



Situation

PANTONE® formula guides are an essential part of any graphic designer's toolkit and are fundamental for choosing and specifying the spot colors of graphical elements and text. Each of the guides' colors has a unique color name and is the result of printing a specific mixture of the base inks of either the Pantone Matching System or the Pantone Goe System. Hence, the original way of printing designs containing Pantone solid colors is using custom-mixed inks, which are typically added to the CMYK process as additional separations and printing stations. This ability to choose from a color gamut significantly larger than that of conventional four-color printing systems gives designers greater flexibility and allows for designs to use more striking colors and to stand out in comparison with prints using only CMYK. However, it also introduces a challenge when reproducing such designs on digital systems, where additional separations and printing stations for custom-mixed inks are not available. Given a design using Pantone colors, their reproduction on a digital printing system is essentially an emulation. Instead of being able to use a mixture of the Pantone Basic Color inks, it is necessary for each Pantone solid color to be translated into RGB or CMYK inputs to a printer, which in turn result in specific amounts of its colorants (e.g., CMYK, CMYKcm, cMYKRGBmnNK, etc.).

A frequent, simplistic approach is simply to use the CMYK amounts intended for offset printing as specified in the Pantone Process Guide or the Pantone Color Bridge on all digital printing systems and regardless of the media types being used. This method results in a given Pantone solid color being rendered in very different—and often incorrect—ways on different printing systems or even on different media used by a single printer.



The next level up is to try and set up the emulation in a manual and iterative way. Here a graphic designer or pre-press professional would first print out a large number of RGB or CMYK combinations on the printer on which the emulation is to be set up. Then visual comparisons between the original Pantone color and alternative RGB or CMYK combinations are made and, once the most similar combination is encountered, it is assigned to the graphical elements that were originally tagged with the Pantone solid color's name. This process is repeated for all Pantone colors in a given design and the result is sent to the printer. In addition to being a frustrating and lengthy process, it may not result in success (due to the difficulty of manually setting up color matches) and can lead to more color errors and disappointment if designs with values specified for one printer are sent to another. This type of manual process also prevents the same application file from being used for both proofing and final production.

Finally, Pantone themselves also provide a service to printer vendors whereby they set up certified, manual emulations for all Pantone colors on a given printer-ink-media combination. Given Pantone's color matching expertise, the result is of very high quality and its only drawback is that it is tuned for a specific media on a given printer. When Pantone colors need to be emulated on one of the many other media that can be used with a given HP printer, it is necessary to have an automated solution.

What it is

HP Professional PANTONE Emulation (HP PPE) is a technology that enables graphical elements in designs to have Pantone color names assigned to them and for the HP printer to substitute these Pantone color names with RGBs or CMYKs determined specifically for that printer and media at the time of printing. HP PPE automatically computes simulations that have been optimized for a specific printer—media combinations to mimic the way in which professional graphic artists and pre-press professionals prepare Pantone emulations by hand. The results are professional quality emulations of Pantone colors that look as similar to the originals as possible on a given printer-media combination. Furthermore, these emulations are computed using either default or user-provided ICC output profiles of the printing system provided by the user.



How it works

When a design that contains graphical elements with Pantone solid colors assigned to them is printed in a PostScript® or PDF workflow, both the assigned color names (for example, “PANTONE 100 C”) and alternative colors are communicated to the printer. Alternative colors are typically RGB or CMYK values specified for the Pantone solid colors for emulation on an analog offset press. In the absence of means of interpreting the color name, it is the alternative color that is printed (as if it were chosen for a particular digital printer), and the results show clear color errors.

What HP PPE does instead is to intercept instances of Pantone color names and replace them with, e.g., RGB values computed specifically for the digital printer and media on which a particular design is to be printed. This way the same Pantone color name is emulated using different values on different printers and media, and these values are such that they result in the closest visual match to original Pantone solid colors.

The match to Pantone solid colors is computed using an algorithm that has been designed in cooperation with professional graphic artists and pre-press professionals, which mimics their manual emulation choices. Furthermore the computation is done on the basis of either the default output ICC profile available for a specific printer-media combination or, if available, based on a custom ICC profile provided for it. Having a more accurate ICC profile for a printer also gives greater accuracy to Pantone emulation. The result of using HP PPE is that if an accurate output profile is available, then the Pantone solid colors that are inside the printing system’s gamut will match and colors that are outside the gamut will be emulated by colors that professional graphic artists and pre-press professionals would use in order to achieve the closest possible match.

HP PPE swatchbook printing

HP PPE also provides a swatchbook printing feature to help users manage Pantone emulation. This feature allows the printing of a swatchbook showing emulations of Pantone colors as well as the ΔE color differences between the emulations and the original Pantone spot colors. As a result, HP PPE not only provides the closest match a printing system can produce,



but it also gives clear information on how close the emulation is to the original spot color.

In the HP Designjet Z6 and Z9+ Printer series, pages from the range of Pantone guides can be selected visually in the Embedded Web Submitter as shown in the figure below. Outputting the result of a selection then gives a print as shown in the following figure. Here the first page explains the limitations of emulation and the details of how to view and compare them with the original Pantone guides, followed by a page indicating the Pantone guide from which the subsequent selected pages come. The emulation patches here are of a size that eases their side-by-side comparison with original Pantone guides.

The figure below shows a sample of an HP PPE swatchbook page, where the RGB values used for emulation and the color differences from the original Pantone solid colors are shown for each color on a page of the Pantone swatchbook. Showing the color differences of the emulations allows a clear communication of how closely individual Pantone solid colors can match. Additionally knowing what RGBs (or CMYKs) are used also makes customization of these emulations easier.

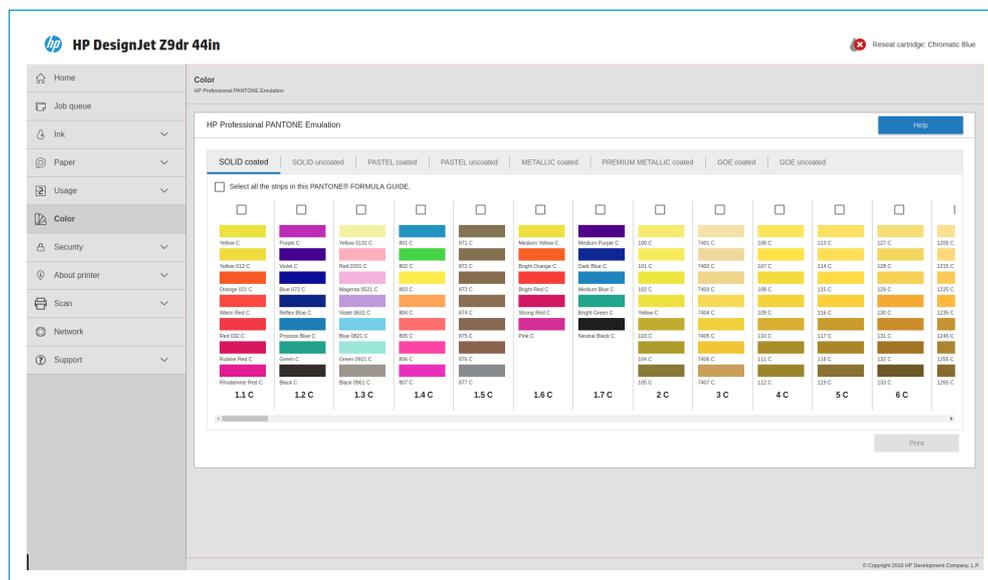


Figure 1

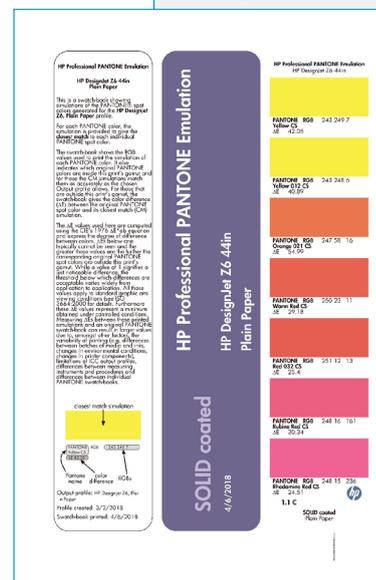


Figure 2



Pantone guide support and availability

At present HP PPE supports the following Pantone Guides:

- PANTONE® GoeGuide coated
- PANTONE® Formula Guide coated, uncoated and matte
- PANTONE® Metallic Formula Guide coated
- PANTONE® Pastel Formula Guide coated and uncoated

Since HP PPE requires a PostScript/PDF workflow, it is supported out-of-the-box in printers with an embedded PostScript RIP.

Customer benefits

Given a design that uses Pantone solid colors for its graphical elements and that needs to be either proofed or produced on a digital printing system, HP PPE technology provides an array of significant benefits:

- It allows for the use of the Pantone color name regardless of whether a design is printed on:

- An analog offset press that uses custom-mixed inks for the Pantone solid colors
- A digital printer or digital offset press that uses CMYK, CMYKcm, CMYKOV, cMYKRGBmnNk or other fixed sets of primary inks

A single digital file can be sent to digital printers and digital offset presses that include HP PPE, to produce high-quality results. Furthermore, the file can be generated using any software application that allows for graphical elements to have Pantone spot colors assigned to them (rather than having their colors defined as CMYK process colors or in terms of RGB values). Software applications such as QuarkXPress, Adobe Illustrator® and Adobe InDesign® (shown below) offer this ability.



- It results in emulations of Pantone solid colors that are optimized for the digital printer, or digital offset press, and the media on which they are printed. These emulations either match the Pantone solid colors, if the solid colors are inside the color gamut of the printer or press, or they are the closest visual match that can be achieved between the simulation and the original.
- HP PPE will automatically make use of the increased color matching accuracy that is possible with custom-built ICC profiles for specific printer-media combinations.
- The swatchbook feature offers clear information about which Pantone colors are inside the printing system's color gamut and about how different the emulations of out-of-gamut Pantone colors are from the originals.
- The Pantone emulations from all devices and configurations supported by HP PPE are consistent with each other. Unlike the use of the same RGB or CMYK values on all printers (which gives significant color differences between them), having values optimized for each printer and configuration results in optimal consistency between the different emulations.
- HP PPE technology puts the knowledge and expertise of industry professionals within the users' reach while saving time and improving output quality.

© Copyright 2018 HP Development Company, L.P. The information contained herein is subject to change without notice. The only warranties for HP products and services are set forth in the express warranty statements accompanying such products and services. Nothing herein should be construed as constituting an additional warranty. HP shall not be liable for technical or editorial errors or omissions contained herein.

Adobe InDesign, Illustrator and PostScript are trademarks of Adobe Systems Incorporated.
PANTONE is Pantone, Inc.'s check-standard trademark for color.

4AA7-3031ENW, Rev. 4.13, May 2018