



GRACoL[®]
 General Requirements for Applications
 in Commercial Offset Lithography

G7[®] Master Program: Pass/Fail Requirements for G7[®] Master Status

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Scope:

This document specifies the criteria for assessing conformance to G7 Master Status: (a) Greyscale, (b) Targeted, and (c) Proofing.

The scope of the document is limited to assessment of deviation from aim values on the supplied OK sheet or proof. Assessment of variation during production is excluded from these criteria.

1.0 Introduction

1. G7[®] Master status is a qualification program not a certification program
2. IDEAlliance G7[®] Experts submit an application and data to the program as specified in the document titled: G7[®] Master Printer Qualification Submission Procedures_Sep10.pdf
3. The press sheet or proof is examined by the auditor and specified test targets are measured and saved as a CGATS .txt file.
4. The data is analyzed to determine if the sheet is within tolerance using the criteria outlined below.

2.0 Sample Submission Requirements

The G7[®] Expert Consultant must ensure that the candidate G7[®] Master site provides valid print samples from which measurements can be obtained by an auditor, as follows.

2.1 Basic Target Submission Requirements (all G7 compliance levels)

1. Either a standard P2P25 target or a custom target containing identical CMYK patch values to columns 4 and 5 of the P2P25 target as well as solid C, M, Y and K patches.
2. If a custom target is supplied (not the standard P2P25) the original electronic version must also be supplied (e.g. in TIFF format) along with suitable reference files.

2.2 Additional Target Submission Requirements (G7 Targeted)

1. If the above target does not include measurable solid CMY and 2-color (RGB) overprint patches, either a standard IT8,7/4 target in a layout and size readable by as specified in section 8.0, or the IDEAlliance ISO 12647-7 color bar, or another target containing those solids readable as specified in section 8.0.



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2.3 Additional Target Submission Requirements (G7 Colorspace)

1. A standard IT8,7/4 target in a layout and size readable as specified in section 8.0.

2.4 Target Submission Requirements (Individual G7 Proofs)

1. An IDEAlliance ISO 12647-7 target in a layout and size readable as specified in section 8.0.

2.5 Pre-verifying Submitted Samples

It is recommended that the G7[®] Expert analyze the samples submitted for compliance evaluation, or identical copies, before their submission, using either the candidate site's or the G7[®] Expert's own measuring equipment. (See section 6.0)

3.0 Pass/Fail Requirements for G7[®] Greyscale Compliance

The G7[®] Greyscale compliance level is intended to allow imaging applications to be recognized for achieving G7[®] Greyscale Calibration. G7[®] Greyscale is defined when "A device or process is calibrated to the basic G7[®] definition of constant neutral Greyscale appearance, but does not necessarily use standard colorants or match a standard or specified color space".

All NPDC measurements are based on the 23 center patches (excluding 0 and 100) of the two 25-step grey scales (CMY and K-only) listed in the G7[®] Specification.

3.1 NPDC (CMY and K-only scales)

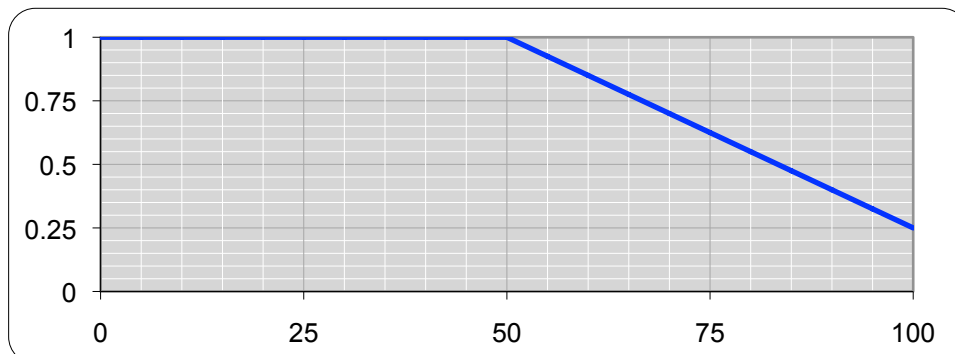
Average Weighted Delta L* ($w\Delta L^*$) = 1.5

Peak $w\Delta L^*$ = 3.0.

Where;

$$w\Delta L^* = (L^*_{\text{sample}} - L^*_{\text{target}}) \times (1 - \max(0, (\% - 50)/50 \times 0.75))$$

The Weighted Delta L* formula reduces the significance of the Delta L* measurement above a greyscale percentage (%) value of 50% on a linear scale beginning at 100% significance when % = 0 through 50 and terminating at 25% significance when % = 100.



The goal is to minimize the significance of hard-to-control lightness errors in very dark greys which are usually less noticeable to the eye than L* errors in lighter tones.

Weighted Delta L* can be calculated using the Classification and Tolerance Spreadsheet available at the following link:
http://files.idealliance.org/gracol/tolerance/draft_g7_tolerance_package.zip.

3.2 Grey Balance (CMY scale only)

Average Weighted Delta F* ($w\Delta F^*$) = 1.5.

Peak $w\Delta F^*$ = 3.0.

Where;

$$\text{Weighted Delta F}^* = ((a^*_{\text{sample}} - a^*_{\text{target}})^2 + (b^*_{\text{sample}} - b^*_{\text{target}})^2)^{1/2} \times (1 - \max(0, (c\% - 50)/50 \times 0.75))$$

The Weighted Delta F* formula is similar to the Weighted Delta L* function, reducing the significance of the Delta F* measurement above a cyan percentage (c%) value of 50% on a linear scale beginning at 100% significance when c% = 0 through 50 and terminating at 25% significance when c% = 100. The goal is to minimize the significance of hard-to-control grey balance errors in very dark CMY greys which are usually covered by black ink.

Weighted Delta F* can be calculated using the Classification and Tolerance Spreadsheet available www.GRACoL.org.

3.3 Spatial Evenness Uniformity

The sheet must exhibit evenness. The target to be measured for qualification must contain solid C M Y and K patches, and the sheet must contain 2 of these targets in different places on the sheet. These two targets must have Max Delta-Eab equal or less than 3 from the values in the target solid patches.

3.4 Exceptions Based on Print Process

IDEAlliance will make exceptions when qualifying G7 Greyscale Compliance processes other than sheetfed offset and web offset. These exceptions will be applied for specific print processes with know print characteristics that may cause a failure based on the



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above requirements. These print processes may include flexo, screen and other processes. An addendum to this document will be added as these exceptions are formalized.

4.0 Pass/Fail Requirements for G7® Targeted Compliance

A printing process is in “G7® Targeted compliance” when it is G7® Greyscale calibrated and meets colorants described in ISO 12647-2 using substrate-corrected aims. For example a commercial offset press is in “G7® GRACoL-Targeted compliance” when it is G7® Greyscale calibrated and meets the standard colorimetric measurements for substrate and colorants for GRACoL.

1. Must meet G7® Greyscale requirements (*see above section 3.0*).
2. Must identify a target condition print condition (color space) consisting of a recognized CGATS specification or Technical Report (TR) or ISO standard.
3. Substrate-corrected solid CMYK patches must meet the target print condition's current ISO tolerances.
4. Two-color (RGB) overprint solid patches must meet the target print condition's current ISO "informative" tolerances.
5. The sheet must exhibit evenness. The target must contain solid C M Y and K patches, and the sheet must contain 2 of these targets in different places on the sheet. The solid patches on each target must have a Max Delta-E equal or less than 6 to the required values specified in IT8.7/4 tolerances.
6. If the printing substrate to be used has a color that differs from the targeted print condition by more than 5 ΔE_{ab} this must be noted on the sheet and application as 'G7 Targeted Relative'. The targeted dataset must be calculated using the spreadsheet SubstrateRelCalc.xls available at www.gracol.org. The resulting dataset must be saved as a cgats file, and submitted via CD-ROM or DVD along with the press sheets.

5.0 Pass/Fail Requirements for G7® ColorSpace Compliance

1. Must meet G7® Targeted requirements (*see above section 4.0*).
3. The IT8.7/4 target must meet or exceed the tolerances listed below.



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5.1 IT8.7/4 tolerances

Target	Tolerance
Substrate	Delta-E equal or less than 3
CMYK Solids	Delta-E equal or less than 5 CIE hue difference less than 2.5
Solids of RGB	Max Delta-E equal or less than 6
All patches of IT8.7/4	Average Delta-E equal or less than 4 95th percentile Delta-E equal or less than 6

6.0 Pass/Fail Requirements for individual G7[®] Production Proofs

1. The IDEAlliance ISO 12647-7 target must meet the ISO 12647-7 (augmented) tolerances (see *next page*).



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6.1 ISO 12647-7 Tolerance Chart (Augmented)

These tolerances are based on ISO 12647-7 augmented with additional Greyscale metrics and data from characterization data sets to meet IDEAlliance G7[®] requirements. **Please reference the original ISO document for additional detailed information.**

Target	Tolerance
Substrate	Delta-E equal or less than 3
CMYK Solids	Delta-E equal or less than 5 CIE hue difference less than 2.5
Solids of GMYRGB	Max Delta-E equal or less than 6
Mid- and shadow tones of GMYRGB	Average Delta-E equal or less than 3
Six step black scale	Max Delta-L* equal or less than 4 Average Delta-L* equal or less than 2
Six step neutral scale	Max Delta-L* equal or less than 4 Average Delta-L* equal or less than 2 Max wΔF* equal or less than 4 Average wΔF* equal or less than 2
Outer gamut patches of Table C.1	Average Delta-E equal or less than 4
Within sheet uniformity (9 points, 3 tests) 65, 50, 50, 50; 40, 30, 30, 30; 20, 15, 15, 15	Std Dev of L, a, b equal or less than 0.5 Max Delta-E of 2 between any point and average

7.0 Verification of Print or Proof Condition by IDEAlliance-Certified G7[®] Expert Consultant

The G7[®] Expert consultant should validate the print condition prior to submitting samples through one or more of the following methods:



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1. Use of a certified G7[®] System[®] software that can verify the above conditions.
 2. Manual measurement analysis by private means (e.g. custom spreadsheet).
 3. Use of the free IDEAlliance G7[®] Fan Graph available at www.idealliance.org

8.0 Color Measurement Method

All targets are to be submitted in a layout and size readable by the X-Rite i1iSis in ColorPort or MeasureTool. If custom targets are provided the target and related reference file must be readable using an X-Rite i1iSis in ColorPort or MeasureTool.

9.0 Failure of Samples

In the event of failure the expert will have 60 days beyond the initial submission to resubmit the sheets. There may be an additional charge for resubmission of sheets to allow for the additional reading and analysis.



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Notes for PPC Review March 2011:

BC Comments

1. For each conformance requirement, specify aim points and tolerance for (a) grey reproduction requirement, (b) printed solid requirements, and (c) data set requirements, when appropriate.
2. For grey reproduction conformance, include (a) necessary control patches and their device values, (b) colorimetric aims, tolerances based on a published data set, (c) substrate-corrected aims. Currently, the specification does not use substrate-corrected aims for conformance assessment.
3. Conformance is different than calibration. It does not require so many levels of triplets. RIT will compare the current assessment (using many triplets and weighted function) with a simple method that uses only three (quarter-tone, midtone, and three-quartertone) triplets and no weighting functions.

Section 3 Comments:

Specify CMY triplets, their colorimetric values based on the specified data set, e.g., GRACoL (2006), and specify the use of tristimulus linear correction for substrate-corrected aims.

It is recommended that conformance does not require so many levels of triplets. RIT will compare the current assessment (using many triplets and weighted function) with a simple method that uses only three triplets and no weighting functions.

SS Comments:

Delta E Conversion from 76 to 00:

1. Convert and note that with the adaption of DE00 for all new documents, and the understanding it is a better visual simulation to our eyes, The DE00 or 3 or 4 is comparable to a CIE DE76 (not having a good correlation to our eyes) of 6 to 8.