Idealliance® G7® AI Master Calibration System Certification Program

Program Description v1.0

1. Introduction

1.1 Summary

Idealliance® G7® AI Master Calibration System Certification program is designed for digital press manufacturers in fulfilling the need of a totally automated G7 Calibration solution for the printing industry. The recent advancements in artificial intelligence (AI), color measurement device, and cloud-based technology made possible the implementation of achieving the G7 calibrated condition as an integral part of the digital presses with full automation and without human intervention.

Idealliance certified G7 AI Master Calibration Systems require no need of human intervention nor any external tools. These systems are designed to empower the end-users, realize the benefits of G7 Calibration, minimize waste, reduce end-user learning curve and human error. It is performed automatically on the certified digital press systems at the fingertip of the end-user. The system is not only calibrating itself automatically but can also have the ability to monitor the outputs real-time throughout the press run.

The certified G7 AI Master Calibration Systems require only the end-user to initiate the custom calibration process and the press will perform automatically all the necessary tasks to achieve the G7 calibrated state. These automated tasks include press status reporting, parts life status reporting, press maintenance, press calibration, press calibration pass/fail reporting, inline color measurement of the printed G7 calibration targets using an inline spectrophotometer, real-time measurement data analysis, and re-calibration when measurement data is outside of the G7 tolerances, G7 results data generation with time/date stamp and press model and serial number, and the G7 Expert approved submission data of G7 results to the 3rd party laboratory for the G7 Master Facility Qualification. Must be capable of being emailed direct from press to: g7@idealliance.org

1.2 Background

As documented in ANSI/CGATS TR015, an American National Standards Institute Technical Report prepared by the Committee for Graphic Arts Technologies Standards as well is being revised into ISO 12647-2, the methodology for establishing printing aims based on a “shared near-neutral gray-scale” is to adjust the one-dimensional tone reproduction curves of Cyan, Magenta, and Yellow to match the gray balance and lightness of the pre-selected reference

dataset (GRACoL, SWOP, etc.) hence the goal of shared appearance on printed materials is accomplished. This document also stated that there are many different implementation approaches including the utilization of ICC Profiles, ICC Device Link Profiles, etc.

The Idealliance G7 AI Master Calibration System Certification program certifies digital press systems achieving the "shared near-neutral gray-scale" appearance using a fully automated methodology with built-in components of automatic press maintenance, inline color measurement with a spectrophotometer and real-time data analysis of G7 test targets, press re-calibrating if the results from measurement data analysis failed the G7 tolerances, auto-submission of time/date stamped G7 Calibration results to the Idealliance 3rd party laboratory for the G7 Master Facility Qualification, no human intervention, and no external hardware and software tools needed for measurement, analysis, calibration, verification, and submission. These components are an integral part of the digital press system and function automatically when initiated by the end-user. Third-party solutions (software and/or cloud solutions) are not included in this certification program at this time.

The Idealliance G7 AI Master Calibration System certification program utilizes the identical aims and tolerances as that of the latest G7 Master Facility Qualification program therefore, the printed materials produced by a G7 AI Master Calibration System shall have the same shared appearance with materials produced by other G7 AI Master Calibration Systems and/or G7 Master Facilities providing the same reference dataset was used by all. Upon installation of these certified systems in the field, these presses can seamlessly submit the system's G7 results data for G7 Master Facility Qualification.

1.2 CRPC (Characterization Reference Printing Condition)

As stated in ISO/PAS 15339 Part 1, the relationship between CMYK input data and color measured on the printed sheet for a given set of printing conditions is defined as the characterization data. When these datasets are used as a reference, it is referred to as a characterized reference printing condition (CRPC).

ISO/PAS 15339 Part 2 specifies seven (7) CRPCs for six commonly used conventional printing conditions and one large color gamut printing condition for the wide format inkjet printer. The table below listed the CRPC numbers, names, and their typical uses.

CRPC	Name	Typical Use	Common Name
1	Universal ColdsetNews	Small gamut printing (newsprint)	Coldset News
2	Universal HeatsetNews	Moderate gamut printing on improved newsprint type paper	Heatset News
3	Universal PremUncoated	Utility printing on a matt uncoated type paper	GRACoL2013 Uncoated
4	Universal SuperCal	General printing on super-calendared paper	SuperCal
5	Universal PubCoated	Typical publication printing	SWOP2013 Coated #3
6	Universal PremCoated	Large gamut (typically commercial) printing	GRACoL2013 Coated #1
7	Universal Extra Large	Extra large gamut printing processes	Extended Gamut

Additional reference datasets of GRACoL2006 Coated #1, SWOP2006 Coated #3, SWOP2006 Coated #5, SWOP2013 Coated #5, and OEM's custom reference dataset all could be used in this program. However, the OEM is required to obtain approval from Idealliance before submission for using custom reference dataset.

1.3 Certification Category and Designation

Category:

- **Idealliance G7 AI Master Calibration System Certification**

This program offers one category of certification. The digital press system submitted for this program must demonstrate its conformance of printing to one of the seven (7) CRPCs in a fully automated manner without external tools, 3rd party solutions and human intervention.

Designation:

- **Idealliance certified G7 AI Master Calibration System**

This program offers one designation of certification. The digital press system submitted for this program must demonstrate its conformance of printing to the same tolerances of the G7 Master Facility Qualification program at a minimum of the G7 Targeted level. This designation is for all the presses of one particular MODEL. A Model is defined as a unique combination of a digital press, digital front-end (DFE) and other features through an OEMs developed, connected Cloud and operating system/"smart system" (software).
The same digital press equipped with a different DFE and Cloud and operating system is treated as a different Model therefore, the certification would apply individually to the Model based on the DFE, Cloud and OS attached to it, even if the press is the same. If these criteria are different, it would be considered a different MODEL.

2. Program Overview and Conditions

2.1 Overview of the Certification Program

- This program assesses the digital press system's capability of using its automated components together with the inline spectrophotometer, the DFE and OEM Cloud/smart system (software) to produce the G7 calibrated or "shared near-neutral

gray-scale" results based on the predetermined CRPC by evaluating the system's Application Data Sheet (ADS) documentation and the G7 conformance.
*Application Data Sheet – a set of step-by-step procedures for the end-user to follow. Application Data Sheet (ADS) available here.

- The certification is conducted by an Idealliance auditor who is to be on-site at the location determined by the Applicant, digital press OEM.
- The Idealliance auditor shall validate the automated processes and evaluate the ADS in-use by a press operator.
- Any digital press manufacturer can apply and submit for the Idealliance G7 AI Master Calibration System certification program.
- The application is Model (DFE, Cloud, smart system software and press) specific and the certification is valid providing there is no change in the press and DFE.
- The online Application Form should be completed and submitted to Idealliance with fees. Application Form available here.
- Idealliance sends confirmation email to the Applicant.
- All fees are payable irrespective of the certification outcome.
- Idealliance assigns auditor and schedules the date and location of validation and witness sessions with the Applicant.
- Applicants who have achieved successful certification will be provided with a logo and intellectual property rights for usage in their web sites and marketing materials.
- Idealliance maintains a list of certified systems on its official *G7 AI Master Calibration System* web site and will update the site within ten (10) days of successful certification.

2.2A Electronic File Submission

The applicant emails the date/time stamped measurement files in G7 Master Pass/Fail format or CGATS format or Idealliance TC1617 to the email addresses listed below.

- G7@idealliance.org

2.2B Color Measurement Conditions

For the Idealliance G7 AI Master Calibration System, both M0 and M1 color measurement conditions are accepted. It depends on the capability of the press internal color measuring devices. The measurement condition shall be stated clearly on the application forms.

2.3 Colorimetric Calculations and the use of CIEDE2000

CIE XYZ tristimulus values and other colorimetric quantities are calculated according to ISO 13655:2017. Colorimetric tolerances, unless otherwise stated, are based on the CIEDE2000 color difference formula, abbreviated as ΔE00. This weighted color difference equation provides good correlation to perceived color differences and is specified in ISO 13655:2017.

2.4 Related ISO Standards

Color measurement and data analysis will be derived from specifications, either wholly or in part, found in the following standards.

CGATS 21:2013 Graphic Technology – Printing digital data across multiple technologies

ISO 3664:2009 Graphic technology and photography – Viewing conditions

ISO 12642-2:2015 Graphic Technology (IT8.7/4) – Input data for characterization of 4-colour process printing – Part 2: Expanded data set

ISO 12647-7:2016 Graphic Technology – Process control for the production of halftone color separations, proof and production prints – Part 7: Proofing processes working directly from digital data

ISO 13655:2017 Graphic Technology – Spectral measurement and colorimetric computation for graphic arts images

ISO/PAS 15339 Graphic technology — Printing from digital data across multiple technologies:
— Part 1: Principles
— Part 2: Characterized reference printing conditions, CRPC1–CRPC7
*PAS stands for Publicly Available Specification

3. Certification Assessment Procedures

Certification assessment is conducted by an Idealliance on-site auditor validating the automated components and processes and witnessing the effective use of the ADS by an end-user.

3.1 Idealliance Auditor on-site Validation

Idealliance auditor conducts on-site validation of the nine (9) automatic components and processes listed below and documents observations.

1. Real-time reporting:
    - Press operation status
    - Press maintenance status
2. Press maintenance
3. Press calibration
4. Press calibration pass/fail reporting
5. Inline color measurement of the printed G7 test targets using inline spectrophotometer
6. Real-time color measurement data analysis
7. Press re-calibration when measurement data is outside of the G7 tolerances
8. G7 results data generation with time/date stamp and press model and serial number

9. G7 Expert/G7 Professional send approved submission of G7 results data to the Idealliance/3rd party laboratory for G7 Master Facility qualification at: g7@idealliance.org

3.2 Idealliance Auditor ADS Evaluation

After the completion of validation, the on-site Idealliance auditor shall witness the press operator performing the automation using the ADS and document observations. The ADS shall contain the following components:

1. Press model and serial number
2. DFE version and Cloud version
3. Press maintenance procedures
4. Procedure to initial the G7 AI Master Calibration
5. Assessment of G7 results data generated by the system
    - Time/date stamp
    - Press model and serial number
    - DFE version/Cloud Version
    - Spectrophotometer model, serial number, and measurement condition
6. G7 conformance monitoring
7. The procedures are stated clearly and easy to follow
8. Press stops and re-calibrates when G7 conformity was not achieved

4. Tolerances

The G7 Master pass/fail requirements used for the G7 Master Facility qualification program listed below are also used for this program.

Tolerances for Press : NPDC (CMY and K-only scales) and Gray Balance (CMY scale only)

Target	Proof/Press Tolerance
Weighted ΔL^* ($w\Delta L^*$) CMY and K-only scales	Average $w\Delta L^* \leq 1.5$ Maximum $w\Delta L^* \leq 3.0$
Weighted ΔC_h ($w\Delta C_h$) CMY scale	Average $w\Delta C_h \leq 1.5$ Maximum $w\Delta C_h \leq 3.0$

Tolerances for Press: Solids, Overprints & Substrate

Target	Press Tolerance
Substrate	$\Delta E_{00} \leq 3.0$
CMY Solids	$\Delta E_{00} \leq 3.5$
K Solids	$\Delta E_{00} \leq 5.0$
RGB Overprint Solids	$\Delta E_{00} \leq 4.2$

*Substrate tolerance may be updated for relative based reference print condition alignment.

5. Print Facilities Equipped with the Idealliance certified G7 AI Master Calibration Systems

For print facilities equipped with the G7 AI Master Calibration Systems, the System generated electronic files of G7 results data are recognized and accepted by Idealliance as valid submission materials for the G7 Master Facility qualification program. The facility's own G7 Experts/Professional or certified OEM G7 Expert can submit applications by following the G7 Master Facility Qualification submission procedures, rules, and fees.