

Canon imagePROGRAF iPF8400S vs. Epson Stylus Pro 9890



Canon imagePROGRAF iPF8400S



Epson Stylus Pro 9890

	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Advantage ✓		
Colour and Black Print 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 iPF8400S and the Epson Stylus Pro 9890, 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, printhead stability and cleaning routines. All testing was performed in BLI's test facility in Wokingham, UK.

TABLE OF CONTENTS

Executive Summary	3
Colour and Black Image Quality	4
Print Productivity	5
Ink Consumption	6
Device Feature Set	7
Driver Feature Set	8
Printhead Reliability / Cleaning Routines	11
Supporting Test Data	12
Ink Consumption Test Methodology Overview	23
About BLI	24

Executive Summary

The Canon imagePROGRAF8400S gave an outstanding performance across the board in BLI's testing, outperforming the Epson Stylus Pro 9890 in all aspects of testing. Aimed at the Graphic Arts (GA) market, both models deliver exceptional image quality, highly accurate colour reproduction and good colour stability. While the Epson model features a higher print resolution and smaller ink drop size, the Canon model produced better image quality overall. It offers a larger colour gamut, higher optical densities for cyan and, in particular, for black, and the skin tones it produced stayed more consistent over the course of testing. In addition, the Canon iPF8400S produced better light/dark contrast definition and better colour saturation. It also had a slight edge when printing fonts and fine lines. They were crisper and darker, which aids readability; Epson's fonts were much finer and still well formed.

In BLI's productivity tests, the Canon iPF8400S delivered a clear speed advantage over the Epson model, with faster times across all settings, particularly High/Max Quality, taking 4.44 minutes to print a single A1 high-resolution portrait, compared with 13.02 minutes for the Epson model. In addition, its speeds were between 47.71% and 53.16% faster than the Epson when printing five copies of BLI's A0- and A1-sized portrait and retail test posters in both Fast/Speed and Standard/Quality modes.

The Canon model also performed better in terms of ink consumption, using significantly less ink in terms of net weight and a lower percentage of available ink in the cartridges than the Epson SP9890 when printing 50-page runs of three different test documents in Standard/Quality mode on 195-gsm Glossy, matte coated and 260-gsm Pearl Photo stocks. Further contributing to the Canon model's more efficient use of ink is the reliability of its printhead, which did not suffer any problems with nozzle clogging when powered off over a weekend. Conversely, the Epson model required two cleaning cycles to rectify the problem, which leads to further ink consumption. Additionally, when the Epson model automatically switches between matte black and photo black inks when necessary depending on the media type used, the process takes up to 8 minutes to complete and consumes 9.1 grams of ink, requiring users to plan their print workflow to avoid consuming ink needlessly.

Another plus for the Canon model is that it offers hot-swap ink tanks, enabling users to replace empty ink cartridges while actively printing, thus reducing operator downtime. The Epson device does not offer this feature.

While the Epson model uses less energy while printing (80 W as opposed to 190 W), the Canon model consumes only 5 W when in standby mode (where the device will spend most of its time) compared with 16 W for the Epson. The Canon model also offers a more feature-rich print driver than the Epson model, including a greater number of media profiles, security watermark options and colour adjustment options.

The two models offer a comparable feature set. The Canon device includes 384 MB of RAM (as opposed to 256 MB with the Epson model) and a standard 250-GB hard drive, whereas a hard drive is not available, even as an option, with the Epson unit. Although unlike with the Epson model, a spectrophotometer option to help ensure consistent colour is not offered for the Canon model, the Canon iPF8400S can benefit from consistent colour not only for its own prints but across multiple compatible devices, if the fleet includes a Canon iPF6400S equipped with the spectrophotometer option. Both devices allow users to integrate with a smaller-format MFP to produce enlarged, poster-size copies—the Canon unit via its free Color imageRUNNER Enlargement Copy Mode, and the Epson unit via its extra cost CopyFactory Utility.

Colour and Black Image Quality

	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Advantage ✓		
Text	✓	
Fine Lines	=	=
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	✓	

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

- All image quality testing, with the exception of colour gamut measurement, was done with Canon's own proofing media, Proofing Paper Glossy 195-gsm, and Epson's own 194-gsm Proofing Paper Commercial media, with print priority set to Proof and quality set to Highest on the Canon model (2,400 x 1,200 dpi), and Max. Quality (2,880 x 1,440 dpi) on the Epson model.
- BLI was unable to run a separate black image quality evaluation due to the fact the Epson model did not allow black-and-white printing based on the selected proofing media, so the image quality analysis covers both black and colour.
- Both models performed excellently under test conditions and delivered an exceptionally high standard of colour output appropriate for their Graphic Arts (GA) target market.
- + Each model produced clearly formed fonts in colour mode down to 3-point type size. There was a minimal amount of ink overspray visible with both models, but only when viewed under magnification. Viewed with the unaided eye, the results were very good, with fine lines and serifs judged to be well formed. Overall, the Canon model slightly edged out the Epson model for text by producing marginally crisper and more distinct fonts, enhancing readability, whereas Epson's fonts were finer.
- The Canon iPF8400S and the Epson SP9890 produced the 1x1 pixel grid in CMY with no quality issues, and both produced a consistent dot laydown in black across all 1x1 and 2x2 pixel grids.
- Both devices delivered excellent vertical and horizontal fine lines down to the 0.1 size, and diagonal lines displayed no stair-stepping. Circles were well formed with no line break-up.
- Both models delivered an impressive range of halftone fill in all colour and black modes, with distinct transitions between all levels.

- + The Canon device produced higher optical densities for cyan and, in particular, black. It had a slightly lower density for yellow compared with the Epson unit, while magenta density was a close match between the devices.
- + Both Canon and Epson models exhibited very good natural-looking skin tones in photographic images, but the Canon unit produced colours with slightly more depth and showed better 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 slightly less variance in two of the three skin shades when compared with output produced by the Epson model.
- Neutral grey consistency was comparable for both models; the Canon model's Delta E value was 0.5 compared with Epson's 0.3 but the difference would not be discernible to the unaided 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 Colour Verifier software, the two devices displayed the same mean Delta E drift of 6.2.
- + The Canon device's colour gamut was slightly larger (1.6% larger) than that of the Epson model when printing on glossy proof media in highest quality settings.
- + Similar results were delivered when printing on 260-gsm Pearl Photo paper: the Canon model's colour gamut was 1.7% larger than the Epson model's, with a CIE volume of 570,109 versus 560,175 with the Epson device.
- BLI analysed a wide range of colour and greyscale output in business graphics and photographic images output by both devices and found them to be comparable overall, with excellent fine details in light and dark contrast areas.

Print Productivity

	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Advantage ✓		
First Page Out From Ready State (Fast/Speed)	✓	
First Page Out From Ready State (Standard/Quality)	✓	
First Page Out From Ready State (High/Max Quality)	✓	
Throughput Speed Portrait (Fast/Speed)	✓	
Throughput Speed Portrait (Standard/Quality)	✓	
Throughput Speed Retail Poster (Fast/Speed)	✓	
Throughput Speed Retail Poster (Standard/Quality)	✓	

- + When printing a single high-resolution portrait, the Canon model easily surpassed the Epson model in terms of speed of the first-page-out from ready state across all modes, particularly in High/Max Quality setting, where it delivered in 266.41 seconds compared with 781.53 seconds for the Epson SP9890.

- + The Canon iPF8400S also outperformed the Epson model with faster first-page-out times from ready state in all modes when printing a single medium-resolution retail poster. In High/Max Quality mode, the Canon model delivered in 245.97 seconds compared with 452.83 seconds for the Epson device.
- + When printing five copies of a single-page A1-size high-resolution portrait test document in both Fast/Speed and Standard/Quality modes, the Canon model displayed a clear speed advantage over the Epson model, with a speed that was 50.4% faster in Fast/Speed mode and 53.2% faster in Standard/Quality mode.
- + When printing five copies of a single-page A1-size medium-resolution retail poster test document in both Fast/Speed and Standard/Quality modes, the Canon model again displayed a clear speed advantage over the Epson model, with a speed that was 48.8% faster in Fast/Speed mode and 50.1% faster in Standard/Quality mode.
- + Similar results were seen with the A0-size high-resolution portrait. When printing five copies of a single-page test document in both Fast/Speed and Standard/Quality modes, the Canon model was much faster than the Epson model, with a speed that was 50.7% faster in Fast/Speed mode and 47.7% faster in Standard/Quality mode.
- + In the A0-size medium-resolution retail poster test, the Canon iPF8400S displayed a clear speed advantage over the Epson model in both modes, with a speed that was 55.1% faster in Fast/Speed mode and 53.3% faster in Standard/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. 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		
Results averaged across three tests of 50-set A1 printing in Standard/Quality Mode	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
PACKAGING PROOF (Standard/Quality Mode)		
Average weight of ink used (grams)	136.6 g	197.2 g
Percentage of total ink used averaged across all colours	2.3%	5.5%
RETAIL POSTER (Standard/Quality Mode)		
Average weight of ink used (grams)	131.5 g	206.8 g
Percentage of total ink used averaged across all colours	2.2%	5.8%
STUDIO PORTRAIT (Standard/Quality Mode)		
Average weight of ink used (grams)	149.7 g	188.7 g
Percentage of total ink used averaged across all colours	2.6%	5.3%

- + In the BLI Packaging Proof ink consumption print runs using Standard/Quality mode on 195-gsm Glossy proofing media, the Canon imagePROGRAF iPF8400S used significantly (30.7%) less ink in terms of net weight than the Epson Stylus Pro 9890, and it also used a lower percentage of available ink than the Epson model. In the BLI Retail Poster print runs on matte coated media, the Canon unit used 36.4% less ink, and it used a lower percentage of available ink than the Epson model. In the BLI Studio Portrait print runs on 260-gsm Pearl Photo media, the Canon model used 20.6% less ink than the Epson device, and, again, it used a lower percentage of available ink than the Epson SP9890.

Device Feature Set

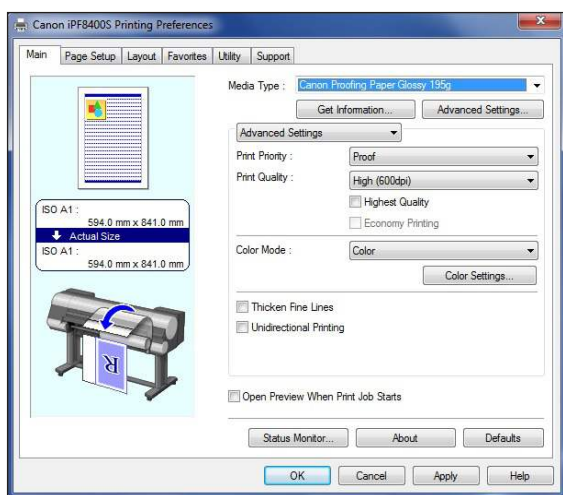
- The Epson Stylus Pro 9890 employs nine inks, four of which are different shades of black, whilst the Canon imagePROGRAF iPF8400S employs eight inks, including two black inks and one grey ink.
- + Canon inks are replaceable during operation which helps to reduce downtime.
- + The Canon model's two printheads contain more nozzles per colour (2,560) than the Epson unit's single printhead, which contains only 360.
- The Canon unit's ink delivery system dispenses a slightly larger (4 picoliter) drop size than the Epson model's 3.5-picoliter variable ink delivery system.
- The capacity of the standard ink cartridge for the Epson model is slightly larger than that of the Canon model, but both offer the same capacity (700 ml) for the higher-capacity cartridge.
- Both models offer borderless printing.
- + The Canon model has a far larger standard memory capacity (384 MB) than the Epson unit, which has a 256-MB memory.
- + A standard 250-GB hard drive is built in to the Canon device, which allows for the storage of commonly used documents and aids spooling workflow; the Epson device doesn't have a hard drive, even as an option.
- The Canon model has a higher advertised peak energy value (190W) than the Epson model (80W).
- + However, the Canon iPF8400S's energy consumption in standby mode (the operating mode most in use) is just 5 W compared with 16 W for the Epson device.
- + 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. This feature is not offered on the Epson model.
- + 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. Epson does not supply an equivalent product.
- + The Canon device includes a media mismatch option, which places on hold jobs that can't be printed due to incorrect media being loaded, while jobs that can be completed are printed; the queued jobs are printed once the required paper is loaded. The Epson device does not offer this capability, and continues printing on the mismatched media, which results in ink and media waste.

- + Canon offers a wide variety of software options designed to appeal to specific segments of the Graphic Arts market such as photography and fine art display, including 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' intended to improve photographic image quality and enhance depth of field.
- + 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's LFP Accounting Tool, a free download from Epson's website for other large-format Epson devices, does not seem to be available for the SP9890.
- Epson SP9890 allows the option of integrating a SpectroProofer 24 with the device to ensure colour consistency and automate workflows for colour calibration and media profile generation, while the Canon iPF8400S does not—unlike its iPF6400S sister model.

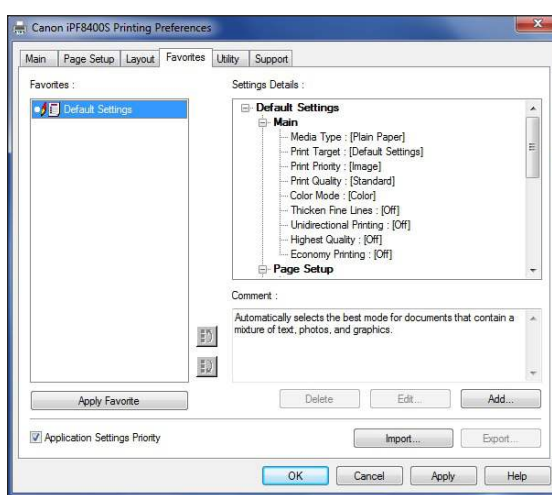
Driver Feature Set

- + The Canon driver includes 55 media profiles versus 30 for the Epson driver.
- + The Canon driver includes a watermark capability; the Epson driver does not.
- + The Canon driver also includes a Thicken Fine Lines image enhancement option; the Epson driver offers only Sharpen Text.
- + Both the Canon and Epson drivers offer N-up printing (up to 16 and 4, respectively).
- Both models also offer poster printing capabilities (2 x 2 with the Canon unit and up to 4 x 4 with the Epson device).
- The page-stamping capabilities of both the Canon and Epson driver include date and time and user name. The Canon driver adds page number, while the Epson driver adds the time, printer name, comment, document name and print settings.
- The Canon driver includes a utility, Color imageRUNNER Enlargement Copy Mode, which allows users to integrate a Canon MFP device or other scanner with the imagePROGRAF iPF8400S. Documents scanned by the Canon MFP are automatically routed to a hot folder, which is monitored by the iPF8400S driver. Users can also set up other scanners to route files directly to the hot folder. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users. A similar feature is offered to Epson users in the form of its extra cost Epson CopyFactory Utility, but this has not been tested by BLI.
- The Canon model's device status monitor can be accessed directly from the front tab of the driver, whereas users of the Epson model must access device status via an icon on the utility tab, which requires an additional click.

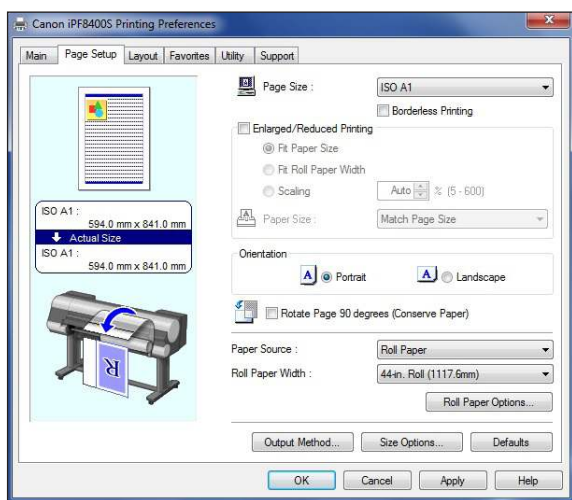
- + The Canon driver features a wider selection of simple colour adjustment options, which include brightness, contrast, saturation and sliding scale adjustments for cyan, magenta, yellow and black. The Epson driver has the same adjustments, but limited to only cyan, magenta and yellow, with no adjustment for black.
- The Epson model provides a handy thumbnail preview for users to check the effects on the image as they make colour adjustments.
- + The Canon driver includes more 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 driver offers more limited colour-matching options, with no rendering-intent options.
- + The Canon driver includes a unidirectional print selection which helps to avoid any banding across output, whereas the Epson driver does not.



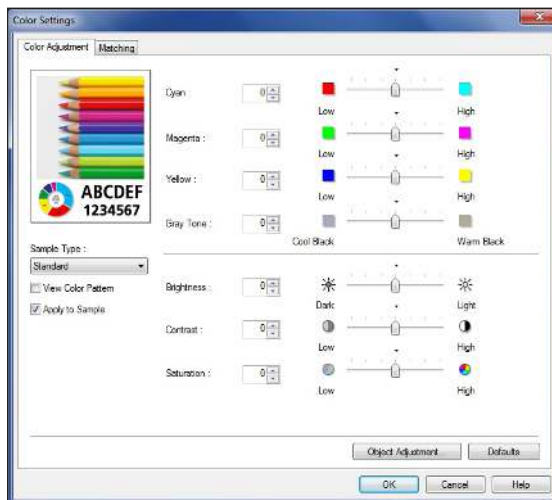
Canon iPF8400S Print Driver Main Tab



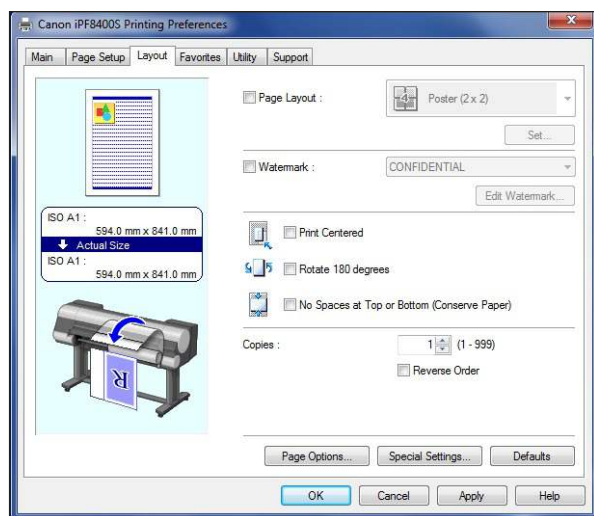
Canon iPF8400S Print Driver Favourites Tab



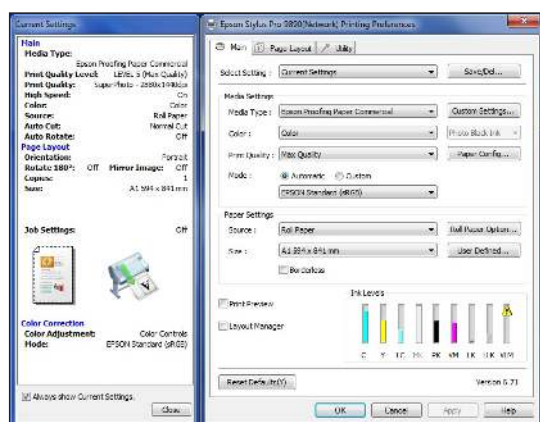
Canon iPF8400S Print Driver Page Setup Tab



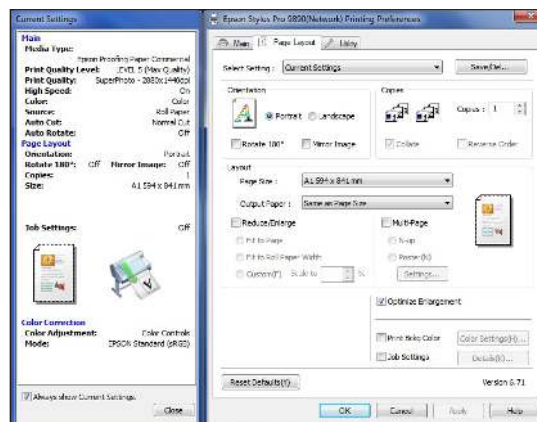
Canon iPF8400S Colour Adjustment Settings



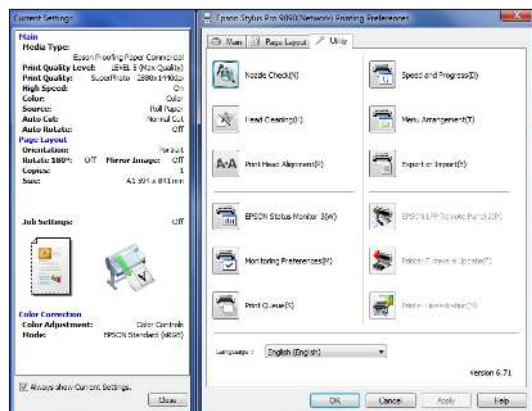
Canon iPF8400S Print Driver Layout Tab



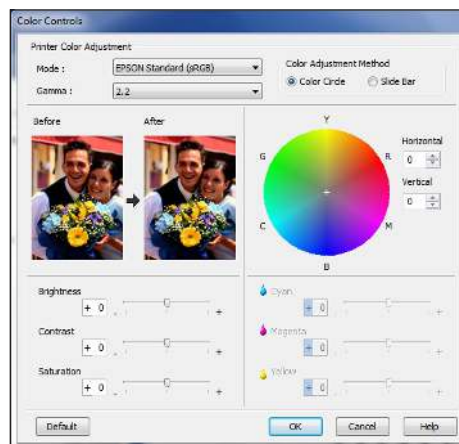
Epson SP9890 Print Driver Main Tab



Epson SP9890 Print Driver Page Layout Tab



Epson SP9890 Print Driver Utility Tab



Epson SP9890 Colour Adjustment Settings

Printhead Reliability / Cleaning Routines

- Both models offer three nozzle check settings at the control panel. The Canon iPF8400S has settings for Off, Per Print or Auto (the default setting), while the Epson SP9890 has settings for Periodic (the default mode), On (Per Job) or Off.
- + When it comes to replacing the printhead, the Canon model offers more flexibility with its user-friendly replacement procedure; the Epson model requires a service technician installation, which would impact on operator downtime and costs.
- + As soon as a clogged nozzle is detected on the Canon unit, an automatic cleaning cycle is triggered to maintain image quality and consistency; this takes place in the background, requiring no user intervention. The Epson model does require user intervention: the control panel alerts users that a cleaning cycle is required, and that they can either opt to wait until a print run has finished, or cancel a print job and run the cleaning cycle immediately.
- + With both devices shut down completely over the course of a weekend, the Canon model had no problems with nozzles clogging. When a nozzle check pattern was requested by BLI analysts, it printed with perfect accuracy every time. In contrast, the nozzles of the Epson unit became clogged and two cleaning cycles were required to resolve the issue. This would result in a good deal of operator downtime for Epson users and also incur more ink (about 15 grams in this case) and paper waste.
- + The Epson SP9890 utilises both matte black and photo black inks which share the same printhead. The device automatically switches to the correct black ink type depending on the media type or driver setting (or provides a warning to users). However, it uses 9.1* grams of ink to switch between matte black and photo black (and vice versa) and it also uses some light black ink during the process. Plus, it takes four to eight minutes to complete each switchover, so BLI would advise that workflows should take into account the potential need for swapping to minimize downtime.
- * The matte black and photo black inks were switched ten times and weighed at the start and at the end with the average used to determine the ink consumption.
- The Canon model performs a cleaning cycle in the background while the device is in operation so the BLI analyst was unable to determine the grams of ink per cartridge used to run and complete the cleaning process.
- The Epson model uses an average of 7.5 grams of ink per cartridge during a cleaning cycle, taking approximately four minutes.

SUPPORTING TEST DATA

Productivity

Colour Throughput Time – A1 High-Resolution Portrait Printing

Canon imagePROGRAF iPF8400S (time in seconds)		Epson Stylus Pro 9890 (time in seconds)	
Fast	Standard	Speed	Quality
152.44	205.88	307.43	439.56

A single-page high-resolution A1 portrait was printed as a 5-page job using the device driver set to the plain 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 speed per page in 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 iPF8400S (time in seconds)		Epson Stylus Pro 9890 (time in seconds)	
Fast	Standard	Speed	Quality
91.11	148.52	177.95	297.81

A single-page medium-resolution A1 portrait was printed as a 5-page job using the device driver set to the plain 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 speed 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 High-Resolution Portrait Printing

Canon imagePROGRAF iPF8400S (time in seconds)		Epson Stylus Pro 9890 (time in seconds)	
Fast	Standard	Speed	Quality
274.79	427.27	556.95	817.22

A single-page high-resolution A0 retail poster was printed as a 5-page job using the device driver set to the plain 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 speed 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 iPF8400S (time in seconds)		Epson Stylus Pro 9890 (time in seconds)	
Fast	Standard	Speed	Quality
146.53	264.41	326.08	566.69

A single-page medium-resolution A0 retail poster was printed as a 5-page job using the device driver set to the plain 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 speed 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).

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

	Canon imagePROGRAF iPF8400S (time in seconds)			Epson Stylus Pro 9890 (time in seconds)		
	Fast	Standard	High	Speed	Quality	Max Quality
Time Before Printing Commences	18.12	18.49	21.05	31.47	32.18	32.21
First Print Out	140.01	210.69	266.41	284.47	415.28	781.53

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 the Canon driver set to the plain paper setting and the Epson driver set to plain paper, black mode. Both devices were loaded with 44" 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 iPF8400S (time in seconds)			Epson Stylus Pro 9890 (time in seconds)		
	Fast	Standard	High	Speed	Quality	Max Quality
Time Before Printing Commences	16.91	17.06	21.51	31.51	31.38	32.97
First Print Out	73.38	129.53	245.97	163.48	282.85	452.83

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 the Canon driver set to the plain paper setting and the Epson driver set to plain paper, black mode. Both devices were loaded with 44" rolls, with each job set to auto-rotate to save media.

SUPPORTING TEST DATA

Colour Print Quality

Colour Optical Density Evaluation

Canon imagePROGRAF iPF8400S Proofing Paper Glossy						
	High (600 dpi)					
	1	2	3	4	Max.	Min.
Cyan	0.70	0.70	0.69	0.70	0.70	0.69
Magenta	1.01	1.01	1.01	1.02	1.02	1.01
Yellow	0.88	0.89	0.90	0.91	0.91	0.88
Black	2.55	2.55	2.54	2.56	2.56	2.54

Epson Stylus Pro 9890 Standard Proofing Paper						
	Quality (720 x 1440 dpi)					
	1	2	3	4	Max.	Min.
Cyan	0.61	0.61	0.61	0.60	0.61	0.60
Magenta	1.01	1.01	1.01	1.01	1.01	1.01
Yellow	0.96	0.96	0.96	0.95	0.96	0.95
Black	2.42	2.41	2.41	2.40	2.42	2.40

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 iPF8400S	Epson Stylus Pro 9890
Colour block		
2	0.1	0.2
3	0.1	0.2
4	0.1	0.3
5	0.1	0.3
6	0.1	0.2
7	0.2	0.2
8	0.1	0.2
9	0.2	0.3
Max. Delta E Variance	0.2	0.3

Skin Tone 2 (C=30, M=63, Y=75, K=0)		
	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Colour block		
2	0.5	0.3
3	0.5	0.2
4	0.3	0.2
5	0.5	0.4
6	0.4	0.2
7	0.4	0.2
8	0.5	0.6
9	0.4	0.4
Max. Delta E Variance	0.5	0.6

Skin Tone 3 (C=19, M=33, Y=50, K=0)		
	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Colour block		
2	0.2	0.3
3	0.3	0.2
4	0.2	0.5
5	0.5	0.4
6	0.5	0.2
7	0.3	0.3
8	0.2	0.7
9	0.3	0.4
Max. Delta E Variance	0.5	0.7

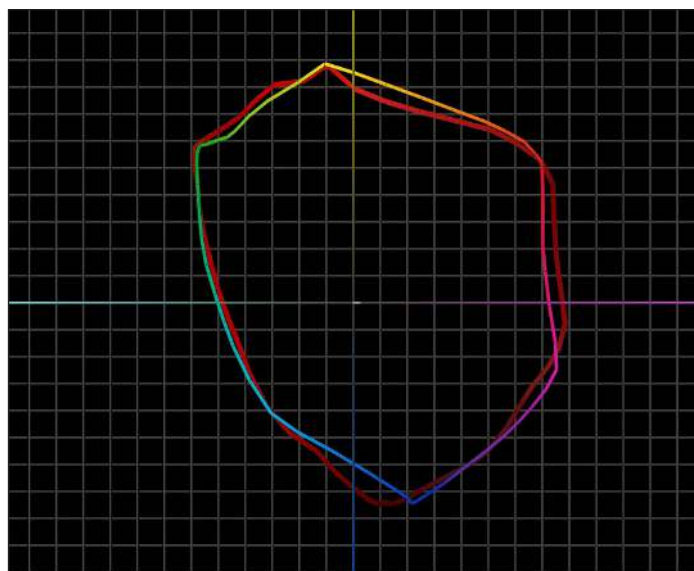
Neutral Grey		
	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Colour block		
2	0.3	0.2
3	0.4	0.2
4	0.2	0.3
5	0.4	0.2
6	0.5	0.2
7	0.1	0.2
8	0.3	0.3
9	0.4	0.2
Max. Delta E Variance	0.5	0.3

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 High/Quality print quality 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 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.

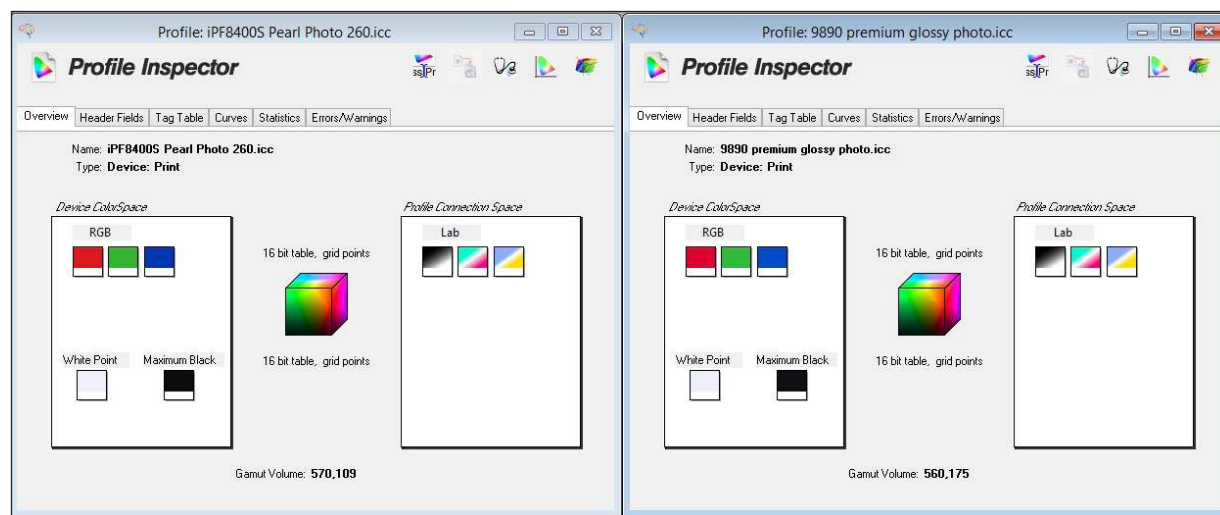
FOGRA 39 DRIFT TEST: Comparison of FOGRA39 colour patches before and after ink consumption test

	Canon imagePROGRAF iPF8400S	Epson Stylus Pro 9890
Delta E Drift	6.2	6.2

Colour Gamut Comparison

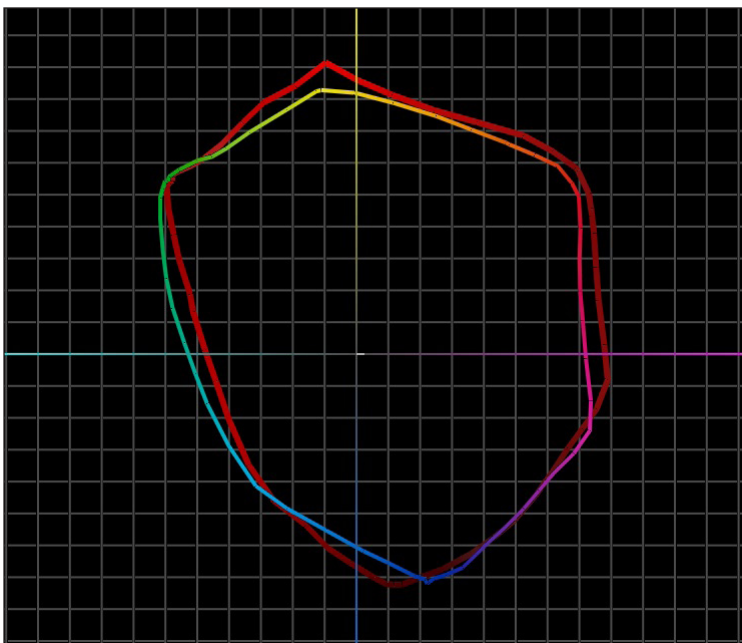


Epson Stylus Pro 9890 colour gamut on Glossy photo paper in maximum quality settings (red) versus Canon imagePROGRAF iPF8400S colour gamut (shown chromatically) on Pearl photo paper in highest quality settings.

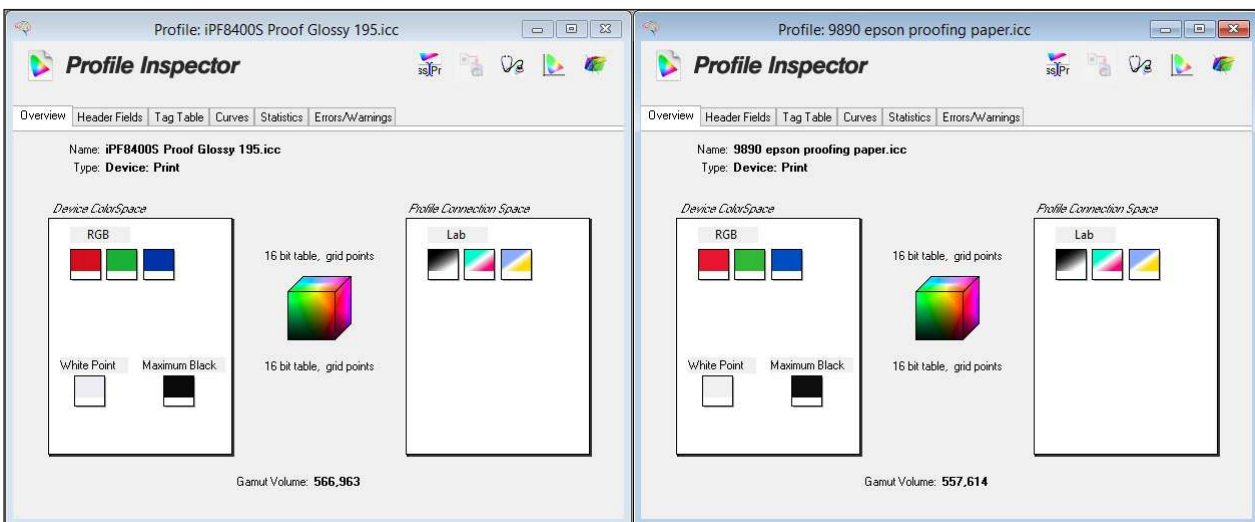


Canon iPF8400S Colour Gamut on Pearl Photo Paper

Epson SP9890 Colour Gamut on Glossy Photo Paper



Epson Stylus Pro 9890 colour gamut on Glossy proof paper in maximum quality settings (red) versus Canon imagePROGRAF iPF8400S colour gamut (shown chromatically) on Glossy proof paper in highest quality settings.



Canon iPF8400S Colour Gamut on Glossy Proof Paper

Epson SP9890 Colour Gamut on Glossy Proof Paper

Device Feature Set

	Canon imagePROGRAF iPF8400S	Advantage		Epson Stylus Pro 9890
Max. print quality	2,400 x 1,200 dpi		✓	2,880 x 1,440 dpi
Number of inks	8		✓	9
Ink tanks replaceable during operation	Yes	✓		No
Ink-drop size	4 picoliter		✓	Minimum 3.5 picoliter (variable)
Ink cartridge capacity	330 ml and 700 ml		✓	150 ml, 350 ml, 700 ml
Number of nozzles	30,720 (2,560 per colour)	✓		2,880 (360 per colour)
Number of printheads	2			1
Line accuracy	+/-0.1% or less	✓		+/-0.2%
Minimum line width	INA			INA
Minimum print margins	Borderless			Borderless
Borderless (0 mm) printing	Yes			Yes
Maximum outside diameter of roll paper	150 mm			150 mm
Maximum printable paper roll length	18 m			Limited by application, OS and driver/RIP used
Maximum cut-sheet media length	1.6 m			INA
Maximum media thickness	0.8 mm		✓	0.5 mm (roll), 1.5 mm (manual feed)
Maximum media width	44 inches			44 inches
Media loading	Front/top			Front/top
Optional media handling	Roll holder spindle and adapter			Roll holder adapter
Standard RAM	384 MB	✓		256 MB
Maximum RAM	384 MB	✓		256 MB
Hard drive	Standard 250-GB	✓		None
Interface	10/1000Base-T/100Base-TX Ethernet, USB 2.0 High Speed	✓		100Base-TX/10Base-T Ethernet, USB 2.0 High Speed
PDL	GARO (Graphic Arts with Raster Operations)			Epson ESC/P raster
Net weight (unpacked)	143 kg			116 kg
Power consumption when in standby	5 W	✓		16 W
Power consumption when active	190 W		✓	80 W
Acoustic pressure	Operation: 50 dB (A) or less; Standby: 35 dB (A) or less			Operation: Less than 50 dB (A); Standby: INA
Acoustic power	Operation: 6.4 Bels or less			Information not available
Option to integrate with a spectrophotometer?	No		✓	Yes (Epson SpectroProofer)

Driver Feature Set

	Canon imagePROGRAF iPF8400S	Advantage		Epson Stylus Pro 9890
Speed settings	Up to 5 (Fast 300, Standard 300, Standard 600, High 600, Highest 600) depending on media settings			Up to 5 depending on media settings
Economy mode	Yes (Fast setting)	✓		No
Predefined profiles	8 (Under Easy Settings)	✓		5
Overview of profile settings provided	Yes			Yes
Media profiles	55	✓		30
IQ optimized for various types of output	Yes			Yes
Watermark	Yes	✓		No
Sharpen text	No		✓	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)
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 also a link to Status Monitor 3)
CMYK balance adjustment	Yes			Yes
Brightness adjustment	Yes			Yes
Contrast adjustment	Yes			Yes
Saturation adjustment	Yes			Yes
Advanced colour management options	Yes			Yes
Enlargement Copy Mode	Yes	✓		Yes (Extra-Cost CopyFactory Utility)
Free Layout Capability	Yes	✓		No
MS Office Plug-in	Yes	✓		No
Accounting Capability	Yes	✓		No
Disable automatic cutter	Yes			Yes
Unidirectional printing selection option	Yes	✓		No
Photoshop Plug-in	Yes	✓		No
Integration with MFP	Yes	✓		Yes (with Copy Factory)

Ink Consumption

Table 1

Amount of Ink in each Canon imagePROGRAF iPF8400S Cartridge (in grams)

	PC	C	BK	MBK	Y	M	PM	GY
Weight of cartridge prior to installation	939.4	944.2	929.1	946.5	933.1	945.9	933.6	936.9
Weight of cartridge at end of life	204.9	204.9	204.9	204.9	204.9	204.9	204.9	204.9
Net weight of ink	734.5	739.3	724.2	741.6	728.2	741.0	728.7	732.0
Total ink weight across eight cartridges								5869.5

Table 2

Amount of Ink in each Epson Stylus Pro 9890 Cartridge (in grams)

	C	Y	LC	MK	PK	VM	LK	LLK	VLM
Weight of cartridge prior to installation	587.6	598.6	591.6	596.7	596.8	595.6	595.1	588.6	590.9
Weight of cartridge at end of life	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5	197.5
Net weight of ink	390.1	401.1	394.1	399.2	399.3	398.1	397.6	391.1	393.4
Total ink weight across nine cartridges									3564.0

Table 3

Ink Used in Three 50-Page Runs of Packaging Proof Test Document on the Canon iPF8400S (grams)

	PC	C	BK	MBK	Y	M	PM	GY
Test Run 1 Net weight of ink used	12.2	8.0	22.3	1.5	16.0	13.0	13.9	48.1
Test Run 2 Net weight of ink used	13.8	8.8	24.9	2.2	16.9	13.4	14.3	46.0
Test Run 3 Net weight of ink used	13.5	7.2	22.2	1.7	16.0	13.9	14.5	45.6
Average amount of ink used across three runs	13.2	8.0	23.1	1.8	16.3	13.4	14.2	46.6
Total average ink weight across eight cartridges								136.6

Table 4

Ink Used in Three 50-Page Runs of Packaging Proof Test Document on the Epson Stylus Pro 9890 (grams)

	C	Y	LC	MK	PK	VM	LK	LLK	VLM
Test Run 1 Net weight of ink used	6.8	14.0	18.2	0.0	34.2	11.7	57.0	30.7	31.7
Test Run 2 Net weight of ink used	7.7	14.7	18.7	0.3	26.3	12.6	52.6	31.5	31.8
Test Run 3 Net weight of ink used	6.7	14.3	18.8	0.0	25.7	11.3	51.6	30.9	31.9
Average amount of ink used across three runs	7.1	14.3	18.6	0.1	28.7	11.9	53.7	31.0	31.8
Total average ink weight across nine cartridges									197.2

Table 5

Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Canon iPF8400S (grams)

	PC	C	BK	MBK	Y	M	PM	GY
Test Run 1 Net weight of ink used	21.3	2.1	1.8	1.6	21.7	28.3	32.4	21.6
Test Run 2 Net weight of ink used	24.4	1.3	1.0	1.0	22.3	28.8	32.7	20.7
Test Run 3 Net weight of ink used	24.3	2.0	1.8	2.0	20.6	28.0	32.5	20.6
Average amount of ink used across three runs	23.3	1.8	1.5	1.5	21.5	28.4	32.5	21.0
Total average ink weight across eight cartridges								131.5

Table 6

Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Epson Stylus Pro 9890 (grams)

	C	Y	LC	MK	PK	VM	LK	LLK	VLM
Test Run 1 Net weight of ink used	4.6	14.7	22.4	7.1	0.2	34.5	7.1	94.1	30.5
Test Run 2 Net weight of ink used	4.1	14.3	18.1	6.9	0.0	34.0	6.5	92.6	26.4
Test Run 3 Net weight of ink used	4.4	14.3	17.4	6.6	0.0	34.0	7.1	92.5	25.6
Average amount of ink used across three runs	4.4	14.4	19.3	6.9	0.1	34.2	6.9	93.1	27.5
Total average ink weight across nine cartridges									206.8

Table 7

Ink Used in Three 50-Page Runs of Studio Portrait Test Document on the Canon iPF8400S (grams)

	PC	C	BK	MBK	Y	M	PM	GY
Test Run 1 Net weight of ink used	30.7	8.3	14.0	2.1	15.7	5.8	36.4	40.4
Test Run 2 Net weight of ink used	27.1	9.4	14.2	1.7	15.9	5.3	34.2	40.3
Test Run 3 Net weight of ink used	27.4	8.7	14.0	2.0	15.0	4.3	36.2	40.3
Average amount of ink used across three runs	28.4	8.8	14.1	1.9	15.5	5.1	35.6	40.3
Total average ink weight across eight cartridges								149.7

Table 8

Ink used in three 50-page runs of studio portrait test document on the Epson Stylus Pro 9890 (grams)

	C	Y	LC	MK	PK	VM	LK	LLK	VLM
Test Run 1 Net weight of ink used	3.2	11.0	27.2	0.1	10.3	4.0	27.6	67.0	38.8
Test Run 2 Net weight of ink used	2.9	10.8	26.8	0.0	10.0	3.7	27.3	67.9	38.5
Test Run 3 Net weight of ink used	3.0	10.9	26.9	0.0	10.1	4.0	27.5	68.1	38.5
Average amount of ink used across three runs	3.0	10.9	27.0	0.0	10.1	3.9	27.5	67.7	38.6
Total average ink weight across nine cartridges									188.7

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 three were sized at ISO A1.

The Canon imagePROGRAF iPF8400S was installed in BLI's lab with the latest level of firmware (as of August 2013) and connected to a Windows 7 workstation using a 1000BaseT TCP/IP connection. The device was left in default configuration throughout testing. The Canon GARO driver was used for all testing and was left in default colour setting configuration. The packaging proof document was printed on 195 gsm 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 250 gsm gloss photo media in standard mode.

The Epson Stylus Pro 9890 was installed in BLI's lab with the latest level of firmware (as of August 2013) and connected to a Windows 7 workstation using a 100BaseT 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 setting, with media selection set to plain paper and the image set to print at actual size. The packaging proof document was printed on 195 gsm 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 250 gsm gloss 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.

The percentage of ink used per cartridge was calculated by dividing the net weight of ink used in the print run by the overall weight of ink in each cartridge and multiplying by 100.

The percentage of total ink used per printer was calculated by adding the percentages used of each of the cartridges and dividing by the number of cartridges.

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

BLI's dedicated test network in Europe, consisting of Windows 2007 servers, Windows 7 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 an IT8 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 Inc.

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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