PANTONE®
EXTENDED GAMUT Coated
Frequently Asked Questions

1) What is PANTONE® EXTENDED GAMUT Color printing?

The basic premise of PANTONE EXTENDED GAMUT "XG" Printing is adding three additional base inks (Orange, Green and Violet) to the traditional CMYK ink set in order to "expand" the color gamut of typical process color printing. This enables printers to reproduce a wider range of colors. This fixed ink set can then be used to accurately simulate PANTONE Spot Colors.

Extended color gamut printing is not a new concept. It has been utilized by commercial printers and packaging converters for the past two decades. Widespread adoption has been limited until the last few years. With the alignment of industry associations, prepress technology partners, press manufacturers and plate manufacturers, XG is now mainstream and accessible for the market segments that want to take advantage of it.

Understanding the design challenges around multiple spot color printing and also the needs of our industry, Pantone has created this seven-color printing guide as another universal language and reference of colors that brand owners, designers and printers can all speak and agree upon.

2) How to use this Guide

The PANTONE PLUS SERIES EXTENDED GAMUT Coated Guide should be used by brand owners, designers, printers and end-users to make an educated decision on how PANTONE Spot Colors will reproduce in final production utilizing the extended gamut offset printing process. By specifying these colors in design files, your color intent can be clearly communicated to the color separator or printer.

It should be understood that each printer may have varying workflows and printing conditions. As such, the color build for each color may differ from printer to printer. The screen percentages in this Guide are included to provide an indication of a starting point for a printer to use to achieve their desired color.

3) Now that I have purchased the PANTONE EXTENDED GAMUT Coated Guide, how can I use the colors in my preferred design software?

PANTONE COLOR MANAGER is a software application supplied by Pantone that syncs the latest PANTONE Color Libraries with your favorite design software. PANTONE COLOR MANAGER is free with purchase of the PANTONE EXTENDED GAMUT Coated Guide via a registration code located at the back of the Guide. This subscription will allow one to register the Guide on the website, download the software and sync PANTONE Color Libraries and palettes.
http://www.pantone.com/pantone-color-manager-software

The PANTONE EXTENDED GAMUT Color Library is also available in PantoneLIVE®. All PANTONE Master Standards and Dependent Standards, including the PANTONE EXTENDED GAMUT Colors, can be utilized via the PantoneLIVE Adobe® Illustrator® Ink Book and Viewer plugins.
http://www.pantone.com/pages/Pantone.aspx?pg=21067

4) How do I effectively specify my colors to my customer, pre-press supplier or printer using the PANTONE EXTENDED GAMUT Coated Guide Color standards?

When designing in the preferred design application, one should specify a color from the PANTONE PLUS SERIES Color Libraries you have synced utilizing PANTONE COLOR MANAGER or the PantoneLIVE Adobe Illustrator Ink Book and Viewer plugins.

Use this PANTONE EXTENDED GAMUT Coated Guide to determine when it may be possible to more accurately reproduce a solid PANTONE Color using PANTONE Process CMYK and PANTONE XG Orange, Green and Violet (OGV) Inks.

First, identify the desired PANTONE MATCHING SYSTEM® Color (using a current PLUS SERIES FORMULA GUIDE Solid Coated – sold separately). Then, locate that PANTONE MATCHING SYSTEM Color using the same page number in the PANTONE EXTENDED GAMUT Coated Guide and compare under proper lighting conditions. If the PANTONE EXTENDED GAMUT Color is not visually acceptable, the color should remain specified as a solid color. When the PANTONE EXTENDED GAMUT Color appears adequate, please use PANTONE COLOR MANAGER software to incorporate these colors into your files. To assist you, support files are available at pantone.com/extendedgamut.

The screen tint percentages supplied are based on the printing conditions under which this Guide was produced and are intended as guidelines (see the PRINTING NOTES section below). If your workflow varies from ours, adjustments may be made to optimize the match.

5) How do I proof work when utilizing the PANTONE EXTENDED GAMUT Coated Guide?

Designers:

If you are utilizing PANTONE COLOR MANAGER to update your Adobe color books, your PANTONE EXTENDED GAMUT Coated Guide colors will reproduce adequately on a well-maintained inkjet proofer. The proofing device will utilize the RGB values in your non-separated "spot color" and reproduce the color to the best of its ability. The PANTONE EXTENDED GAMUT Coated Guide should be used to check the accuracy of your printed proof. If more accuracy is needed, you may want to consult with a color management professional.

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After color separation, printers and color separators should use your press specific proofing profile to reproduce a color accurate proof. There are many proofing RIPS that specialize in the PANTONE EXTENDED GAMUT Process. Please contact your preferred RIP manufacturer to check compatibility of your RIP and proofer.

6) What does the PANTONE EXTENDED GAMUT printing process mean to the brand owners and designers?

The PANTONE EXTENDED GAMUT workflow removes many of the standard limitations and frees designers to focus on creativity. Designers can specify as many colors in their designs as they wish without being told they need to limit their color palette to CMYK and 2 spot colors. Graphic designers who design for the XG workflow are able to maintain highly impactful colors and, at the same time, create more dynamic designs than ever before.

If a critical color has been identified in your design, it is suggested that you compare the PANTONE EXTENDED GAMUT Coated Guide to a PANTONE PLUS SERIES FORMULA Guide, to ensure there is an acceptable match. If there is not an acceptable match, it is suggested that you retain the critical color as a PANTONE Spot Color.

After installing the PANTONE COLOR MANAGER Software, be sure to specify from the PANTONE EXTENDED GAMUT Color Palette so your printing partners will know your acceptable process colors and reproduce your artwork to satisfaction.

7) What does the PANTONE EXTENDED GAMUT Coated Guide mean to pre-press and printers?

PANTONE EXTENDED GAMUT printing provides for significant efficiencies in the pressroom. If not printing spot colors, one can decrease change-over times, lower ink consumption, utilize fewer plates and increase consistency and quality of a press run from beginning to end.

When using the PANTONE EXTENDED GAMUT Guide, you should use the XG standards as your targets when converting PANTONE Spot Colors into EXTENDED GAMUT process printed colors. XG standards are "achievable" for the given printing process, substrate and ink system.

The screen percentages in this Guide are included to provide an indication of a starting point for a printer to use to achieve their desired color. However, it should be understood that your unique workflow will dictate the final separation values.
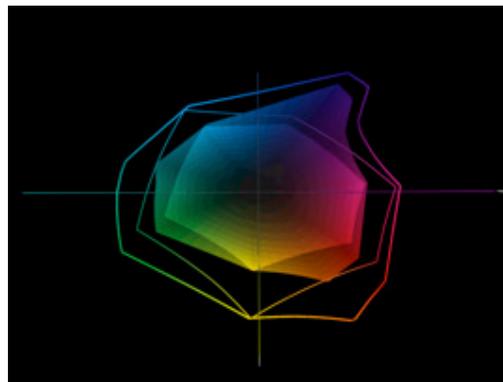
8) How does using PANTONE EXTENDED GAMUT printing compare to printing PANTONE Spot Colors using CMYK?

Pantone conducted a detailed visual analysis of how acceptable the Extended Gamut printed colors are to the PANTONE Spot Colors printed in the PANTONE PLUS SERIES FORMULA GUIDE Coated. We also compared the visual acceptance to that of the CMYK colors printed in the PANTONE COLOR BRIDGE Coated Guide. The Extended Gamut printing process provided a 30% increase in the number of visually acceptable colors. In the case where both Guides provided an "acceptable" match, the Extended Gamut printed color was a better match 60% of the time.

Below are dimensional diagrams showing the difference between a CMYK and XG Color Space.
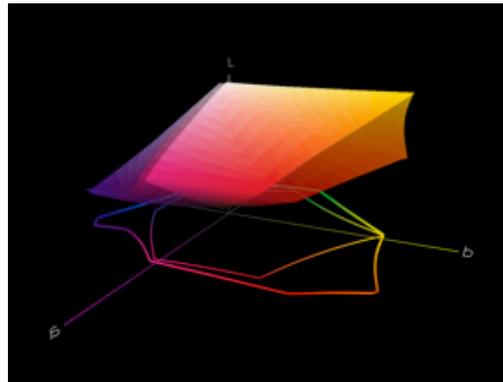
Pantone XG vs GRACoL Color Space

Pantone XG vs GRACoL Color Space

9) How is PANTONE EXTENDED GAMUT different from Hexachrome?

a. PANTONE EXTENDED GAMUT printing can simulate spot colors just as well or better

b. PANTONE EXTENDED GAMUT printing doesn't require new, special inks or software

c.   PANTONE EXTENDED GAMUT printing CMYK bases conform
     to ISO 2846-1

d.   PANTONE EXTENDED GAMUT printing inks are "coatable"

**10) What inks were chosen for the PANTONE XG Base Inks –
Orange, Green and Violet?**

When defining the PANTONE XG Base Inks – Orange, Green and Violet,
the ink set must contain four attributes:

- Provide the largest achievable color gamut when combined with
  ISO compliant CMYK Inks
- Be mono-pigmented
- Maintain a specified hue angle
- Retain a high chroma value while maintaining an effective print
  contrast ratio

Below are the pigment index and hue angles for the XG PANTONE Base
Inks. These ink bases are available from your Pantone-licensed ink supplier.

Ink Base	Pigment Index	Hue Angle	Film Thickness
Orange	PO34	58°	1.10g/m2
Green	PG7	180°	1.30g/m2
Violet	PV23	311°	1.10g/m2

11) PRINTING NOTES

Workflow
The Guide was produced using a completely digital workflow.

Screen Tints
The digitally-produced screens with round dots were output utilizing
CTP technology.

Ink Set and Print Parameters
CMYK: Aims to conform to ISO 2846-1 & 12647-2:2-2004/Amd
1:2007.
OGV: Ink set aligns to research conducted by leading industry associa-
tions.
Coating: Aqueous Coating

Print Screen Rotation Angles

PANTONE XG Color Rotation	Primary Angles	Secondary Angle for V
1. Violet	45°	MKV or KV = 15°
2. Black	45°	
3. Cyan	15°	
4. Green	75°	Tertiary angle for V
5. Magenta	75°	CKV = 75°
6. Orange	15°	
7. Yellow	90°	

Target Aim Points
Measurements were taken with an X-Rite eXact™ Spectrophotometer
utilizing ISO Status T & M0 Measurements

PANTONE XG Ink Name	Filter/Density Ref.	Metric/ Value
Black	(K) 1.60	(Lightness) 16
Cyan	(C) 1.30	(Hue) 233°
Magenta	(M) 1.35	(Hue) 357°
Yellow	(Y) 1.00	(Hue) 93°
Orange	(Y) 1.85	(Hue) 58°
Green	(C) 1.50	(Hue) 180°
Violet	(M) 1.60	(Hue) 311°

Paper Stock
Coated #1 grade 100 lb. gloss text stock (148 g/m2)
The paper stock contains optical brighteners.

Line Screen
175 lines per inch/69 lines per cm

Dot Gain Specification

PANTONE XG Color	Dot Gain Spec
Black	ISO specified
Cyan	ISO specified
Magenta	ISO specified
Yellow	ISO specified
Orange	DE-P / CCRC
Green	DE-P / CCRC
Violet	DE-P / CCRC

DE-P (Delta E Minus Paper) and CCRC (ColorCert Relative Colorimetric)
are colorimetric approaches to calculating dot gain for non-CMYK colors

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Variables

Many variables in the printing process may affect color reproduction, including:

- output devices and dot gain
- dot gain method
- color rotation, form layout
- color registration
- ink color accuracy/density
- variations in paper color, quality and texture

12) What is the calculation of the total ink coverage of the screen print percentages?

Maximum coverage: 257%

Average coverage: 107%

13) Why are some of the sRGB values printed in the Guide different than the values found in PANTONE COLOR MANAGER Software and/or PantoneLIVE?

The Guide's values were derived from predicted data – not actual printed values but are reasonably close. Customers with any doubt should proceed with the data found in PANTONE COLOR MANAGER Software and PantoneLive.

14) Where can I get more information on the Esko Equinox software for assistance with Extended Color Gamut printing?

Visit: info.usa@esko.com or call 937.454.1721.

A note about The PANTONE EXTENDED GAMUT Guide and ISO 12647-2

When X-Rite Pantone created the PANTONE EXTENDED GAMUT Guide ISO 12647-2 was used to establish our targets and tolerances. ISO 12647-2:2013 stipulates that: Measurement is in accordance with ISO 13655-D50 illuminant, 2° observer, 0:45 or 45:0 geometry. Measurements should be made using M1.

When we created the calibration curves for this press run, we worked in parallel to measure and validate that they conformed with both ISO12647-2:2004/GRACoL2006/M0/ΔE76, and ISO12647-2:2013/GRACoL2013/M1/ΔE2000. The press control systems were based on M0 values, due to the technology available at the time. We used the measurements of the eXact with M1 to validate that it complied under both conditions. The logic was to run to the current industry practices, M0, but still validate that the process works under the new measurement methods, M1, as well.

Below are the results of the sample measurements, for the G7 calibration, within tolerances, under both conditions.

GRACoL 2006/M0/ΔE76					
Inks	L*	a*	b*	Δ76	Tolerance
Cyan	56.26	-36.10	-50.35	1.70	5.00
Magenta	49.04	76.54	-1.04	3.32	5.00
Yellow	89.85	-5.99	95.91	3.04	5.00
Black	15.70	0.65	3.66	3.90	5.00
M+Y	49.33	68.72	47.81	2.25	6.00
C+Y	51.88	-65.11	27.70	4.63	6.00
C+M	24.84	-0.80	-0.28	3.22	6.00
Paper	94.38	1.06	-3.47	ΔL 1.38	ΔL +/- 3
				Δa* .06	ΔL +/- 2
				Δb* .53	ΔL +/- 4

GRACoL 2013/M1/ΔE00					
Inks	L*	a*	b*	Δ00	Tolerance
Cyan	56.42	-35.38	-51.45	1.42	3.50
Magenta	49.08	76.68	-2.27	1.28	3.50
Yellow	89.90	-6.08	95.27	1.26	3.50
Black	15.70	0.69	3.49	3.49	5.00
M+Y	49.35	68.71	47.18	2.25	4.20
C+Y	51.94	-65.08	27.19	1.92	4.20
C+M	24.88	-0.75	-0.70	2.01	4.20
Paper	94.55	1.46	-5.80	ΔL 1.55	ΔL +/- 3
				Δa* .46	ΔL +/- 2
				Δb* 1.8	ΔL +/- 4

There is an important point to be made about this calibration information. We documented the process that we used to create the book. The method of calibration and the print process will impact the CMYKO-

GV builds that are in the book. We are not telling users to follow this calibration method or even the print method. Most users will be printing flexo or gravure on a variety of substrates from film to board and even different extended gamut color inks. This is intended to represent a range of colors that can be produced with 7 primary inks, not their specific printing condition. Users will need to calibrate their process as well, for the specific conditions that they are running. They will need to profile their process to derive the specific process color builds required to achieve the colors in the book.

X-Rite Pantone has observed that, in packaging, M0 is still the dominant measurement mode and thus that is what was published in our guide. In retrospect, we should have noted that the production would conform to both the old and the new ISO conditions.