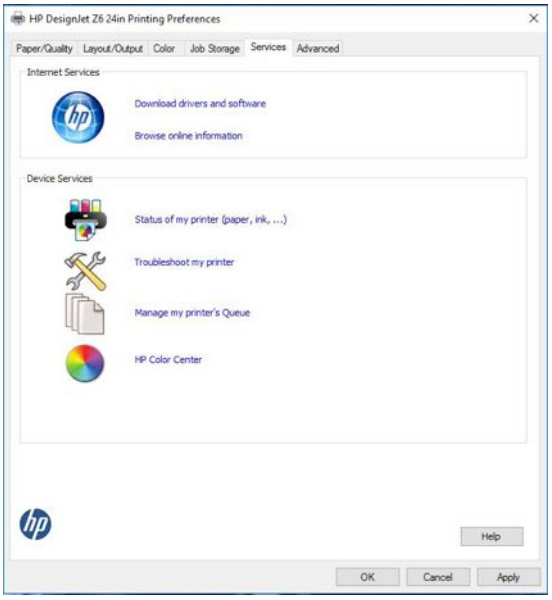
HP DesignJet Z6 Layout/Output Tab



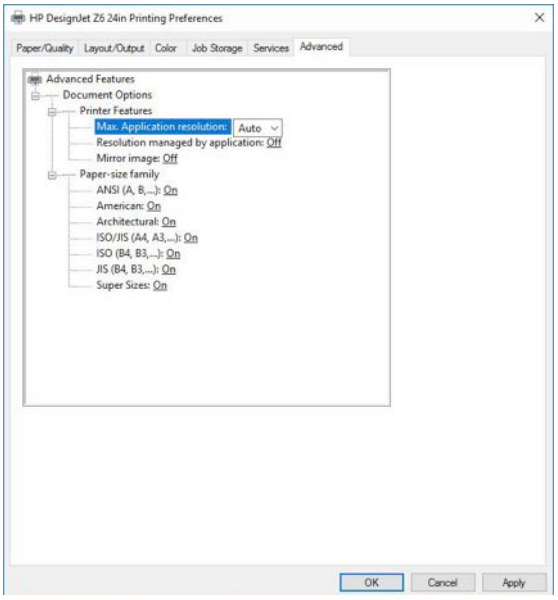
HP DesignJet Z6 Colour Tab



HP DesignJet Z6 Job Storage Tab



HP DesignJet Z6 Services Tab



HP DesignJet Z6 Advanced Tab

Printhead Reliability / Cleaning Routines

O The Canon TM-200 offers users the ability to run a printhead nozzle check pattern at the control panel. The default setting is Standard; additional settings are 'after one page', 'after 10 pages' or 'disable'. There are three printhead cleaning options available: Cleaning, Deep Cleaning and System Cleaning and under each option, there are three additional settings available for cleaning all colours, Pattern 1 and Pattern 2. The HP DesignJet Z6 offers one option 'Print Diagnostic Image' to run a nozzle check on its control panel, which can be found in the main Settings menu under the Optimize Print Quality option.

O When a clogged nozzle is detected on the Canon unit, it pauses during operation and automatically runs a cleaning cycle to maintain image quality and consistency; it resumes printing once the cleaning cycle is completed, with no user intervention required. The HP model does not offer any indication that it conducts automatic printhead maintenance. However, users can initiate a clean printhead maintenance process at the control panel for one, two or all three printheads. The control panel indicates an estimated time and estimate of the amount of ink consumed, which differs depending on how many printheads are selected.

\+ After both devices were shut down completely over the course of a weekend, the Canon model had no problems with nozzles clogging and when a nozzle check pattern was registered by Buyers Lab technicians, it printed with perfect accuracy. In contrast, the nozzles of the HP unit became clogged and required at least two cleaning cycles to resolve the issue, leading to operator downtime.

\+ A standard cleaning cycle performed on the Canon model takes approximately two minutes on average to complete, whilst on the HP model, a cleaning cycle takes approximately eight minutes, 47 seconds.

SUPPORTING TEST DATA

Productivity

Colour Throughput Time – A1 High-Resolution Portrait Printing (in Seconds)

Canon imagePROGRAF TM-200			HP DesignJet Z6		
Fast	Standard	High	Fast	Normal	Best
31.31	54.11	97.07	83.03	140.74	267.96

A single-page high-resolution A1 portrait was printed as a five-page job using the device driver set to the plain paper/colour setting. Both devices were loaded with 24" rolls, with each job set to auto-rotate to save media. The time indicated is the average number of seconds (based on timing from the cutting of the first page to the cutting of the final page and dividing by four to exclude the initial processing time).

Colour Throughput Time – A1 Medium-Resolution Retail Poster Printing (in Seconds)

Canon imagePROGRAF TM-200			HP DesignJet Z6		
Fast	Standard	High	Fast	Normal	Best
35.12	63.06	98.03	81.01	125.91	256.18

A single-page medium-resolution A1 portrait was printed as a five-page job using the device driver set to the plain paper/colour setting. Both devices were loaded with 24" rolls, with each job set to auto-rotate to save media. The time indicated is the average number of seconds (based on timing the cutting of the first page to the cutting of the final page and dividing by four to exclude the initial processing time).

First-Print-Out Time from Ready State – High-Resolution Portrait Printing (in Seconds)

	Canon imagePROGRAF TM-200			HP DesignJet Z6		
	Fast	Standard	High	Fast	Normal	Best
Time Before Printing Commences	22.20	20.67	23.71	18.54	28.32	39.45
First Print Out Time	48.35	68.24	114.43	61.87	120.28	269.12

First-page-out times are determined by sending an A1 high-resolution portrait PDF file to print, timed from job release to page out, with both Canon and HP drivers set to plain media. Both devices were loaded with 24" rolls.

First-Print-Out Time from Ready State – Medium-Resolution Retail Poster Printing (in Seconds)

	Canon imagePROGRAF TM-200			HP DesignJet Z6		
	Fast	Standard	High	Fast	Normal	Best
Time Before Printing Commences	19.66	19.85	22.06	11.96	23.15	25.04
First Print Out Time	43.31	64.52	113.34	56.03	112.43	229.01

First-print-out times are achieved by sending an A1 medium-resolution retail poster PDF file to print, timed from job release to page out with both Canon and HP drivers set to plain media. Both devices were loaded with 24" rolls.

Colour Print Quality

Colour Optical Density Evaluation

	Canon imagePROGRAF TM-200 Canon Standard Plain Paper 2					
	Highest					
	1	2	3	4	Max.	Min.
Cyan	1.31	1.33	1.32	1.33	1.33	1.31
Magenta	1.20	1.23	1.20	1.22	1.23	1.20
Yellow	1.07	1.07	1.06	1.07	1.07	1.06
Black	1.46	1.46	1.47	1.47	1.47	1.46

	HP DesignJet Z6 HP Universal Bond					
	Best					
	1	2	3	4	Max.	Min.
Cyan	1.20	1.22	1.21	1.20	1.22	1.20
Magenta	1.06	1.06	1.05	1.05	1.06	1.05
Yellow	0.92	0.92	0.92	0.92	0.92	0.92
Black	1.46	1.44	1.46	1.45	1.46	1.44

Note: Colour density readings were assessed by printing a Buyers Lab test file on proofing paper in high-quality colour settings and measuring the density of 100% dot fill using an XRite exact^{Xp} densitometer.

Skin Tone and Neutral Grey Consistency

	Skin Tone 1 (Formula: C=6, M=15,Y=16,K=0)	
	Canon imagePROGRAF TM-200	HP DesignJet Z6
Colour block		
2	0.3	0.7
3	0.3	0.7
4	0.5	0.9
5	0.5	0.6
6	0.5	0.5
7	0.4	0.8
8	0.1	0.7
9	0.5	0.7
Max. Delta E Variance	0.4	0.4

	Skin Tone 2 (Formula: C=30, M=63,Y=75,K=0)	
	Canon imagePROGRAF TM-200	HP DesignJet Z6
Colour block		
2	0.4	0.3
3	0.3	0.3
4	0.3	0.6
5	0.4	0.8
6	0.4	0.6
7	0.5	0.8
8	0.5	0.5
9	0.8	0.6
Max. Delta E Variance	0.5	0.5

	Skin Tone 3 (Formula: C=19, M=33,Y=50,K=0)	
	Canon imagePROGRAF TM-200	HP DesignJet Z6
Colour block		
2	0.3	0.7
3	0.3	0.3
4	0.1	0.3
5	0.2	0.4
6	0.2	0.6
7	0.2	0.9
8	0.4	0.9
9	0.4	0.7
Max. Delta E Variance	0.3	0.6

	Neutral Grey	
	Canon imagePROGRAF TM-200	HP DesignJet Z6
Colour block		
2	0.3	0.3
3	0.4	0.2
4	0.1	0.8
5	0.3	0.7
6	0.8	0.3
7	0.4	0.7
8	0.3	0.6
9	0.4	0.3
Max. Delta E Variance	0.7	0.6

Note: Skin tone and neutral grey consistency measurements are based on nine readings taken from a Buyers Lab proprietary PDF test target file comprising four A1-sized solid coverage documents of three skin tones and a neutral grey, with the High/Best quality print driver setting selected in the driver and the target printed on the manufacturer's own brand of plain media. Colour differences across the A1 image were measured comparing eight locations to that of the colour measured at the top left of the page, using an EFI ES1000 colour spectrophotometer and Gretag MacBeth EyeOne Share colour comparison software.

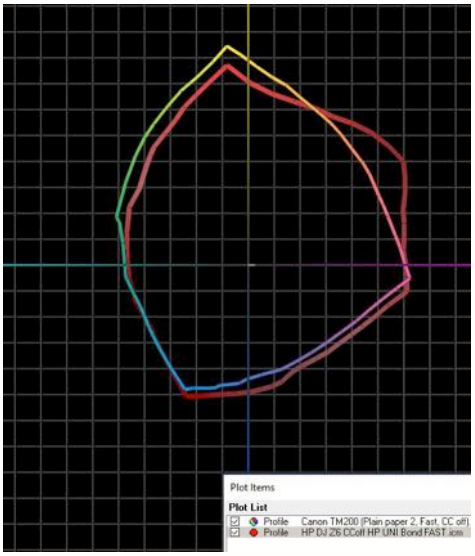
FOGRA 39 DRIFT TEST:

Comparison of FOGRA39 colour patches before and after ink consumption test

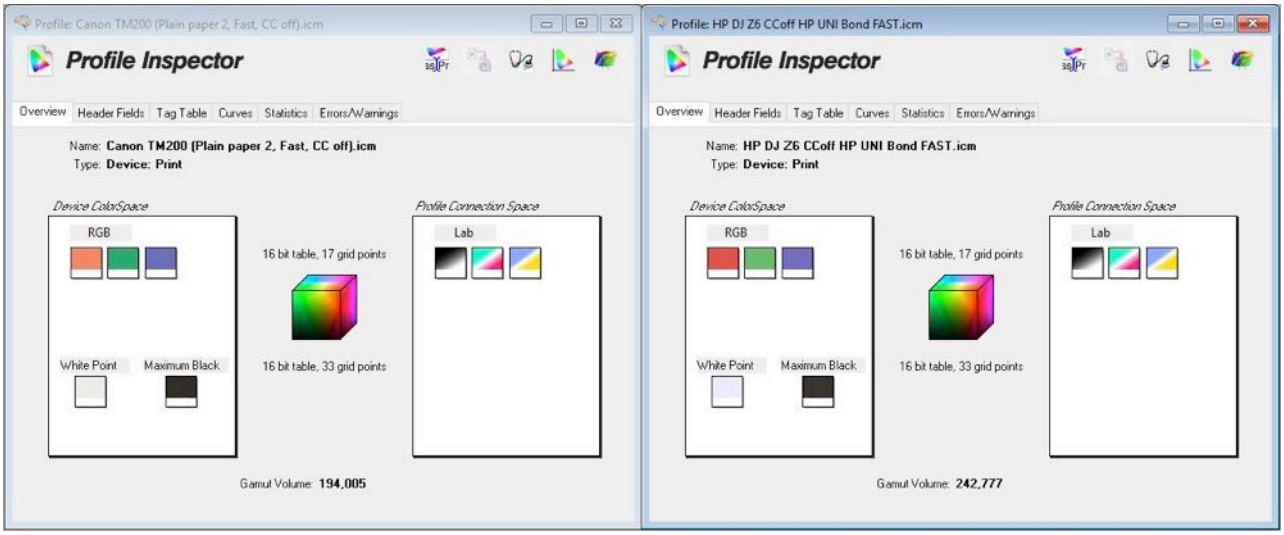
	Canon imagePROGRAF TM-200	HP DesignJet Z6
Delta E Drift	2.1	6.1

Colour Gamut Comparison

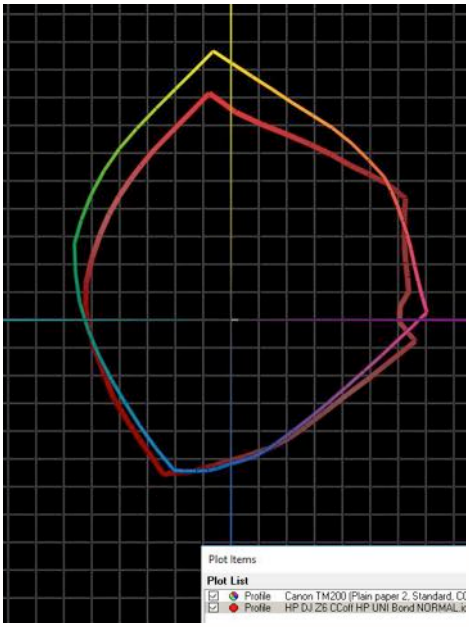
Media Type/Settings	Canon imagePROGRAF TM-200	HP DesignJet Z6	Canon % larger/smaller (-) than HP
Plain Paper Fast	194,005	242,777	-20.0
Plain Paper Standard/Normal	323,403	247,403	30.7
Plain Paper High/Best	322,698	300,750	7.3
Matte Coated High/Best	413,801	386,106	7.2



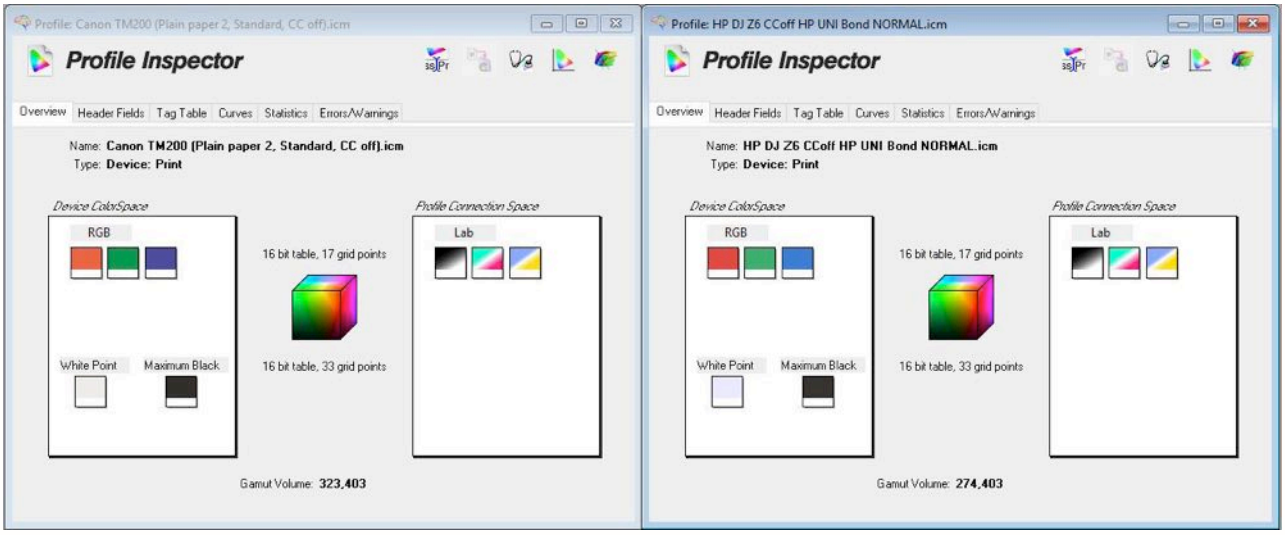
Canon imagePROGRAF TM-200 colour gamut on plain paper in Fast settings (shown chromatically) versus HP DesignJet Z6 colour gamut (shown in red) on plain paper in Fast settings.



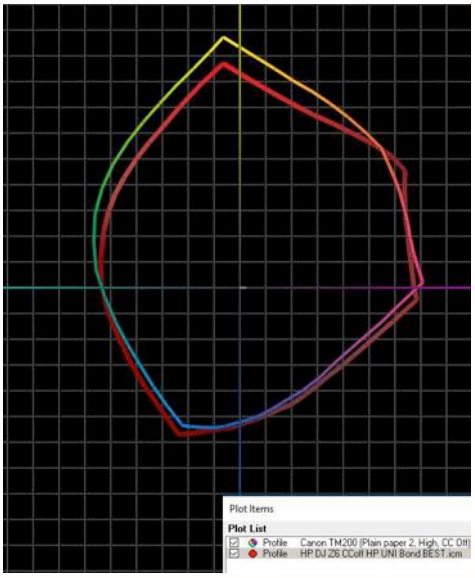
Colour gamut profile for Canon imagePROGRAF TM-200 (left) and HP DesignJet Z6 (right) on plain paper in Fast mode.



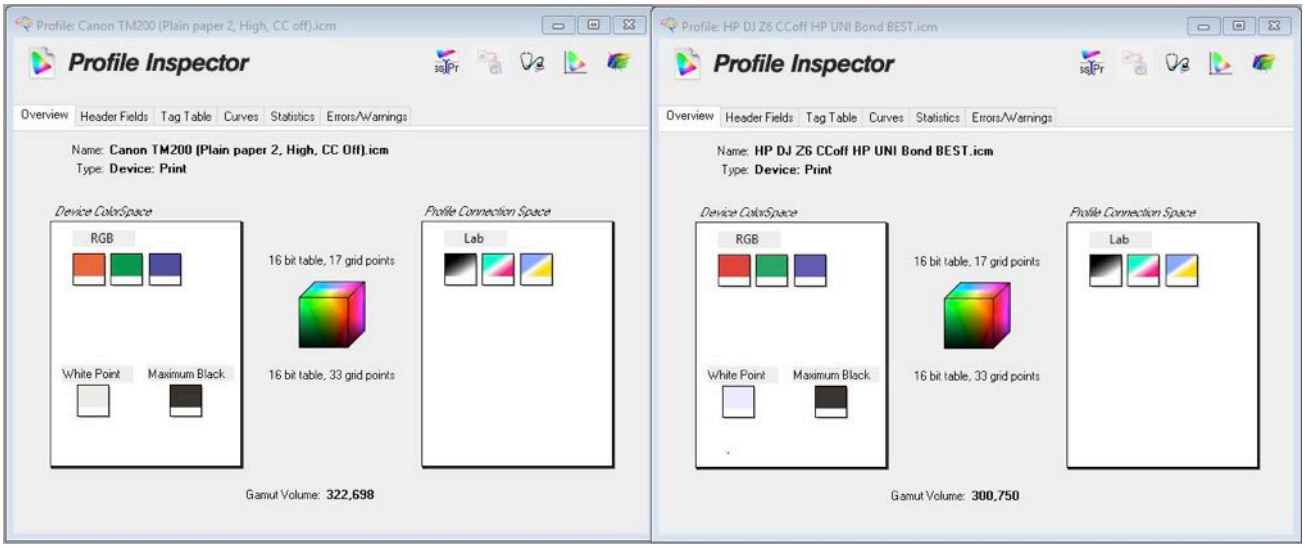
Canon imagePROGRAF TM-200 colour gamut on plain paper in Standard settings (shown chromatically) versus HP DesignJet Z6 colour gamut (shown in red) on plain paper in Normal settings.



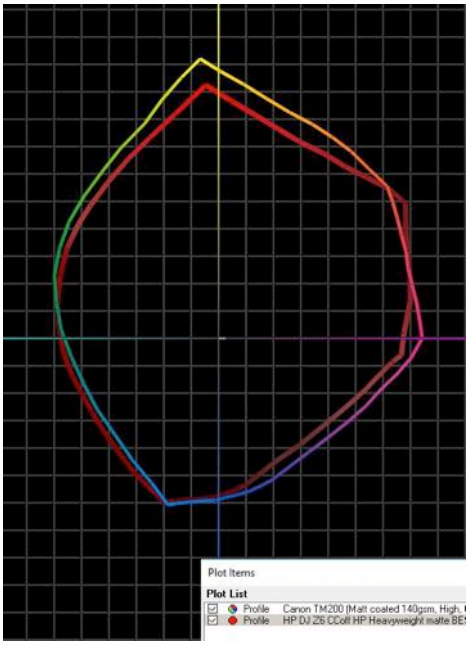
Colour gamut profile for Canon imagePROGRAF TM-200 (left) and HP DesignJet Z6 (right) on plain paper in Standard/ Normal modes.



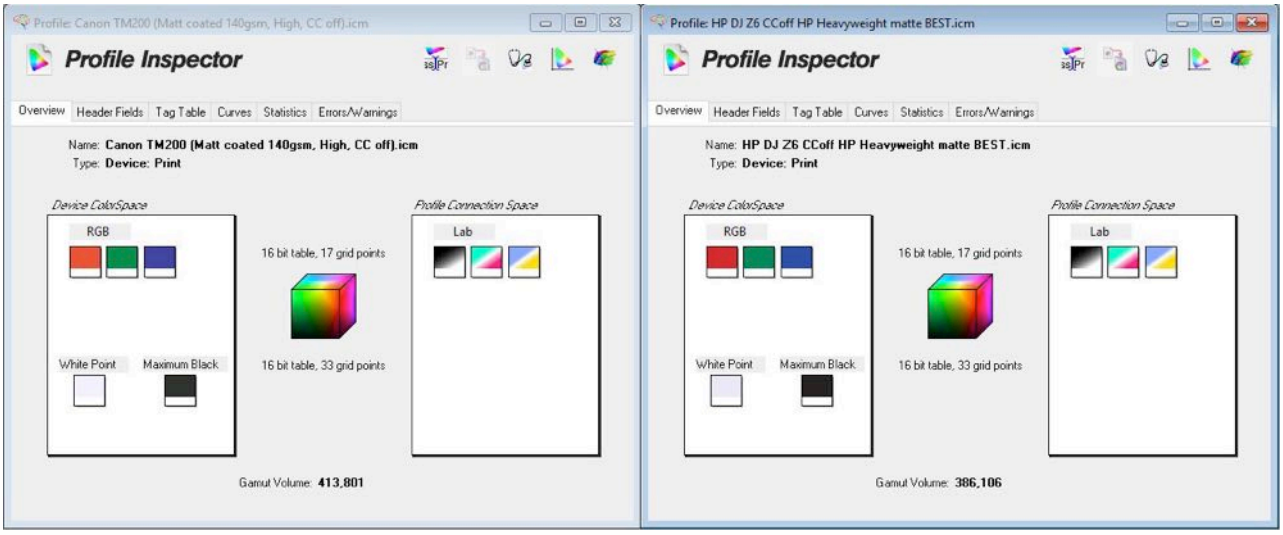
Canon imagePROGRAF TM-200 colour gamut on plain paper in High settings (shown chromatically) versus HP DesignJet Z6 colour gamut (shown in red) on plain paper in Best settings.



Colour gamut profile for Canon imagePROGRAF TM-200 (left) and HP DesignJet Z6 (right) on plain paper in High/Best quality modes.



Canon imagePROGRAF TM-200 colour gamut on matte coated paper in High quality settings (shown chromatically) versus HP DesignJet Z6 colour gamut (shown in red) on matte coated paper in Best settings.



Colour gamut profile for Canon imagePROGRAF TM-200 (left) and HP DesignJet Z6 (right) on matte coated paper in High/Best quality modes.

Device Feature Set

	Canon imagePROGRAF TM-200	Advantage		HP DesignJet Z6
Max. print resolution	2400 x 1200 dpi			2400 x 1200 dpi
Number of inks	5		✔	6
Ink tanks replaceable during operation	Yes	✔		No
Ink-drop size	5 picoliter	✔		7/3 picoliter dual-drop weight (M, C, PK); 6 picoliter single-drop weight (Y, CR, MK)
Starter cartridge ink capacity	490 ml total (130 ml MBk; 90 ml CMYK)			INA
Ink cartridge capacity	130 ml and 300 ml (all colours)			300 ml (all colours)
Number of nozzles	MBk: 5,120 nozzles; other colours: 2,560 nozzles each; 15,360 nozzles in total			INA
Number of printheads	1 (User-replaceable)			3 (User-replaceable)
Line accuracy	+/-0.1% or less			+/-0.1%
Minimum line width	INA			0.02 mm
Minimum print margins	Roll paper: Borderless or 3 mm (all sides); Cut sheet: 3 mm (Top, Side), 20 mm (Bottom); Cut sheet for Apple AirPrint Only: Top: 3 mm, Bottom: 12.7 mm, Side: 3 mm			Roll paper: Borderless (select media) or 5 mm (all sides); Cut sheet: 5 x 17 x 5 x mm
Borderless (0 mm) printing	Yes (Roll paper)	✔		Yes (select media only: photo, polypropylene and backlit roll media)
Maximum outside diameter of roll paper	150 mm			INA
Maximum printable paper roll length	18 m (varies according to the OS and application)			INA
Maximum cut-sheet media length	1.6 m			INA
Maximum media thickness	0.8 mm			0.8 mm
Maximum media width	24 inches			24 inches
Media loading	Top			Top
Optional media handling	Roll holder set (supports 2" and 3" media cores)			Roll holder adapter (supports 3" media core)
Standard RAM	2 GB		✔	128 GB with 4 GB physical memory
Hard drive	Not supported		✔	Standard 500-GB
Interface	10/100/1000Base-T Ethernet, USB Built-in High Speed, USB Memory Direct, Wireless LAN			10/100/1000Base-T Ethernet (802.3, 802.3u, 802.3ab), USB Type-A host port
PDL	SG Raster (Swift Graphic Raster), HPGL/2, HP RTL, JPEG (Ver. JFIF 1.02)			Adobe PostScript 3, Adobe PDF 1.7, TIFF, JPEG, CALS G4, HPGL/2, HP-RL
Net weight (unpacked)	69 kg		✔	66 kg
Power consumption when in standby	INA			32 W or less
Power consumption when active	69 W	✔		100 W

	Canon imagePROGRAF TM-200	Advantage		HP DesignJet Z6
Acoustic pressure	Operation: 44 dB (A) or less; Stand-by: 35 dB (A) or less			Operation: 42-45 dB (A); Standby: 33 dB (A)
Acoustic power	Operation: 6.0 Bels or less; Standby: INA			Operation: 6.0-6.3 Bels; Standby: 5.1 Bels
Standard spectrophotometer?	No			No (available with the 44-inch model)

INA – Information not available

Driver Feature Set

	Canon imagePROGRAF TM-200	Advantage		HP DesignJet Z6*
Speed settings	5 (Fast 300, Fast 600, Standard 600, High 600 and 1200)	✔		3 (Fast, Normal, Best)
Economy mode	Yes (Fast setting)			Yes (Fast setting)
Predefined profiles	6 (Default, Photo (colour), Poster, CAD (colour line drawing), CAD (mono line drawing) and Perspective GIS)		✔	7 (Default, CAD, GIS, Photo, Black and White Photo, Poster and Canvas)
Overview of profile settings provided	Yes	✔		No
Media profiles	50 + 10 user customizable special options	✔		40
IQ optimized for various types of output	Yes			Yes
Watermark	Yes	✔		No
Sharpen text	Yes			Yes (called Max Detail)
Thicken fine lines	Yes			Yes (called Max Detail)
Mirror image	Yes			Yes
Multi-up printing	Yes, 2 to 16	✔		No
Poster print mode	Yes (2 by 2)	✔		No
Page stamping	Yes (Date, Time, Name, Page Number)	✔		No
Image rotation	Yes, 90 degrees and 180 degrees		✔	Yes, auto, 90, 180 and 270 degrees
Option to preview before print	Yes			Yes
Link to device web server from driver	No (there is a link to Status Monitor)		✔	Yes
CMYK balance adjustment	Yes (CMY only)	✔		No
Brightness adjustment	Yes	✔		No
Contrast adjustment	Yes	✔		No
Saturation adjustment	No			No
Advanced colour management options	Yes	✔		No

	Canon imagePROGRAF TM-200	Advantage		HP DesignJet Z6*
Enlargement Copy Mode	Yes			INA
Free Layout Capability	Yes (flexible placement)	✔		Yes (automatic nesting via HP Click)
MS Office Plug-in	Yes			INA
Adobe Photoshop Plug-in	INA			INA
Accounting Capability	Yes	✔		No
Disable automatic cutter	Yes			Yes
Unidirectional printing selection option	Yes	✔		No
Integration with MFP	Yes			INA

The Canon imagePROGRAF TM-200 comes bundled with PosterArtist Lite.

*Note KPI usually tests HP models using the HPGL/2 driver, which was not available at the time of testing; the PCL3 driver was used instead.

Ink Consumption

Table 1: Amount of Ink in each Canon imagePROGRAF TM-200 Cartridge (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Weight of cartridge prior to installation	395.2	391.7	389.9	395.4	388.0
Weight of cartridge at end of life	74.3	74.3	74.3	74.3	74.3
Net weight of ink	320.9	317.4	315.6	321.1	313.7
Total ink weight across five cartridges					1,588.7

Table 2: Amount of Ink in each HP DesignJet Z6 Cartridge (in Grams)

	Magenta	Yellow	Cyan	Chromatic Red	Photo Black	Matte Black
Weight of cartridge prior to installation	416.6	416.6	413.8	418.9	418.5	419.7
Weight of cartridge at end of life	105.1	105.1	105.1	105.1	105.1	105.1
Net weight of ink	311.5	311.5	308.7	313.8	313.4	314.6
Total ink weight across six cartridges						1,873.5

Table 3: Ink Used in Three 50-Page Runs of ISO Poster Test Document (Standard Mode) on the Canon imagePROGRAF TM-200 (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	9.1	1.3	1.9	9.3	17.6
Test Run 2 Net weight of ink used	9.5	0.7	1.6	10.6	18.2
Test Run 3 Net weight of ink used	9.8	1.1	1.8	10.8	18.0
Average amount of ink used across three runs	9.5	1.0	1.8	10.2	17.9
Total ink weight across five cartridges for 50-page run (based on averages)					40.4

Table 4: Ink Used in Three 50-Page Runs of ISO Poster Test Document (Normal Mode) on the HP DesignJet Z6 (in Grams)

	Magenta	Yellow	Cyan	Chromat-ic Red	Photo Black	Matte Black
Test Run 1 Net weight of ink used	7.4	7.3	17.7	5.3	10.3	4.0
Test Run 2 Net weight of ink used	7.3	7.2	17.7	5.2	9.9	4.3
Test Run 3 Net weight of ink used	7.3	7.4	17.9	5.1	9.8	4.0
Average amount of ink used across three runs	7.3	7.3	17.8	5.2	10.0	4.1
Total ink weight across six cartridges for 50-page run (based on averages)						51.7

Table 5: Ink Used in Three 50-Page Runs of GIS Map Test Document (Standard Mode) on the Canon imagePROGRAF TM-200 (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	10.4	1.5	3.2	4.9	8.1
Test Run 2 Net weight of ink used	9.0	1.3	4.1	6.0	9.0
Test Run 3 Net weight of ink used	9.3	1.2	4.2	6.5	9.9
Average amount of ink used across three runs	9.6	1.3	3.8	5.8	9.0
Total ink weight across five cartridges for 50-page run (based on averages)					29.5

Table 6: Ink Used in Three 50-page Runs of GIS Map Test Document (Normal Mode) on the HP DesignJet Z6 (in Grams)

	Magenta	Yellow	Cyan	Chromat-ic Red	Photo Black	Matte Black
Test Run 1 Net weight of ink used	19.5	3.7	44.4	4.1	5.0	7.3
Test Run 2 Net weight of ink used	18.8	4.6	40.8	4.8	5.7	7.7
Test Run 3 Net weight of ink used	19.1	3.7	44.2	4.0	5.0	7.1
Average amount of ink used across three runs	19.1	4.0	43.1	4.3	5.2	7.4
Total ink weight across six cartridges for 50-page run (based on averages)						83.1

Ink Consumption Test Methodology Overview

Buyers Lab's ink consumption analysis was conducted using two document types (ISO Office poster and GIS Map). Each document was formatted as a PDF and sized at ISO A1.

The Canon imagePROGRAF TM-200 was installed in Buyers Lab's lab with the latest "01.02" level of firmware (as of July 2018) and connected to a Windows 10 workstation using a 1000BaseT TCP/IP connection. The device was left in default configuration throughout testing. The Canon driver was used for all testing and was left in default colour setting configuration. The ISO Office document was printed on 140gsm matte coated media in Standard mode, and the GIS map was printed on plain media in Standard mode.

The HP DesignJet Z6 was installed in Buyers Lab's lab with the latest "JGR6_02_18_13.16" level of firmware (as of July 2018) and connected to a Windows 10 workstation using a 1000BaseT TCP/IP connection. The device was left in default configuration throughout testing. The PCL 3 driver was used for all testing and was left in default colour setting, with media selection set to plain paper and the image set to print at actual size. The ISO Office document was printed on heavyweight coated media in Normal mode, and the GIS map was printed on plain media in Normal mode.

Before installing the ink cartridges, Buyers Lab technicians weighed and recorded the weight of each with all packaging removed. At the end of each 50-print test run, the cartridges were weighed again and the resulting weight of ink used for the test run calculated for each colour.

For both models, one cartridge was then run to exhaustion and the weight of the empty cartridge was recorded and used as the empty weight for each colour.

Test Environment

Products were tested in Buyers Lab's environmentally controlled UK test lab, which replicates typical office conditions.

Test Equipment

Buyers Lab's dedicated test network in Europe, consisting of Windows 2012 servers and Windows 10 Professional workstations, 10/100/1000BaseTX network switches and CAT5e/6 cabling.

Test Procedures

The test methods and procedures employed by Buyers Lab in its lab testing include Buyers Lab's proprietary procedures and industry-standard test procedures. In addition to a number of proprietary test documents, Buyers Lab uses industry standard files including a Buyers Lab test file and an ASTM monochrome test document for evaluating black image quality. In addition to a visual observation, colour print quality and gamut size are evaluated using XRite i1 profile software and an i1 Pro colour spectrophotometer, and analysed using XRite i1i0 Advanced Scanning Table. Density of black and colour output was measured using XRite exact^{Xp} densitometers.

About Keypoint Intelligence - Buyers Lab

Keypoint Intelligence is a one-stop shop for the digital imaging industry. With our unparalleled tools and unmatched depth of knowledge, we cut through the noise of data to offer clients the unbiased insights and responsive tools they need in those mission-critical moments that define their products and empower their sales.

For over 50 years, Buyers Lab has been the global document imaging industry's resource for unbiased and reliable information, test data, and competitive selling tools. What started out as a consumer-based publication about office equipment has become an all-encompassing industry resource. Buyers Lab evolves in tandem with the ever-changing landscape of document imaging solutions, constantly updating our methods, expanding our offerings, and tracking cutting-edge developments.

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