

## KPI Comparative Lab Test Report

OCTOBER 2018

# Canon imagePROGRAF TM-305

vs. HP DesignJet T930

Advantage ✓	Canon imagePROGRAF TM-305	HP DesignJet T930
Colour Image Quality	✓	
Black Image Quality	✓	
Print Productivity	✓	
Banner Printing	✓	
Poster Printing	✓	
Direct Print Submission Functionality	=	=
Ink Consumption	✓	
Device Feature Set	✓	
Print Driver Feature Set	✓	

## TEST OBJECTIVE

Keypoint Intelligence - Buyers Lab was commissioned by Canon Europe to conduct confidential document imaging device performance testing on the Canon imagePROGRAF TM-305 and the HP DesignJet T930, and produce a report comparing the relative strengths and weaknesses of the two printers in the areas of image quality, productivity, banner and poster printing, direct print submission functionality, device feature set, driver functionality, and ink consumption. All testing was performed in Buyers Lab's European test facility in Wokingham, UK.

## Executive Summary

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Canon's latest 36-inch five-colour wide-format printer, the Canon imagePROGRAF TM-305, delivered an all-round strong performance in Buyers Lab's evaluation, outclassing the HP DesignJet T930 in many areas. Specifically, it had higher productivity under all test conditions, superior colour and black image quality, lower ink consumption and richer device and driver feature sets. Notably, Buyers Lab technicians observed that the speed advantage of the Canon model became even more pronounced as the quality level was increased, which enables Canon users to achieve optimum image quality without sacrificing productivity. It also features a significant productivity-boosting hot-swap ink tank design, which means inks can be replaced on the fly without having an impact on user productivity or causing unnecessary waste. In contrast, when the HP T930 runs out of ink, printing must stop for a cartridge to be replaced, leading to operator downtime. In Buyers Lab's ink consumption evaluation, the Canon TM-305 used less ink in all three tests.

Image quality delivered by both printers was entirely congruous with the standard demanded by professionals working in Architectural, Engineering and Construction (AEC), Computer-Aided Design (CAD) and Geographic Information Systems (GIS) industries. Yet, the Canon imagePROGRAF TM-305 delivered consistently crisp colour and black text, fine lines, circles and smoother halftone coverage. It delivered larger colour gamuts in most modes tested when printing on both plain and (especially) photo-quality paper, more natural-looking skin tones, and excellent definition in light contrast areas. The HP model delivered higher black optical densities.

In terms of device and driver feature sets, the Canon imagePROGRAF TM-305 has plenty of advantages over its rival. It has higher cartridge capacities, higher memory and hard drive capacities to aid with job processing and storage, smaller ink drop sizes, more media profiles, a unidirectional feature which eliminates banding on image output even when printing in Fast mode, and a flexible layout nesting option to save on paper. While the HP model offers a similar nesting feature, jobs are positioned automatically and it doesn't support the same flexibility and control over image placement. Canon users can integrate the imagePROGRAF TM-305 device with a smaller-format MFP to produce enlarged, poster-size copies via the free Color imageRUNNER Enlargement Copy Mode, a feature not offered by the HP model. Both models come with strong security features, such as secure disk/file erase (optional for the HP model), and support for IPsec authentication and data encryption over the network. Both units offer robust direct print submission functionality as well as support for mobile printing via proprietary mobile print apps for iOS and Android mobile devices, providing additional flexibility for workers who are travelling between sites, or working remotely. Buyers Lab technicians were impressed with the design and build quality of the HP T930's rear-mounted stacker assembly which can hold up to 50 printed sheets in perfect alignment; there is no equivalent stacker assembly available with the TM-305, however, the unit's stand/basket is capable of holding 20 A1- or A2-sized prints in landscape orientation.

In conclusion, the Canon imagePROGRAF TM-305 is the stronger performer in Buyers Lab's large-format evaluation overall. Not only did it deliver faster productivity, lower ink consumption and top-class colour and black image quality, its driver and device feature sets are richer, providing many ways to boost productivity and enhance functionality.

## Colour Image Quality

Advantage ✓	Canon imagePROGRAF TM-305	HP DesignJet T930
Text	✓	
Fine Lines	✓	
Halftone Range	=	=
Halftone Fill	✓	
Solid Density	=	=
AEC Graphics	=	=
GIS Graphics	=	=
Business Graphics	✓	
Photographic Images	=	=
Colour Gamut (Plain Paper, Fast)	=	=
Colour Gamut (Plain Paper, Standard/Normal)	✓	
Colour Gamut (Plain Paper, High/Best Quality)	✓	
Colour Gamut (Gloss Photo, High/Best Quality)	✓	

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

- O All image quality testing was conducted on CAD 90gsm inkjet plain paper.
- O In terms of colour optical solid density, the Canon TM-305 produced higher optical densities for CMY in Fast mode, as well as a higher cyan density in Standard and High modes, and higher yellow density in High/Best mode; the HP T930 produced higher composite black optical density in all modes. Both models had comparable densities for magenta and yellow in Standard/Normal and magenta in High/Best mode.
- O In Buyers Lab’s colour gamut assessment conducted on plain paper in Fast mode, both models produced comparable colour gamuts, with a CIE volume of 136,778 for the Canon TM-305 versus a CIE volume of 137,431 for the HP model.
- + The Canon model produced a 33.0% larger colour gamut when printing on plain paper using Standard/Normal settings—with a CIE volume of 204,730 versus a CIE volume of 153,924 for the HP device.
- + When printing on plain paper in High/Best quality settings, the Canon TM-305 delivered a 27.1% larger colour gamut than the HP T930, with a CIE volume of 224,127 versus a CIE volume of 176,335 for the HP model.
- + In High/Best quality settings using gloss photo-quality paper, the Canon model delivered a 44.8% larger colour gamut, with a CIE volume of 655,466 compared with a CIE volume of 452,584 for the HP T930.
- + The Canon TM-305 delivered superior colour text overall; it produced dark, pin-sharp Arial sans serif text that was legible down to the smallest (3-pt.) type size, with no breakup or ink bleed, in all tested modes. Serif characters, again, displayed no bleed and were legible down to 3-pt. size. In contrast, the HP model’s serif and sans serif fonts were legible down to the 3-pt. level in Fast mode, but displayed poor fills and some ink bleed; in Normal mode, serif fonts were legible down to the 4-pt. level and down to the 3-pt. level for sans serif fonts, with no bleed. However, in Best quality mode text was legible down to 3-pt. size with some bleed evident.

- + Fine lines produced by both devices remained distinct down to the 0.1-pt. level across all modes, except for the HP model's Fast mode in which fine lines were distinct at the 0.25-pt. mark. In Standard/Normal mode, fine lines were rated excellent for the Canon TM-305 model as they were crisp and clean, but only rated good for the HP T930.
- + The Canon model produced 0.1-pt. circles that were rated good in Fast mode and excellent in Standard and High modes as they were clean and smooth. Circles produced by the HP T930 model were fully formed at 0.1-pt. size but were blurred and indistinct in Fast and Normal modes, whilst in Best mode circles were rated only good as they were slightly fuzzy.
- + The Canon TM-305 produced the 1x1 pixel grid in CMY with no quality issues, and coverage was consistently very good across all colours in Fast and Standard modes; in High mode, CMY 1x1 pixel grids were excellent. In contrast, the HP T930 delivered good coverage in Best mode, but its 1x1 pixel grid output was rated only fair in Fast mode and good in Normal and Best modes.
- O Both devices delivered colour halftone output across the full range—from the 10% to 100% dot-fill levels—in all modes with distinct transitions between all levels.
- + The Canon TM-305 delivered very good, smooth colour halftone fills in all modes; the HP model delivered smooth halftone coverage that was consistently rated good.
- O When evaluating Architectural, Engineering and Construction (AEC) graphics in Standard/Normal and High/Best modes, both the Canon and HP units' output exhibited an excellent level of detail, very distinct fine lines and clear text formation, although there was some evidence of ink bleed with both models' output in Standard/Normal mode and with the HP model's output in Best mode when viewed under magnification.
- O When evaluating Geographic Information Systems (GIS) graphics in High/Best mode on plain paper, both units delivered very good detail and exhibited an equally good depth of field—a critical factor in delivering a realistic three-dimensional rendering of topographical features.
- + Colour business graphics produced by the Canon TM-305 unit exhibited sharper details than did those produced by the HP device.
- O When comparing photographic images in Standard/Normal and High/Best quality modes, the Canon model delivered very good fine detailing in dark and light contrast areas and bright colours, as did the HP model. While the HP model's output showed slightly better depth of field, the Canon model delivered smoother tonal transitions.
- + Skin tones produced by the Canon TM-305 were natural-looking, while those produced by the HP model were slightly reddish in comparison.
- + Both models performed strongly in Buyers Lab's assessment of colour image quality, but the Canon TM-305 had the advantage, overall, with larger colour gamuts, superbly crisp text and fine lines (which suffered none of the ink bleed that was evident on the HP T930's text and line art output when viewed under magnification), smoother circles, smoother halftone coverage, and natural-looking skin tones. As befitting the needs of their target markets, both models produced distinct fine lines in AEC drawings and an excellent level of detail in GIS graphics with very good depth of field even on plain paper.

## Black Image Quality

Advantage ✓	Canon imagePROGRAF TM-305	HP DesignJet T930
Text	✓	
Fine Lines	✓	
Halftone Range	=	=
Halftone Fill	✓	
Solid density		✓
AEC Graphics	=	=
Business Graphics	✓	
Photographic Images	✓	

- When printing in monochrome, the HP model delivered darker solids than did the Canon unit, producing higher optical densities in all modes.
- + Black serif text produced by the Canon TM-305 unit displayed clear character definition and was legible down to the 5-pt. size with no breakup or ink bleed in Fast and Standard modes; in High quality mode, Times characters were crisp and legible down to the 3-pt. size. Sans serif characters were crisp, dark and legible down to the 3-pt. level for all modes. Although serif and sans serif fonts produced by the HP T930 were legible down to the 3-pt. level for all modes, character definition was far less distinct, suffering from some ink bleed or overspray in all modes tested.
- + In Buyers Lab’s line art reproduction test, both models’ fine lines remained distinct at the 0.1-pt. level in all modes. However, the Canon TM-305 delivered better quality overall, with crisp and distinct fine lines in Standard/Normal and High/Best modes, which were rated very good, but judged good for the HP model. In Fast mode, the Canon model’s fine lines were rated good, but rated only fair for the HP T930. White-on-black fine lines produced by both models remained distinct at the 0.25-pt. level in all quality modes and were rated very good for the Canon TM-305 across the board, but only fair for the HP T930, except in Fast mode where its white-on-black lines were rated poor as white lines were barely visible.
- + Although circles produced by both models were fully formed at 0.1pt, those produced by the Canon TM-305 were smoother and were rated as very good in Fast and Standard modes and excellent in High quality mode, as opposed to a good rating for the HP T930 at all three settings.
- O Both models delivered black halftone output across the full range—from the 10% to the 100% dot-fill levels—with distinct transitions between all levels.
- + Halftone fill results in all modes were rated very good for the Canon model and just good for the HP device as its greyscale coverage was slightly grainy.
- O When evaluating AEC graphics in Standard/Normal and High/Best quality modes in black, both models delivered excellent detailed and distinct fine lines.
- + Monochrome business graphics were produced more accurately by the Canon model, whereas some fine lines and circles were indistinct on output from the HP unit, even without magnification.

- + Greyscale photographic images produced on plain paper by the Canon TM-305 displayed very good depth of field and fine detailing in light contrast areas; however, dark areas on output produced in Fast and Standard modes were slightly grainy, and there was some banding on images produced in Fast mode. In contrast, the HP T930 produced poor quality images in Fast mode which were grainy and lacked detail; there was visible banding as well. Although banding was confined to dark areas on output produced in Normal mode, and eliminated in Best mode, fine detailing in light contrast areas was still quite flat.
- + Buyers Lab technicians found that the Canon device delivers superior black image quality, producing smoother greyscale coverage and pin-sharp text and crisp fine lines, with no breakup or ink bleed. The HP model produced higher optical black densities in all modes, however it was unable to match the Canon in delivering smooth circles, and displayed some ink bleed or overspray in text and line art when viewed under magnification. Both models delivered excellent AEC graphics.

## Print Productivity

Advantage ✓	Canon imagePROGRAF TM-305	HP DesignJet T930
First Page Out from Weekend Non-Use	✓	
First Page Out from Ready State	✓	
Throughput Speed (Fastest mode)	✓	
Throughput Speed (Default mode)	✓	
Throughput Speed (Highest-quality mode)	✓	
Job Stream	✓	

- + The Canon TM-305 delivered 30.6% faster first-page-out time of 86.84 seconds after a weekend of non-use, compared with 125.08 seconds for the HP T930 device. Start-up time before printing commenced was faster for the Canon model at 35.85 seconds, compared with 54.22 seconds for the HP unit.
- + The Canon device delivered a 29.1% faster first-page-out time of 61.33 seconds from its ready state, compared with 86.56 seconds for the HP T930. However, start-up time before printing commenced was slower for the Canon model—26.45 seconds versus 15.60 seconds for the HP model.
- + When printing Buyers Lab’s job stream, designed to simulate a typical mixed workflow for a large-format unit, the Canon TM-305 was 11.4% faster than the HP model in Fast mode, 36.0% faster in Standard/Normal mode, and 54.4% faster in High/Best mode.
- + When printing Buyers Lab’s 12-page DWF test file in colour, the Canon TM-305 was faster than the HP unit in all modes tested; it was 4.0% faster in Fast mode; 36.7% faster in Standard/Normal mode; and 54.7% faster in High/Best mode.
- + Similarly, when printing Buyers Lab’s 12-page DWF test file in monochrome, the Canon model was the faster model across the board; it was 1.2% faster in Fast mode; 36.7% faster in Standard/Normal mode and 54.5% faster in High/Best mode than the HP unit.

- + When printing Buyers Lab’s single-page A0-size Cottage Architectural Plan test target in Standard/Normal mode, the Canon TM-305 delivered a first-page-out time (110.53 seconds) that was 25.1% faster than that of the HP unit (147.62 seconds). The time to print five A0-size pages was 35.4% faster for the Canon TM-305 than for the HP device (475.14 seconds versus 735.34 seconds).
- + The Canon model’s unique sub ink tank system provides a further boost to productivity. When ink needs replacing on the Canon model it will continue to print, drawing ink from its sub tank while the cartridge is being replaced on the fly, so there’s no operator downtime. For added convenience, the control panel alerts users to replace ink and also provides purchasing information. In contrast, when the HP T930 model runs out of ink, printing must stop for the cartridge to be replaced, which leads to operator downtime.
- O Both the Canon and HP models will pause and alert the operator when they run out of paper. After a new roll is installed, each device resumes printing at the beginning of the interrupted page, rather than printing the portion of the page that remained before running out of paper, so less ink and paper is wasted.

## Banner Printing

	Canon imagePROGRAF TM-305	HP DesignJet T930
Image Quality	=	=
Productivity	✓	

Both models successfully printed Buyers Lab’s 36" x 105" banner (a 4,955-KB PDF file) in Fast mode, although the HP DesignJet T930 took longer to print it than did the Canon TM-305. The HP unit took 7 minutes, 8.84 seconds from PC release to final paper cut and provided no preview. In contrast, the Canon model took 15.35 seconds to generate a preview at the desktop, and an additional 1 minute, 59.13 seconds from preview to final paper cut. With a total preview and print time of 2 minutes, 14.48 seconds, the Canon TM-305 is clearly the much faster model.

## Poster Printing

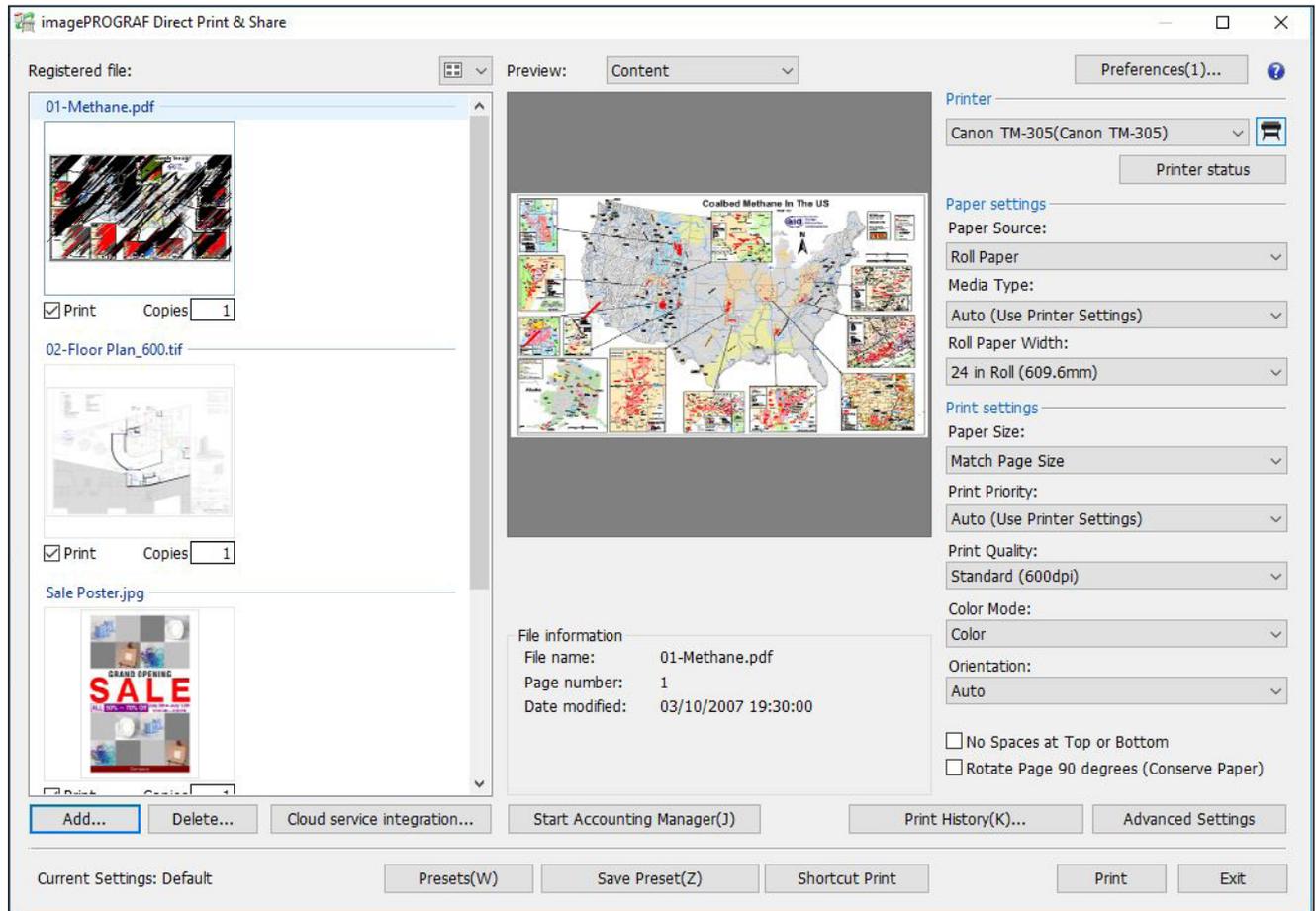
Advantage ✓	Canon imagePROGRAF TM-305	HP DesignJet T930
Image Quality (Fast mode)	✓	
Image Quality (Standard/Normal mode)	=	=
Image Quality (High/Best mode)	=	=
Productivity (Fast mode)		✓
Productivity (Standard/Normal mode)	✓	
Productivity (High/Best mode)	✓	

- When printing Buyers Lab’s Poster test target in Fast mode at 300 dpi, the Canon TM-305 took 41.01 seconds to complete the job, while the HP T930 took 38.23 seconds.
- + In terms of image quality, some banding was evident in Fast mode on output produced by both models (across the whole image with the HP unit, but only in dark areas with the Canon model). Colours on the HP poster were slightly paler compared with the much brighter colours in the poster produced by the Canon model. When unidirectional printing was selected in the Canon print driver (not available with the HP model), banding was eliminated and the time to print the banner increased to 54.58 seconds.
- + The Canon model took 59.43 seconds to print the poster in Standard mode at 600 dpi, while the HP T930 took 1 minute, 17.47 seconds in Normal mode.
- O In Standard/Normal mode, the Canon poster showed minimal banding in some dark areas and colours were vibrant with good detailing. The HP unit’s poster still exhibited some banding in both light and dark areas, although colour vibrancy improved.
- + When printing the poster in High quality (600 dpi) mode, the Canon model took 1 minute, 38.64 seconds, which is 43.5% faster than the HP unit’s 2 minutes, 54.44 seconds result when printing in Best mode.
- O At the High/Best quality settings, there was no observable banding and definition of fine details and colour reproduction were equally good on output from both models.

## Direct Print Submission Functionality

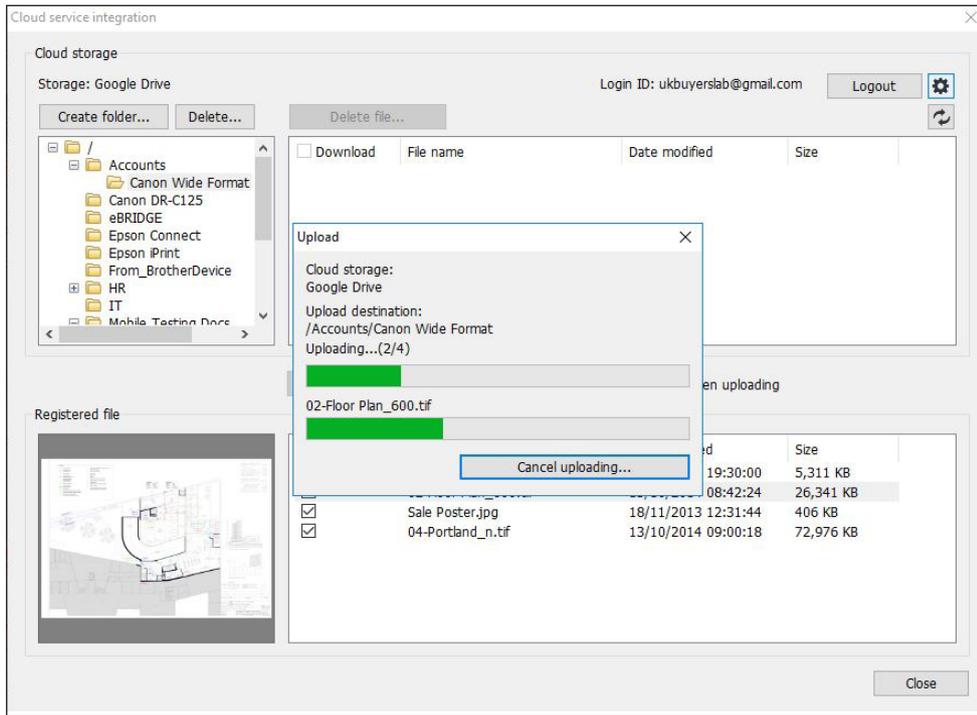
Advantage ✓	Canon imagePROGRAF TM-305	HP DesignJet T930
Ease of Use	=	=
Direct Print Submission Functionality	=	=
Mobile App Integration	=	=

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

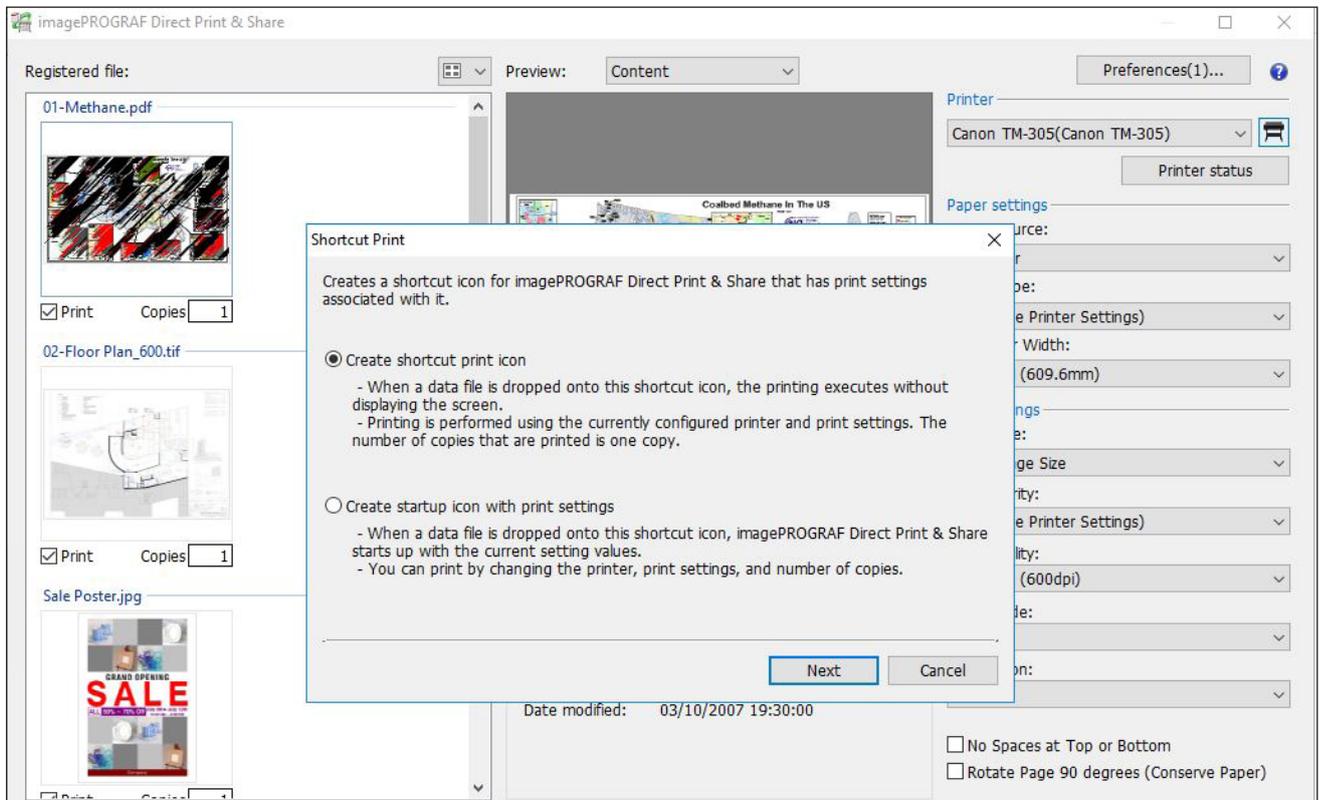


**Canon’s imagePROGRAF Direct Print & Share utility provides users with an image preview. Users can maximize the utility’s window to obtain a larger preview, which enhances usability.**

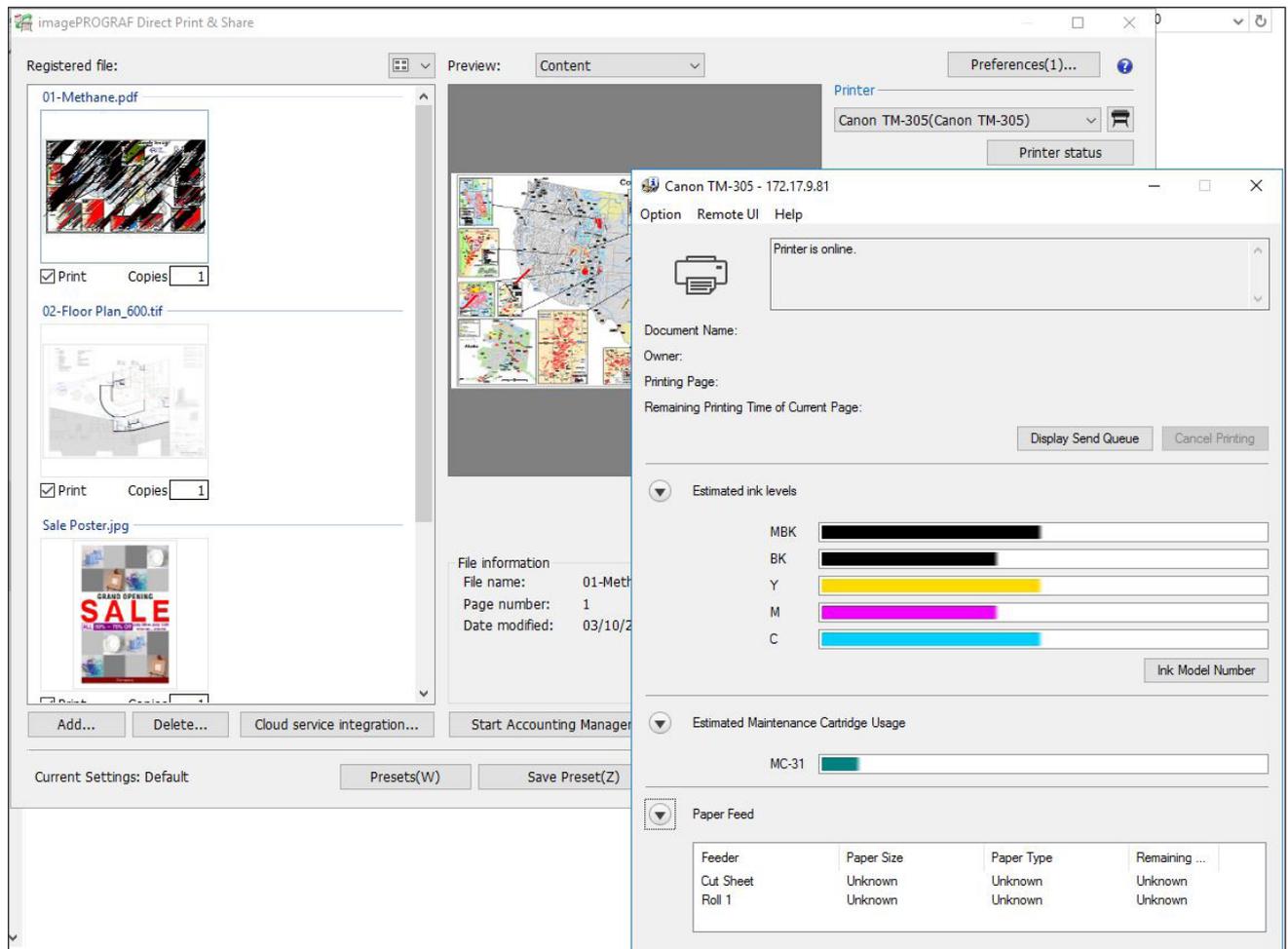
- The imagePROGRAF Direct Print & Share utility supports “Shortcut Print” functionality, enabling users to create a desktop shortcut that includes commonly used print settings, including output printer, print quality, paper type and paper size. Akin to a hot folder workflow, files are automatically printed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



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

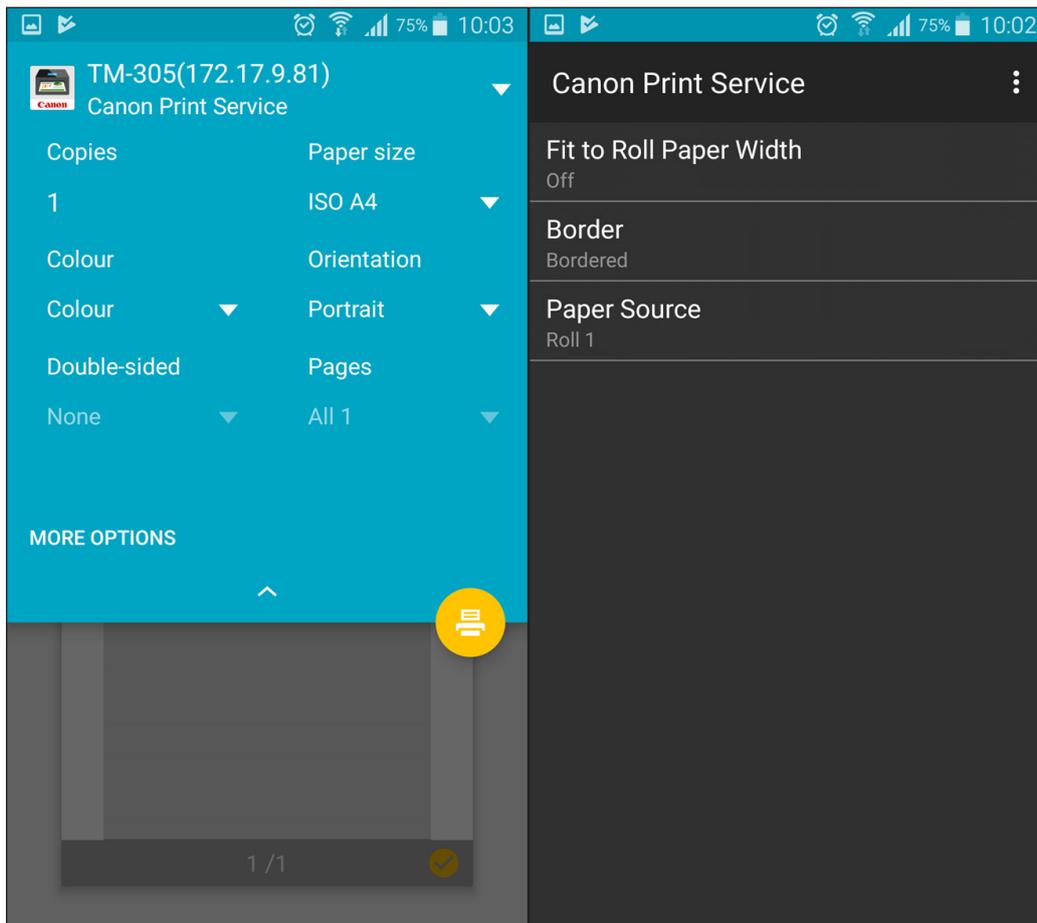


**To help standardize and streamline common print workflows, users can register and save job profiles in the utility as well as create desktop shortcuts that allow drag and drop automatic file printing with predefined print settings.**



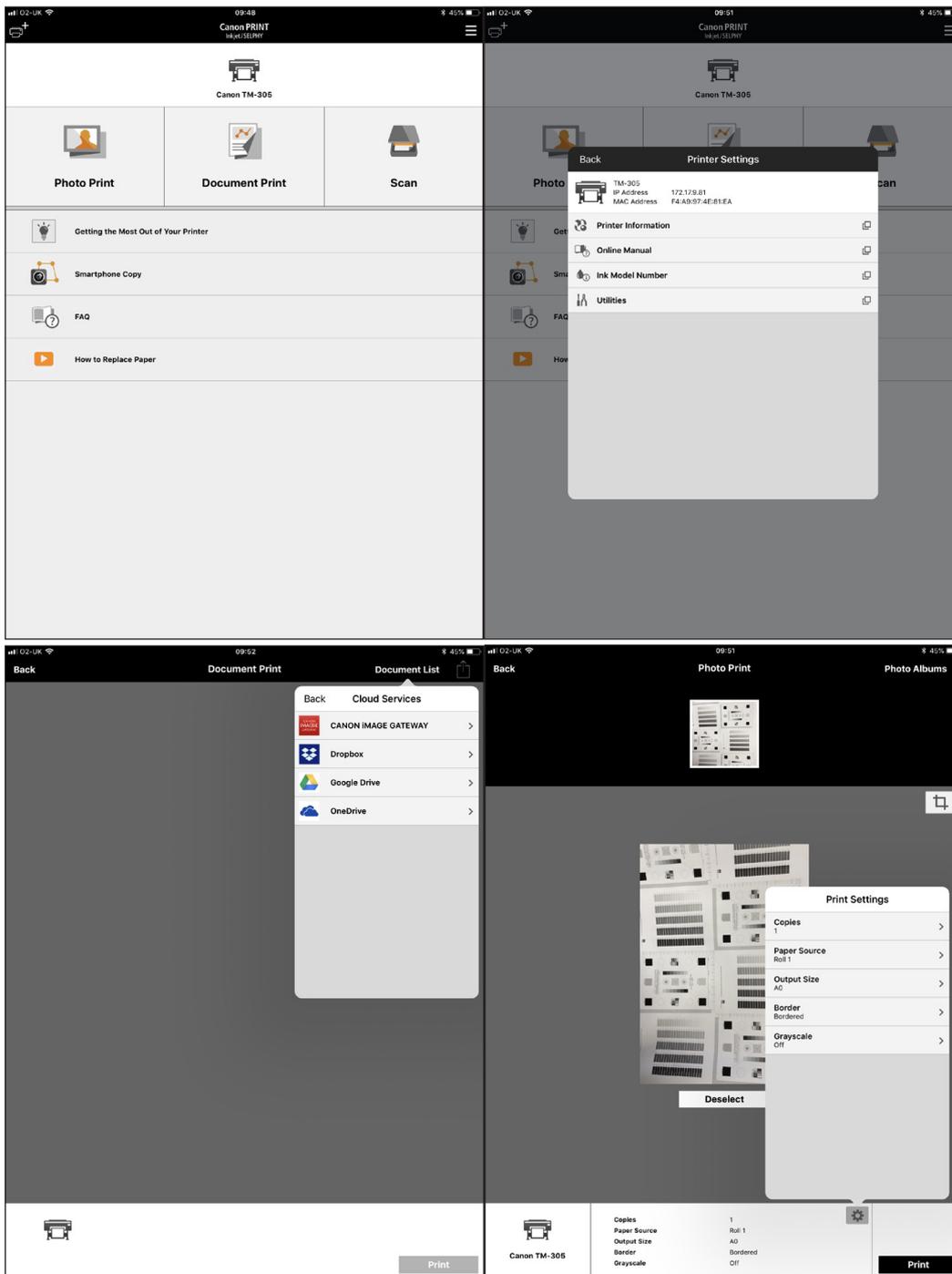
**Conveniently, users can view device and consumables status via the utility before sending jobs to print.**

- Users can download stored files from Google Drive and AutoCAD 360 cloud storage services for printing via the imagePROGRAF Direct Print & Share utility. Files can be uploaded directly to cloud storage as well. For added convenience and collaboration, the utility offers the option to share files simultaneously with one or more users (via Google Drive only), who will receive an email notification with a link to download the shared file without the need to log in.
- Additional benefits provided by imagePROGRAF Direct Print & Share include quick and easy printing of jobs selected from the print history log using the same settings as before; the ability to view device and consumables status via a link to Status Monitor; and the option to insert a divider sheet in between jobs when outputting multiple files simultaneously for easier identification.
- The free Canon Print Service (CPS) mobile print plugin lets Android users print wirelessly to the TM-305 and other compatible Canon printers on the same WiFi network. The service automatically detects compatible Canon printers, offers a broad range of print settings, and is very straightforward to use.



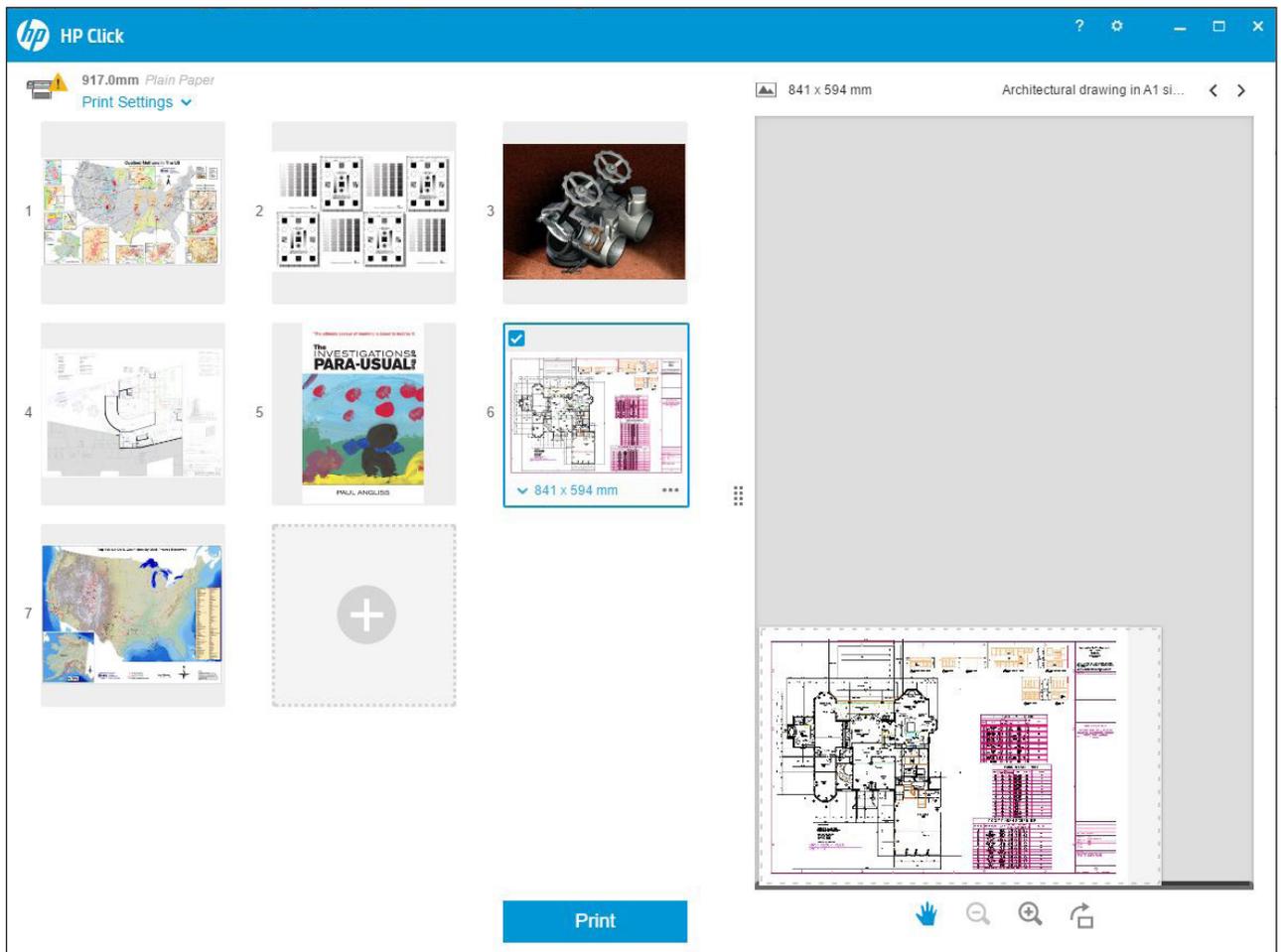
**The Canon Print Service mobile print plugin is an easy way for Android users print to the TM-305, and it offers a broad range of print settings, including colour, orientation, and borderless printing.**

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



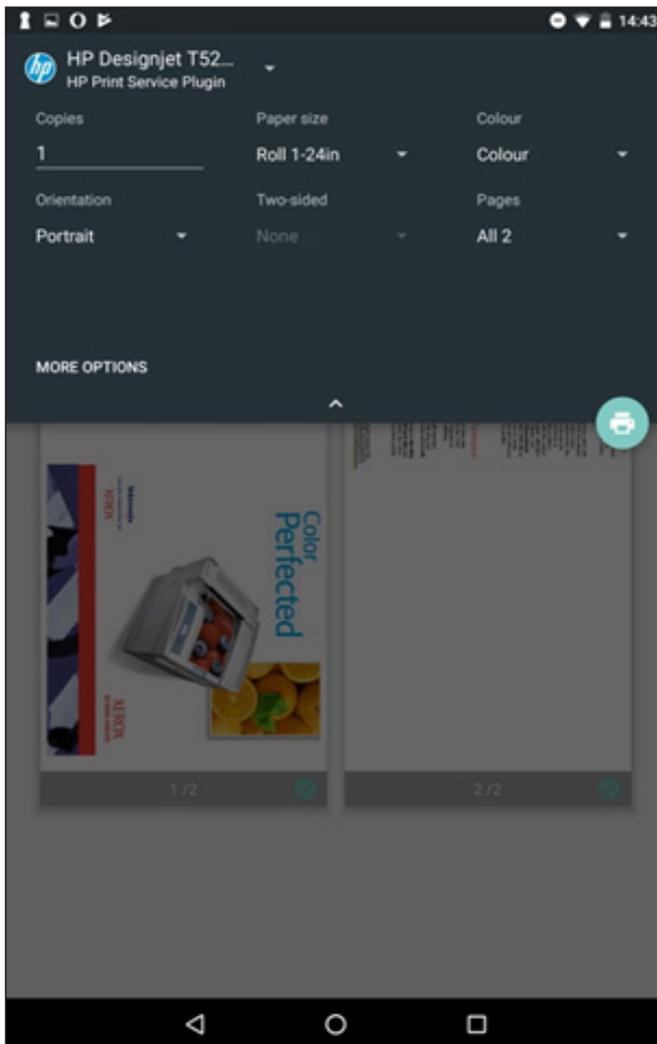
Canon’s imagePROGRAF TM series supports mobile printing via the Canon Print Inkjet SELPHY app. Android and iOS users can easily preview and print documents (including Microsoft Office files), and images stored on their mobile devices or from cloud accounts such as Dropbox or OneDrive, as well as view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

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



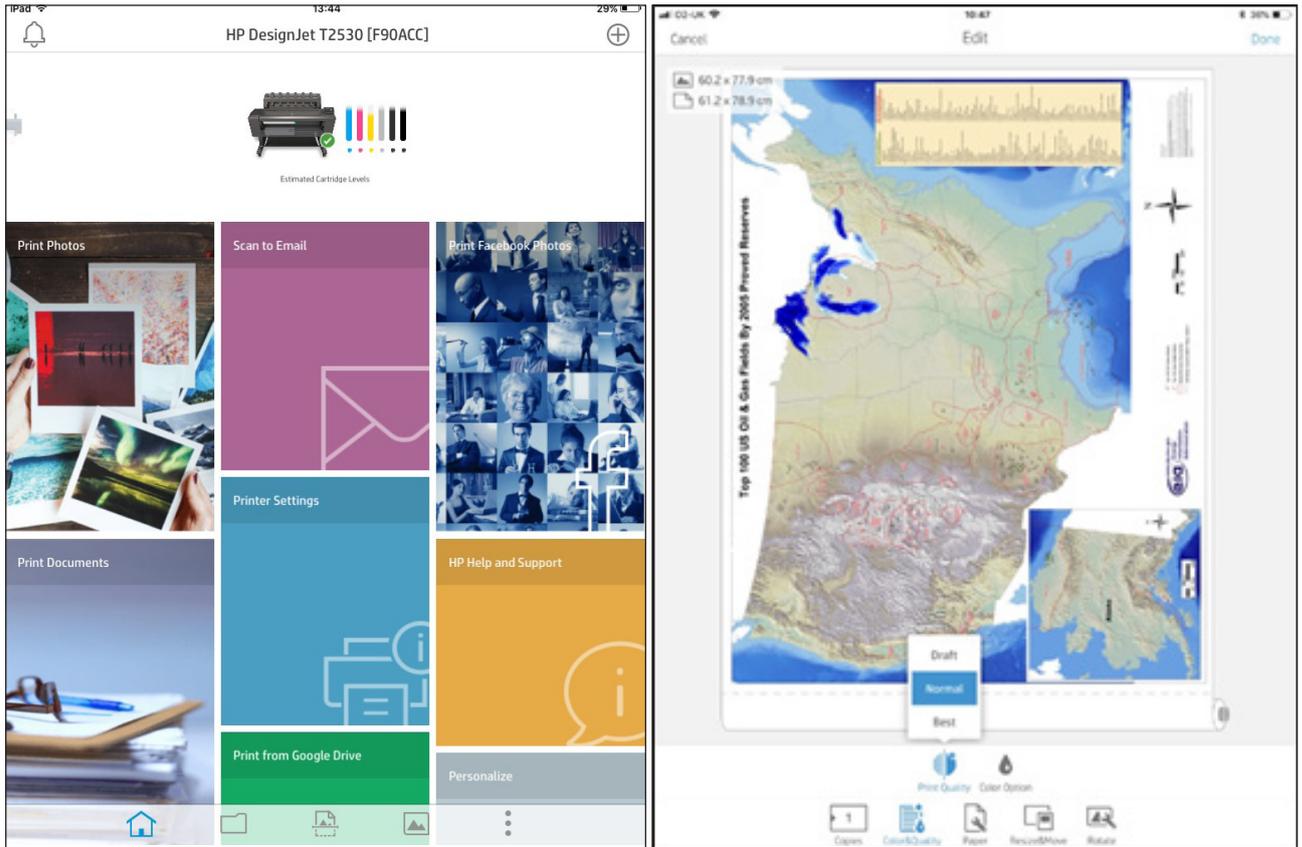
**Via HP Click, users can select basic print settings, preview images, manipulate images as well as utilize the automatic nesting feature to reduce paper waste.**

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



The HP Mobile Printing service enables Android (shown left) and iOS mobile devices to pair with the HP T930 and other compatible HP devices easily. Users can retrieve files from cloud storage, preview images and perform image adjustments.

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



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

- In addition, the HP T930 supports HP ePrint functionality, whereby users are able to send print jobs remotely by email either via a workstation PC or a mobile device; PDF, TIFF and JPEG files (up to 10 MB) are supported.

## Ink Consumption

Overall Weight of Ink Used (in Grams)

	Canon imagePROGRAF TM-305	HP DesignJet T930
Cottage Architectural Plan	29.1	41.6
ISO Poster	85.3	100.2
GIS Map	76.2	103.8

Results are averaged across three sets of 50-page A0 printing in Standard/Normal mode.

- + When producing 50 prints of a Cottage Architectural Plan in Standard/Normal mode, the Canon unit used 30.0% less ink than the HP T930.
- + When printing an ISO Poster in Standard/Normal mode, the Canon unit used 14.9% less ink than the HP T930.
- + When printing a GIS Map in Standard/Normal mode, the Canon TM-305 used 26.6% less ink than the HP device did.

## Device Feature Set

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- + The total capacity of the Canon TM-305's starter ink cartridges is 490 ml, which is higher than the 269 ml total starter ink volume available with the HP model.
- + Canon's replacement ink cartridge capacities are 130 ml and 300 ml for all colours, whereas the HP model offers 130 ml for CMY, Photo Black and Grey and 300 ml for Matte Black only. As a consequence, the Canon cartridges will need replacing less frequently.
- + While Canon's ink cartridges are replaceable during operation, which helps reduce downtime, the HP unit must stop before a cartridge can be replaced.
- + If the Canon device detects that printhead nozzles are becoming clogged, it automatically starts a cleaning routine when there are no more nozzles available to compensate for the clogged ones. This task would have to be done manually with the HP unit, although Buyers Lab technicians did not encounter any nozzle clogging issues with either model during testing.
- O Both units utilize a single user-replaceable printhead, which takes less than five minutes to replace.
- + The Canon unit supports a higher maximum cut-sheet media length of 1.6 m compared with 1.219 m for the HP unit.
- O Both models offer USB 2.0 and Gigabit Ethernet connectivity.
- Buyers Lab technicians were impressed with the design and build quality of the HP T930's rear-mounted stacker assembly which can hold up to 50 printed sheets in perfect alignment. The Canon model's stand/basket is designed to collate up to 20 A1 or A2 sheets in landscape orientation.
- + The Canon model offers a standard, non-upgradable RAM capacity of 128 GB with 2 GB physical memory, while the HP unit has a standard non-upgradable RAM capacity of 64 GB, with file processing based on 1.5 GB.
- + The Canon model has a 500-GB hard drive capacity as standard, while the HP model has a 320-GB standard hard drive.
- + The Canon TM-305 supports borderless printing regardless of what roll media type is being used, whilst the HP T930 only supports this feature when photo paper is selected.
- + The Canon TM-305 supports up to 0.8 mm media thickness for roll paper and 150 mm as the outside diameter of the roll, while the HP T930 supports up to 0.5 mm in thickness and 140 mm in diameter.
- O The Canon TM-305 comes with robust security features, including secure disc/file erase and protocol locking to prevent unauthorised access to the device; it also supports SNMP v3 (secure network protocol) and IPsec which provides further security by authenticating and encrypting data over the network. The HP T930 supports IPSec, 802.1x, SNMPv3, PIN printing as well as optional Secure Disk Erase, which lets users choose whether to erase particular files or the whole hard drive.

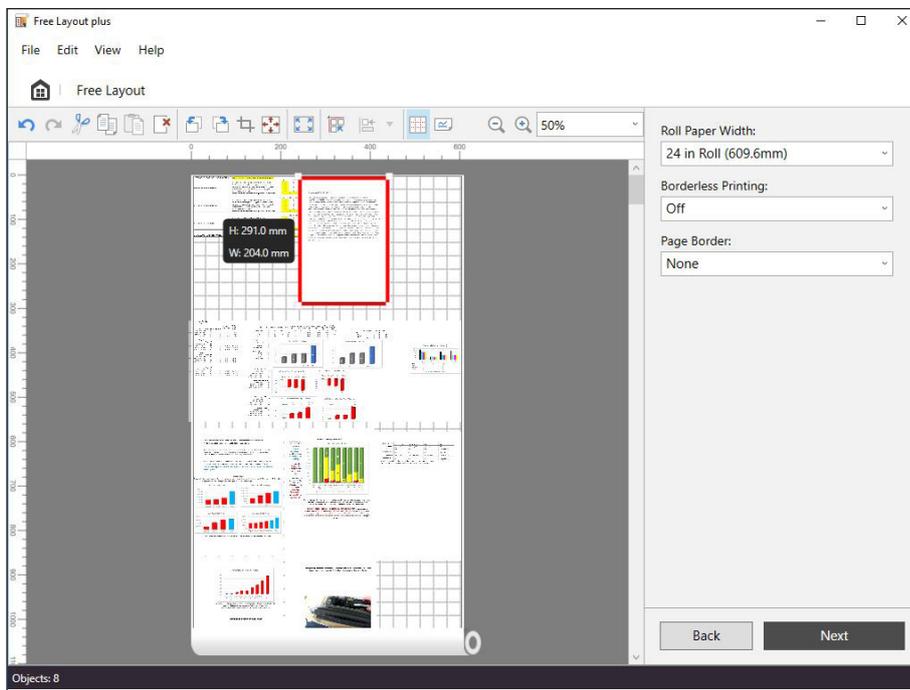
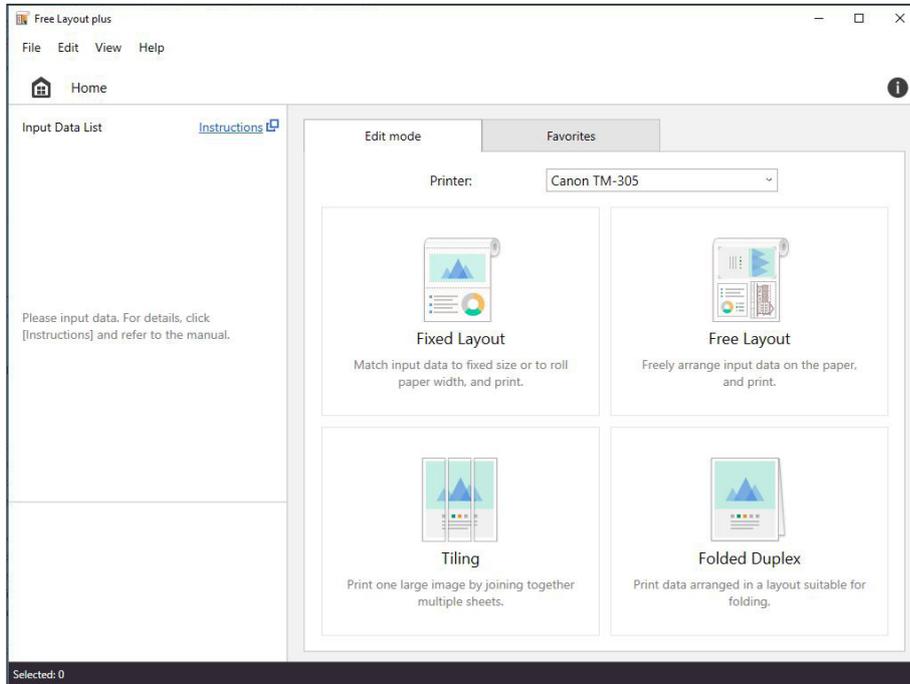
- + The Canon model is lighter (79 kg versus 87 kg) than the HP unit.
- O Both models offer a colour touchscreen user interface, which are similarly responsive and intuitive to navigate.
- + The Canon TM-305's power consumption while active is far lower—69 watts versus 120 watts—than that of the HP model.
- However, in standby mode (where it may spend more of its time) the HP T930's power consumption is lower (1.3 watts versus the Canon model's 3.6 watts).
- + Rated noise emissions are slightly lower for the Canon model (44 dB) compared to the HP device (47 dB) while the devices are printing.

## Print Driver Feature Set

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- + The Canon TM-305 has five speed settings (Fast 300, Standard 600, Fast 600, High 600 and High 1200), although not all speed settings are available with all media types. In contrast, the HP device has three settings (Fast, Normal and Best).
- + The Canon driver offers the option of unidirectional printing, even in Fast mode, which helps to eliminate banding across output because the printhead travels in only one direction to create the desired image. The HP driver does not offer this feature.
- O Both the Canon imagePROGRAF Printer Driver and the HP-GL/2 driver provide a useful overview of the settings for predefined profiles.
- + Six predefined profiles are available with the Canon driver, while the HP driver offers a smaller range of four settings.
- + The Canon driver supports multi-up (2 to 16) printing, while the HP driver does not support multi-up printing.
- + The Canon driver offers a 2 by 2 poster mode, while the HP model does not offer support for poster printing.
- The Canon driver offers page stamping (Date, Time, Name and Page Number); the HP driver also enables custom stamps to be created in addition to these.
- O The Canon imagePROGRAF Printer Driver offers a broad range of built-in adjustments for CMY balance, brightness and contrast, while the HP T930's HP-GL/2 driver also offers CMY balance and brightness adjustments. The Canon driver contains advanced colour-matching capabilities that include the ability to match ICC profiles and select the rendering intent based on different elements in the document. A wide range of colour management profiles are available when the HP driver and colour management tools (from the Printing Preferences menu) are downloaded from HP's website. Additionally, users can preview images before printing—features which were not included in the Startup driver disk supplied to Buyers Lab with the device.
- + The Canon driver includes the Color imageRUNNER Enlargement Copy Mode utility, which is standard with the 32-bit version of the driver and available as a download for the 64-bit version of the driver via the Printer Driver Extra Kit. It enables users to integrate a Canon small-format MFP device with the TM-305, whereby documents scanned at the MFP are automatically routed to a hot folder that is monitored by the TM-305 driver. The image is then resized and printed, offering a fast, easy-to-use poster creation tool for office users.
- + Canon's Free Layout plus software enables files—even those created with different applications—to be scaled, resized, or grouped together as a single job from the printer driver. Images can be dragged and dropped to the desired locations and printed together on a single page, helping to save on paper. The HP unit offers a similar nesting feature, which can be activated directly on the control panel or from the print driver utility, or when using

HP Click. However, unlike the Canon tool, it does not allow users to have precise control over the positioning of jobs, rather it will randomly position jobs to print across the width of a page, either in the order they were submitted or in 'optimized' layout order.



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

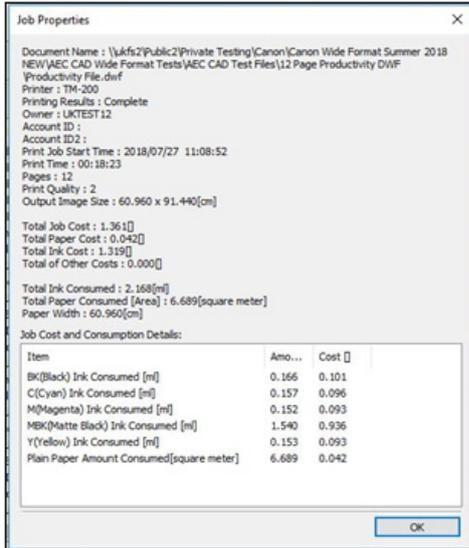
- + The Canon model also offers a plug-in for printing from Microsoft Office applications, which includes useful tools for automatic media resizing, nesting and borderless printing. No such plug-in is available to HP users.

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



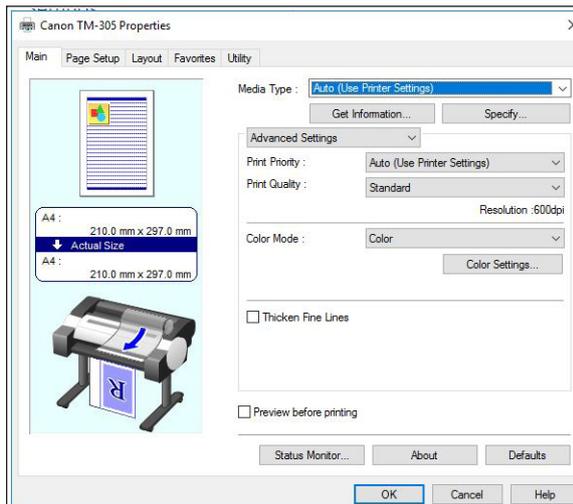
**Canon’s PosterArtist Lite is an easy-to-use poster creation tool; newly-enhanced, it provides additional templates to create multi-language versions of a poster, 900 common expressions in 10 languages and a wide range of pictographic icons.**

- Available for the TM series, Canon’s Accounting Manager can be downloaded for free from Canon’s website and offers comprehensive accounting management for all print jobs. Users enter the actual costs for individual inks and media types, and the cost per job is calculated automatically and displayed. For each job, the media type, area, ink used and total print time are listed, and more detailed cost and consumption information can be obtained by double-clicking on an individual job name or by highlighting a range of different jobs. Job cost information can then be saved in .CSV format and opened in Excel. HP offers similar accounting management and tracking capabilities via the Accounting tab on its embedded web server page, or via the HP DesignJet Excel Accounting tool, which is available as a free download.

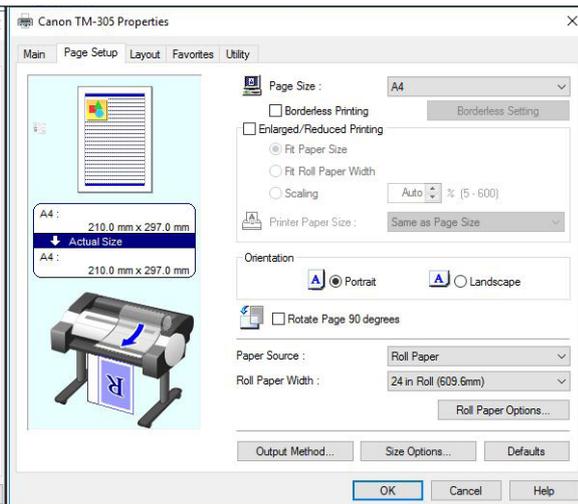


Canon Accounting Manager tool; users can double click on a job to view a breakdown of the individual costs.

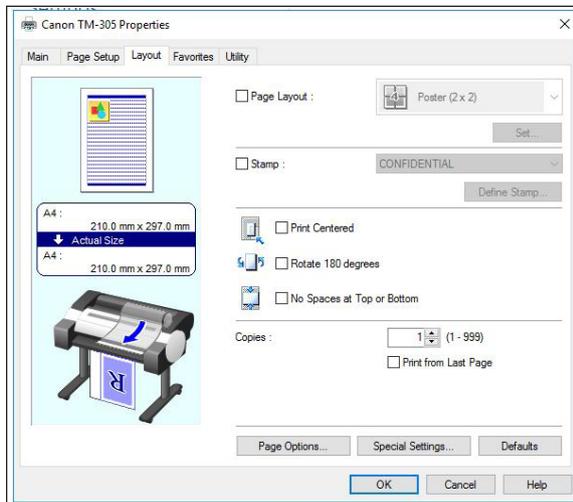
### Test Models' Print Driver Screenshots



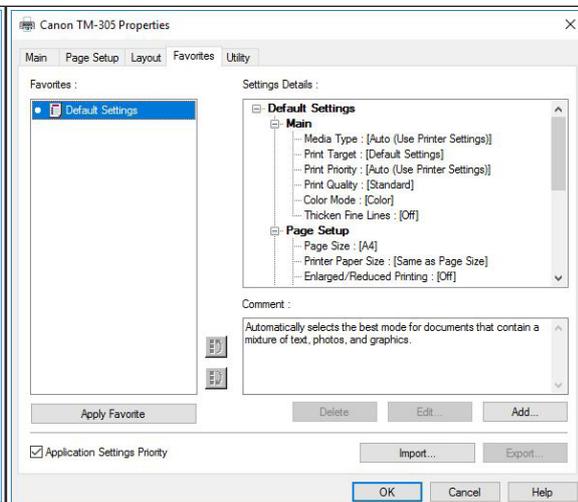
Canon imagePROGRAF TM-305 Main Tab



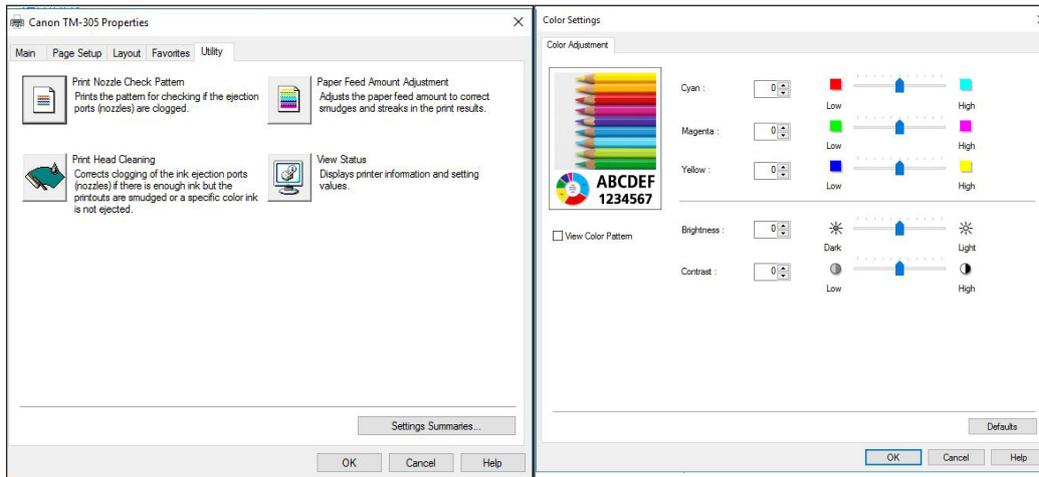
Canon imagePROGRAF TM-305 Page Setup Tab



Canon imagePROGRAF TM-305 Layout Tab

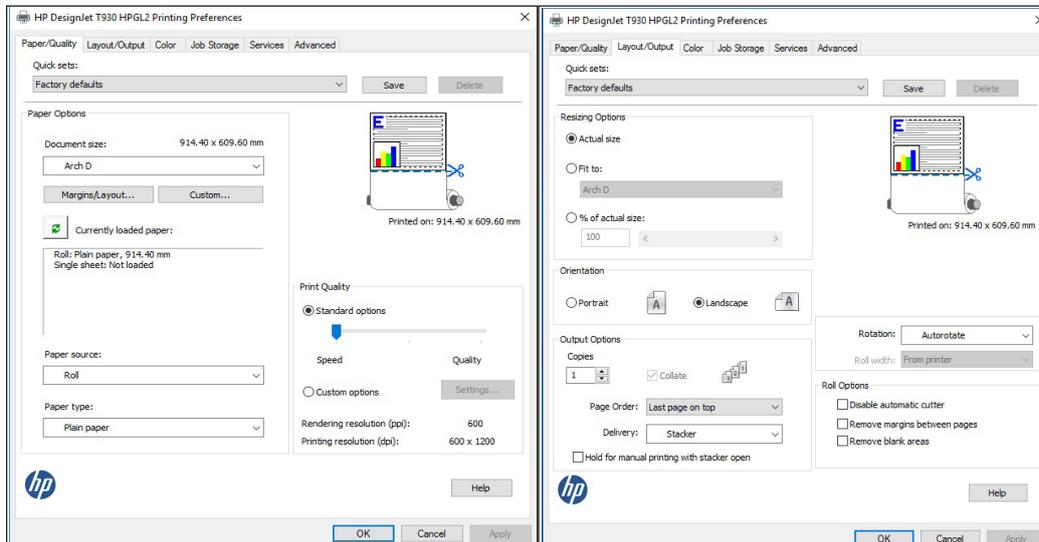


Canon imagePROGRAF TM-305 Favourites Tab



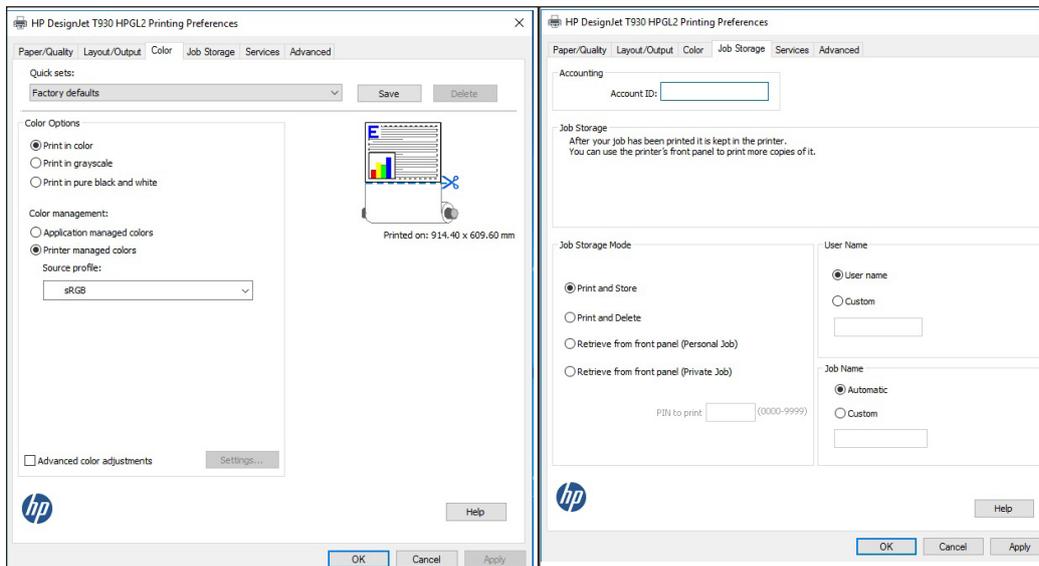
Canon imagePROGRAF TM-305 Utility Tab

Canon imagePROGRAF TM-305 Colour Adjustment Tab



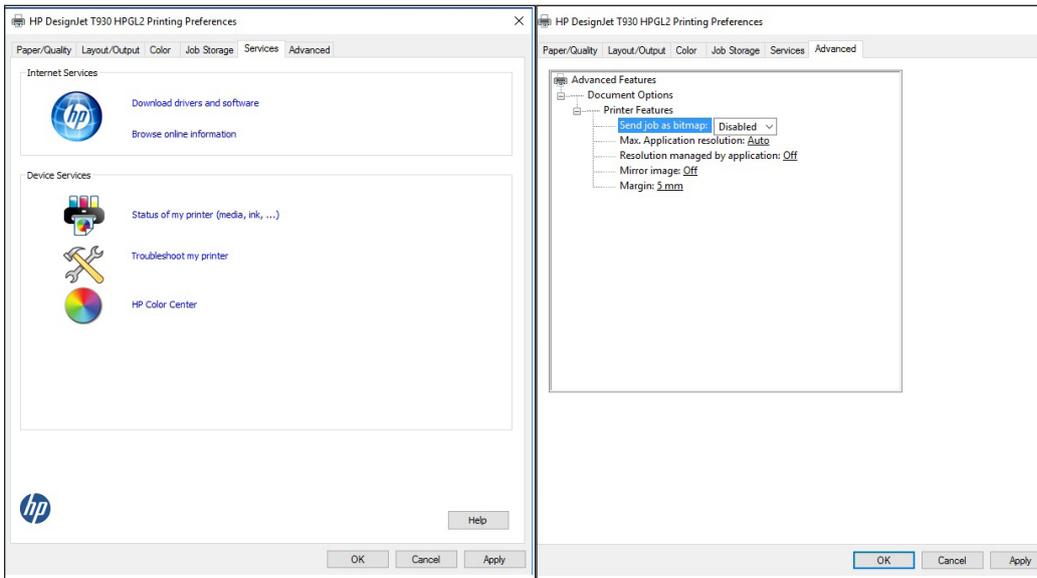
HP DesignJet T930 Paper/Quality Tab

HP DesignJet T930 Layout/Output Tab



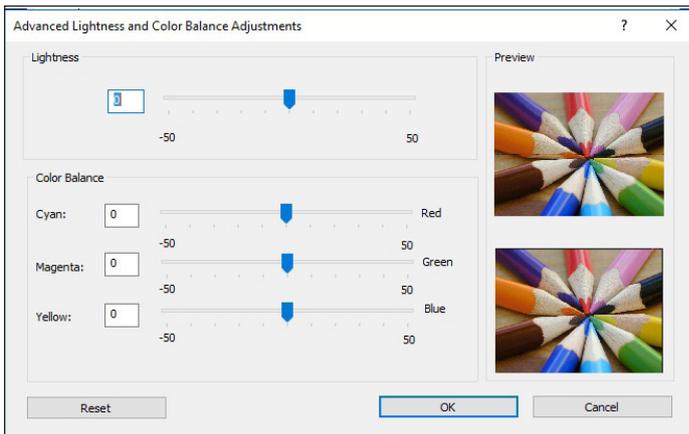
HP DesignJet T930 Colour Tab

HP DesignJet T930 Job Storage Tab



HP DesignJet T930 Services Tab

HP DesignJet T930 Advanced Tab



HP DesignJet T930 Advanced Lightness and Colour Balance Adjustments

# SUPPORTING TEST DATA

## Print Productivity

### Job Stream Productivity (in Seconds)

#### Mixed File Types, Same Size

Canon imagePROGRAF TM-305		HP DesignJet T930	
Fast	623.37	Fast	703.67
Standard	1,027.16	Normal	1,605.55
High	1,854.89	Best	4,071.42

Buyers Lab's job stream consists of nine files, including PDF, TIFF and DWF files totalling 19 pages, all at Arch D-size, ensuring that the files are set to fit to page. This test replicates the type of traffic a typical wide-format device might experience in a real-world, multi-user environment. All of the files are submitted to the controller in a specific order and sent to the printer as a group, at which time the stopwatch begins; timing ends when the last page of the last file exits the device. Both devices were loaded with 914-mm rolls, with each file set to auto-rotate to save media.

### Colour Productivity (in Seconds)

Canon imagePROGRAF TM-305		HP DesignJet T930	
Fast	392.21	Fast	408.59
Standard	675.75	Normal	1,068.32
High	1,210.50	Best	2,672.17

The 12-page DWF test file was printed using the device driver set to the plain paper/colour setting. Both devices were loaded with 914-mm rolls. The actual time indicated is the time it took to RIP, image and deliver all pages of the test document to the collection bin.

### Monochrome Productivity (in Seconds)

Canon imagePROGRAF TM-305		HP DesignJet T930	
Fast	402.47	Fast	407.38
Standard	671.60	Normal	1,060.40
High	1,205.11	Best	2,647.61

The 12-page DWF test file was printed with the Canon driver set to the plain paper/monochrome setting and the HP driver set to plain paper, black mode. Both devices were loaded with 914-mm rolls. The actual time indicated is the time it took to RIP, image and deliver all pages of the test document to the collection bin.

### First-Page-Out Productivity after a Weekend of Non-Use (in Seconds)

	Canon imagePROGRAF TM-305	HP DesignJet T930
Time Before Printing Commences	35.85	54.22
First Page Out	86.84	125.08

First-Page-Out Productivity from Ready State (in Seconds)

	Canon imagePROGRAF TM-305	HP DesignJet T930
Time Before Printing Commences	26.45	15.60
First Page Out	61.33	86.56

First-page-out times are achieved by sending an Arch D-size PDF file to print, timed from release to page out with the Canon driver set to the plain paper/monochrome setting and the HP driver set to plain paper, black mode. Both devices were loaded with 914-mm rolls.

A0 First-Page-Out and Throughput Productivity (in Seconds)

	Canon imagePROGRAF TM-305	HP DesignJet T930
First Page Out	110.53	147.62
Five Pages Out	475.14	735.34

The single-page A0-size Cottage Architectural Plan DWG TrueView Drawing test file was printed using the device driver with the plain paper/colour setting in Standard/Normal mode. The actual time indicated is the time it took to RIP, image and deliver five pages of the test document to the collection bin.

## Colour Image Quality

Colour Optical Density Evaluation

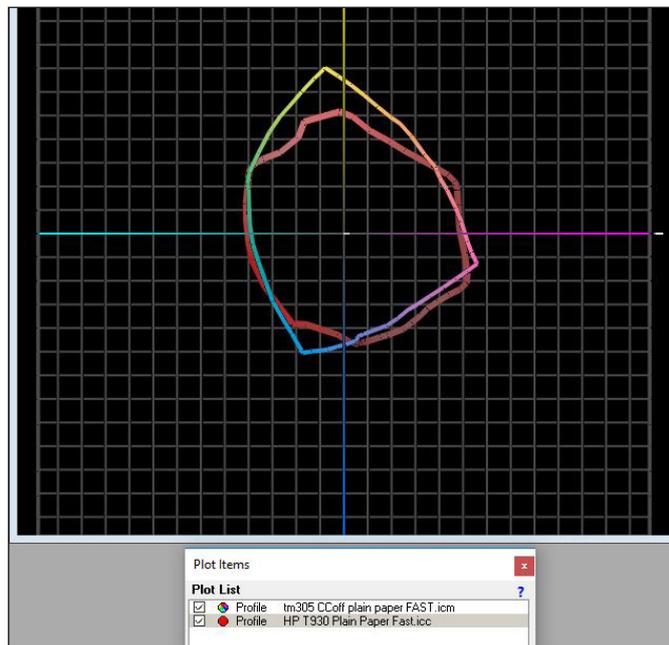
Canon imagePROGRAF TM-305						
	Fast		Standard		High	
	50%	100%	50%	100%	50%	100%
Cyan	0.42	0.89	0.49	1.03	0.52	1.08
Magenta	0.36	0.73	0.42	0.90	0.44	0.96
Yellow	0.32	0.71	0.37	0.85	0.39	0.89
Black	0.45	1.32	0.52	1.30	0.54	1.32

HP DesignJet T930						
	Fast		Normal		Best	
	50%	100%	50%	100%	50%	100%
Cyan	0.46	0.58	0.40	0.65	0.41	0.69
Magenta	0.58	0.69	0.47	0.90	0.50	0.96
Yellow	0.48	0.59	0.51	0.84	0.50	0.84
Black	0.43	1.37	0.56	1.53	0.57	1.46

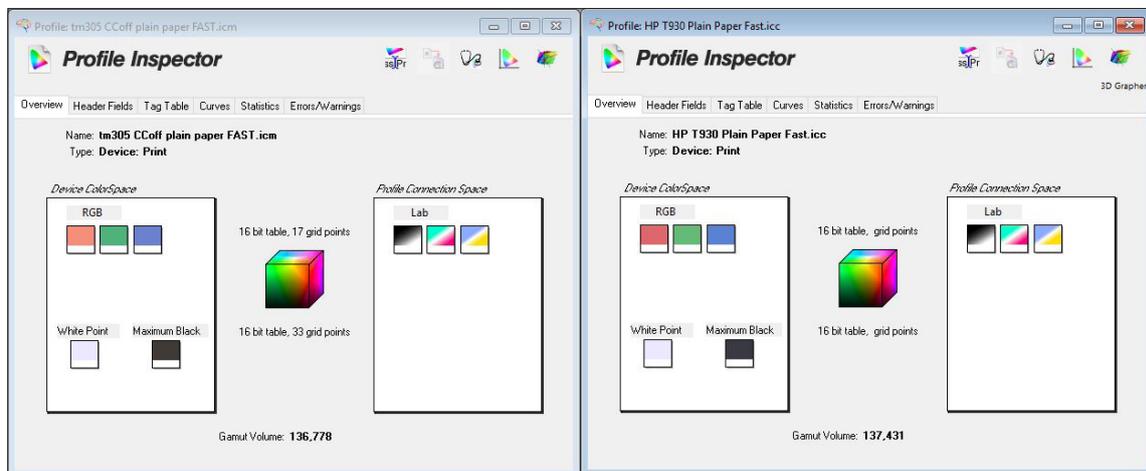
Note: Colour density readings were assessed by printing a Buyers Lab's proprietary PDF test target file on plain paper in default colour mode at all quality settings available and measuring the density of 100% dot fill and 50% dot fill using an XRite 508 and XRite exact<sup>XP</sup> densitometer.

## Colour Gamut Comparisons

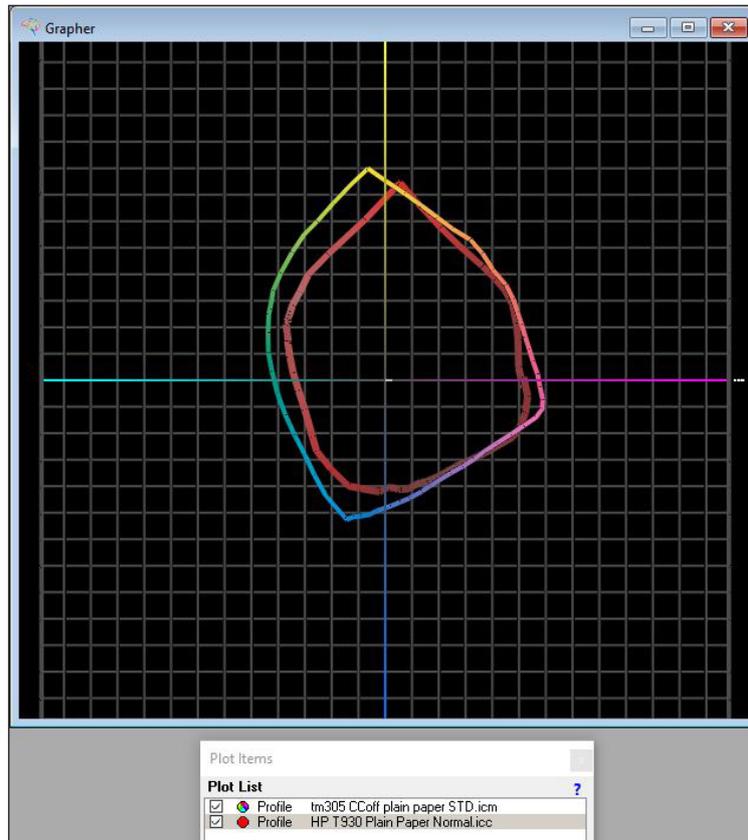
Media Type/Quality Settings	Canon imagePROGRAF TM-305	HP DesignJet T930
Plain Paper Fast	136,778	137,431
Plain Paper Standard/Normal	204,730	153,924
Plain Paper High/Best	224,127	176,335
Gloss Photo High/Best	655,466	452,584



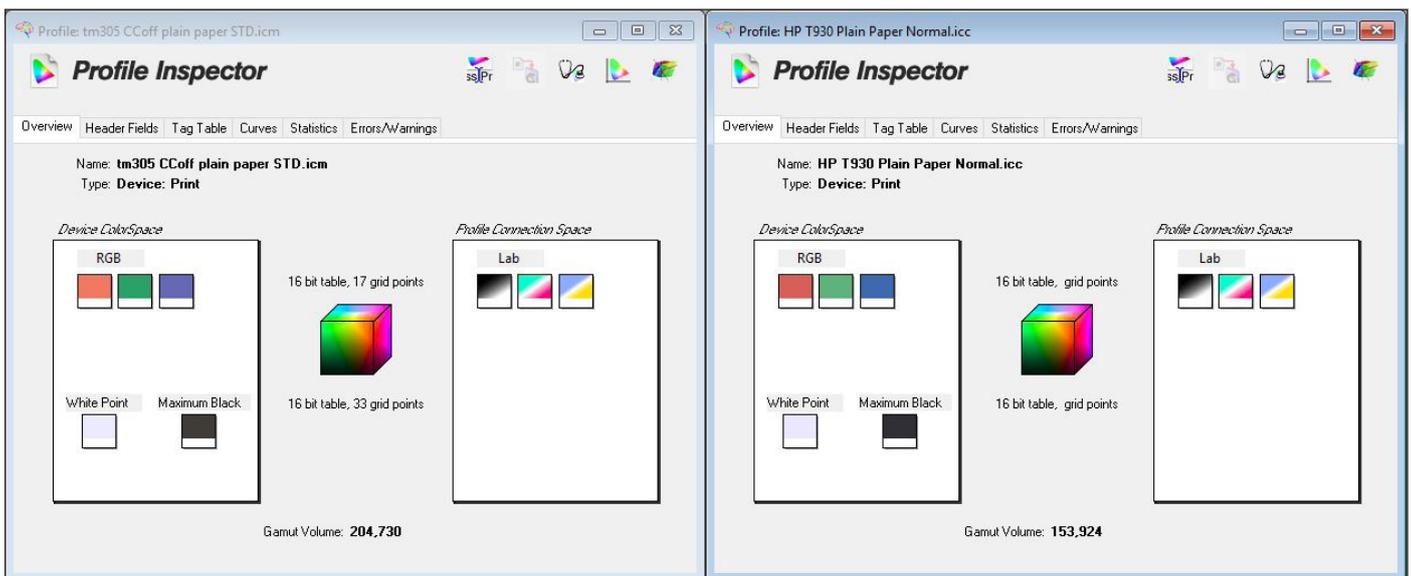
Canon imagePROGRAF TM-305 colour gamut on plain paper in Fast settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on plain paper in Fast settings.



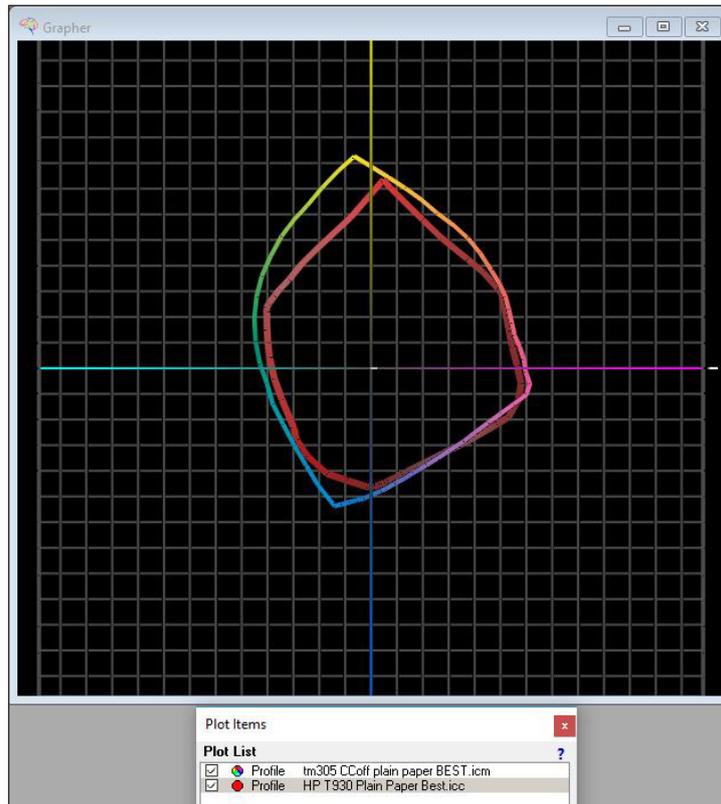
Colour gamut profile for Canon imagePROGRAF TM-305 (left) and HP DesignJet T930 (right) on plain paper in Fast mode.



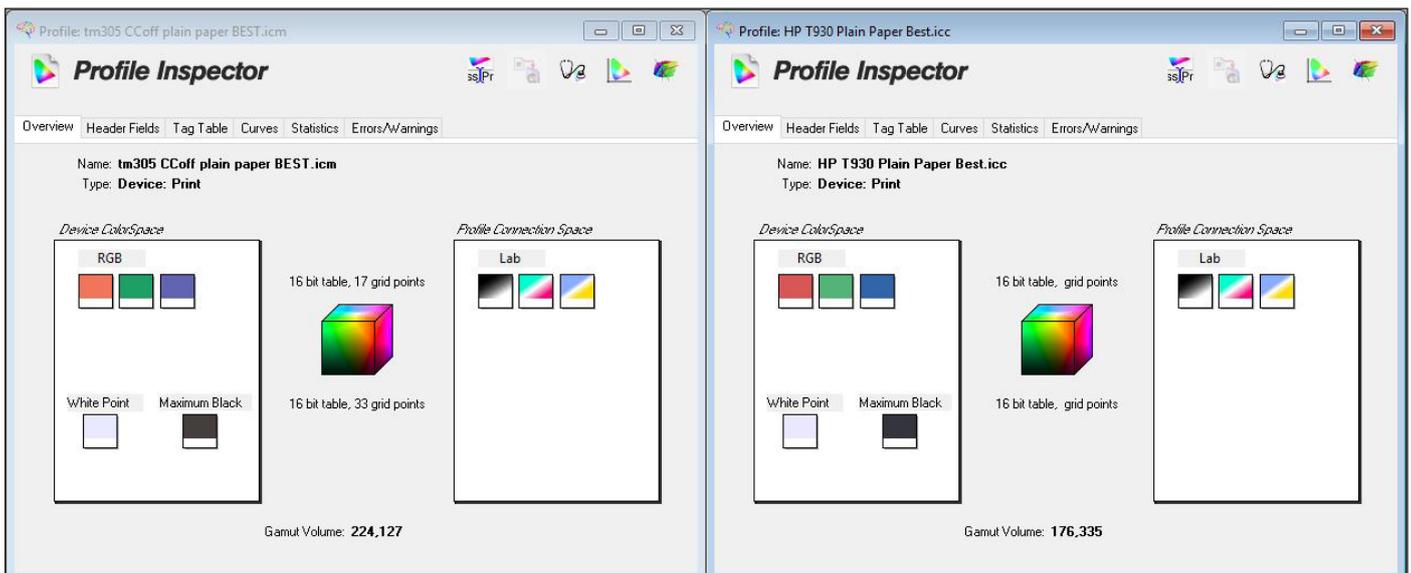
Canon imagePROGRAF TM-305 colour gamut on plain paper in Standard settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on plain paper in Normal settings.



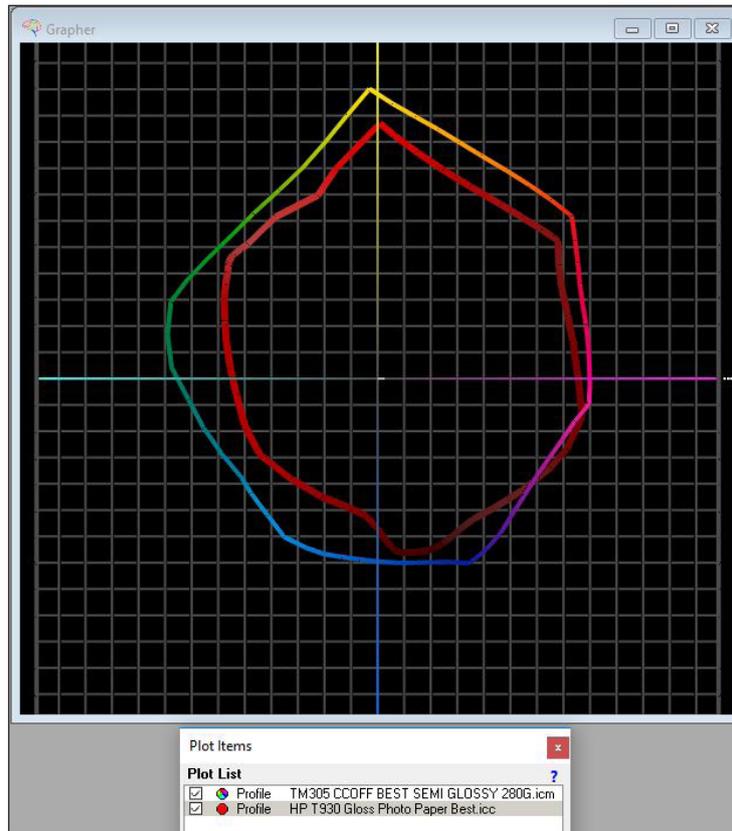
Colour gamut profile for Canon imagePROGRAF TM-305 (left) and HP DesignJet T930 (right) on plain paper in Standard/Normal modes.



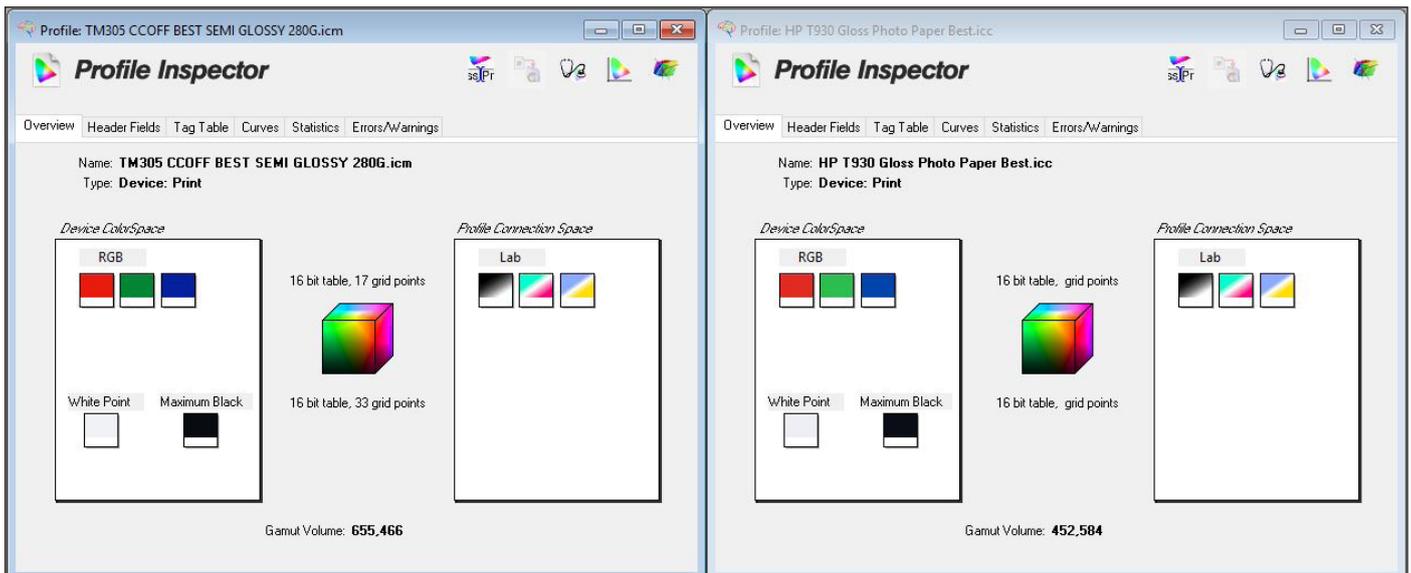
**Canon imagePROGRAF TM-305 colour gamut on plain paper in High settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on plain paper in Best settings.**



**Colour gamut profile for Canon imagePROGRAF TM-305 (left) and HP DesignJet T930 (right) on plain paper in High/Best quality modes.**



Canon imagePROGRAF TM-305 colour gamut on photo paper in High quality settings (shown chromatically) versus HP DesignJet T930 colour gamut (shown in red) on photo paper in Best settings.



Colour gamut profile for Canon imagePROGRAF TM-305 (left) and HP DesignJet T930 (right) on photo paper in High/Best quality modes.

## Black Print Quality

### Black Optical Density Evaluation

Canon imagePROGRAF TM-305				HP DesignJet T930		
Density Block						
	Fast	Standard	High	Fast	Normal	Best
1	1.32	1.37	1.35	1.51	1.40	1.46
2	1.37	1.32	1.32	1.49	1.40	1.47
3	1.38	1.36	1.30	1.48	1.38	1.46
4	1.36	1.37	1.32	1.48	1.40	1.47

NoNote: Solid black density measurements are based on four readings taken from a Buyers Lab proprietary PDF test target file corresponding to four different 100% solid black locations on the output. The output was assessed at all quality settings available, with the Canon driver set to plain paper/monochrome mode and the HP driver set to plain paper, black mode. Density was measured using an XRite 508 densitometer and XRite exact<sup>XP</sup> densitometer.

## Device Feature Set

	Canon imagePROGRAF TM-305	Advantage	HP DesignJet T930
Max. image resolution	2400 x 1200 dpi		2400 x 1200 dpi
Number of inks	5	✓	6
Ink tanks replaceable during operation	Yes	✓	No
Ink-drop size	5 picoliter	✓	6 picoliter (CMY, G, PBk); 9 picoliter (MBk)
Starter ink cartridge capacity	490 ml total (130 ml MBk; 90 ml CMYK)	✓	269 ml (5 x 40 ml, 1 x 69 ml)
Ink cartridge capacity	130 ml and 300 ml (all colours)		130 ml and 300 ml (all colours)
Number of nozzles	MBk: 5,120 nozzles; other colours: 2,560 nozzles each; 15,360 nozzles in total	✓	8,256 in total (1,376 per colour)
Number of printheads	1 (User-replaceable)		1 (User-replaceable)
Line accuracy	+/-0.1%		+/-0.1%
Minimum line width	0.02 mm		0.02 mm
Minimum print margins	Roll paper: Borderless or 3 mm (all sides); Cut sheet: 3 mm (Top, Side), 20 mm (Bottom); Cut sheet for Apple AirPrint Only: Top: 3 mm, Bottom: 12.7 mm, Side: 3 mm		3 mm
Borderless (0 mm) printing	Yes (Roll only)	✓	Yes (Photo paper only)
Maximum outside diameter of roll paper	150 mm	✓	140 mm
Maximum printable paper roll length	18 m (varies according to the OS and application)		INA

	Canon imagePROGRAF TM-305	Advantage		HP DesignJet T930
Maximum cut-sheet media length	1.6 m	✓		1.219 m
Maximum media thickness for roll paper	0.8 mm	✓		0.5 mm
Maximum media width	914 mm (36 inches)			914 mm (36 inches)
Media loading	Top			Front
Dual Roll	Not Supported			Not Supported
Optional media handling	Roll holder set (supports 2" and 3" media cores)			Roll media adapter
High-capacity stacker assembly	NA		✓	50 sheets
Standard RAM	128 GB with 2 GB physical memory	✓		64 GB (file processing based on 1.5 GB)
Maximum RAM	128 GB with 2 GB physical memory	✓		64 GB (file processing based on 1.5 GB)
Hard drive capacity	500-GB (Standard)	✓		320-GB (Standard)
Interface	10/100/1000Base-T Ethernet, USB Built-in High Speed, USB Memory Direct, Wireless LAN			1000Base-T Ethernet, USB 2.0
PDL	SG Raster (Swift Graphic Raster), HPGL/2, HP RTL, JPEG (Ver. JFIF 1.02)			HP-GL/2, HP-RTL, TIFF, JPEG, CALS G4, HP-PCL3 GUI, URF
Net weight (unpacked)	79 kg	✓		87 kg
Power consumption when in standby	3.6 W		✓	1.3 W
Power consumption when active	69 W	✓		120 W
Acoustic pressure	Operation: 44 dB (A) or less; Standby: 35 dB (A) or less	✓		Operation: 47 dB (A); Standby: 39 dB (A)
Acoustic power	Operation: 6.0 Bels or less; Standby: INA			Operation: 6.5 Bels; Ready: 5.8 B(A)

INA – Information not available

## Printer Driver Feature Set

	Canon imagePROGRAF TM-305	Advantage		HP DesignJet T930
Speed settings	5 (Fast 300, Fast 600, Standard 600, High 600 and 1200)	✓		3 (Fast, Normal and Best)
Economy mode	Yes (in Fast mode)			Yes (in Fast mode)
Predefined profiles	6 (Default, Photo (colour), Poster, CAD (colour line drawing), CAD (mono line drawing) and Perspective GIS)	✓		4
Overview of profile settings provided	Yes			Yes
Media profiles	50 + 10 user customizable special options	✓		35

	Canon imagePROGRAF TM-305	Advantage		HP DesignJet T930
IQ optimized for print profiles	Yes			Yes
Watermark	Yes	✓		No
Sharpen text	Yes			Yes (Max. Detail setting)
Thicken fine lines	Yes			Yes (Max. Detail setting)
Mirror image	Yes			Yes
Multi-up printing	Yes, 2 to 16	✓		No
Poster print mode	Yes (2 by 2)	✓		No
Page stamping	Yes (Date, Time, Name, Page Number)		✓	Yes (Date, Time, Name, Page Number; plus the ability to add custom stamps)
Image rotation	Yes, 90 degrees and 180 degrees	✓		Yes, auto 90 degrees
Option to preview before print	Yes	✓		No
CMYK balance adjustment	Yes (CMY only)			Yes (CMY only)
Brightness adjustment	Yes			Yes
Contrast adjustment	Yes			Yes
Saturation adjustment	No			No
Advanced colour management options	Yes			Yes
Enlargement Copy Mode	Yes	✓		No
Free Layout Capability	Yes (flexible placement)	✓		Yes (automatic placement)
MS Office Plug-in	Yes	✓		No
Accounting capability	Yes			Yes
Disable automatic cutter	Yes			Yes
Unidirectional printing selection op-tion	Yes	✓		No
Integration with MFP	Yes	✓		No

The Canon imagePROGRAF TM-305 comes bundled with PosterArtist Lite.

## Ink Consumption

Table 1: Amount of Ink in each Canon imagePROGRAF TM-305 Cartridge (in Grams)

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

Table 2: Amount of Ink in each HP DesignJet T930 Cartridge (in Grams)

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Weight of cartridge prior to installation	193.0	189.9	194.2	191.5	191.2	191.9
Weight of cartridge at end of life	57.3	57.3	57.3	57.3	57.3	57.3
Net weight of ink	135.7	132.6	136.9	134.2	133.9	134.6
Total ink weight across six cartridges						807.9

Table 3: Ink Used in Three 50-Page Runs of Cottage Architectural Plan Test Document (Standard Mode) on the Canon imagePROGRAF TM-305 (in Grams)

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	20.0	2.0	1.7	4.8	2.8
Test Run 2 Net weight of ink used	17.5	2.1	1.8	3.2	2.7
Test Run 3 Net weight of ink used	18.5	1.8	1.6	4.2	2.2
Average amount of ink used across three runs	18.7	2.0	1.7	4.1	2.6
Total ink weight across five cartridges for 50-page run (based on averages)					29.1

Table 4: Ink Used in Three 50-Page Runs of Cottage Architectural Plan Test Document (Normal Mode) on the HP DesignJet T930 (in Grams)

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Test Run 1 Net weight of ink used	0.4	0.4	26.4	8.8	3.5	1.6
Test Run 2 Net weight of ink used	0.4	0.4	26.7	8.8	3.4	1.7
Test Run 3 Net weight of ink used	0.5	0.5	27.2	8.9	3.6	1.7
Average amount of ink used across three runs	0.4	0.4	26.8	8.8	3.5	1.7
Total ink weight across six cartridges for 50-page run (based on averages)						41.6

**Table 5: Ink Used in Three 50-Page Runs of ISO Poster Test Document (Standard Mode) on the Canon imagePROGRAF TM-305 (in Grams)**

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	18.6	1.8	2.1	22.6	36.5
Test Run 2 Net weight of ink used	19.1	1.6	2.4	22.2	37.9
Test Run 3 Net weight of ink used	21.6	2.0	2.1	25.0	40.2
Average amount of ink used across three runs	19.8	1.8	2.2	23.3	38.2
Total ink weight across five cartridges for 50-page run (based on averages)					85.3

**Table 6: Ink Used in Three 50-Page Runs of ISO Poster Test Document (Normal Mode) on the HP DesignJet T930 (in Grams)**

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Test Run 1 Net weight of ink used	0.6	4.0	20.5	54.9	15.6	4.4
Test Run 2 Net weight of ink used	0.5	4.4	20.9	55.5	15.9	4.3
Test Run 3 Net weight of ink used	0.6	4.1	20.2	54.0	15.6	4.5
Average amount of ink used across three runs	0.6	4.2	20.5	54.8	15.7	4.4
Total ink weight across six cartridges for 50-page run (based on averages)						100.2

**Table 7: Ink Used in Three 50-Page Runs of GIS Map Test Document (Standard Mode) on the Canon imagePROGRAF TM-305 (in Grams)**

	Matte Black	Black	Yellow	Magenta	Cyan
Test Run 1 Net weight of ink used	20.7	0.8	7.9	12.0	19.9
Test Run 2 Net weight of ink used	24.8	1.1	10.9	16.3	22.8
Test Run 3 Net weight of ink used	25.4	1.5	14.2	21.8	28.7
Average amount of ink used across three runs	23.6	1.1	11.0	16.7	23.8
Total ink weight across five cartridges for 50-page run (based on averages)					76.2

**Table 8: Ink Used in Three 50-page Runs of GIS Map Test Document (Normal Mode) on the HP DesignJet T930 (in Grams)**

	Photo Black	Gray	Matte Black	Cyan	Magenta	Yellow
Test Run 1 Net weight of ink used	0.6	35.4	11.1	27.9	10.3	17.5
Test Run 2 Net weight of ink used	0.4	35.9	11.1	28.2	10.4	17.7
Test Run 3 Net weight of ink used	0.5	36.2	11.5	28.4	10.3	18.1
Average amount of ink used across three runs	0.5	35.8	11.2	28.2	10.3	17.8
Total ink weight across six cartridges for 50-page run (based on averages)						103.8

## Ink Consumption Test Methodology Overview

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Buyers Lab's ink consumption analysis was conducted using three document types (Cottage Architectural Plan, ISO Office Poster and a GIS Map). Each document was formatted as a PDF (except for the Cottage Architectural Plan, which was formatted as a DWG TrueView Drawing) and sized at ISO A0.

The Canon imagePROGRAF TM-305 was installed in Buyers Lab's lab with the latest "01.02" level of firmware (as of July 2018) and connected to a Windows 10 workstation using a 1000BaseT TCP/IP connection. The Canon imagePROGRAF Printer Driver was used for all testing with media selection set to plain paper (Cottage Architectural Plan) and matte coated paper (ISO Office and GIS Map) and the image set to print at actual size. For the Cottage Architectural Plan, print priority settings were set to Line Drawing/Text with quality set to Standard (600 dpi). For the ISO Poster and the GIS map, print priority settings were set to Image with quality set to Standard (600 dpi).

The HP DesignJet T930 was installed in Buyers Lab's lab with the latest "MRY\_04\_01\_00.2" level of firmware (as of February 2016) and connected to a Windows 10 workstation using a 1000BaseT TCP/IP connection. The HPGL/2 driver was used for all testing and left in its default colour setting, with media selection set to plain paper (Cottage Architectural Plan) and heavy weight coated paper (ISO Office and GIS Map) and the image set to print at actual size. All three document types were printed with quality set to Normal mode.

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

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

### Test Environment

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

### Test Equipment

Buyers Lab's dedicated test network, consisting of Windows 2008 and Microsoft Exchange servers, Windows 10 workstations, 10/100/1000BaseTX network switches and CAT6 cabling.

### Test Procedures

The test methods and procedures employed by Buyers Lab in its lab testing include Buyers Lab's proprietary procedures and industry-standard test procedures. In addition to a number of proprietary test documents, Buyers Lab uses industry standard files including a Buyers Lab test file and an ASTM monochrome test document for evaluating black image quality. In addition to a visual observation, colour print quality and gamut size are evaluated using XRite i1 profile software and an i1 Pro colour spectrophotometer, and analysed using Xrite i1i0 Advanced Scanning Table. Density of black and colour output was measured using XRite 508 and XRite exact<sup>XP</sup> densitometers.

## About Keypoint Intelligence - Buyers Lab

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

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

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