



G7 PRESS CONTROL SYSTEM CERTIFICATION PROTOCOL

VERSION 018

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PART 1: INTRODUCTION

This document describes the application process for a candidate Idealliance-Certified G7 Press Control System, and the deliverables needed to pass certification.

This version (18) addresses questions and suggestions submitted during the first review cycle.

TYPICAL CANDIDATE OR APPLICANT

A typical applicant to the program would be a manufacturer or vendor of an automated press control system. The press control system should be capable of measuring printed samples over the complete size of the sheet in real time and giving feedback either visually to the press operator, or automatically to the press itself, in terms of increased or reduced ink quantities.

PRIMARY TECHNOLOGY AFFECTED

Although the certification program can theoretically be applied to any printing method, the most obvious candidates are offset press control systems, because offset lithography is almost unique in its reliance on real-time monitoring and adjustment of ink quantities to maintain consistent appearance of the printed result.

PURPOSE OF THE PROGRAM

Since its introduction in 2005, the G7 calibration method has been adopted by countless printing facilities world-wide. Its success stems from the fact that, if applied correctly, the confirmation print at the end of the calibration cycle delivers predictable, standardized gray balance and tonality, both visually and by measuring the 50 patches in columns 4 and 5 of the P2P target.

In live production, measuring the six G7 control patches (HR_cmy, HR_k, HC_cmy, HC_k, SC_cmy and SC_k) is often sufficient to maintain the G7 condition achieved in the calibration cycle, unless some major component, such as ink or substrate, is changed. On printing systems that rely on real-time ink adjustments to maintain print quality (for example offset) any deviation of the G7 control patches can be used to suggest ink adjustments that should move those patches back to their ideal G7 values, and therefore move the printing system back to its ideal “G7 appearance”.

Unfortunately, most press control systems do not allow the operator to monitor and control G7 gray balance and tonality directly, so many of today’s G7 Master printing facilities are unable to realize the full benefits of their G7 investment.

The purpose of the G7 Press Control System certification program is to acknowledge systems that do provide G7-specific tools, and to help those that don’t yet have those features, understand what is needed to make their systems G7-compliant. The program will also help printers identify whether or not their press control system is G7 compliant, and if not, if there is an upgrade path.

The purpose of adding G7 metrics to a press control system is to allow the press operator to see in real time how close to the G7 targets the printing result is, and what ink adjustments are needed to achieve G7 compliance.

HOW IS G7 PRESS CONTROL DIFFERENT?

The key difference between G7 and traditional press control is that gray tonality and gray balance are given equal or higher priority to traditional single color solid ink metrics. This is not an arbitrary rule, but a result of analyzing how the average human observer (trained or novice) judges “good color”. The human visual system typically detects small errors in gray balance and tonality (relative to the scene’s white point, or the print’s substrate) before it notices small errors in richly saturated colors.

RELATIONSHIP TO SOLID INK AND TVI METRICS

Although G7 philosophy assumes gray balance and tonality to be the most important parameters in the average printing job, that is not true in all cases, which is why an ideal G7 press control system should also monitor and control as many other metrics as possible, and allow the press operator to choose which metrics are most important for the job in hand and give priority to those metrics.

In some situations, G7 corrections may drive other parameters such as solid ink densities (or solid LAB values) and/or TVI out of tolerance. It is up to the individual press control system to decide how to handle these situations.

Regardless of other functions or indicators, a G7 press control system must be able to calculate ink adjustments based on the G7 definitions of gray balance and tonality.

BENEFITS OF THE PROGRAM

The program offers direct value to press manufacturers, manufacturers of press control systems, printers, print buyers and the industry at large.

G7 Press Control system certification will increase the value of new press control systems and create a market for system upgrades.

Printers with G7 certified press control systems should achieve more of the theoretical advantages of G7, (e.g. shorter make-ready times and more consistent visual appearance in neutral tones) and become more attractive to G7-aware print buyers.

Print buyers don’t have to understand the subtleties of G7 press control to know that a G7 Master printer with a G7-certified press control system is more likely to deliver consistent G7 quality on every press run than a printer with a press control system that does not support G7.

As more press control systems are installed or upgraded, the industry at large should see an overall improvement in print consistency and “shared neutral appearance”.

WHAT THE PROGRAM CERTIFIES

Based on supplied examples of initial press measurements, the testing program certifies the candidate system’s ability to;

- Calculate the ideal G7 “target values” or “aim-points” for tonality (expressed in L^* or neutral density) and gray balance (expressed in CIE a^* and b^*). *Note that the target values are what should be measured on a printed sheet that perfectly complies with the G7 specification.*
- Suggest ink quantity adjustment trends (i.e. increased or decreased ink densities) likely to help the press meet those G7 target values

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To test these functions, the certification process tests the system's ability to;

- Correctly apply the math in TR015 to calculate target values for HR_cmy, HC_cmy, SC_cmy HR_k, HC_k and SC_k control patches, appropriate for the supplied initial press measurements.
- Indicate to the press operator, and/or directly send to the press, approximate ink adjustment values necessary to achieve the desired target values.

The certification process also tests that the following support materials meet minimum requirements;

- The measured elements (e.g. control bar[s] or target[s]) used by the system for G7 press control.
- An Application Data Sheet (ADS) describing the actual steps an end-user must take to successfully repeat the certification process.

WHAT THE PROGRAM DOES NOT CERTIFY

- G7 press calibration (e.g. calculating offset plate curves).
- Control of single-ink TVI or "Dot Gain" values from other specifications or standards, such as ISO 12647-2.
- Control of solid ink colorimetric or density values according to any specification such as GRACoL, or the ISO 12647-2 standard.
- Accuracy or consistency of production press sheets or prints compared to a colorimetric reference print condition (CRPC) such as CGATS.21-6.
- Accuracy or consistency of production press sheets or prints compared to an original image, physical proof or reference print.

LIMITATIONS AND ASSUMPTIONS

Note that the certification process only evaluates the system's ability to measure and control the G7 parameters of gray balance and gray tonality, and pays no attention to how the suggested G7 adjustments might affect solid ink values or TVI.

Idealliance recognizes that in many cases, press control based only on G7 parameters may not be sufficient, and does not suggest that "good" press control only looks at grays. However for testing purposes, it is essential to measure that ability independently of other press control variables.

Although the ability to control solid ink values is not evaluated, it is assumed to be an existing function of a press control system, in parallel with controlling G7 gray balance and tonality.

For practical reasons, the certification process is limited to testing the system's response to synthetic (recorded) colorimetric data with no actual press runs involved.

It is assumed that a G7 press control system can only steer a press to meet G7 compliance if the press has already been G7-calibrated, or is naturally able to meet G7 parameters.

PART 2: APPLICATION PROCEDURE

TIMELINE

1. Applicant submits form at www.idealliance.org/G7_Press_Control
2. Idealliance sends test kit and invoice to applicant
3. Applicant pays invoice
4. Applicant conducts self-assessment of the system and submits required samples, measurements, and documentation to test facility.
5. Testing facility evaluates applicant's deliverables and reports to Idealliance PASS/FAIL of the application according to the G7 Press Control certification scheme.

PASS/FAIL PROCESS

IF THE SYSTEM PASSES ALL TESTS

- Idealliance informs applicant of successful certification and supplies a digital package of system logos, Certificate of Certification, usage rules, etc.
- Applicant may use the Certified G7 Press Control System logo on literature, software, websites, etc., subject to Idealliance usage rules.
- The system is listed on the Idealliance website.
- The system's ADS PDF is hosted on the Idealliance website.
- Idealliance issues, in coordination with applicant, a news release about the new system's certification.
- The system is mentioned in future G7 Expert/Professional training courses and other public presentations or publications, as appropriate.

IF THE SYSTEM FAILS THE DATA TESTS

- Idealliance informs the applicant of the nature of the failure.
- The applicant may repeat the tests once more
- If the system fails the second test, the process ends with a FAIL.
- To continue, the cycle starts from the beginning with a new application fee.

IF THE SYSTEM FAILS THE ADS REQUIREMENTS

Idealliance suggests changes until the document meets requirements.

IF THE SYSTEM FAILS THE CONTROL ELEMENT (PRESS BAR) REQUIREMENTS

Idealliance suggests the minimum changes needed and the applicant re-submits the control element until it meets requirements.

PART 3: TEST PARAMETERS

The system is tested for the following four parameters:

- Ability to accurately calculate G7 “target values” for any initial press condition
- Ability to suggest logical ink quantity adjustments to aim the press toward those target values
- Correctly-written, self-explanatory ADS (Application Data Sheet)
- Compatibility with a suitable G7 press control bar or target

TEST 1: CALCULATING G7 PRESS CONTROL TARGET VALUES

The first test determines the system’s ability to accurately compute correct G7 target values from several sets of test data, representing press runs in various states of G7 compliance or non-compliance, including;

- At least one press in perfect G7 compliance.
- At least one press currently not in G7 compliance, but which can be moved towards G7 compliance with simple press adjustments (e.g. more or less ink).
- At least one press currently not in G7 compliance, and which cannot be moved towards G7 compliance with simple press adjustments (e.g. more or less ink).

DEFINITION OF “TARGET VALUES”

In this context, the phrase “Target Values” refers to the ideal values that would be measured on a printed sheet that perfectly complies with the G7 specification. (Note that “Target Values” are sometimes called “Aim Values”.)

G7 target values are based on just three sample measurements;

- Substrate (paper)
- 100% black ink
- 100% CMY inks (100C + 100M + 100Y)

From these three measurements, G7 target values can be calculated for the ND (Neutral Density), or L* values of HR (50%), HC (25%), SC (75%) patches for both CMY and K, and the a*, b* values of HR, HC and SC for CMY only.

G7 TARGET VALUE FORMULAE (MATH SOURCE)

Target values for neutral density (ND) and gray balance must be calculated separately for each test data set according to the definitions in **ANSI/CGATS TR015** available from www.npes.org or www.idealalliance.org.

Note: target ND and gray balance values should NOT be taken from any existing CRPC, such as GRACoL.

REQUIRED TARGET VALUES

The candidate system must display (or otherwise deliver) the following target values;

- **EITHER** absolute or relative ND (neutral density)
- **OR** absolute CIE_L* values for;
- HC_cmy, HR_cmy, SC_cmy

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- HC_k, HR_k, SC_k
- **AND** absolute CIE_a* and CIE_b* values for;
- HC_cmy, HR_cmy, SC_cmy

TEST DATA FORMAT

Test data are supplied in units of spectral, CIEXYZ and CIELAB.

It is up to the system manufacturer to re-format the supplied data so the candidate system can use them as if they were data measured from a live press run.

TEST 2: INK ADJUSTMENT LOGIC

The second test determines whether the suggested ink increase or decrease suggestions are logical, based on the deviation of the test data set.

- The system calculates and displays (or otherwise delivers) recommendations to either increase or decrease C, M, Y and K inks.
- If the data represents a condition that cannot be restored to G7 compliance by physical press adjustments (e.g. more or less ink), the system should ideally display some kind of warning to that effect.

TEST 3: ADS (APPLICATION DATA SHEET)

At the time of testing, the manufacturer must supply an Application Data Sheet describing the steps necessary for the testing facility to successfully replicate the test results, within tolerances specified in the ADS.

- The ADS will be judged effective if the testing facility can successfully operate the system only by reading the ADS, without help from the manufacturer.
- A draft ADS template is provided separately.
- The testing process may involve changes or clarifications in the manufacturer's ADS prior to certification.
- Once certified, the ADS will be available as a PDF on the Idealliance website.

TEST 4: PRESS CONTROL ELEMENT

The system must provide a custom control element (bar or target), or be compatible with a generic control bar such as this one available free from Idealliance.

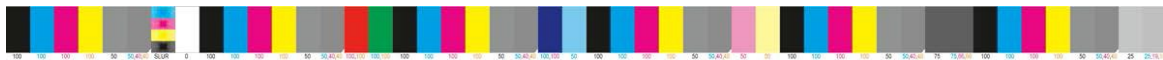


Figure 1: Idealliance G7 Press Control Bar (300% patch to be added)

Note: Compatibility with the Idealliance control bar is NOT REQUIRED. Any control bar containing the minimum required patches is acceptable.

MINIMUM REQUIRED PATCHES

To be recognized as a “G7 Press Control System”, the control element must contain, at a minimum, the following patches:

- Solids: Substrate (0%), C+M+Y (300%), K
- G7 patches: HR_cmy, HR_k, SC_cmy, SC_k, HC_cmy, HC_k

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RECOMMENDED ADDITIONAL PATCHES

In addition, it is recommended that the following patches are also included, although they are not required to pass the certification process:

- Solids: C, M, Y, C+M (B), C+Y (G), M+Y (R)
- Tints: 50% of C, M, Y

PART 4: DELIVERABLES TO APPLICANT

SUPPLIED DATA POINTS (MEASURED PATCH VALUES)

The testing process is based on several sets of measured data, representing different initial press conditions, with varying degrees of G7 compliance.

Measurement values are provided for the following patches:

- Solids: (0%), C, M, Y, K, C+M, C+Y, M+Y, C+M+Y
- Tints: 25%, 50% and 75% of C, M, Y (and K as G7 patches)
- G7 patches: HR_cmy, HR_k, SC_cmy, SC_k, HC_cmy, HC_k

CMYK TEST DATA

The test data consist of CMYK, CIELAB, CIEXYZ and spectral data values for each of the test patches listed above.

Test data files are generated in Microsoft Excel and supplied in CGATS text format, with a period "." decimal separator.

The data sets contain only one reading for any CMYK patch value, not the multiple readings normally produced across a whole press sheet.

DATA RE-FORMATING

It is up to the applicant to re-format the supplied data to suit the candidate system's preferred control bar layout, or to simulate live measurements

SIGNIFICANCE OF THE SOLID INK VALUES

The solid ink values in each test data set do not necessarily represent the ideal target solid ink values for the final, G7 press condition. They simply show what values the inks were at when the readings were taken.

It is expected that the G7 solid ink values may be higher or lower after applying the changes suggested by the press control system in order to achieve correct NPDC and gray balance conditions.

Note that the solid ink values should not be used, by themselves, as guides to correct press adjustment. In other words, **do not assume the desired press condition matches a specific CRPC.**

NOTE: The certification program deliberately includes one or more test data sets that do not imitate any particular CRPC, in order to test the system's performance in custom printing situations, where the only desire is to meet G7 Grayscale compliance.

ADS TEMPLATE

The testing process is based on several sets of measured data, representing different types of press condition, good and bad.

Measurement values are provided for the following patches:

CANDIDATE RESPONSE FILE

To simplify the testing process, target values calculated by the system for each test data set should (ideally) be returned in a copy of the supplied empty CANDIDATE RESPONSE FILE, with a new copy for each test dataset.

PART 5: DELIVERABLES TO IDEALLIANCE

TEST 1: TARGET VALUES

For each separate set of sample data, the system must calculate the following values:

- **EITHER** ND (neutral density - either absolute or paper-relative)
- **OR** CIE_L* (absolute)

For;

- HC_cmy, HR_cmy, SC_cmy
- HC_k, HR_k, SC_k

- **AND** absolute CIE_a* and CIE_b* values;

For;

- HC_cmy, HR_cmy, SC_cmy

TARGET CIELAB					TARGET ND				
C M Y					C M Y				
L* a* b* K					Abs Rel Abs Rel				
HC	72.81	1.0	-3.5	74.83	HC	0.35	0.25	0.32	0.22
HR	55.00	0.7	-2.4	57.64	HR	0.64	0.54	0.59	0.50
SC	36.87	0.3	-1.2	37.73	SC	1.02	0.93	1.00	0.91

Figure 2: Target values shown in typical table form. **Either L* OR ND values are required.** ND values may be absolute or relative.

PRECISION AND TOLERANCES

Because the math in TR015 is clear and unambiguous, the testing process requires target CIELAB values expressed with one (1) decimal and ND with at least two (2) decimals, with the following allowed tolerances:

LAB tolerances					ND Tolerances		
CMY_L CMY_A CMY_B K_L					CMY K		
HC	0.1	0.1	0.1	0.1	HC	0.01	0.01
HR	0.2	0.2	0.2	0.2	HR	0.02	0.02
SC	0.3	0.3	0.3	0.3	SC	0.03	0.03

Figure 3: Permitted Target value tolerances.

MANDATORY DELIVERABLES

- Live demonstration (via TeamViewer, WebEx, etc.) showing the system's user interface in action
- The calculated values entered in the Answer sheet of the Microsoft Excel test data workbook.

OPTIONAL DELIVERABLES (ADDITIONAL TO MANDATORY DELIVERABLE)

- A demonstration version of the software showing the target values generated live from the test data.

TEST 2: INK ADJUSTMENT VECTORS

For each separate set of sample data, the system must calculate recommended ink adjustment vectors, (if needed), to move the press toward G7 compliance.

If the system believes the press condition represented by a test data set cannot be restored to G7 compliance by simple ink adjustments, the system may, optionally, display some kind of warning to that effect.

Note: All test data sets are designed to avoid ambiguous ink adjustment vectors. There can only be one correct vector for each ink.

MANDATORY DELIVERABLE

- **EITHER** a screenshot showing recommended ink adjustment vectors, e.g. up/down arrows, +/- symbols, etc. for the four (CMYK) inks.
- **OR** numeric indicators entered in the *Answer sheet* of the Microsoft Excel test data workbook, where the value “1” (one) indicates “add ink”, “0” (zero) means “no adjustment needed” and “-1” (minus one) means “subtract ink”.
- Corrections are calculated globally, as a single set of adjustments.

INK CORRECTION VECTORS			
C	M	Y	K
1	0	-1	1

Figure 5: Numeric ink correction vectors in the supplied Excel workbook.

Note: In a production press run, these vectors may be different across the sheet but for testing purposes, only one vector set is required.

OPTIONAL DELIVERABLES (ADDITIONAL TO MANDATORY DELIVERABLE)

- A demonstration version of the software showing the recommended ink adjustment directions and/or warning notices generated live from the test data.

TEST 3: ADS

Applicant must provide an Application Data Sheet describing the steps necessary for an end user to operate the system and successfully replicate the test results.

MANDATORY DELIVERABLE

The submitted ADS must be in Microsoft Word or PDF format using the template provided in the application package.

TEST 4: CONTROL ELEMENT (PRESS BAR)

MANDATORY DELIVERABLE

Applicant must provide an image or digital file of the control element (press control bar or target) in a format that can be opened in Adobe Photoshop, Illustrator, InDesign or Acrobat, and whose pixel values can be examined in the same software.

PART 6: TERMS OF CERTIFICATION

The certification term is permanent, so long as the system does not change in basic functionality or performance.

However as most systems evolve over time, the following provisions are designed to accommodate new versions or updates in a fair and cost-effective way.

SYSTEM UPDATES OR BUG-FIXES

If a new version or update of the system is released whose basic functionality regarding the G7 parameters remain unchanged, no further actions and confirmation tests are needed.

If the system involves significant UI changes regarding the G7 parameters, an up-dated ADS must be provided.

No re-certification fee will be charged.

MAJOR UPGRADES

If a new system version is released whose basic functionality regarding the G7 parameters would alter the certification testing outcome;

- The original test data must re-processed through the new version and results submitted.
- If the system involves significant UI changes regarding the G7 parameters, an up-dated ADS must be provided.

If all elements of the new version pass on first attempt, a re-certification fee equivalent to 50% of a new system certification will be charged.

ADDITION AND REMOVAL

Once the new system and ADS are approved, they will be added to the database along with the older version(s) of the same software.

If new versions or updates are added, the older version(s) will remain on the Idealliance certified systems list indefinitely.