

Selecting a Paper for G7 Calibration

G7[®] is a proofing and printing system calibration and process control methodology. The G7 specification provides a universal colorimetric definition (based on CIE L*a*b*) of near-neutral gray balance throughout the tonal scale, and a calibration methodology that may be applied to any CMYK printing system where tonal percentage output curves (e.g., RIP, CtP) can be adjusted.

G7 has become a familiar acronym in the graphic arts industry. The “G” refers to the calibration method used to align color reproduction devices and processes with established gray values. The numeral “7” denotes the seven process colors and overprints (cyan, magenta, yellow, black, red, green, blue) monitored during the calibration procedure.

Normal human color perception is quite sensitive to slight variation in shades of gray—especially in the mid-tonal range. If a near-neutral, mid-tone gray image is printed among surrounding highly saturated bright colors and solids, it would not be surprising to notice more variation in the shade of the 3/color mid-tone gray patch than would be evident with the high-density images. Therefore, a basic premise of the G7 method is that if all proofers and printing systems are aimed toward matching a common three-color gray balance and tonality standard, four-color images will also fall in line and exhibit a reasonably close visual match.

G7 can be used to calibrate and control various CMYK print processes including digital, sheetfed offset, web offset, flexographic, gravure, wide format ink jet, etc., so that common files may be shared between printers and imaged on various devices with the expectation of a relatively consistent visual color match. The G7 process is considered substrate relative as it allows neutral gray to appear “neutral” regardless of the paper or other substrate used. When calibrating a printing system, gray balance targets are calculated according to the a* and b* values of the chosen paper. This G7 colorimetric calculation allows gray values to adapt to the optical characteristics of the printing paper. Consequently the gray targets will always appear neutral and color balanced.

Since no paper is G7 approved, qualified, or certified, we suggest performing G7 calibration with whichever paper the printer most often runs. GRACoL[®] is a reference print condition (i.e., a set of characterization data, colorimetric aim-points, and print guidelines) commonly used for sheetfed offset printing and inkjet proof verification.¹ Therefore, a sheetfed printing paper which closely aligns with the target white-point of GRACoL 2013[®] is the best general recommendation for G7 system calibration.

The paper white-point target specified by GRACoL 2013 is 95L*, 1a*, -4b* (specified according to the M1 color measurement condition).² The average shade of Sappi North America's Flo Sheets (measured in M1) is 95.78L*, 1.38a*, -4.45b*. A very close match!³ Flo is designed to be used as a house sheet, and therefore its shade is intentionally aligned with GRACoL 2013. Due to Flo's relatively low level of fluorescence (because of less optical brightener content than many competitors), printed images will maintain good color stability in a variety of lighting conditions.

For printers who follow the older reference print condition GRACoL 2006, Flo is also an excellent choice for G7 calibration.⁴

Printers may desire to calibrate their printing systems or generate a second set of curves using a premium grade, mid-range brightness paper. Sappi recommends Opus; a paper often specified for higher quality print projects. The average white-point of Opus is within 2.4 ΔE of the GRACoL 2013 target.⁵

¹ As GRACoL provides characterization data for sheetfed offset, SWOP (SWOP 2013) is the reference print condition and proofing data set commonly used for web offset. CGATS 21 and ISO 15339 specify other G7 based characterization data sets which are growing in recognition and use throughout the industry.

² The target paper white-point of GRACoL 2013 aligns with that of ISO 12647-2:2013; Paper Type PS1—Premium Coated. Both GRACoL 2013 and ISO12647-2:2013 mandate use of the M1 color measurement condition.

³ Average variation is less than 1 ΔE (00).

⁴ The average L*a*b* values of Flo sheets, measured in the M0 condition, are within the substrate ΔE tolerance for GRACoL 2006 based G7 Targeted calibration.

⁵ CIE ΔE2000; L*a*b* values measured and specified according to the M1 measurement condition.

Although slightly more challenging; brighter, blue-white papers may also be used for G7 calibration by simply recalculating the GRACoL target reference print condition colorimetric aim-points.⁶

Colorimetric targets for the SWOP[®] specifications are typically used when G7 calibrating web offset printing systems.⁷ Sappi North America can also suggest appropriate papers which align with the SWOP 2013 and SWOP 2006 specifications.

The G7 specification provides other levels of compliance which do not require alignment with the characterization data sets and paper white-point requirements of GRACoL or SWOP.

For more information, please contact your Sappi North America sales representative or Sappi Printer Technical Service at 877.727.7443.



Illustration of a G7 calibration print form

⁶ Reference print condition data sets are recalculated using the Substrate Corrected Color Aims (SCCA) in accordance with CGATS 21. When a recalculated reference print condition data set is used for G7 calibration, the resulting aims are called GRACoL relative.

If a printer uses high-brightness papers, it is highly recommended that the workflow includes viewing conditions which conform to ISO 3664:2009 and the M1 color measurement condition as specified by ISO 13655:2009.

⁷ As with GRACoL, SWOP is based on the G7 gray balance specification.