

BLI Comparative Performance Evaluation

SEPTEMBER 2013

Canon imagePROGRAF iPF6400S vs. Epson Stylus Pro 7890



Canon imagePROGRAF iPF6400S



Epson Stylus Pro 7890

	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Advantage ✓		
Print Quality	✓	
Print Productivity	✓	
Ink Consumption	✓	
Device Feature Set	✓	
Print Driver Feature Set	✓	
Spectrophotometer Functionality	✓	
Colour Stability using calibration link	✓	
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 iPF6400S with Spectrophotometer and the Epson Stylus Pro 7890 with SpectroProofer, 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, spectrophotometer functionality, colour stability, printhead stability and cleaning routines. All testing was performed in BLI's test facility in Wokingham, UK.

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Executive Summary

The Canon imagePROGRAF iPF6400S gave an outstanding performance in BLI's testing, delivering far greater productivity (especially in High/Max Quality modes), superior image quality, lower ink consumption and a stronger device and driver feature set when compared with the Epson Stylus Pro 7890. The Epson model delivers smaller ink-drop sizes, a larger ink cartridge capacity and lower power consumption while printing (but not in standby mode).

As would be expected of two models aimed at the Graphic Arts (GA) marketplace, both units delivered superlative image quality overall, with the Canon iPF6400S delivering a fractionally higher colour gamut on both photo and proofing media, higher optical densities for cyan, magenta and black and less colour drift than the Epson unit to give it the edge overall.

One outstanding feature offered by both models is the option of attaching an X-Rite Spectrophotometer (which Epson calls a SpectroProofer) to guarantee colour consistency and to automate workflows for colour calibration, target measurement and media profile generation when used in conjunction with software tools available from both companies. According to Epson, it offers Look Up Table (LUT) technology for spot colour optimization, increased gamut size and verification of colour difference from the test targets. Canon's innovative Media Configuration Tool, in conjunction with the Colour Calibration Management Console utility, offers an important advantage over the Epson software in that it can also be used to check colour consistency across a whole range of compatible large-format devices, even those in remote locations—a significant advantage for proofing in the Graphic Arts, Photography and Advertising industries where colour consistency across devices is of paramount concern. In BLI's testing of two models in the iPF X400S Series, the Canon model's SU-21 Spectrophotometer achieved a remarkably low Delta E variation of 1.8 on Pearl Photo paper, and even less variation—1.4—when the same media was saved with custom settings. Canon's included Colour Calibration Management Console utility also enables administrators to monitor the calibration status of each connected unit remotely. The utility displays a progress bar for each media type to indicate when a colour calibration should be conducted, and features a Delta E threshold setting whose default value is 2.0 but this can be changed over a scale of 0.4 to 5.0, ensuring that high colour consistency is maintained over time. BLI analysts noted that Canon's calibration process is a one-off procedure which covers all resolutions, whereas the Epson model requires users to perform a separate calibration for each available resolution setting, which can take up to one hour to complete.

The test included an ink consumption evaluation, in which BLI assessed the cost of printing with three different document types in Standard/Quality mode on Glossy 195-gsm proofing media, on 150-gsm matte coated paper and on 260-gsm Pearl Photo media. In BLI's ink consumption print runs, the Canon imagePROGRAF iPF6400S used significantly less ink in terms of net weight, and a comparable percentage of available ink in the cartridge than the Epson Stylus Pro 7890.

The Canon model's feature set is also superior. It includes 256 MB of internal memory (as 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. The Canon model also offers a number of print driver feature advantages over the Epson model, including a wider variety of media profiles and colour adjustment options. Both models can integrate with smaller-format MFPs to produce enlarged poster-size copies—Canon via its Enlargement Copy Mode and Epson via its extra cost CopyFactory Utility.

Colour Image Quality

	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Advantage ✓		
Text	=	=
Fine Lines	=	=
1 x 1 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 (proofing media)	✓	
Colour Gamut (photo media)	✓	

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

- All image quality testing was done with the respective vendor's own paper—Canon's Proofing Glossy 195-gsm media and Epson's 194-gsm proofing paper Commercial media—with print priority set to Proof and quality set to Highest on the Canon model, and the Epson model set to Max Quality (2880 x 1440 dpi). Note that the Epson model doesn't allow for black-and-white printing on the media selected for testing, so image quality analysis for black and colour are combined here.
- As would be expected of models aimed at the Graphic Arts (GA) marketplace, both units delivered excellent output in colour, with only slight differences in some respects.
- The Canon iPF6400S and the Epson SP7890 both displayed clear formation of both serif and non-serif fonts in all colours down to 3-point size. There was very little visual difference in clarity of text when viewed with and without magnification, with fonts that were crisp and fully formed.
- + The Canon iPF6400S produced the 1x1 pixel grid in CMY without error, whereas the Epson SP7890 failed to deliver any coverage in black across the grid, although its CMY coverage matched that of the Canon unit.
- Both devices delivered excellent vertical and horizontal fine lines down to 0.1 size with no evidence of stair-stepping in diagonal lines.
- Both models delivered an impressive range of halftone fills in colour and greyscale modes, with distinct transitions between all levels.
- + The two models produced optical densities that were identical for yellow, while the Canon unit had a slightly higher density for magenta and significantly higher densities for cyan and black.

- Both models exhibited natural-looking skin tones in photographic images.
- When evaluating the consistency with which different skin tones were delivered, the Canon model displayed fractionally greater variance with one of the three skin shades when compared with the Epson model.
- Neutral grey consistency was comparable for both models, with equally low variance—ultra-low Delta E values—that would not be discernible to the naked eye.
- + During BLI's colour drift analysis, in which the FOGRA39 media wedge is submitted to print before and after productivity and ink consumption tests and color shift measured using EFI Colour Verifier software, the output produced by the Canon model displayed a mean Delta E drift of 5.5, compared with the Epson device's mean drift of 6.2.
- + The Canon device's colour gamut was marginally (0.6%) larger than that achieved by the Epson model when printed on proofing/glossy media with Max Quality settings.
- + On Pearl Photo Quality paper the Canon unit delivered a colour gamut that was fractionally (0.3%) higher than the Epson model's with Max Quality settings on Glossy Photo paper.
- BLI analysed a wide range of colour and greyscale areas 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 iPF6400S	Epson Stylus Pro 7890
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 high-resolution portrait, the Canon model delivered much faster speeds than the Epson model from the ready state in all modes, being 48.2% faster in Fast/Speed mode, 49.2% faster in Standard/Quality mode, and 66.0% faster in High/Max Quality mode.
- + When printing a medium-resolution Retail Poster, the Canon model was again much faster than the Epson model from the ready state in all modes—54.9% faster in Fast/Speed mode, 56.6% faster in Standard/Quality mode, and 45.0% faster in High/Max Quality mode.

- + 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 speeds that were 44.5% faster in Fast/Speed mode and 47.2% 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 speeds that were 52.4% faster in Fast/Speed mode and 52.1% 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-page A1 printing in Standard /Quality Mode	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
PACKAGING PROOF (Standard/Quality Mode)		
Average weight of ink used (grams)	142.2	197.2
Percentage of total ink used averaged across all colours	5.6%	5.5%
RETAIL POSTER (Standard/Quality Mode)		
Average weight of ink used (grams)	128.2	206.7
Percentage of total ink used averaged across all colours	5.0%	5.8%
STUDIO PORTRAIT (Standard/Quality Mode)		
Average weight of ink used (grams)	133.0	188.7
Percentage of total ink used averaged across all colours	5.2%	5.3%

- + In all three of the BLI Packaging Proof ink consumption print runs using Standard/Quality mode on 195-gsm Glossy proofing media, the Canon imagePROGRAF iPF6400S used significantly (27.8%) less ink in terms of net weight than the Epson Stylus Pro 7890. In the BLI Retail Poster print runs on matte coated media, the Canon unit used 38.0% less ink, and in the BLI Studio Portrait print runs on 260-gsm Pearl Photo media it used 29.5% less ink than the Epson device.
- In all of the BLI Packaging Proof print runs using Standard/Quality mode on 195-gsm Glossy proofing media, the Canon model used a very similar percentage of available ink than the Epson model. In the BLI Retail Poster print runs on matte coated media, the Canon unit used a lower percentage of ink available, and in the BLI Studio Portrait print runs on 260-gsm Pearl Photo media, the Canon iPF6400S used a very similar percentage of available ink than the Epson SP7890.

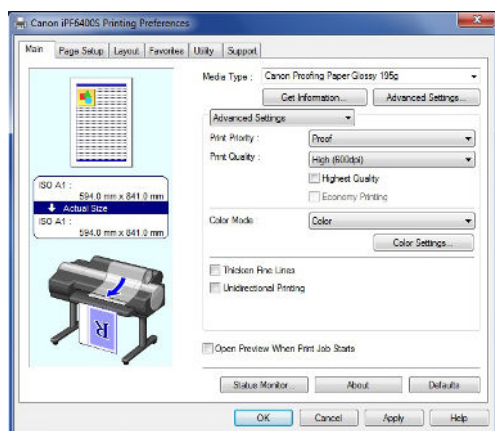
Device Feature Set

- The Epson Stylus Pro 7890 employs nine inks, four of which are different types of black including photo/matte black, whilst the Canon imagePROGRAF iPF6400S employs eight inks including two black inks and one grey ink.
- + The fact that the Canon inks are replaceable during operation helps to reduce downtime.
- + The Canon model's two printheads contain more nozzles per colour than the Epson unit's single integrated printhead.
- 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 Epson model's maximum 700 ml ink cartridge capacity is significantly larger than the 300 ml of the Canon model.
- Both models offer borderless printing.
- The Canon model has the same internal memory capacity (256 MB) as the Epson unit.
- + The Canon model has a 250-GB hard drive, 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 consumption value (100W) than the Epson model (70W).
- + However, the Canon iPF6400S's energy consumption in standby mode (where it will spend a large amount of time) 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 cannot be printed due to incorrect media being loaded, while jobs that can be completed are printed; the held jobs are printed once the appropriate paper is loaded. The Epson device does not offer this capability, and continues printing on the mismatched media, which can result in ink and media waste.
- + The Canon model 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, prints 16-bit files directly from Adobe RGB or CMYK colour space 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.
- + 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 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.

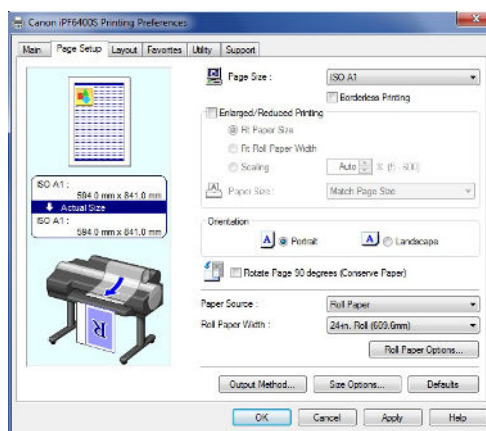
- Epson's LFP Accounting Tool, a free download from Epson's website for other large-format Epson devices, does not seem to be available for the SP7890.

Driver Feature Set

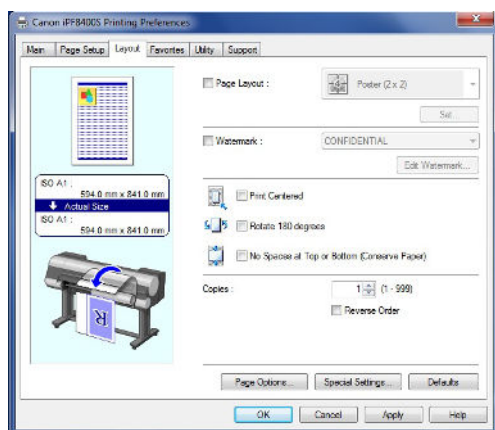
- + The Canon driver includes 55 predefined media profiles versus 30 for the Epson driver, although both units permit users to build a library of custom media profiles.
- + The Canon driver includes a watermark capability; the Epson driver does not.
- + The Canon driver also includes a Thicken Fine Lines image enhancement option; the Epson driver offers only Sharpen Text.
- Both the Canon and Epson drivers offer N-up (up to 16 and 4, respectively) and poster printing (2 x 2 and 4 x 4, respectively) capabilities.
- 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, Colour imageRUNNER Enlargement Copy Mode, which allows users to integrate a Canon MFP device or other scanner with the imagePROGRAF iPF6400S. Documents scanned by the Canon MFP are automatically routed to a hot folder, which is monitored by the imagePROGRAF iPF6400S utility. 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 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 one more click.
- + The Canon driver includes a wider selection of simple colour adjustment options, including sliding scale adjustments for brightness, contrast, saturation and CMYK. The Epson driver is limited to only CMY with brightness, contrast and saturation control.
- + 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 reduce the risk of banding, whereas the Epson driver does not.



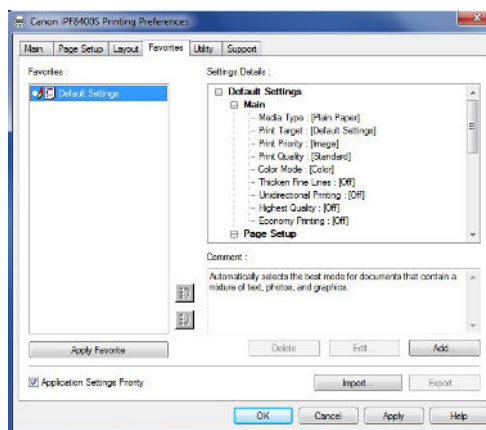
Canon iPF6400S Print Driver Main Tab



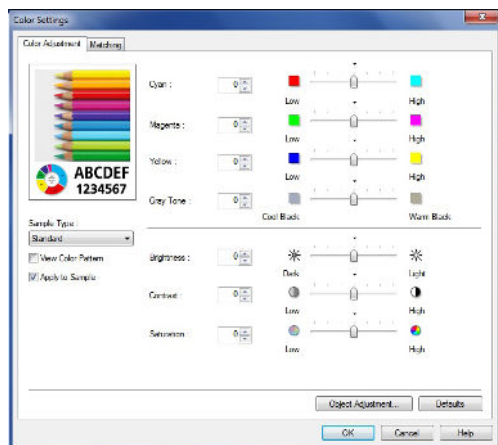
Canon iPF6400S Print Driver Page Setup Tab



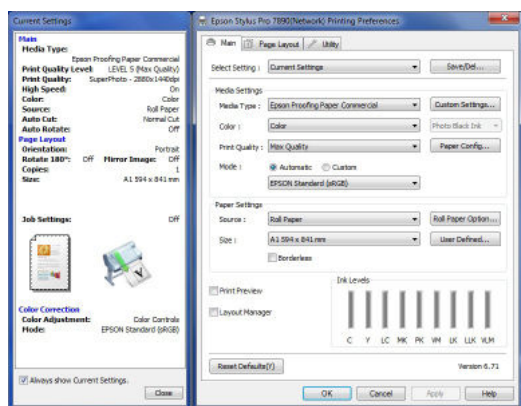
Canon iPF6400S Print Driver Layout Tab



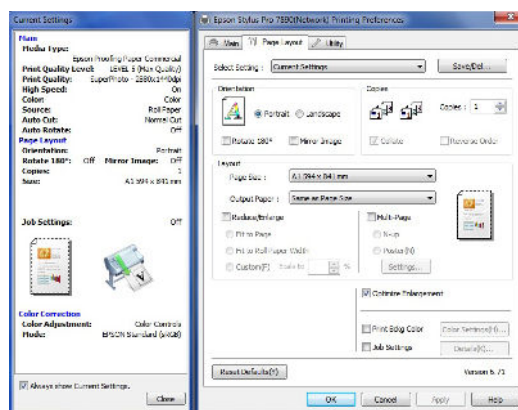
Canon iPF6400S Print Driver Favourites Tab



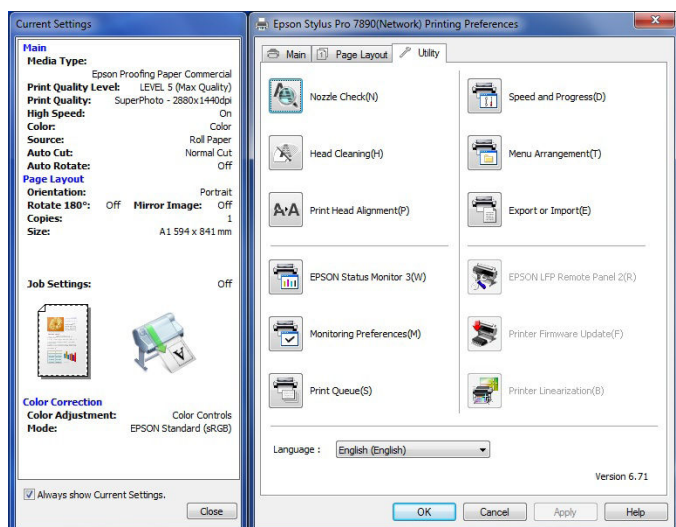
Canon iPF6400S Colour Adjustment Settings



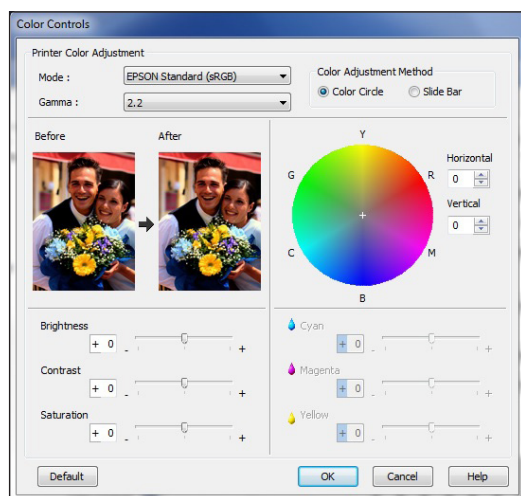
Epson SP7890 Print Driver Main Tab



Epson SP7890 Print Driver Page Layout Tab



Epson SP7890 Print Driver Utility Tab



Epson SP7890 Print Driver Colour Adjustments

Spectrophotometer Functionality

- One outstanding feature offered with both models is the extra-cost 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 when used in conjunction with software tools offered by both companies.
- According to Epson, the SP7890 offers Look Up Table (LUT) technology for spot colour optimization, increased gamut size and verification of colour difference from the test targets.

Colour Stability using Calibration Link

- + The Canon iPF6400S has a built-in densitometer (referred to by Canon as a multi-sensor because it does more than measure density) positioned on the printhead to conduct a colour calibration which can be applied to all Canon media as well as third-party media used on the device. Canon recommends that calibration be performed after the printer is installed, after printheads are replaced, or if colour appears to vary over time. For third-party media, a calibration can be initiated either at the control panel or via the Colour Calibration Management Console utility, which allows users to create customized media profiles. After initiation, a colour calibration chart is automatically printed and scanned using a built-in three-colour LED, and the colour calibration results are set automatically.
- + Canon's calibration process is a one-off procedure which covers all resolutions, whereas the Epson model requires users to perform a separate calibration for each available resolution setting. The Canon model's calibration routine takes about 10 minutes to perform and uses just 25 cm of paper and an average of 10 grams of ink, whereas the Epson unit takes about 15 minutes for each calibration routine, and when all four resolution settings are required it can take up to an hour, using 90 cm of paper, although it uses less ink than the Canon model at an average of 4 grams.
- + Canon's innovative Media Configuration Tool and Colour Calibration Management Console utility offer an important advantage over the Epson software in that they can also be used to check for and maintain colour consistency across a whole range of compatible large-format devices, even ones in remote locations—a significant advantage for proofing in the graphic arts, photography and advertising industries where consistency of colour across devices is critical.
- + In BLI's testing, the Canon iPF6400S with the SU-21 Spectrophotometer produced output with a remarkably low Delta E variation of 1.4 from the same FOGRA39 colour patch printed by the iPF8400S when saved as a custom profile. Canon's included Colour Calibration Management Console utility enables administrators to monitor the calibration status of each connected unit remotely when required. The utility displays a progress bar for each media type to indicate when a colour calibration should be conducted, and features a Delta E threshold setting whose default value is 2.0 but can be set to a value on a scale of 0.4 to 5.0, ensuring that colour consistency is maintained over time.

Printhead Reliability / Cleaning Routines

- Both models offer three choices of settings for nozzle checks at the control panel. The Canon iPF6400S has settings for Off, Per Print or Auto (the default setting), while the Epson SP7890 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.
- + When a clogged nozzle is detected on the Canon unit, the device automatically runs a cleaning cycle in the background to maintain image quality and consistency, with no user intervention required. If a clogged nozzle is detected on the Epson device, the control panel alerts users that a cleaning cycle is required, and offers a choice between waiting until a print run is finished, or cancelling a print job and running a cleaning cycle immediately. The Epson unit's method requires more user intervention.
- + When the two devices were powered off completely over a weekend, the Canon model had no issues 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. This would result in a good deal of downtime for Epson users, and waste a considerable amount of ink (about 15 grams in this case) and paper.
- + The Epson SP7890 has both matte black and photo black inks which share the same printhead, and the device automatically makes the choice depending on the media loaded. However, the procedure for swapping the black inks then takes about ten minutes and uses an additional 7.3 grams of ink (including some Light Black ink) on average—a figure determined by requiring that the inks be swapped ten times in total during the tests, so BLI would advise that workflows should take into account the potential need for swapping to minimize downtime.
- It was not possible to measure the amount of ink used by the Canon model during cleaning cycles as this is accomplished automatically on the fly, without any user intervention being required.
- The Epson model uses between 1.3 and 1.7 grams of ink per cartridge during cleaning cycles, taking between five and nine minutes.

SUPPORTING TEST DATA

Productivity

Colour Throughput Time - High-Resolution Portrait Printing

Canon imagePROGRAF iPF6400S (time in seconds)		Epson Stylus Pro 7890 (time in seconds)	
Fast	Standard	Speed	Quality
185.21	252.49	333.63	473.16

A single-page high-resolution A1 portrait was printed as a 5-set job using the device driver set to the plain paper/colour setting. Both devices were loaded with 24" rolls, with each file 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 - Medium-Resolution Retail Poster Printing

Canon imagePROGRAF iPF6400S (time in seconds)		Epson Stylus Pro 7890 (time in seconds)	
Fast	Standard	Speed	Quality
104.52	214.36	164.02	332.43

A single-page medium-resolution A1 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 24" rolls with each file 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).

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

	Canon imagePROGRAF iPF6400S (time in seconds)			Epson Stylus Pro 7890 (time in seconds)		
	Fast	Standard	High	Speed	Quality	Max Quality
Time Before Printing Commences	15.80	16.26	18.92	31.63	32.95	32.31
First Print Out	162.37	229.18	293.50	313.50	450.82	862.23

First-page-out times are determined by sending an A1-size 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 24" rolls, with each file set to auto-rotate to save media.

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

	Canon imagePROGRAF iPF6400S (time in seconds)			Epson Stylus Pro 7890 (time in seconds)		
	Fast	Standard	High	Speed	Quality	Max Quality
Time Before Printing Commences	16.45	15.92	19.11	32.09	32.21	32.45
First Print Out	83.78	138.09	274.96	185.70	318.47	500.03

First-page-out times are determined by sending an A1-size 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 24" rolls, with each file set to auto-rotate to save media.

SUPPORTING TEST DATA

Colour Print Quality

Colour Optical Density Evaluation

Canon imagePROGRAF iPF6400S Proofing Paper Glossy						
	High (600 dpi)					
	1	2	3	4	Max.	Min.
Cyan	0.70	0.71	0.71	0.70	0.71	0.70
Magenta	1.03	1.04	1.03	1.04	1.04	1.03
Yellow	0.95	0.95	0.95	0.95	0.95	0.95
Black	2.57	2.57	2.56	2.57	2.57	2.56

Epson Stylus Pro 7890 Standard Proofing Paper						
	Quality (720 x 1440 dpi)					
	1	2	3	4	Max.	Min.
Cyan	0.60	0.61	0.61	0.61	0.61	0.60
Magenta	1.01	1.02	1.01	1.02	1.02	1.01
Yellow	0.95	0.95	0.95	0.95	0.95	0.95
Black	2.39	2.41	2.40	2.39	2.41	2.39

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

Skin Tone and Neutral Grey Consistency

Skin Tone 1 (C=6, M=15, Y=16, K=0)		
	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Colour block		
2	0.1	0.2
3	0.3	0.2
4	0.2	0.3
5	0.3	0.3
6	0.4	0.2
7	0.2	0.2
8	0.3	0.2
9	0.4	0.3
Max. Delta E Variance	0.4	0.3

Skin Tone 2 (C=30, M=63, Y=75, K=0)		
	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Colour block		
2	0.2	0.3
3	0.2	0.2
4	0.2	0.2
5	0.2	0.4
6	0.2	0.2
7	0.3	0.2
8	0.2	0.6
9	0.1	0.4
Max. Delta E Variance	0.3	0.6

Skin Tone 3 (C=19, M=33, Y=50, K=0)		
	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Colour block		
2	0.2	0.3
3	0.4	0.2
4	0.5	0.5
5	0.2	0.4
6	0.4	0.2
7	0.5	0.3
8	0.1	0.7
9	0.4	0.4
Max. Delta E Variance	0.5	0.7

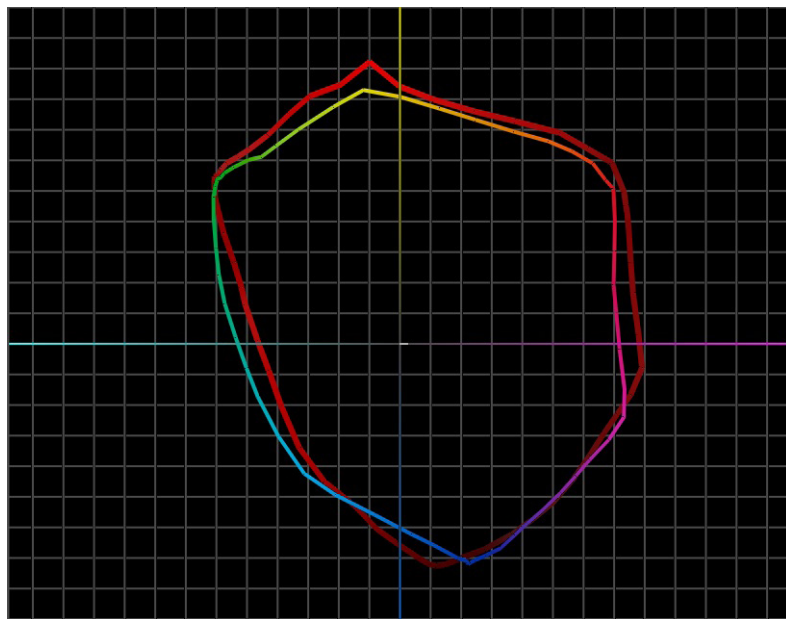
Neutral Grey		
	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Colour block		
2	0.3	0.2
3	0.3	0.2
4	0.3	0.3
5	0.3	0.2
6	0.1	0.2
7	0.3	0.2
8	0.1	0.3
9	0.3	0.2
Max. Delta E Variance	0.3	0.3

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 Glossy 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.

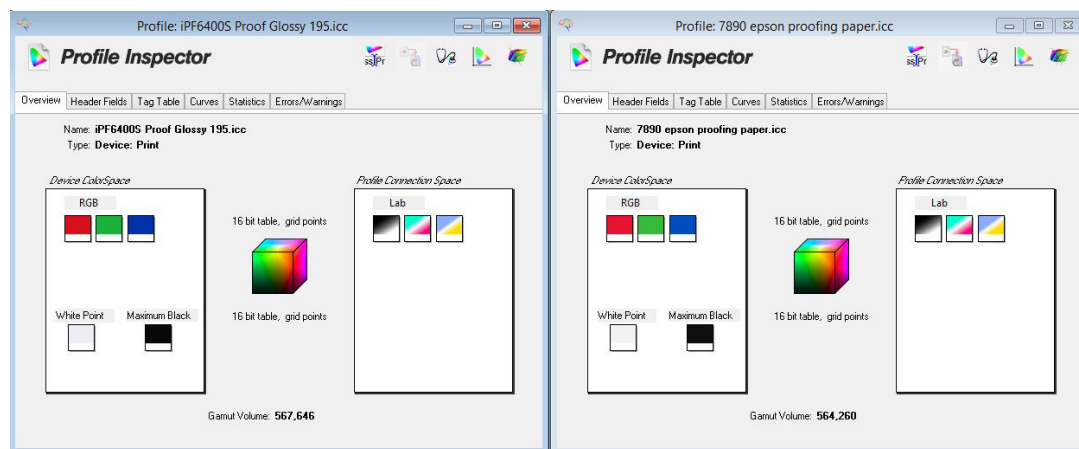
FOGRA 39 DRIFT TEST: comparison of FOGRA39 colour patches before and after ink consumption test.

	Canon imagePROGRAF iPF6400S	Epson Stylus Pro 7890
Delta E Drift	5.5	6.2

Colour Gamut Comparison

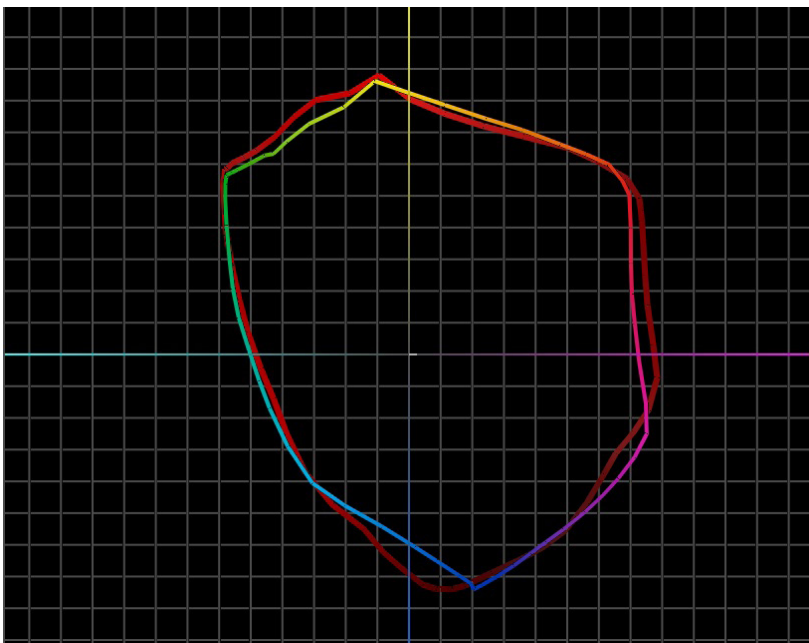


Epson Stylus Pro 7890 colour gamut on proofing paper in Max quality settings (red) versus Canon imagePROGRAF iPF6400S colour gamut (shown chromatically) on proofing paper in highest-quality settings.

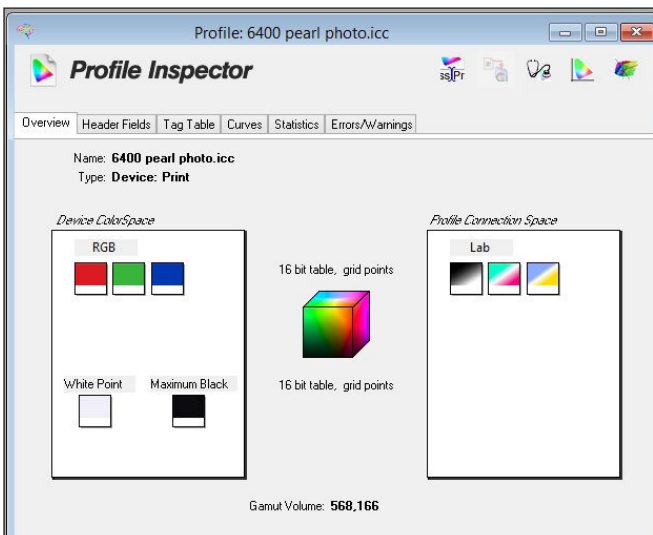


Canon iPF6400S Colour Gamut on Proofing Paper

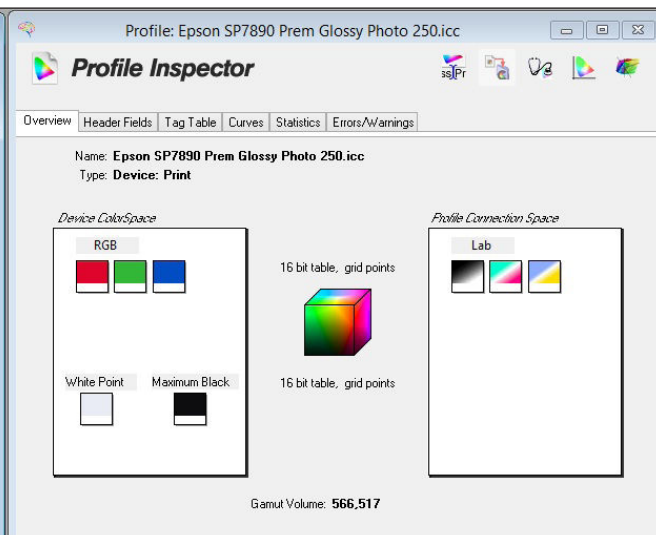
Epson Stylus Pro 7890 Colour Gamut on Proofing Paper



Epson Stylus Pro 7890 colour gamut on photo paper in Max quality settings (red) versus Canon imagePROGRAF iPF6400S colour gamut (shown chromatically) on photo paper in highest quality settings.



Canon iPF6400S Colour Gamut on Photo Paper



Epson Stylus Pro 7890 Colour Gamut on Photo Paper

Device Feature Set

	Canon imagePROGRAF iPF6400S	Advantage		Epson Stylus Pro 7890
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	130 ml, 300 ml		✓	150ml, 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 (varies according to the OS and application)			Limited by application, OS and driver/RIP used
Maximum cut-sheet media length	1.6 m	✓		INA
Maximum media thickness	0.8 mm (roll), 1.5 mm manual feed from front			0.5 mm (roll), 1.5 mm manual feed from top
Maximum media width	24 inches (610 mm)			24 inches (610 mm)
Media loading	Front			Top
Optional media handling	Roll holder set			Roll media adapter
Standard RAM	256 MB			256 MB
Maximum RAM	256MB			256 MB
Hard drive	Standard 250-GB	✓		None
Interface	10/100/1000Base-T/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)	70 kg	✓		101kg
Power consumption when in standby	5 W or less	✓		16 W or less
Power consumption when active	100 W		✓	70 W
Acoustic pressure	Operation: 47 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

Driver Feature Set

	Canon imagePROGRAF iPF6400S	Advantage		Epson Stylus Pro 7890
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 only)	✓		No
Predefined profiles	8 (Under Easy Settings)	✓		5
Overview of profile settings provided	Yes			Yes
Media profiles	55	✓		30
IQ optimized for options	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 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			Yes
Disable automatic cutter	Yes			Yes
Unidirectional printing selection option	Yes	✓		No
Integration with MFP	Yes	✓		Yes (with CopyFactory)
Photoshop Plug-in	Yes	✓		No

Ink Consumption

Table 1

Amount of Ink in each Canon imagePROGRAF iPF6400S Cartridge (in grams)

	GY	MBK	PC	Y	C	M	PM	BK
Weight of cartridge prior to installation	391.8	398.8	394.7	391.8	395.7	394.3	391.1	392.2
Weight of cartridge at end of life	73.9	73.9	73.9	73.9	73.9	73.9	73.9	73.9
Net weight of ink	317.9	324.9	320.8	317.9	321.8	320.4	317.2	318.3
Total ink weight across eight cartridges								2,559.2

Table 2

Amount of Ink in each Epson Stylus Pro 7890 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									3,564.0

Table 3

Ink used in Three 50-Page Runs of Packaging Proof Test Document on the Canon iPF6400S (grams)

	GY	MBK	PC	Y	C	M	PM	BK
Test Run 1 Net weight of ink used	47.2	1.9	12.1	17.1	8.5	15.2	16.9	26.1
Test Run 2 Net weight of ink used	47.0	1.5	11.6	15.2	9.0	16.1	15.6	25.9
Test Run 3 Net weight of ink used	45.0	0.8	12.5	15.4	8.4	14.6	16.6	26.4
Average amount of ink used across three runs	46.4	1.4	12.1	15.9	8.6	15.3	16.4	26.1
Total average ink weight across eight cartridges								142.2

Table 4

Ink Used in Three 50-Page Runs of Packaging Proof Test Document on the Epson Stylus Pro 7890 (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 iPF6400S (grams)

	GY	MBK	PC	Y	C	M	PM	BK
Test Run 1 Net weight of ink used	17.1	2.4	23.3	19.4	4.4	25.7	31.4	1.3
Test Run 2 Net weight of ink used	18.8	5.3	22.7	18.0	5.0	26.0	31.3	0.7
Test Run 3 Net weight of ink used	17.5	6.8	23.6	19.1	4.7	27.1	32.0	0.9
Average amount of ink used across three runs	17.8	4.8	23.2	18.8	4.7	26.3	31.6	1.0
Total average ink weight across eight cartridges								128.2

Table 6

Ink Used in Three 50-Page Runs of Retail Poster Test Document on the Epson Stylus Pro 7890 (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									206.7

Table 7

Ink Used in Three 50-Page Runs of Studio Portrait Test Document on the Canon iPF6400S (grams)

	GY	MBK	PC	Y	C	M	PM	BK
Test Run 1 Net weight of ink used	36.6	1.7	24.5	14.4	4.7	5.9	36.7	9.4
Test Run 2 Net weight of ink used	36.3	1.2	26.0	13.0	4.6	5.5	36.2	8.6
Test Run 3 Net weight of ink used	36.1	1.7	25.1	13.9	4.7	6.2	36.3	9.7
Average amount of ink used across three runs	36.3	1.5	25.2	13.8	4.7	5.9	36.4	9.2
Total average ink weight across eight cartridges								133.0

Table 8

Ink Used in Three 50-Page Runs of Studio Portrait Test Document on the Epson Stylus Pro 7890 (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 (packaging 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 iPF6400S 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 SRGB colour profile setting configuration. The Packaging Proof document was printed on 260 gsm Pearl Photo proofing media in Standard mode, the Retail Poster was printed on plain coated media in Standard mode, and the Studio Portrait photo was printed on 250 gsm Glossy Photo media in Standard Mode.

The Epson Stylus Pro 7890 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 SRGB colour profile setting, with media selection set to plain paper and the image set to print at actual size. The Packaging Proof document was printed on 255 gsm Epson Glossy proofing media in Quality (720 dpi) mode, The Retail Poster was printed on Epson Coated media in Quality mode, and the Studio Portrait photo was printed on 250 gsm Epson 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. One cartridge from the Canon imagePROGRAF iPF6400S and Epson Stylus Pro 7890 was then 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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