Custom Test Report

BLI Comparative Performance Evaluation

OCTOBER 2016

Canon imagePROGRAF PRO-4000S

vs. Epson SureColor SC-P8000

Canon imagePROGRAF PRO-4000S

Epson SureColor SC-P8000

	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000
Advantage ✔		
Image Quality	✔	
Print Productivity	✔	
Ink Consumption	✔	
Device Feature Set	✔	
Print Driver Feature Set	=	=
Printhead Reliability/Cleaning Routines	=	=

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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 Epson SureColor SC-P8000, 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

With its superior productivity performance, better image quality overall, lower ink consumption and richer device feature set, the Canon imagePROGRAF PRO-4000S outshone the Epson SureColor SC-P8000 in the majority of categories evaluated. The PRO-4000S's productivity 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 Epson SureColor SC-P8000 runs out of ink, printing has to stop for the cartridge to be replaced, which leads to operator downtime.

Another key area was the Canon PRO-4000S's more efficient use of ink in BLI's ink consumption evaluation. It used significantly less ink in terms of net weight than the Epson SureColor SC-P8000 when printing 50-page runs of three different test documents in Standard mode on the Canon device and Quality mode on the Epson unit using matte coated, glossy photo and semi-gloss media. One factor that affects the Epson model's ink consumption is that some ink will be used in the process of changing from matte black to photo black inks (or vice versa), as they share the same printhead. Both models' printheads performed reliably throughout the evaluation, with neither experiencing nozzle clogging issues when powered off over a weekend.

Both models delivered an exceptionally high standard of colour output appropriate for their Graphic Arts (GA) target market; yet, the Canon PRO-4000S had the overall edge with its crisper text and smoother circles, and in the photographic image evaluation, it delivered finer detailing in dark contrast areas, and smoother transitions between light and dark areas. Business graphics output was of a comparable quality, and both models delivered natural-looking skin tones in photographic images. The Epson model produced higher optical densities for cyan, yellow and black over the course of testing. Both models produced excellent colour gamuts on photo paper, with the Canon delivering a slightly smaller (by 11.9%) gamut than that of the Epson model.

In terms of device and driver feature sets, the Canon PRO-4000S offers a stronger device feature set, which includes its aforementioned hot-swap ink tanks, higher memory capacity, a 320-GB hard drive (which is only offered as an option to Epson users), lower rated power consumption in standby mode and the option to install a dual-roll unit, giving users the added flexibility of switching between different media types or sizes without having to reload the media each time. However, the Epson SureColor SC-P8000 delivers smaller (but variable) ink-drop sizes and has a lower advertised power consumption while printing. In addition, the Epson model offers the option of attaching an X-Rite Spectrophotometer (which Epson calls a SpectroProofer) to provide more precise colour management control. While the Canon PRO-4000S does not offer this as an option, the device 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 lets administrators control colour remotely across the PRO-4000S/8000S series to ensure colour consistency. Both models offer a comparable feature-rich driver set; the Epson model offers a greater number of media profiles (although both models let users build a library of

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custom media profiles), whilst the Canon unit offers a paper-saving flexible layout nesting option and security watermark options. ICC profile settings and built-in colour adjustment settings are available with both drivers, with the Epson driver offering a handy thumbnail preview for users to check the effects on their image as they make their changes.

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

Image Quality

	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000
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 own Semi-gloss Photo 280-gsm media and Epson's own Semi-gloss Photo 250-gsm media, with quality set to Highest (1200 dpi) on the Canon model and the Epson model set to Max Quality Level 5 (2880 x 1440 dpi); solid density and colour gamut were tested with Colour Correction disabled on the Canon model, and Colour Adjustment disabled on the Epson device.

+ The Canon model produced clearly formed sans serif fonts in black and in 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). In contrast, the Epson device under magnification delivered poorly formed colour and black serif fonts that exhibited some break-up even in the larger type sizes (7-pt. and 8-pt.) in the test target. However, text remained legible and its sans serif fonts were much better, with characters fully formed down to the 4-pt. level.

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+ Both models produced the 1x1 pixel grid in CMY with no quality issues. The Canon delivered a consistent dot laydown in the 1x1 black-on-white pixel grid, whereas the Epson model could only deliver the 2x2 black-on-white pixel grid (there were no dots visible on the 1x1 grid). The Epson unit produced a flawless 1x1 white-on-black pixel grid, whilst the Canon device delivered a slightly less distinct 1x1 white-on-black grid.

○ Both devices delivered excellent vertical and horizontal fine lines down to the 0.1-pt. size.

+ Whilst there was some slight stair-stepping evident in diagonal lines produced by the Canon model, it was much more pronounced in the Epson model's diagonal lines. Circles were smooth and well formed on the Canon device's output, whilst circles produced by the Epson unit exhibited some jaggedness.

○ 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, and with distinct transitions between all levels. Neutral greyscale halftone coverage was equally good from both units.

— The Canon device produced a higher optical density for magenta, but it had lower densities for yellow, cyan and black compared with the Epson SC-P8000.

○ Both models exhibited very good natural-looking skin tones in photographic images.

○ 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 all three skin shades when compared with the Epson 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 variance was 0.4 compared with Epson's 0.5.

— 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 Colour Verifier software, the Epson device delivered a slightly lower mean Delta E drift of 1.8 than the Canon unit's mean Delta E, which was 2.8. (The PRO-4000S tested is a pre-production model with pre-matured mechanical structure, so results with production devices may differ.)

— When printing on semi-glossy photo media in highest quality settings, both models' colour gamuts were impressive, with the Canon PRO-4000S delivering an 11.9% smaller colour gamut than that of the Epson model, with a CIE volume of 679,092 versus 770,749.

+ BLI analysed a wide range of colour and greyscale output in photographic images produced by both devices and found them to be of an exceptionally high standard, with vibrant colours and excellent detailing in light contrast areas. That said, there were some subtle differences and the Canon unit has an overall edge with its finer detailing in dark contrast areas, and better transitions between light and dark areas.

○ Both models delivered a very high level of quality in business graphics, which would perfectly satisfy customer requirements.

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Print Productivity

	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000
Advantage ✔		
First Print Out From Ready State (Standard/Speed, High/Quality, Highest/Max Quality modes)	✔	
Throughput Speed Portrait (Standard/Speed, High/Quality, Highest/Max Quality modes)	✔	
Throughput Speed Retail Poster (Standard/Speed, High/Quality, Highest/Max Quality modes)	✔	

+ When printing a single high-resolution portrait, the Canon model easily surpassed the Epson model in terms of speed of the first-print-out from ready state across all three modes; when using the Highest/Max Quality setting, it was 46.3% faster—421.66 seconds compared with 784.80 seconds—than the Epson SureColor SC-P8000. In Standard/Speed and High/Quality modes, the PRO-4000S was 41.1% and 55.1% faster, respectively, compared with the Epson SC-P8000.
+ When printing a single medium-resolution retail poster on matte coated media, the Canon PRO-4000S delivered first-print-out speeds that were faster by 47.1% (Standard/Speed), 44.3% (High/Quality) and 13.4% (Highest/Max Quality) when compared with the Epson device.
+ In BLI's throughput speed evaluation, the Canon PRO-4000S displayed a clear advantage over the Epson model when printing five pages of a single-page A1-size high-resolution portrait test document in all three tested modes; its per-page speed was 46.5% faster in Standard/Speed mode, 61.7% faster in High/Quality mode and 48.8% faster in Highest/Max Quality mode.
+ When printing five copies of a single-page A1-size medium-resolution retail poster test document, the Canon model again outperformed the Epson device, with per-page speeds that were faster by 53.1% (Standard/Speed), 49.7% (High/Quality) and 17.9% (Highest/Max Quality) compared with the Epson SureColor SC-P8000.
+ Similar results were seen with the A0-size high-resolution portrait test run. The Canon unit produced five copies of a single-page test document with per-page speeds that were 41.3% (in Standard/Speed), 55.2% (in High/Quality) and 25.6% faster (in Highest/Max Quality), compared with the Epson model.
+ The Canon model completed its superior performance by delivering the A0-size medium-resolution retail poster test in per-page times that were faster than the Epson device in all three modes; it was 49.7% faster in Standard/Speed mode, 45.8% faster in High/Quality mode and 12.1% faster in Highest/Max Quality mode.

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.

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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 tests of 50-set A1 printing in Standard/Quality mode

RESULTS		
Average weight of ink used (grams)	**Canon imagePROGRAF PRO-4000S**	**Epson SureColor SC-P8000**
PACKAGING PROOF	133.1	246.7
RETAIL POSTER	100.3	228.6
STUDIO PORTRAIT	129.2	258.3

+ When printing BLI's Packaging Proof test target using Standard/Quality mode on semi-gloss proofing media, the Canon PRO-4000S used significantly less (46.0%) ink in terms of net weight than the Epson SureColor SC-P8000.
+ In the BLI Retail Poster print run evaluation using Standard/Quality mode on matte coated media, the Canon PRO-4000S used 56.1% less ink than the Epson SureColor SC-P8000.
+ When printing BLI's Studio Portrait ink consumption test target using Standard/Quality mode on glossy photo media, the Canon PRO-4000S used 50.0% less ink than the Epson SureColor SC-P8000.

Device Feature Set

— The Epson SC-P8000 employs nine inks, which include two black inks and two grey inks, whilst the Canon PRO-4000S uses eight inks, including two black inks and one grey ink.

+ Ink cartridges can be replaced during operation on the Canon model (but not on the Epson device), which helps to reduce downtime.
+ The PRO-4000S's single printhead contains more nozzles per colour—1,536—than the Epson unit's single printhead, which contains 360 nozzles per colour.

— The Canon unit's ink delivery system dispenses a 4-picoliter drop size for all colours, while Epson's dispenses a slightly smaller drop size of 3.5 picoliter for all colours.

○ Both models offer the same capacity (700 ml) for the higher-capacity cartridges.

○ Both models offer borderless printing.

+ The Canon unit supports a larger diameter of roll paper (170 mm as opposed to 150 mm with the Epson device).
+ The Canon device has a larger standard memory capacity (3 GB) than the Epson unit, which has a 1-GB capacity.
+ A standard 320-GB hard drive is built into the Canon device, which allows for the storage of commonly used documents and aids spooling workflow; the Epson model offers a 320-GB hard drive, but only as an option.

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+ The PRO-4000S has a more compact footprint than the Epson model, with a weight of 121 kg versus 135 kg for the Epson unit.

— Rated noise emissions while active are fractionally lower for the Epson model compared with the Canon unit (47 dB versus 49 dB).

— The Epson model has a lower advertised operational peak energy value (75 W) than the Canon device (107 W).

+ In standby mode (the operating mode most in use), the Canon PRO-4000S's energy consumption is just 1.8 W compared with 5.4 W for the Epson device.

○ The Canon PRO-4000S offers user-friendly media loading options (at the front) while the Epson unit allows media rolls to be loaded from the top rear, which offers good access as well.

+ The Canon model can support an optional dual-roll unit, giving users the added flexibility of switching between different media types or sizes without having to reload the media each time, or allowing the automatic take-up of printed output; the Epson unit does not offer this option.

○ Overall, BLI technicians found it easier to add media rolls on the SC-P8000, as the Epson model does not require the insertion of the media roll on a spindle; operators must attach media holders to both ends of the roll in order to pick up and position the roll into place on the device. In contrast, Canon operators must slide the media roll on to a central spindle, which is slightly more awkward. However, it offers automatic paper feed, whereas manual paper feed is required with the Epson model, which takes more time.

○ Both models offer 2" and 3" core adapters. The 3" cores especially help to avoid paper curling towards the end of a roll.

○ Both models offer USB 2.0 and Gigabit Ethernet connectivity.

+ The Canon device, but not the Epson model, offers direct Wi-Fi connectivity.

— Epson users have the option of attaching an X-Rite Spectrophotometer (which Epson calls a SpectroProofer) to ensure colour consistency and to automate workflows for colour calibration, target measurement and media profile generation on Epson and third-party devices when used in conjunction with software tools offered by the company, whilst 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 across the PRO-4000S/8000S series via Canon's free Device Management Console utility to ensure colour consistency.

+ The Canon device includes a media mismatch option, which places jobs that can't be printed due to incorrect media being loaded on hold, while those without a mismatch 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 Epson device offers a paper size check setting which, if enabled, means it will stop printing altogether, should it detect an issue.

○ 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 Epson device; its LFP Print Plug-in for Office 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 second 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.

○ 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

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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 their photos; choose black and white photo mode, and save favourite settings, among others. Epson's Print Layout is a plug-in for Photoshop, Lightroom and Nikon View NX-I, which lets users perform more advanced colour management, layout and print photos, optimize black-and-white photos and save media types and sizes for future use.

○ 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. Epson offers similar accounting management and tracking capabilities via its LFP Accounting Tool software, which is available as a free download from the company's website.

Print Driver Feature Set

— The Canon driver includes 49 media profiles versus 52 for the Epson driver, although both units enable users to build a library of custom media profiles.

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

\+ The Canon driver also includes a Thicken Fine Lines image enhancement option, which is not available with the Epson model.

\+ Both the Canon and Epson drivers offer N-up printing (up to 16 and 4, respectively).

— Poster printing capability (2 x 2) is offered by the Canon model, but Epson users can select a further option for 4 x 4 poster printing.

— The Canon driver offers page-stamping (date, time, user-name and page number); a wider range of page stamping options is available with the Epson driver, including a free text comments field for users to add personal comments.

\+ The Canon model's device status monitor can be accessed directly from the first tab of the driver, but Epson users are required to perform an extra click to access device status via an icon on the Utility tab.

○ The Canon driver features a wide selection of simple colour adjustment options, which include brightness and contrast, as well as a sliding scale adjustments for cyan, magenta, yellow and black. The Epson driver has similar adjustment options for cyan, magenta and yellow, but not black, along with brightness, contrast and saturation.

— The driver for the Epson 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 Epson Color Calibration Utility offers 'Paper Preset Management,' which offers users the ability to create, install and export media ICC profiles using the unit's optional embedded spectrophotometer.

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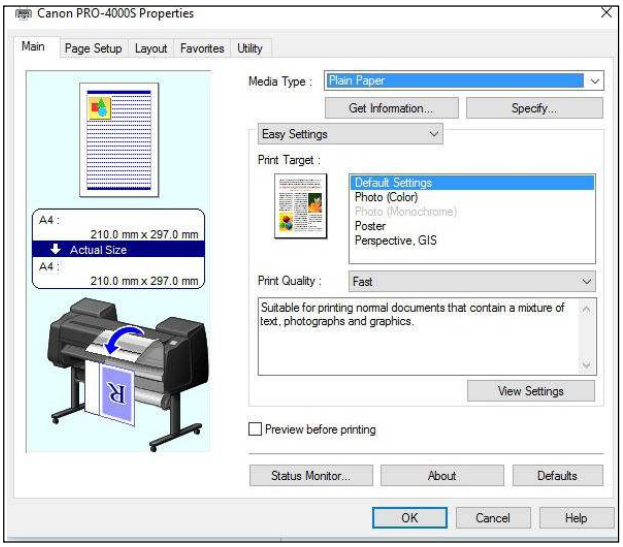
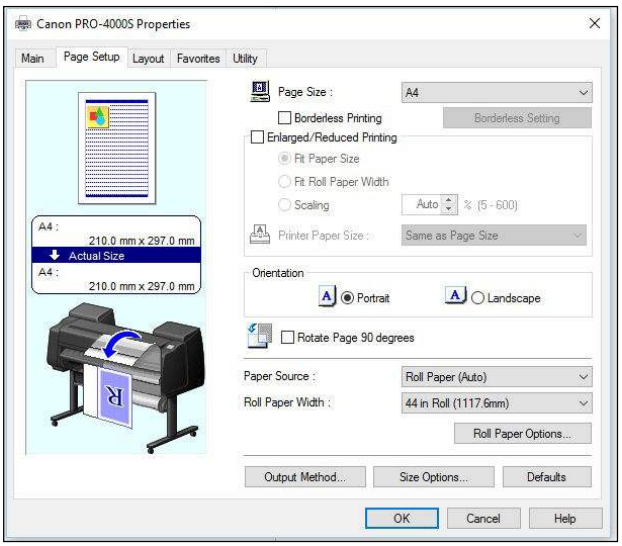
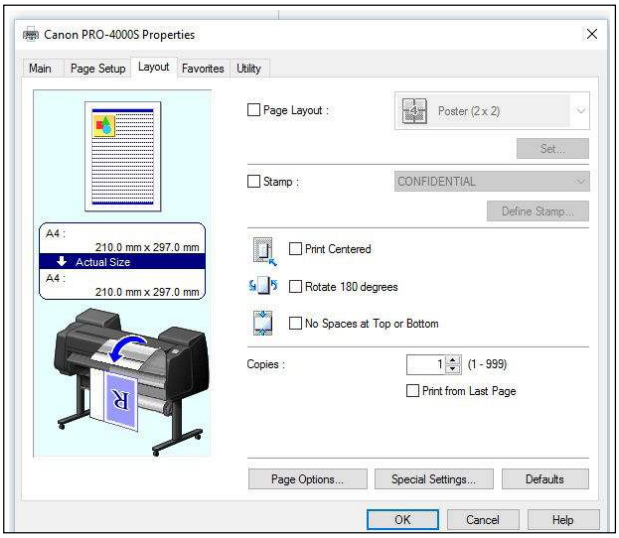
- The Canon driver includes a unidirectional print selection that helps to avoid any banding across output. The Epson driver also offers unidirectional printing adjustment settings.



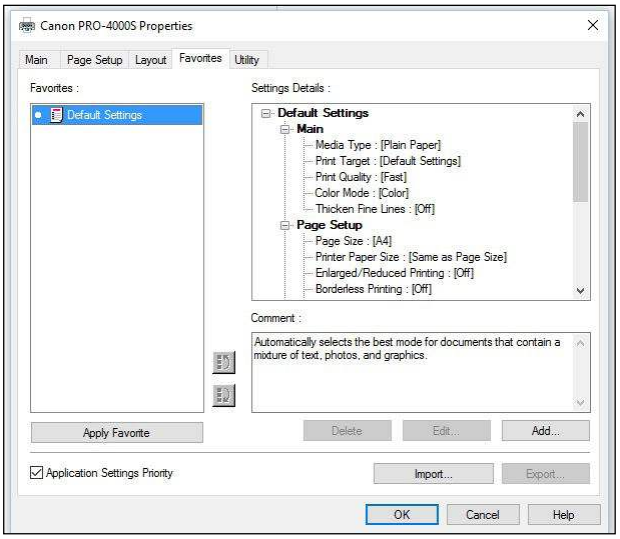
Canon PRO-4000S Print Driver Main Tab



Canon PRO-4000S Print Driver Page Setup Tab



Canon PRO-4000S Print Driver Layout Tab



Canon PRO-4000S Print Driver Favourites Tab

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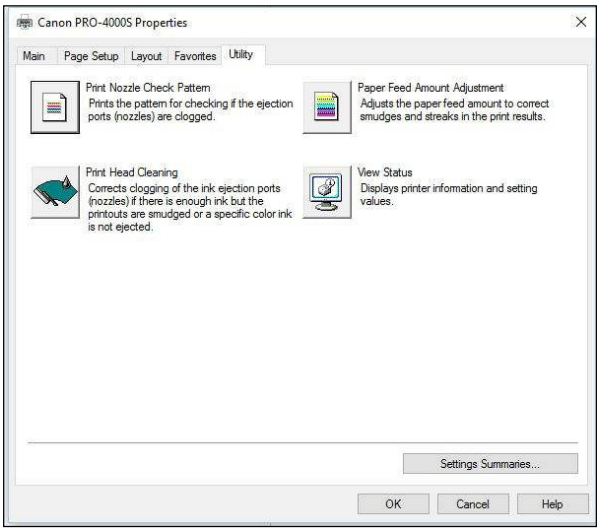
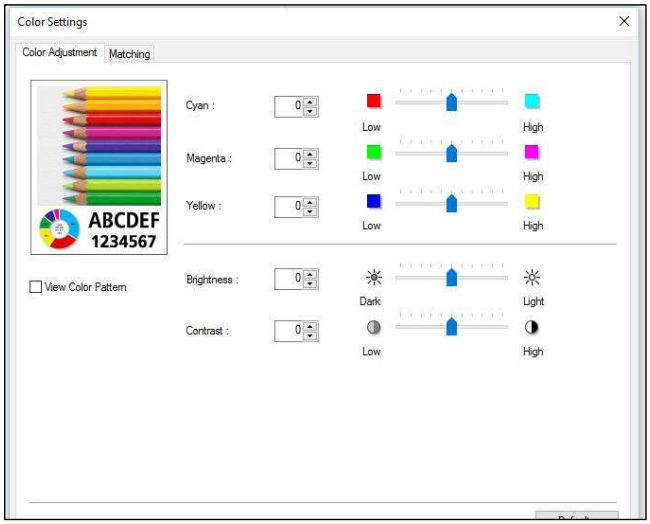
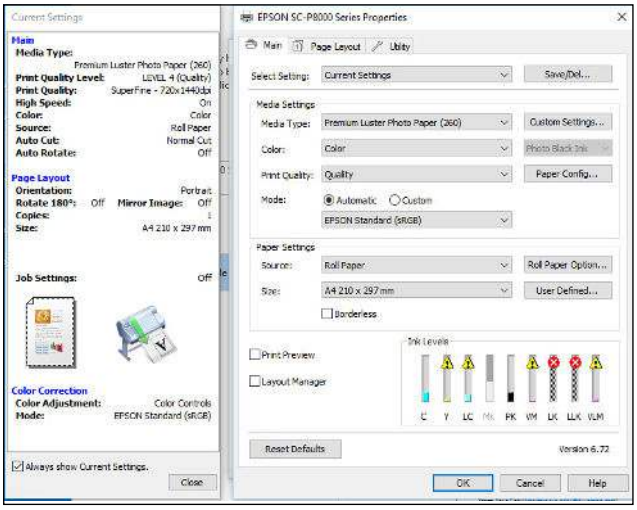


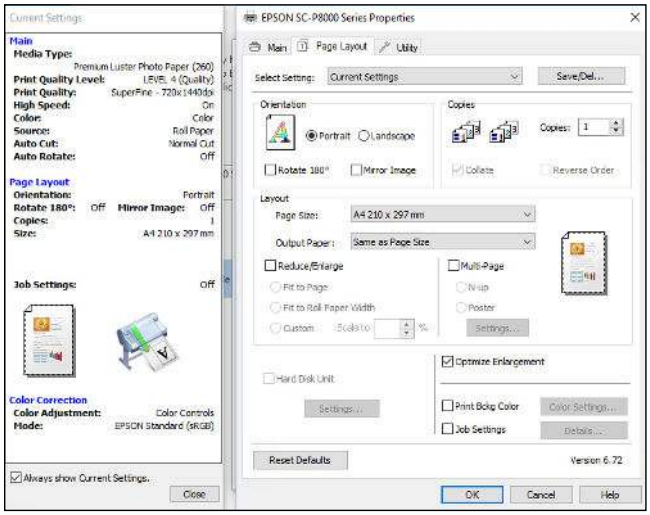
Canon PRO-4000S Utility Tab



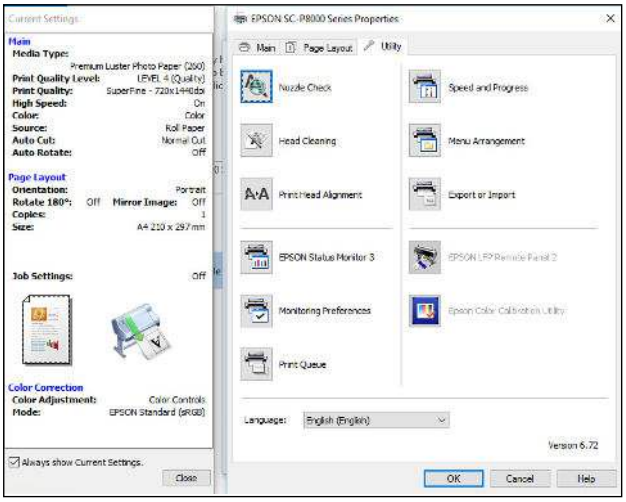
Canon PRO-4000S Colour Adjustment Settings



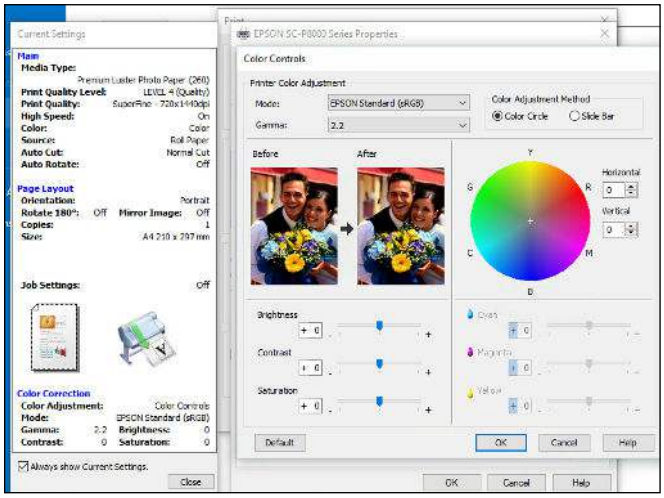
Epson SureColor SC-P8000 Print Driver Main Tab



Epson SureColor SC-P8000 Print Driver Page Layout Tab



Epson SureColor SC-P8000 Print Driver Utility Tab



Epson SureColor SC-P8000 Print Driver Colour Controls Tab

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Printhead Reliability / Cleaning Routines

- ○ Both models offer various nozzle check settings at the control panel. The default setting for the Canon imagePROGRAF PRO-4000S is “Auto Nozzle Check”. Additional settings include “after one page”, “after 10 pages” or “disabled”. Nozzle checks can be performed on the Epson model either at the control panel or via the driver. If the Auto Nozzle Check option is enabled, there are three choices: “Periodic” (the default mode), “On” (which performs a check at each job) or “Off” (during which the machine performs a check under specific conditions, such as after initial ink charging).
- ○ 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. If a clogged nozzle is detected on the Epson device, the machine can run a cleaning cycle immediately without the user having to print a nozzle check pattern, with the number of automatic cleaning cycles set in the driver (a choice of one–the default–to three). There are two types of cleaning offered: ‘Normal’ and ‘Power’. Users can opt to clean either one or more pairs of nozzles that have problems, or all nozzles at once.
- ○ When the two devices were powered off completely over a weekend, the Canon model had no issues with nozzles clogging. Nozzle check patterns were printed with perfect accuracy every time upon request. Similarly, the Epson SC-P8000 did not suffer any issues with nozzles clogging and printed a faultless nozzle check pattern upon request.
- \+ As the Epson SC-P8000 has both matte black and photo black inks which share the same printhead, users are required to choose to switch between them for a specific job at the control panel (or this can be done automatically via the Auto Black Change setting in the printer driver)—a process which takes about two minutes and uses an indeterminate amount of ink to complete.
- \+ A standard cleaning cycle performed on the Canon model takes approximately 4 minutes, 30 seconds on average to complete, whilst on the Epson model, a Standard clean cycle takes approximately 7 minutes.

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SUPPORTING TEST DATA

Productivity

Colour Throughput Time – A1 High-Resolution Portrait Printing

Canon imagePROGRAF PRO-4000S (time in seconds)			Epson SureColor SC-P8000 (time in seconds)		
Standard	High	Highest	Speed (Level 2)	Quality (Level 4)	Max Quality (Level 5)
186.74	219.10	418.88	348.95	571.34	817.75

A single-page high-resolution A1 portrait was printed as a 5-page job using the device driver set to the semi-gloss photo paper/colour setting. Both devices were loaded with 36" 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)			Epson SureColor SC-P8000 (time in seconds)		
Standard	High	Highest	Speed (Level 2)	Quality (Level 4)	Max Quality (Level 5)
108.52	199.14	386.06	231.23	396.24	470.45

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 36" 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)			Epson SureColor SC-P8000 (time in seconds)		
Standard	High	Highest	Speed (Level 2)	Quality (Level 4)	Max Quality (Level 5)
369.30	440.55	840.63	629.60	983.11	1,129.21

A single-page high-resolution A0 portrait poster was printed as a 5-page job using the device driver set to the semi-gloss photo photo paper/colour setting. Both devices were loaded with 36" 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).

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Colour Throughput Time – A0 Medium-Resolution Retail Poster Printing

Canon imagePROGRAF PRO-4000S (time in seconds)			Epson SureColor SC-P8000 (time in seconds)		
Standard	High	Highest	Speed (Level 2)	Quality (Level 4)	Max Quality (Level 5)
218.50	413.56	816.11	433.98	763.18	928.72

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 36" 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-Page-Out Time from Ready State – High-Resolution Portrait Printing

	Canon imagePROGRAF PRO-4000S (time in seconds)			Epson SureColor SC-P8000 (time in seconds)		
	Standard	High	Highest	Speed (Level 2)	Quality (Level 4)	Max Quality (Level 5)
Time Before Printing Commences	23.23	21.34	23.56	30.56	30.57	30.56
First Page Out Time	190.73	220.02	421.66	323.84	490.39	784.80

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 Epson drivers set to semi-gloss photo paper. Both devices were loaded with 36" rolls, with each job set to auto-rotate to save media.

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

	Canon imagePROGRAF PRO-4000S (time in seconds)			Epson SureColor SC-P8000 (time in seconds)		
	Standard	High	Highest	Speed (Level 2)	Quality (Level 4)	Max Quality (Level 5)
Time Before Printing Commences	22.03	24.08	23.62	29.47	29.51	29.48
First Page Out Time	114.10	206.83	387.79	215.87	371.56	447.67

First-page-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 the Canon and Epson drivers set to matte coated media. Both devices were loaded with 36" rolls, with each job set to auto-rotate to save media.

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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

Epson SureColor SC-P8000						
Semi-Glossy Photo Paper						
Max Quality Level 5 (2880 x 1440 dpi)						
	1	2	3	4	Max.	Min.
Cyan	1.79	1.79	1.80	1.79	1.80	1.79
Magenta	1.13	1.14	1.13	1.14	1.14	1.13
Yellow	1.45	1.46	1.46	1.45	1.46	1.45
Black	2.62	2.62	2.61	2.57	2.62	2.57

Note: Colour density readings were assessed by printing a BLI test file on proofing paper in high- quality colour settings (with Colour Correction disabled on the Canon device and Colour Adjustment disabled on the Epson device) 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	Epson SureColor SC-P8000
Colour block		
2	0.5	0.3
3	0.5	0.1
4	0.4	0.2
5	0.5	0.1
6	0.6	0.1
7	0.7	0.3
8	0.7	0.2
9	0.8	0.2
Max. Delta E Variance	0.4	0.2

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	Skin Tone 2 (C=30, M=63,Y=75,K=0)	
	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000
Colour block		
2	0.6	0.6
3	0.6	0.5
4	0.2	0.5
5	0.9	0.3
6	0.8	0.4
7	0.7	0.5
8	0.9	0.4
9	1.4	0.8
Max. Delta E Variance	1.2	0.5

	Skin Tone 3 (C=19, M=33,Y=50,K=0)	
	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000
Colour block		
2	0.8	0.7
3	1.2	0.4
4	0.1	0.5
5	0.7	1.2
6	0.9	1.2
7	1.2	0.5
8	0.9	0.6
9	1.3	0.5
Max. Delta E Variance	1.2	0.8

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	Neutral Grey	
	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000
Colour block		
2	0.3	0.1
3	0.4	0.4
4	0.3	0.1
5	0.6	0.2
6	0.2	0.4
7	0.3	0.1
8	0.4	0.2
9	0.3	0.6
Max. Delta E Variance	0.4	0.5

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/Max Quality print quality setting selected in the driver, with Colour Correction disabled on the Canon device and Colour Adjustment disabled on the Epson device, and the target printed on the manufacturer's own brand of proofing semi-gloss 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 PRO-4000S (time in seconds)	Epson SureColor SC-P8000 (time in seconds)
Delta E Drift	2.8	1.8

Colour Gamut Comparisons

Media Type/Settings	Canon imagePROGRAF PRO-4000S	Epson SureColor SC-P8000	Canon % larger/smaller (-) than Epson
Photo Paper Highest/Max Quality	679,092	770,749	-11.9

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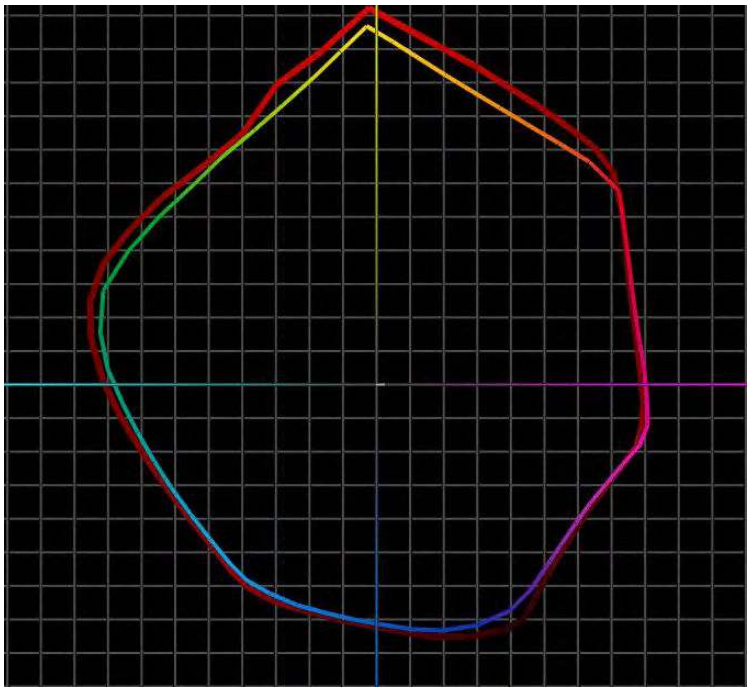
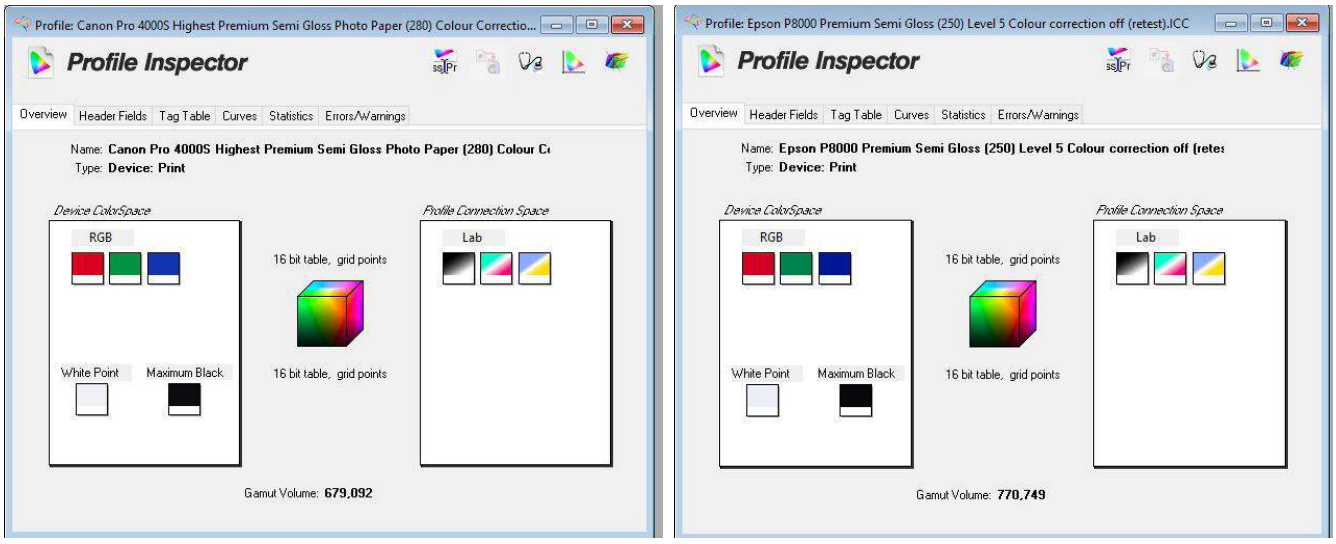
Colour Gamut Comparison



Canon imagePROGRAF PRO-4000S colour gamut (shown chromatically) on Semi-Gloss 280gsm photo paper in Highest setting and with colour correction disabled versus Epson SureColor SC-P8000 colour gamut (red) on Semi-Gloss 250gsm photo paper in Max Quality Level 5 setting with Colour Adjustment disabled.



Colour gamut profiles for the Canon imagePROGRAF PRO-4000S (left) and Epson SureColor SC-P8000 (right) on semi-gloss photo paper in highest quality settings.

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Device Feature Set

	Canon imagePROGRAF PRO-4000S	Advantage		Epson SureColor SC-P8000
Max. print resolution	2400 x 1200 dpi		✔	2880 x 1440 dpi
Number of inks	8		✔	9
Ink tanks replaceable during operation	Yes	✔		No
Ink-drop size	4 picoliter		✔	3.5 picoliter
Ink cartridge capacity	160 ml, 330 ml and 700 ml (all colours)			150 ml, 350 ml and 700 ml (all colours)
Starter ink capacity	2,080 ml total (330 ml x C, M, Y, MBk; 190 ml x PC, PM, Bk, GY)	✔		990 ml total
Number of nozzles	18,432 (1,536 per colour)	✔		2,880 (360 per colour)
Number of printheads	1			1
Line accuracy	+/-0.1% or less	✔		+/-0.2%
Minimum line width	INA			INA
Minimum print margins	Roll paper: Borderless or 3 mm (all sides); Cut sheet: 3 mm (Top, Side); 20 mm (Bottom)			Roll paper: Borderless or 3 mm (all sides); Cut sheet: 3 mm (Top, Side); 14 mm (Bottom)
Borderless (0 mm) printing	Yes			Yes
Maximum outside diameter of roll paper	170 mm	✔		150 mm
Maximum printable paper roll length	18 m	✔		140 mm
Maximum cut-sheet media length	1.6 m			INA
Maximum media thickness	Roll/cut: 0.07-0.8 mm			0.5 mm
Maximum media width	44 inches			44 inches
Dual-Roll	Optional	✔		No
Media loading	Front			Top rear
Optional media handling	Roll holder set (supports 2" and 3" media cores)			Roll media adapter (supports 2" and 3" media cores)
Standard RAM	3 GB	✔		1 GB
Hard drive	Standard 320-GB	✔		Optional 320-GB
Interface	10/100/10000Base-T Ethernet, USB 2.0 High Speed, USB Memory Direct, Wireless LAN	✔		10Base-T/100Base-TX Ethernet,
PDL	SG Raster			Epson ESC/P raster
Net weight (unpacked)	121 kg	✔		135 kg
Power consumption when in standby	1.8 W	✔		5.4 W
Power consumption when active	107 W		✔	75 W
Acoustic pressure	Operation: 49 dB (A) or less; Standby: 35 dB (A) or less		✔	Operation: 47 dB (A); Standby: INA
Acoustic power	Operation: 6.6 Bels or less			Operation: 6.5 Bels
Option to integrate with a spectrophotometer?	No		✔	Yes (Epson SpectroProofer)

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Driver Feature Set

	Canon imagePROGRAF PRO-4000S	Advantage		Epson SureColor SC-P8000
Speed settings	Up to five, depending on media settings			Up to five, depending on media settings
Economy mode	Yes (Fast setting)			Yes (Level 1 setting)
Predefined profiles	5 (Under Easy Settings)			5
Overview of profile settings provided	Yes			Yes
Media profiles	49		✔	52
IQ optimized for various types of output	Yes			Yes
Watermark	Yes	✔		No
Sharpen text	No		✔	Yes (Edge Smoothing)
Thicken fine lines	Yes	✔		No
Mirror image	Yes			Yes
Multi-up printing	Yes, 2 to 16	✔		Yes, 2 and 4
Poster print mode	Yes (2 by 2)		✔	Yes (4 by 4)
Page stamping	Yes (Date, Time, Name, Page Number)		✔	Yes (Date, Time, Document/User/Printer Name, Media Type, Print Quality Level, Resolution, Print Mode, High Speed, Finest Detail, Edge Smoothing, Colour Adjustment and Value, Colour Density and Freehand comments)
Image rotation	Yes, auto 180 degrees			Yes, auto 180 degrees
Option to preview before print	Yes			Yes
Link to device web server from driver	No (there is a link to Status Monitor)			No (there is a link to Status Monitor 3)
CMYK balance adjustment	Yes	✔		Yes (C, M, Y only)
Brightness adjustment	Yes			Yes
Contrast adjustment	Yes			Yes
Saturation adjustment	No		✔	Yes
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*			Yes**
Accounting Capability	Yes			Yes
Disable automatic cutter	Yes			Yes
Unidirectional printing selection option	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.

** Epson SC-P8000 supports Epson Print Layout, which is a plug-in for Adobe Lightroom, Adobe Photoshop and Nikon View NX-I, and is available as a free download from Epson's website.

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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 Epson SureColor SC-P8000 Cartridge (in grams)

	C	Y	LC	MBK	PBK	VM	LBK	LLBK	VLM
Weight of cartridge prior to installation	1,003.8	1,008.2	968.1	1,014.2	1,010.9	1,004.7	1,000.1	988.9	989.9
Weight of cartridge at end of life	351.5	351.5	351.5	351.5	351.5	351.5	351.5	351.5	351.5
Net weight of ink	652.3	656.7	616.6	662.7	659.4	653.2	648.6	637.4	654.8
Total ink weight across nine cartridges									5,841.7

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

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Table 4: Ink Used in Three 50-Page Runs of Packaging Proof Test Document on the Epson SureColor SC-P8000 (grams)

	C	Y	LC	MBK	PBK	VM	LBK	LLBK	VLM
Test Run 1 Net weight of ink used	6.4	14.6	28.6	0.0	16.5	16.1	50.9	32.4	36.9
Test Run 2 Net weight of ink used	6.4	14.3	28.6	0.0	13.1	15.9	50.7	36.1	36.4
Test Run 3 Net weight of ink used	16.3	27.3	46.3	0.0	26.0	29.1	77.2	56.7	57.4
Average amount of ink used across three runs	9.7	18.7	34.5	0.0	18.5	20.4	59.6	41.7	43.6
Total average ink weight across nine cartridges									246.7

Table 5: Ink Used in Three 50-Page Runs of Retail Poster 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	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 Epson SureColor SC-P8000 (grams)

	C	Y	LC	MBK	PBK	VM	LBK	LLBK	VLM
Test Run 1 Net weight of ink used	3.8	14.4	23.5	4.6	0.0	6.7	11.9	165.8	38.2
Test Run 2 Net weight of ink used	4.0	14.4	23.6	4.7	0.0	33.4	11.6	78.2	37.9
Test Run 3 Net weight of ink used	4.0	14.4	23.8	4.6	0.0	33.7	11.7	79.0	38.2
Average amount of ink used across three runs	3.9	14.4	23.6	4.6	0.0	24.6	11.7	107.7	38.1
Total average ink weight across nine cartridges									228.6

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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 Epson SureColor SC-P8000 (grams)

	C	Y	LC	MBK	PBK	VM	LBK	LLBK	VLM
Test Run 1 Net weight of ink used	6.8	11.4	39.7	0.0	16.1	5.5	55.0	133.2	56.4
Test Run 2 Net weight of ink used	3.3	5.5	19.2	0.0	8.1	2.7	27.0	129.3	27.7
Test Run 3 Net weight of ink used	3.4	5.8	19.7	0.1	8.1	2.8	27.5	132.7	27.7
Average amount of ink used across three runs	4.5	7.6	26.2	0.0	10.8	3.7	36.5	131.7	37.3
Total average ink weight across nine cartridges									258.3

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 Epson SureColor SC-P8000 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 Epson ESC/P driver was used for all testing and was left in default colour settings,

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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 Quality mode, the retail poster was printed on matte coated media in Quality mode, and the studio portrait photo was printed on 250gsm glossy photo media in Quality 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 ExTech RH520 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.

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