

Canon imagePROGRAF PRO-4000S vs. HP DesignJet Z5200PS



Canon imagePROGRAF PRO-4000S



HP DesignJet Z5200PS

	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Advantage ✓		
Image Quality	✓	
Print Productivity	✓	
Ink Consumption	✓	
Device Feature Set	✓	
Print Driver Feature Set	✓	
Printhead Reliability/Cleaning Routines	=	=

TEST OBJECTIVE

Buyers Laboratory LLC (BLI) was commissioned by Canon Europe to conduct confidential document imaging device performance testing on the Canon imagePROGRAF PRO-4000S and the HP DesignJet Z5200PS, and produce a report comparing the relative strengths and weaknesses of the two products in terms of image quality, productivity, ink consumption, device feature set, driver functionality, and printhead stability and cleaning routines. All testing was performed in BLI's test facility in Wokingham, UK.

Executive Summary

The Canon imagePROGRAF PRO-4000S outperformed the HP DesignJet Z5200PS in the majority of categories evaluated. While both models produced excellent image quality, as would be expected of a model aimed at the Graphics Arts marketplace, with highly accurate colour reproduction and good colour stability, the Canon model had the overall edge. It offered a larger colour gamut on photo media, delivered better colour business graphics output, had higher solid densities for CMYK and exhibited less colour drift when FOGRA39 colour patches were compared before and after the ink consumption test, with a Delta E of 2.8 compared with 6.7 for the HP device. Text reproduction, fine lines and photographic images were all of a comparable quality.

In BLI's productivity tests, the PRO-4000S's performance, in particular, was outstanding, with a clear speed advantage in all tested modes. 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 Z5200PS runs out of ink, printing has to stop for the cartridge to be replaced, which leads to operator downtime. Furthermore, the HP model's ink cartridges have a significantly smaller capacity (300 ml versus 700 ml for the Canon device), and thus would need replacing more frequently, leading to more interrupted workflows.

In the ink consumption evaluation, where the cost of printing with three different document types on three different media is assessed, the Canon model used less ink in terms of net weight for all three tests, when compared with the HP Z5200PS.

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. Another advantage is its standard embedded spectrophotometer, which allows for fast single-step media profiling, a feature not offered with this Canon model, even as an option. It should be noted, though, that the Canon PRO-4000S comes with standard calibration features which allow users to calibrate the printer not only with the manufacturer's own brand of genuine paper, but other media brands as well, and enables administrators to control colour remotely across the PRO-4000S/6000S series in an effort to ensure colour consistency.

Overall, however, the Canon model offers a stronger device and driver feature set. It includes a standard 320-GB hard drive (as opposed to 160-GB with the HP model), delivers a smaller ink-drop size, and has a lower power consumption in standby mode (1.8 W as opposed to 12 W), in which the device will spend most of its time. Furthermore, the Canon PRO-4000S offers a greater number of media profiles, security watermark options, poster print capability and colour adjustment options. Both models can produce enlarged poster-size copies; the

PRO-4000S supports Canon's imageRUNNER Enlargement Copy Mode, so documents scanned on a Canon MFP can be sent to the PRO-4000S, while the HP Z5200PS can integrate with a smaller-format MFP to produce enlarged poster-size copies via the Serif PosterDesigner Utility (not tested with this unit).

In summary, with its superior productivity, more efficient use of ink, excellent overall image quality and notable driver and device feature sets, the Canon imagePROGRAF PRO-4000S is judged to be the stronger performer in BLI's evaluation.

Image Quality

	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Advantage ✓		
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	=	=
Business Graphics	✓	
Photographic Images	=	=
Colour Gamut (photo media)	✓	

+, – and ○ represent positive, negative and neutral attributes, respectively.

- Image quality testing was done with Canon's Semi-gloss Photo 280-gsm media and HP's proofing Semi-gloss Satin media, with quality set to Highest (2400 x 1200 dpi) on the Canon model and the HP model set to Best (2400 x 1200 dpi).
- The Canon model produced clearly formed sans serif fonts in black and colour down to the smallest 3-pt. type size, while its serif fonts were distinct down to the 4-pt. level (in black) and 5-pt. level (in colour). Similarly, the HP model delivered well-formed fonts down to the 3-pt type size, but they exhibited slight fuzziness on serifs when viewed under magnification.
- Both models produced the 1x1 pixel grid in CMY with no quality issues, as well as a consistent dot laydown in the 1x1 black-on-white pixel grid.
- Both devices delivered excellent vertical and horizontal fine lines down to 0.1-pt size. Whilst there was some

slight stair-stepping evident in diagonal lines produced by the Canon model, its circles were smooth and well formed with no line break-up, with the HP model delivering circles of comparable quality.

- 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.
- 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 all colours compared with those with the HP Z5200PS.
- Both models exhibited very good natural-looking skin tones in photographic images, with good definition in the light contrast areas.
- The three skin tone tests yielded fairly consistent results for each model when compared with the original target. Output produced by the Canon model displayed greater variance with two of the three skin shades when compared with HP model, however, overall there’s no meaningful real-world difference that would be discernible to the naked eye.
- Neutral grey consistency was comparable for both models; the Canon model’s Delta E value was 0.4 compared with the HP unit’s 0.2, but the difference would not be discernible to the naked eye.
- + During BLI’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 PRO-4000S displayed a much lower mean Delta E drift than the HP device—2.8 versus 6.7.
- + When printing on photo media in highest quality settings, the Canon PRO-4000S delivered a larger (by 27.4%) colour gamut than the HP model, with a CIE volume of 679,092 versus 532,938.
- BLI analysed a wide range of colour and greyscale output in photographic images output by both devices and found them to be of an exceptionally high standard, with vibrant colours and excellent fine detailing in light and dark contrast areas.
- + Both models delivered a very high level of quality in colour business graphics, which would perfectly satisfy customer requirements. However, the Canon model has the slight edge with its white-on-black images whereas the HP Z5200PS’s white-on-black circles and fine lines in 0.1pt were of a poorer quality.

Print Productivity

	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Advantage ✓		
First Print Out From Ready State (Fast and Standard/Normal modes)	✓	
Throughput Speed Portrait (Fast and Standard/Normal modes)	✓	
Throughput Speed Retail Poster (Fast and Standard/Normal modes)	✓	

- + When printing a single high-resolution portrait, the Canon model easily surpassed the HP model in terms of speed of the first-print-out from ready state across both tested modes. In Fast and Standard/Normal modes, the PRO-4000S was 45.6% and 41.5% faster, respectively, compared with the HP Z5200PS.
- + The Canon PRO-4000S also outperformed the HP model with faster first-print-out times from ready state when printing a single medium-resolution retail poster on matte coated media. The Canon delivered its output with speeds that were 43.5% (in Fast) and 44.2% (in Standard/Normal) faster than the HP device.
- + When printing five copies of a single-page A1-size high-resolution portrait test document in both Fast and Standard/Normal modes, the Canon model displayed a clear speed advantage over the HP model, with per-page speeds that were 39.6% faster in Fast mode and 28.4% faster in Standard/Normal mode.
- + When printing five copies of a single-page A1-size medium-resolution retail poster test document, the Canon model again delivered its output with speeds that were 46.9% (Fast) and 51.3% (Standard/Normal) faster compared with the HP Z5200PS.
- + Similar results were seen with the A0-size high-resolution portrait test run. The Canon device produced five copies of a single-page test document in both Fast and Standard/Normal modes with per-page speeds that were 38.0% and 24.2% faster, respectively, compared with the HP model. When delivering the A0-size medium-resolution retail poster test, the Canon model was, again, faster than the HP device in both modes—by 63.6% (in Fast) and 43.0% (in Standard/Normal).

Ink Consumption

BLI analysts 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 BLI 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.

Results averaged across three 50-page A1 print jobs in Standard/Normal Mode

RESULTS		
Average weight of ink used (grams)	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
PACKAGING PROOF	133.1	192.8
RETAIL POSTER	100.3	109.9
STUDIO PORTRAIT	129.2	149.0

- + When printing BLI’s Packaging Proof test target using Standard/Normal mode on semi-gloss proofing media, the Canon PRO-4000S used significantly less (31.0%) ink in terms of net weight than the HP Z5200PS.
- + In the BLI Retail Poster print run evaluation using Standard/Normal mode on matte coated media, the Canon PRO-4000S used slightly (8.7%) less ink than the HP Z5200PS.
- + When printing BLI’s Studio Portrait ink consumption test target using Standard/Normal mode on glossy photo media, the Canon PRO-4000S used 13.3% less ink than the HP Z5200PS.

Device Feature Set

- Both models employ eight inks, which include two black inks and one grey ink.
- + The Canon PRO-4000S's ink cartridges have a far larger capacity than those offered with the HP Z5200PS. Since they can be replaced during operation, (which cannot be carried out on the HP unit), the Canon PRO-4000S is likely to experience longer, uninterrupted print runs.
- + The PRO-4000S's single printhead contains more nozzles per colour—1,536 —than the HP unit's four print-heads, which contain 1,056 nozzles per colour.
- + The Canon unit's ink delivery system dispenses a 4-picoliter drop size for all colours, while HP's dispenses two drop sizes: 4-picoliter (LC, LM, LG, PK) and a slightly larger 6-picoliter drop size for cyan, magenta, yellow and matte black.
- Both models offer borderless printing.
- + The Canon unit supports a larger diameter of roll paper than that offered by the HP device (170mm as opposed to 150mm).
- The HP device has a larger standard and maximum RAM (32 GB, including virtual memory) than the Canon unit, which offers 3 GB.
- + A standard 320-GB hard drive is built in to the Canon device, which allows for the storage of commonly used documents and aids spooling workflow; the HP model only offers a 160-GB hard drive.
- The HP Z5200PS is a lighter, more portable device than the Canon model, with a weight of 83 kg versus 121 kg for the Canon unit.
- + The Canon model has a lower advertised operational peak energy value (107 W) than the HP model (170W).
- + In standby mode (the operating mode most in use), the Canon PRO-4000S's energy consumption is just 1.8 W compared with 12 W for the HP device.
- + The Canon PRO-4000S offers user-friendly media loading options (front) whereas the HP device only allows media rolls to be loaded from the back, which can be cumbersome and requires a larger footprint.
- + The Canon model offers both 2" and 3" core adaptors; the 3" cores especially help to avoid paper curling towards the end of the life of a roll. The HP device only supports 2" core media.
- Both models offer USB 2.0 and Gigabit Ethernet connectivity
- + Direct Wi-Fi connectivity is supported by the Canon unit, but not by the HP model.
- The Canon model includes a plug-in for Microsoft Office, which provides a wizard that walks users through the process of creating posters from Word, Excel or PowerPoint, avoiding the need for complex resizing. A similar poster creation feature is offered with the HP device; its Instant Printing Pro utility (available as a free download) enables users to click on a file name and, without opening the application, set individual options such as print size, rotation, print quality and number of copies before printing. Supported file formats include PDF, TIFF, JPEG and PPT. A free download plug-in provides compatibility with other MS Office applications.
- 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 offers Serif PosterDesigner Pro as an extra-cost option, which enables poster and banner creation on HP large-format printers.
- + The Canon device includes a media mismatch option, which places jobs on hold that can't be printed due to incorrect media being loaded, while jobs that can be completed are printed; the held jobs are printed once the

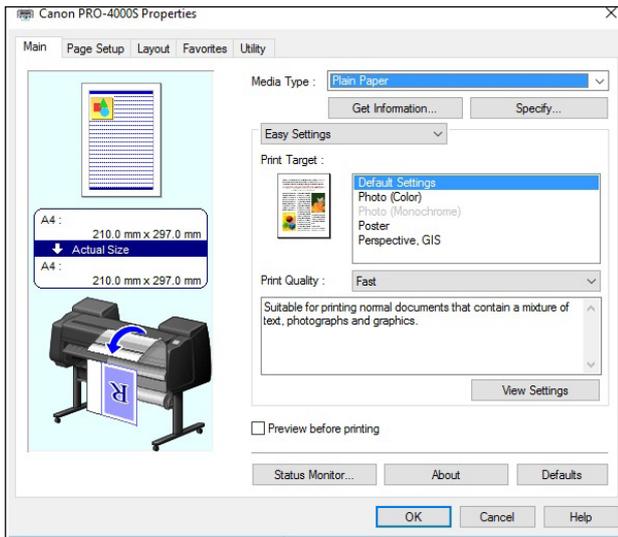
required paper is loaded, all of which minimizes the risk of ink and paper being wasted. The HP device does not offer this capability. Although an error message is generated on the driver, it will continue to print on the mismatched media, which results in ink and media waste.

- + Canon offers a Print Studio PRO plug-in which offers support for a variety of software options designed to appeal to specific segments of the Graphic Arts market such as photography and fine art display. These include a print plug-in for Photoshop, which, according to Canon, allows users to print 16-bit files directly from Adobe RGB with a wide gamut and clear tonal gradation, and a plug-in for DPP (Digital Photo Professional) that includes a 'Digital Lens Optimizer' to improve photographic image quality and enhance depth of field; Adobe Lightroom is also supported. Print Studio PRO has additional functions allowing users to add text to the photos; choose black and white photo mode, and save favourite settings among others.
- Canon's Accounting Manager, accessed via the Status Monitor, 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. HP offers similar accounting management and tracking capabilities via the Accounting tab on its embedded web server page, or via the HP DesignJet Accounting tool, which is available as a free download.
- The HP Z5200PS includes a standard built-in spectrophotometer that can be used to conduct colour calibrations for all HP and third-party devices to ensure colour consistency, while the Canon PRO-4000S does not offer this option.
- + Yet, the PRO-4000S's standard calibration features allow users to calibrate the printer not only with the manufacturer's own-brand of genuine paper, but other media brands as well. Conveniently, administrators can control colour and monitor the calibration status remotely across the PRO-4000S/6000S series via Canon's free Device Management Console utility to ensure colour consistency.

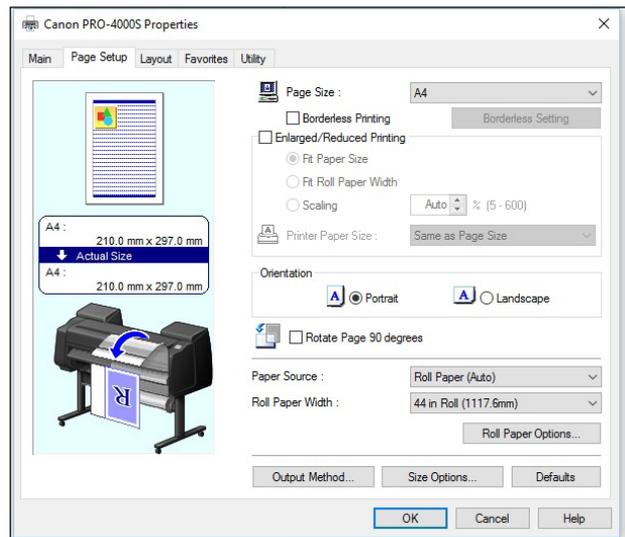
Print Driver Feature Set

- + The Canon driver includes 49 media profiles versus 34 for the HP driver, although both units permit users to build a library of custom media profiles.
- + The Canon driver includes a watermark capability; the HP driver does not.
- + The Canon driver includes a Thicken Fine Lines image enhancement option, which is not available with the HP model.
- Both the Canon and HP drivers offer N-up printing (up to 16).
- + 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 model's device status monitor can be accessed directly from the first tab of the driver, but HP users are required to perform an extra click to access device status via an icon on the Services tab.
- + The Canon driver features a wider selection of simple colour adjustment options, which include brightness and contrast, and sliding scale adjustments for cyan, magenta, yellow and black. The HP driver has adjustment options for cyan, magenta and yellow, but not black or brightness.
- The driver for the HP model provides a handy thumbnail preview for users to check the effects on their image as they make colour adjustments.

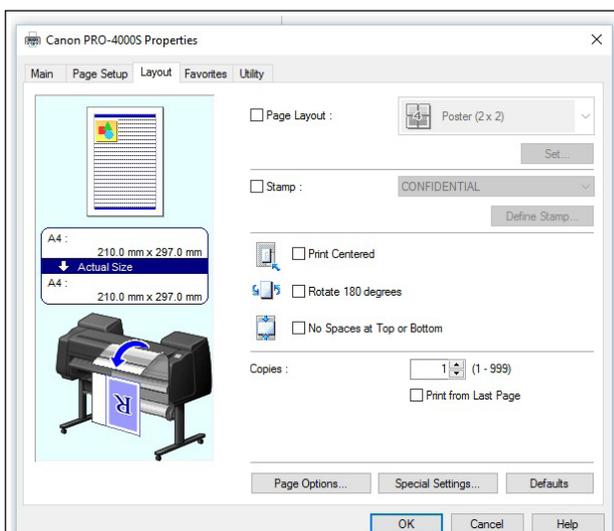
- The Canon driver includes advanced colour-matching capabilities, including the ability to match ICC profiles and select the rendering intent based on different elements in the document. The HP Utility Color Centre offers ‘Paper Preset Management’, which offers users the ability to create, install and export media ICC profiles using the unit’s embedded spectrophotometer.
- HP Professional PANTONE Emulation is a noteworthy feature that allows users to create and print a swatchbook of multiple PANTONE colours and see how the printer will reproduce them on selected media.
- + The Canon driver includes a unidirectional print selection that helps to avoid any banding across output, whereas the HP driver does not.



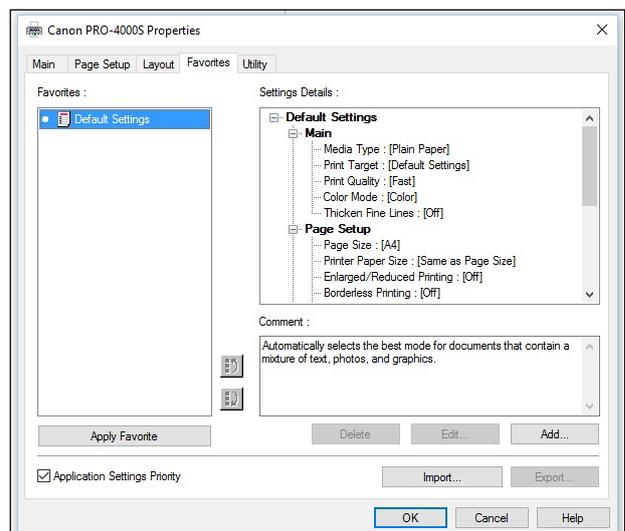
Canon imagePROGRAF PRO-4000S Print Driver Main Tab



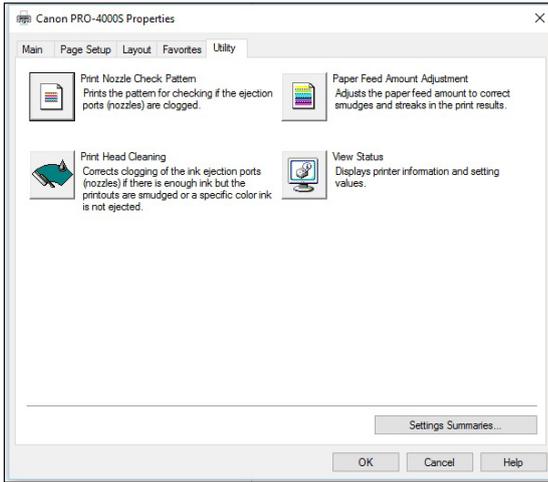
Canon imagePROGRAF PRO-4000S Print Driver Page Setup Tab



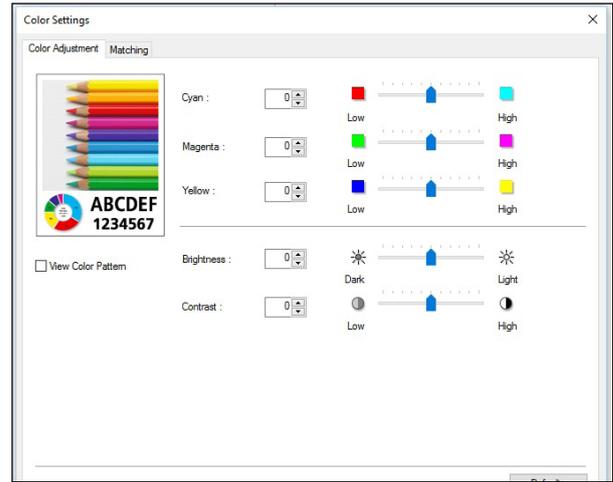
Canon imagePROGRAF PRO-4000S Print Driver Layout Tab



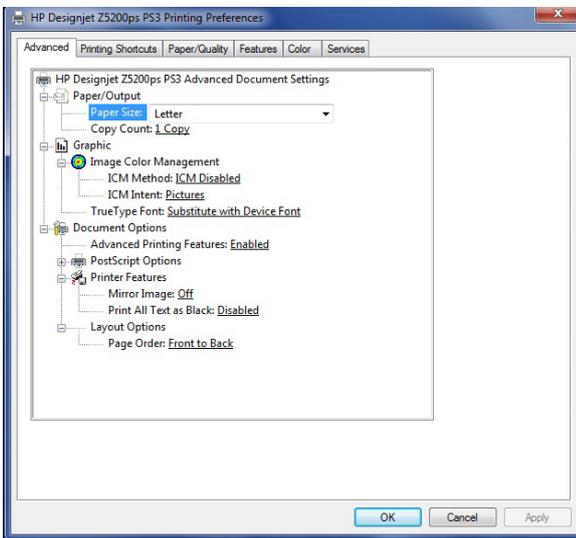
Canon imagePROGRAF PRO-4000S Print Driver Favourites Tab



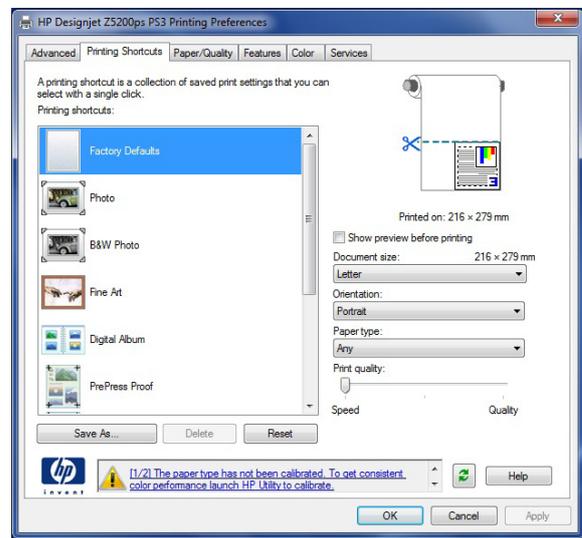
Canon imagePROGRAF PRO-4000S Utility Tab



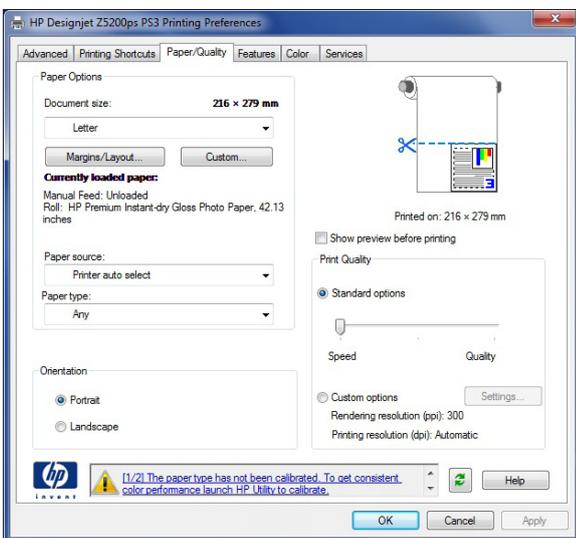
Canon imagePROGRAF PRO-4000S Colour Adjustment Settings



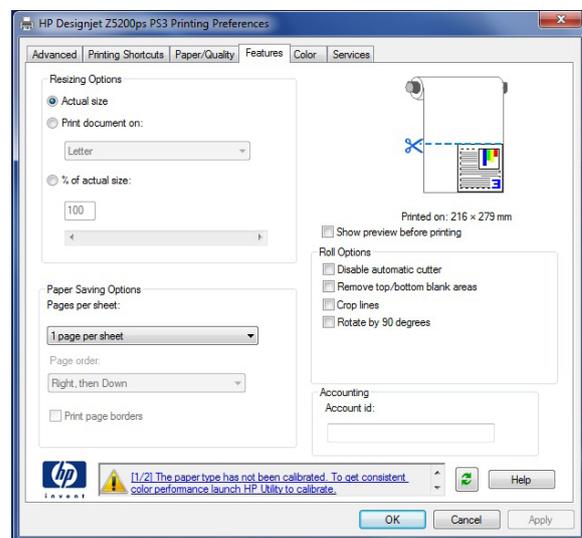
HP DesignJet Z5200PS Print Driver Advanced Tab



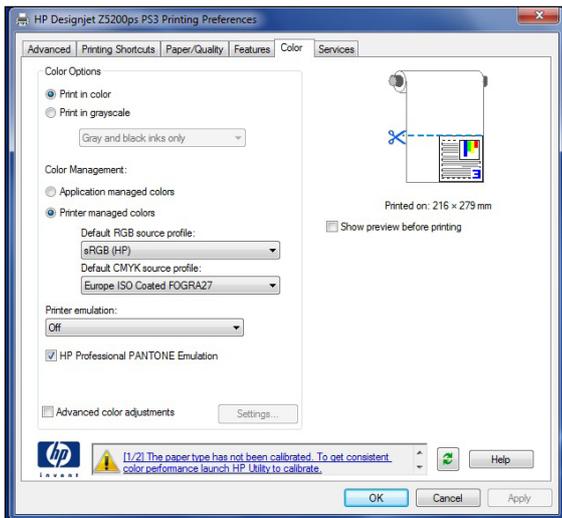
HP DesignJet Z5200PS Print Driver Printing Shortcuts Tab



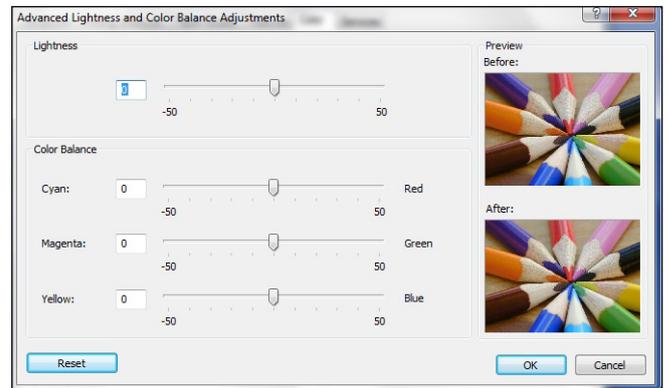
HP DesignJet Z5200PS Print Driver Paper/Quality Tab



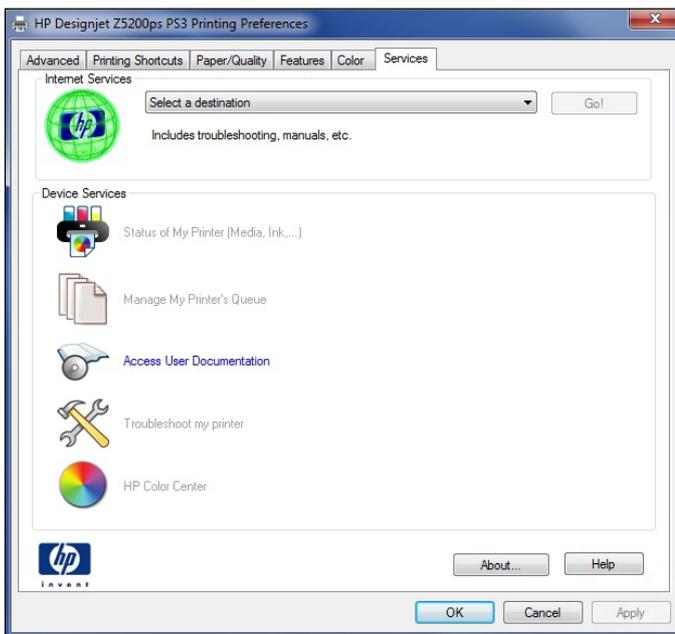
HP DesignJet Z5200PS Features Tab



HP DesignJet Z5200PS Colour Tab



HP DesignJet Z5200PS Colour Adjustments Settings



HP DesignJet Z5200PS Services Tab

Printhead Reliability / Cleaning Routines

- The Canon PRO-4000S offers various nozzle check settings at the control panel. The default setting is “Auto Nozzle Check”. Additional settings include “after one page”, “after 10 pages” or “disabled”. The HP DesignJet Z5200PS does not offer this capability on its control panel.
- When it comes to replacing the printhead, both models offer flexibility with their user-friendly replacement procedure.

- + 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 print-head maintenance.
- After both devices were shut down completely over the course of a weekend, neither model had problems with nozzles clogging.
- + A standard cleaning cycle performed on the Canon model takes approximately four minutes, 30 seconds on average to complete, whilst on the HP model, a cleaning cycle takes approximately seven minutes.

SUPPORTING TEST DATA

Productivity

Colour Throughput Time – A1 High-Resolution Portrait Printing

Canon imagePROGRAF PRO-4000S (time in seconds)		HP DesignJet Z5200PS (time in seconds)	
Fast (Level 5)	Standard (Level 4)	Fast	Normal
145.25	214.39	240.56	299.57

A single-page high-resolution A1 portrait was printed as a five-page job using the device driver set to the semi-gloss photo paper/colour setting. Both devices were loaded with 44" 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

Canon imagePROGRAF PRO-4000S (time in seconds)		HP DesignJet Z5200PS (time in seconds)	
Fast (Level 4)	Standard (Level 3)	Fast	Normal
75.86	122.83	142.99	252.17

A single-page medium-resolution A1 portrait was printed as a 5-page job using the device driver set to the matte coated paper/colour setting. Both devices were loaded with 44" 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).

Colour Throughput Time – A0 High-Resolution Portrait Printing

Canon imagePROGRAF PRO-4000S (time in seconds)		HP DesignJet Z5200PS (time in seconds)	
Fast (Level 5)	Standard (Level 4)	Fast	Normal
269.50	424.71	435.00	560.39

A single-page high-resolution A0 retail poster was printed as a 5-page job using the device driver set to the glossy paper/colour setting. Both devices were loaded with 44" rolls, with each job set to auto-rotate to save media. The time indicated is the average number of seconds per page (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).

Colour Throughput Time – A0 Medium-Resolution Retail Poster Printing

Canon imagePROGRAF PRO-4000S (time in seconds)		HP DesignJet Z5200PS (time in seconds)	
Fast (Level 4)	Standard (Level 3)	Fast	Normal
92.71	250.78	254.41	439.88

A single-page medium-resolution A0 retail poster was printed as a 5-page job using the device driver set to the matte coated paper/colour setting. Both devices were loaded with 44" 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

	Canon imagePROGRAF PRO-4000S (time in seconds)		HP DesignJet Z5200PS (time in seconds)	
	Fast (Level 5)	Standard (Level 4)	Fast	Normal
Time Before Printing Commences	22.57	22.86	74.88	84.47
First Print Out Time	145.24	217.87	266.85	372.40

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 semi-gloss photo paper. Both devices were loaded with 44" rolls, with each job set to auto-rotate to save media.

First-Print-Out Time from Ready State – Medium-Resolution Retail Poster Printing

	Canon imagePROGRAF PRO-4000S (time in seconds)		HP DesignJet Z5200PS (time in seconds)	
	Fast (Level 4)	Standard (Level 3)	Fast	Normal
Time Before Printing Commences	22.14	21.98	39.40	40.69
First Print Out Time	76.75	129.16	135.94	231.41

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 matte coated media. Both devices were loaded with 44" rolls, with each job set to auto-rotate to save media.

Colour Print Quality

Colour Optical Density Evaluation

Canon imagePROGRAF PRO-4000S						
Semi-Glossy Photo Paper						
Highest (2400 x 1200 dpi)						
	1	2	3	4	Max.	Min.
Cyan	1.61	1.61	1.64	1.63	1.64	1.61
Magenta	1.34	1.33	1.36	1.35	1.36	1.33
Yellow	1.29	1.28	1.29	1.29	1.29	1.28
Black	2.45	2.46	2.43	2.42	2.46	2.42

HP DesignJet Z5200PS						
HP Proofing semi-gloss satin paper						
Best (2400 x 1200 dpi)						
	1	2	3	4	Max.	Min.
Cyan	0.92	0.93	0.92	0.93	0.93	0.92
Magenta	1.15	1.18	1.15	1.17	1.18	1.15
Yellow	1.19	1.19	1.19	1.19	1.19	1.19
Black	2.39	2.42	2.39	2.42	2.42	2.39

Note: Colour density readings were assessed by printing a BLI test file on proofing paper in high-quality colour settings and measuring the density of 100% dot fill using an XRite 508 densitometer.

Skin Tone and Neutral Grey Consistency

Skin Tone 1 (C=6, M=15, Y=16, K=0)		
	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Colour block		
2	0.5	0.2
3	0.5	0.3
4	0.4	0.2
5	0.5	0.1
6	0.6	0.1
7	0.7	0.2
8	0.7	0.2
9	0.8	0.2
Max. Delta E Variance	0.4	0.2

Skin Tone 2 (C=30, M=63, Y=75, K=0)		
	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Colour block		
2	0.6	0.3
3	0.6	0.3
4	0.2	0.3
5	0.9	0.4
6	0.8	0.4
7	0.7	0.2
8	0.9	0.2
9	1.4	0.1
Max. Delta E Variance	1.2	0.3

Skin Tone 3 (C=19, M=33, Y=50, K=0)		
	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Colour block		
2	0.8	0.1
3	1.2	0.2
4	0.1	0.1
5	0.7	0.3
6	0.9	0.3
7	1.2	0.2
8	0.9	0.3
9	1.3	0.2
Max. Delta E Variance	1.2	0.2

Neutral Grey		
	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Colour block		
2	0.3	0.1
3	0.4	0.1
4	0.3	0.3
5	0.6	0.3
6	0.2	0.1
7	0.3	0.2
8	0.4	0.2
9	0.3	0.2
Max. Delta E Variance	0.4	0.2

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

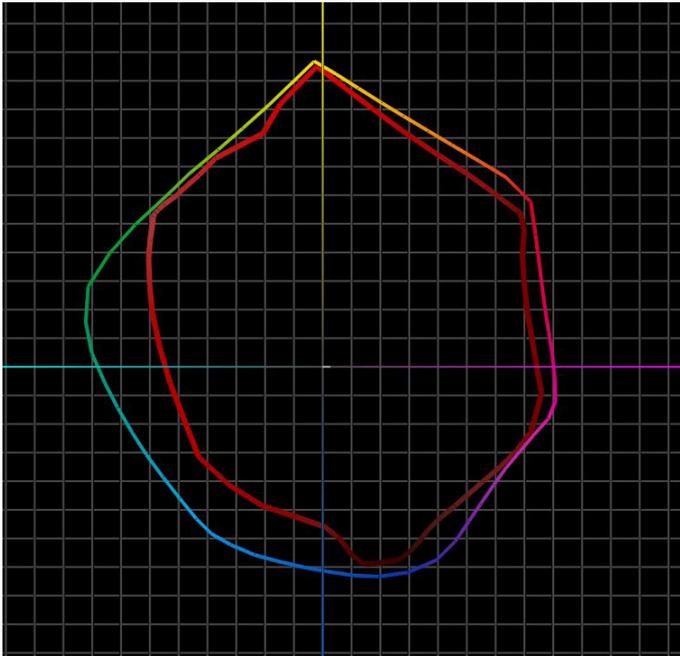
FOGRA 39 DRIFT TEST: Comparison of FOGRA39 colour patches before and after ink consumption test

	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS
Delta E Drift	2.8	6.7

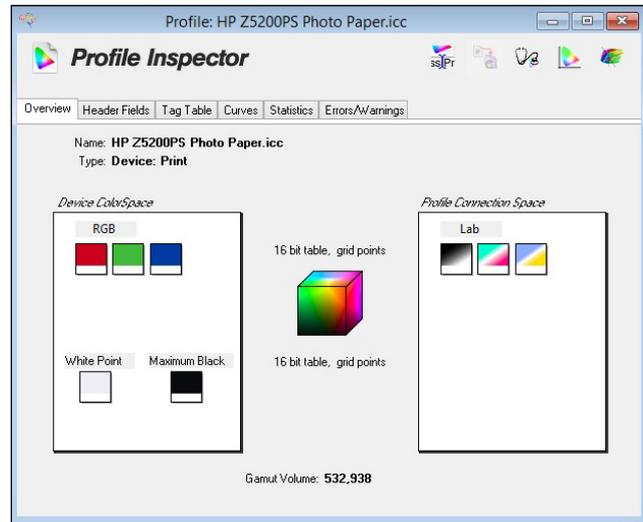
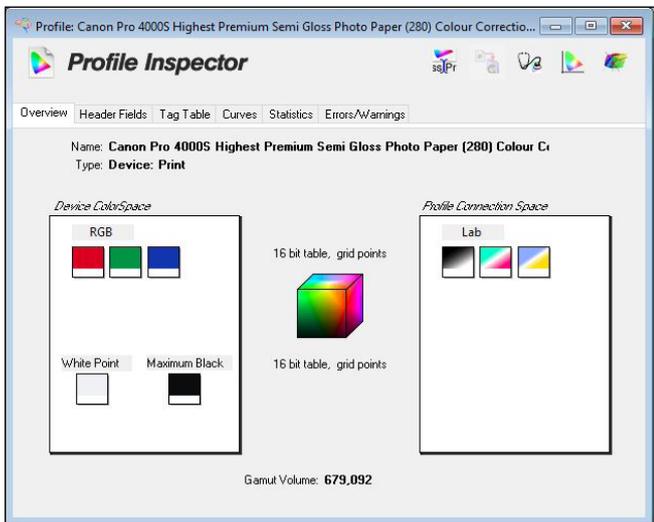
Colour Gamut Comparisons

Media Type/Settings	Canon imagePROGRAF PRO-4000S	HP DesignJet Z5200PS	Canon % larger/smaller (-) than HP
Photo Paper Highest/Best	679,092	532,938	27.4%

Colour Gamut Comparison



Canon imagePROGRAF PRO-4000S colour gamut (shown chromatically) on photo paper in highest quality settings versus HP DesignJet Z5200PS colour gamut on photo paper in highest quality settings (red).



Colour gamut profiles for the Canon imagePROGRAF PRO-4000S (left) and HP DesignJet Z5200PS (right) on photo paper in highest quality settings.

Device Feature Set

	Canon imagePROGRAF PRO-4000S	Advantage		HP DesignJet Z5200PS
Max. print resolution	2400 x 1200 dpi			2400 x 1200 dpi
Number of inks	8			8
Ink tanks replaceable during operation	Yes	✓		No
Ink-drop size	4 picoliter	✓		4 picoliter (LC, LM, LG, PK); 6 picoliter (C, M, Y, MK)
Ink cartridge capacity	160 ml, 330 ml and 700 ml (all colours)	✓		130 ml and 300ml (all colours)
Number of nozzles	18,432 (1,536 per colour)	✓		8,448 (1,056 per colour)
Number of printheads	1			4
Line accuracy	+/-0.1% or less	✓		+/-0.2%
Minimum line width	INA			0.08 mm
Minimum print margins	Roll paper: Borderless or 3 mm (all sides); Cut sheet: 3 mm (Top, Side), 20 mm (Bottom)			Borderless
Borderless (0 mm) printing	Yes			Yes
Maximum outside diameter of roll paper	170 mm	✓		150 mm
Maximum printable paper roll length	18 m (varies according to the OS and application)		✓	91 m
Maximum cut-sheet media length	1.6 m			1.6 m
Maximum media thickness	0.8 mm			0.08 mm
Maximum media width	44 inches			44 inches
Media loading	Front	✓		Rear
Optional media handling	Roll holder set (supports 2" and 3" media cores)			Roll holder (spindles available for multi-roll users)
Standard RAM	3 GB		✓	32 GB (including virtual memory)
Hard drive	Standard 320-GB	✓		Standard 160-GB
Interface	10/100/1000Base-T Ethernet, USB 2.0 High Speed, USB Memory Direct, Wireless LAN	✓		1000Base-T Ethernet, USB 2.0 High Speed
PDL	SG Raster			HP PCL 3 GUI, Adobe PS3
Net weight (unpacked)	121 kg		✓	83 kg
Power consumption when in standby	1.8 W	✓		12 W
Power consumption when active	107 W	✓		170 W
Acoustic pressure	Operation: 49 dB (A) or less; Standby: 35 dB (A) or less		✓	Operation: 49 dB (A); Standby: 29 dB (A)
Acoustic power	Operation: 6.6 Bels or less			Operation: 6.5 Bels;
Option to integrate with a spectrophotometer?	No		✓	Embedded spectrophotometer

Driver Feature Set

	Canon imagePROGRAF PRO-4000S	Advantage		HP DesignJet Z5200PS
Speed settings	Up to five, depending on media settings	✓		3 (Fast 300, Normal 300, Best 600)
Economy mode	Yes (Fast setting)			Yes (Fast setting)
Predefined profiles	5 (Under Easy Settings)		✓	9
Overview of profile settings provided	Yes	✓		No
Media profiles	49	✓		34
IQ optimized for various types of output	Yes			Yes
Watermark	Yes	✓		No
Sharpen text	No		✓	Yes (called Max Detail)
Thicken fine lines	Yes	✓		No
Mirror image	Yes			Yes
Multi-up printing	Yes, 2 to 16			Yes, 2 to 16
Poster print mode	Yes (2 by 2)	✓		No
Page stamping	Yes (Date, Time, Name, Page Number)	✓		No
Image rotation	Yes, auto 180 degrees	✓		Yes, auto 90 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	✓		Yes (C, M, Y only)
Brightness adjustment	Yes			Yes
Contrast adjustment	Yes	✓		No
Saturation adjustment	No			No
Advanced colour management options	Yes			Yes
Enlargement Copy Mode	Yes			Yes
Free Layout Capability	Yes	✓		No
MS Office Plug-in	Yes			Yes
Adobe Photoshop Plug-in	Yes*	✓		No
Accounting Capability	Yes			Yes
Disable automatic cutter	Yes			Yes
Unidirectional printing selection option	Yes	✓		No
Integration with MFP	Yes			Yes

* Canon's imagePROGRAF PRO-4000S supports Canon's Print Studio PRO plug-in which lets users print from industry-standard editing and graphics software Adobe Lightroom, Adobe Photoshop and Canon Digital Photo Professional. It also comes bundled with PosterArtist Lite.

Ink Consumption

Table 1: Amount of ink in each Canon imagePROGRAF PRO-4000S Cartridge (in grams)

	GY	PM	M	MBK	PBK	PC	Y	C	
Weight of cartridge prior to installation	737.9	743.1	661.1	658.1	736.9	765.8	635.6	641.4	
Weight of cartridge at end of life	201.3	201.3	201.3	201.3	201.3	201.3	201.3	201.3	
Net weight of ink	536.6	541.8	459.8	456.8	535.6	564.5	434.3	440.1	
Total ink weight across eight cartridges								3,969.5	

Table 2: Amount of ink in each HP DesignJet Z5200PS Cartridge (in grams)

	M	Y	LM	LC	PK	LG	MK	C	
Weight of cartridge prior to installation	195.9	192.1	191.1	191.7	194.1	191.9	194.9	193.3	
Weight of cartridge at end of life	54.4	54.4	54.4	54.4	54.4	54.4	54.4	54.4	
Net weight of ink	141.5	137.7	136.7	137.3	139.7	137.5	140.5	138.9	
Total ink weight across eight cartridges								1,109.8	

Table 3: Ink Used in Three 50-Page Runs of Packaging Proof Test Document on the Canon imagePROGRAF PRO-4000S (grams)

	GY	PM	M	MBK	PBK	PC	Y	C	
Test Run 1 Net weight of ink used	31.5	19.4	15.6	4.4	31.0	10.7	12.6	8.9	
Test Run 2 Net weight of ink used	31.2	19.0	15.4	3.7	32.6	11.9	13.6	9.2	
Test Run 3 Net weight of ink used	29.2	19.0	14.5	7.1	28.3	9.7	12.2	8.6	
Average amount of ink used across three runs	30.6	19.1	15.2	5.1	30.6	10.8	12.8	8.9	
Total average ink weight across eight cartridges								133.1	

Table 4: Ink Used in Three 50-Page Runs of Packaging Proof Test Document on the HP DesignJet Z5200PS (grams)

	M	Y	LM	LC	PK	LG	MK	C	
Test Run 1 Net weight of ink used	14.5	30.3	46.4	21.2	14.1	62.8	3.3	3.8	
Test Run 2 Net weight of ink used	14.0	30.0	44.7	20.3	13.5	62.8	2.9	3.7	
Test Run 3 Net weight of ink used	14.2	29.2	44.8	20.7	13.8	60.8	3.2	3.9	
Average amount of ink used across three runs	14.2	29.8	45.3	20.7	13.8	62.1	3.1	3.8	
Total average ink weight across eight cartridges									192.8

Table 5: Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Canon image-PROGRAF PRO-4000S (grams)

	GY	PM	M	MBK	PBK	PC	Y	C	
Test Run 1 Net weight of ink used	1.5	2.8	51.2	9.1	0.8	4.3	23.5	19.4	
Test Run 2 Net weight of ink used	3.7	3.3	44.5	6.7	2.5	2.2	19.8	14.5	
Test Run 3 Net weight of ink used	1.3	1.9	50.8	9.9	0.9	2.0	23.4	1.0	
Average amount of ink used across three runs	2.2	2.7	48.8	8.6	1.4	2.8	22.2	11.6	
Total average ink weight across eight cartridges									100.3

Table 6: Ink Used in Three 50-Page Runs of Retail Poster Test Document on the HP DesignJet Z5200PS (grams)

	M	Y	LM	LC	PK	LG	MK	C	
Test Run 1 Net weight of ink used	19.5	16.8	14.1	5.8	6.5	39.7	4.7	1.9	
Test Run 2 Net weight of ink used	20.5	16.8	14.1	5.7	6.2	39.1	5.2	2.2	
Test Run 3 Net weight of ink used	20.4	17.0	14.2	5.9	6.3	39.7	5.4	2.2	
Average amount of ink used across three runs	20.1	16.9	14.1	5.8	6.3	39.5	5.1	2.1	
Total average ink weight across eight cartridges									109.9

Table 7: Ink Used in Three 50-Page Runs of Studio Portrait Test Document on the Canon imagePROGRAF PRO-4000S (grams)

	GY	PM	M	MBK	PBK	PC	Y	C	
Test Run 1 Net weight of ink used	25.9	18.2	20.1	9.6	11.2	12.9	7.3	6.8	
Test Run 2 Net weight of ink used	31.7	34.5	19.1	9.6	13.4	21.9	12.5	6.2	
Test Run 3 Net weight of ink used	17.6	25.5	13.6	11.8	14.3	21.4	12.9	9.6	
Average amount of ink used across three runs	25.1	26.1	17.6	10.3	13.0	18.7	10.9	7.5	
Total average ink weight across eight cartridges									129.2

Table 8: Ink Used in Three 50-Page Runs of Studio Portrait Test Document on the HP DesignJet Z5200PS (grams)

	M	Y	LM	LC	PK	LG	MK	C	
Test Run 1 Net weight of ink used	5.3	20.4	43.6	18.8	6.2	50.2	2.4	2.1	
Test Run 2 Net weight of ink used	5.3	20.3	44.0	18.9	6.5	50.0	2.5	2.4	
Test Run 3 Net weight of ink used	5.3	20.2	43.0	18.7	6.1	50.3	2.4	2.2	
Average amount of ink used across three runs	5.3	20.3	43.5	18.8	6.3	50.2	2.4	2.2	
Total average ink weight across eight cartridges									149.0

Ink Consumption Test Methodology Overview

Buyers Lab's ink consumption analysis was conducted using three document types (proof, retail poster and photo). The packaging proof document was formatted as a PDF, the retail poster as a JPG file and the studio portrait was formatted as a TIFF file and all were sized at ISO A1.

The Canon imagePROGRAF PRO-4000S was installed in BLI's lab with the latest level of firmware (as of July 2016) 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 packaging proof document was printed on 255gsm semi-gloss proofing media in Standard mode, the retail poster was printed on matte coated media in Standard mode, and the studio portrait photo was printed on 250gsm glossy photo media in Standard mode.

The HP DesignJet Z5200PS was installed in BLI's lab with the latest level of firmware (as of September 2013) and connected to a Windows 7 workstation using a 1000BaseT TCP/IP connection. The device was left in default configuration throughout testing. The HP Adobe PS3 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 packaging proof document was printed on 255gsm semi-gloss proofing media in Normal mode, the retail poster was printed on matte coated media in Normal mode, and the studio portrait photo was printed on 250gsm gloss photo media in Normal mode.

Before installing the ink cartridges, BLI 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. To ensure that the sub-tank on the Canon model did not affect results, a procedure was followed to ensure that the sub-tank level was at its maximum before the print run commenced and again after the print run was completed, thereby ensuring that ink replenishment of the sub-tanks was taken into account for each print run. Then, for each model, one cartridge was run to exhaustion and the weight of the empty cartridge was recorded.

Test Environment

Testing was conducted in BLI's European test lab, in an atmospherically controlled environment monitored by a 24/7 Dickson Temperature/RH chart recorder, ensuring that typical office conditions were maintained. All paper used in testing was allowed to acclimatize inside the facility for a minimum of 12 hours before being used.

Test Equipment

Test equipment: BLI's dedicated test network in Europe, consisting of Windows 2008 servers, Windows 10 workstations, 10/100/1000BaseTX network switches and CAT5e/6 cabling.

Test Procedures

The test methods and procedures employed by BLI in its lab testing include BLI's proprietary procedures and industry-standard test procedures. In addition to a number of proprietary test documents, BLI uses industry standard files including a BLI 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 a profile software tool from Colour Confidence that was read using an EFI ES-1000 colour spectrophotometer and analysed using Chromix ColorThink Pro 3.0 software. Density of black and colour output was measured using an X-Rite 508 densitometer.

About Buyers Laboratory LLC

Buyers Laboratory LLC (BLI) is the world's leading independent provider of analytical information and services to the digital imaging and document management industry. For more than 50 years, buyers have relied on BLI to help them differentiate products' strengths and weaknesses and make the best purchasing decisions, while industry sales, marketing and product professionals have turned to BLI for insightful competitive intelligence and valued guidance on product development, competitive positioning and sales channel and marketing support. Using BLI's web-based bliQ and Solutions Center services, 40,000 professionals worldwide create extensive side-by-side comparisons of hardware and software solutions for more than 15,000 products globally, including comprehensive specifications and the performance results and ratings from BLI's unparalleled Lab, Solutions and Environmental Test Reports, the result of months of hands-on evaluation in its US and UK labs. The services, also available via mobile devices, include a comprehensive library of BLI's test reports, an image gallery, hard to find manufacturers' literature and valuable tools for configuring products, calculating total cost of ownership (TCO) and annual power usage. BLI also offers consulting and private, for-hire testing services that help manufacturers develop and market better products and consumables.

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