



G7 Press Control System Application Data Sheet

The Idealliance Print Properties Council has established a certification process for G7 Press Control Systems.

In accordance with this process, the G7 Press Control System Certification Program evaluates the ability of a candidate press control system to drive a press towards ideal G7 conditions, with special focus on the system's ability to:

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

Full details of the G7 Press Control System Certification process are given in the companion document, *G7 Press Control System Certification Process*. At the time of the testing, the manufacturer must supply an Application Data Sheet.

Manufacturer



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Product

IntelliTrax2 Pro / eXact Auto-Scan Pro Software

Configuration

G7 Set Up

This document is not a complete instruction guide for the *X-Rite IntelliTrax2 Pro / eXact Auto-Scan Pro software*. Nor is it intended to explain the G7 Methodology. Prior to using the G7 tools, in production, it is expected that a G7 neutral print density calibration has been performed. Before attempting the G7 set up, it is assumed that the user already has an understanding of and how to use the Editors to create Press definitions, Color Bars and Project Templates. In the sections below we will provide guidance on some of these asset files, but not the detailed step-by-step instructions to create them.

Editors

Launch the Editors to build your Project Template.

Press

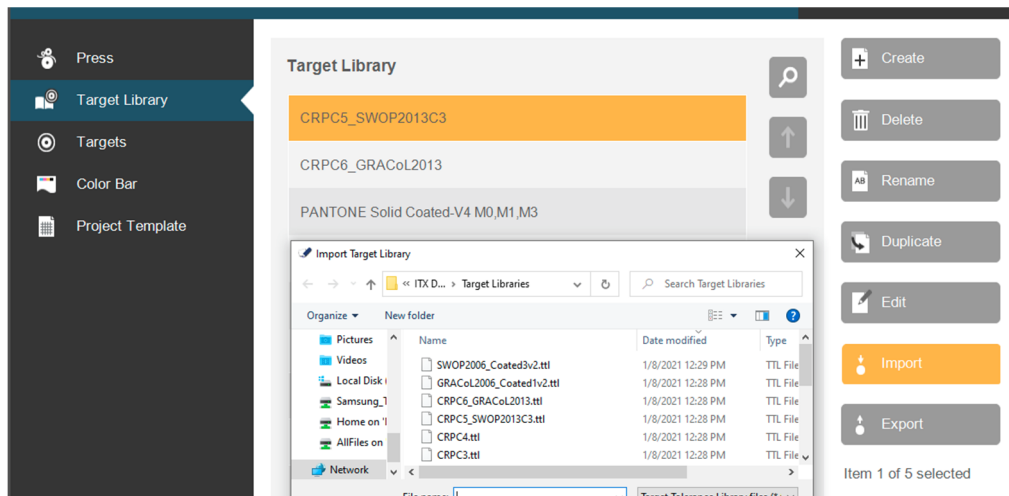
You will use a press configuration that you have previously configured for your press. So there is no need to create a new one for G7 production.

Target Libraries

X-Rite has included several of the current G7 ISO15339 CRPC Target Libraries as well as the legacy SWOP 2006 and GRACoL 2006 with the required color target values, and tolerances.

Users will create Project Templates that will based on these target libraries. During the press run, the targets can be easily switched between using these published target values, or modified SCCA (Substrate Corrected Colorimetric Aims). SCCA provides adjusted CMYK Solid targets, and RGB Overprint targets, based on the white point of the paper that you are actually printing on, rather than the paper defined in the original target data. In many cases, SCCA is the preferred method, however there are times when a Brand may require that production is run to the published target values.

These G7 CRPC Target Libraries can be imported into the Target Library Editor as needed. Click on the Import button, and locate your desired Target Library in: *C:\Program Files (x86)\X-Rite\IntelliTrax\Editor Import Files\Target Libraries*



Targets

The targets are each of the color standards contained in the Target libraries. These do not need to be edited.

Color Bar

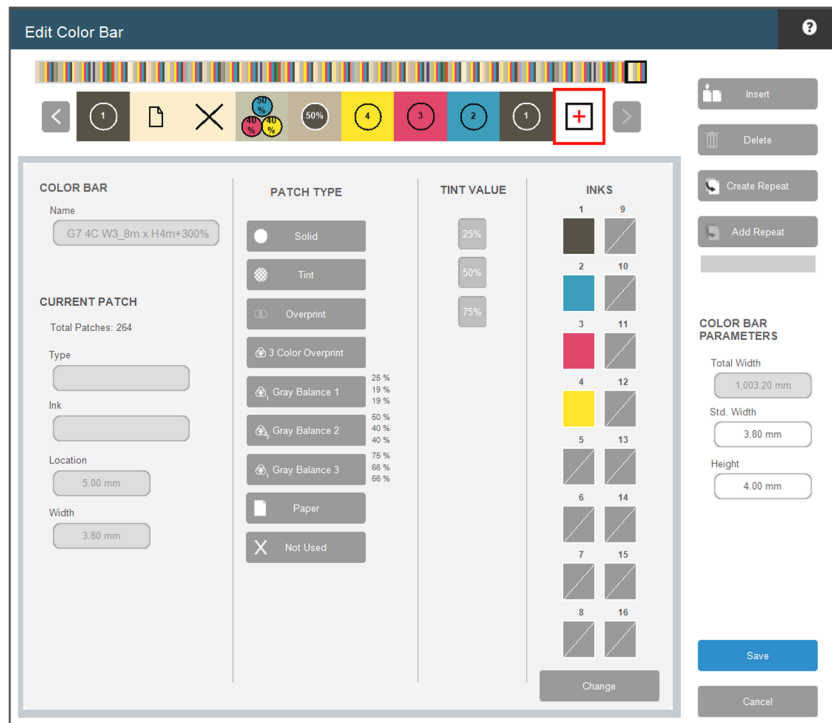
An example color bar .eps file and matching Color Bar definition are included with the software. The XR G7 6C 3.8x4mm.eps file is located in this folder: C:\Program Files (x86)\X-Rite\IntelliTrax\G7 Documentation If this bar works for the intended press and production, it may be used. However, in many cases, users will need to specify a custom bar to fit their specific press and production requirements, or to match an existing bar that is already in use.

To import the XR G7 6C 3.8x4mm color bar definition into the Editor, Select Color Bar, then click Import, then select the file from: C:\Program Files (x86)\X-Rite\IntelliTrax\Editor Import Files\ColorBars

If you choose to create a custom Color Bar, you will need to specify the required patch size and patch order into a Color Bar definition. This color bar must match the patch size and order within your color bar graphic file, used in your plate file.

The minimum supported G7 color bar requires CMYK process solids; K 25, 50 & 75% patches; and the CMY gray balance patches, Highlight Range (HR) 50/40/40, Highlight Contrast (HC) 25/19/19, and Shadow Contrast (SC) 75/66/66. For best press control, we recommend including C, M & Y 50% TVI patches and RGB overprint patches. The minimum supported G7 color bar will provide Static G7 gray balance matching to the published gray balance targets from your selected Characterized Reference Printing Condition (CRPC).

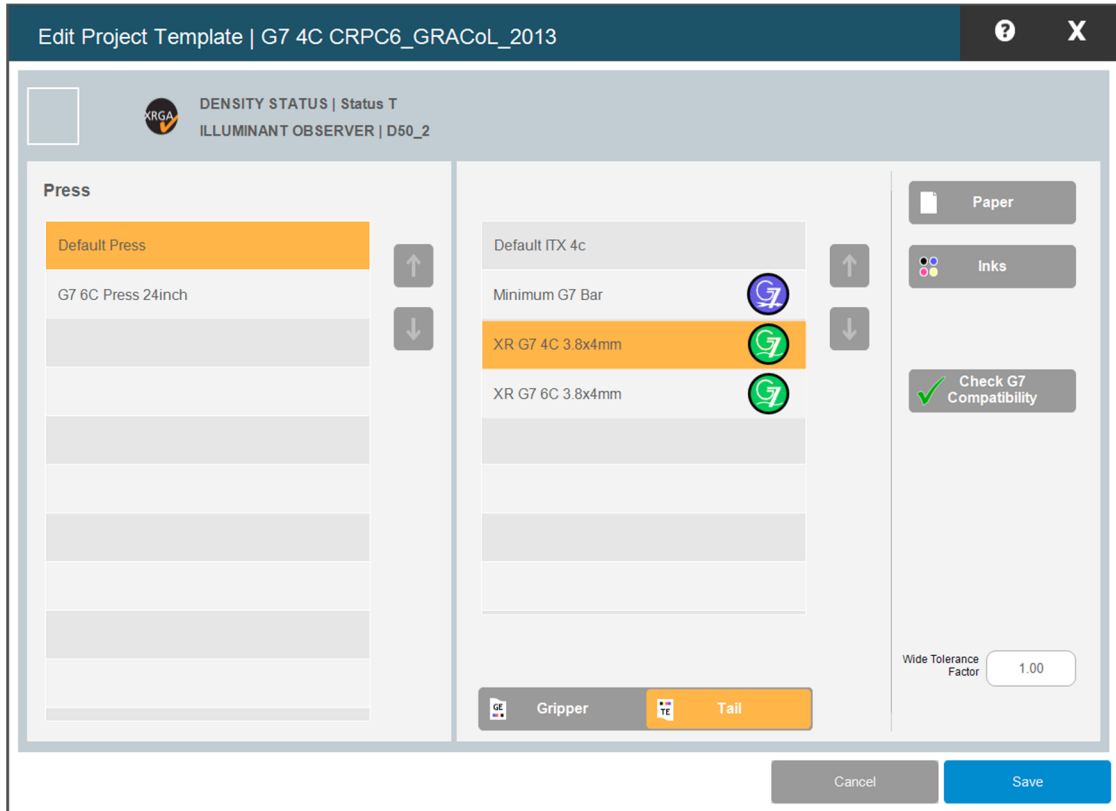
By adding the Substrate patch, and CMY100% patch, preferred Dynamic G7 method will be available. The Dynamic G7 method complies to the intent of the G7 process by adapting the gray balance targets to the paper and inks that you are using.



Project Template

To create a G7 Job Template select the desired predefined Press definition, and the Color Bar definition that matches the color bar on the press sheet. Color Bars with the green G7 icon support Dynamic G7. Those with the blue icon, only support Static G7.

Use the Paper and Inks buttons to load the paper color and CMYK color targets from the desired SWOP2006, GRACoL2006 or ISO15339 CRPC Target Library. Then save this Project Template, to use for production.

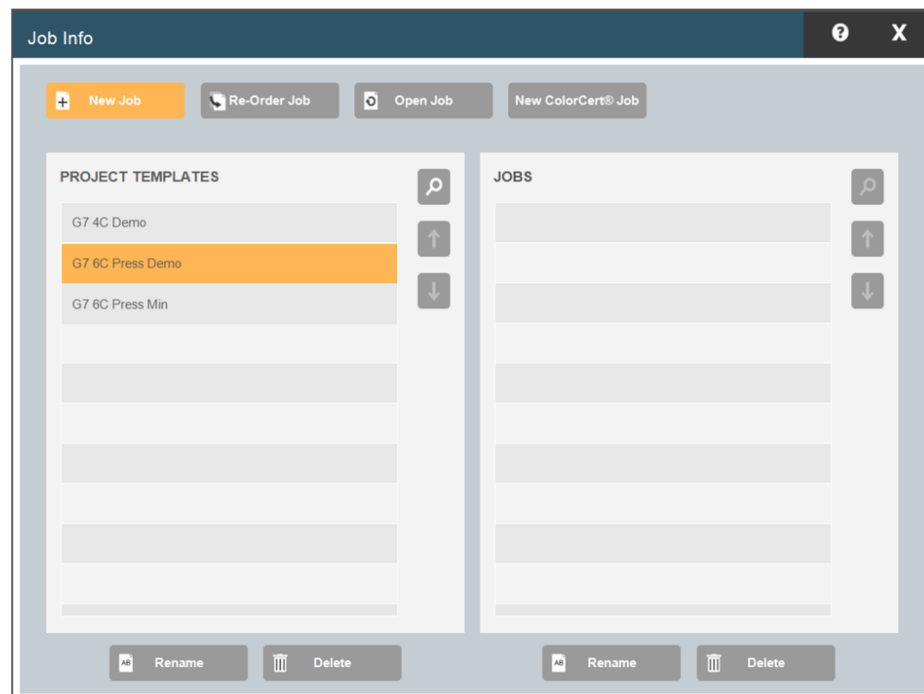


QC in Production

Starting a G7 Job

Running the press to the G7 target values requires that the press condition has been calibrated with G7 Neutral Print Density plate curves, prior to production.

Upon launching the Press tool, the first time a job is run, use the New Job button, and select the desired G7 Project Template. The user selects or creates a Project and Job as they normally would.



When the job opens, if the job includes any spot ink colors, they are added, as they normally are. Then the user performs first press sheet scan.

Select the G7 Options

The G7 targets can be run as they are published, or they can be modified to compensate for the specific paper color that is running. The operator can switch between Static or Dynamic G7 for the gray balance targets. The operator can also choose to enable or disable SCCA for the ink solids and overprints. *As stated earlier, if printing for a brand color quality program, make sure that you confirm what methods comply with their requirements.*

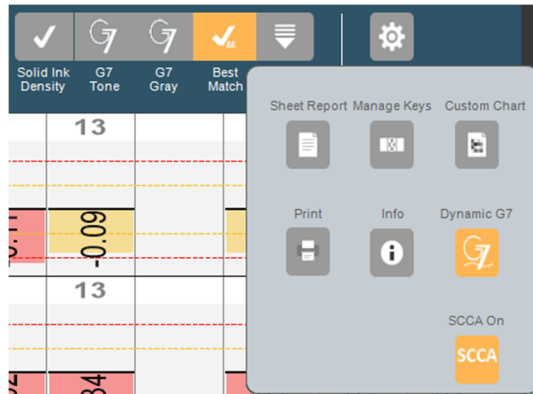
Static G7 – uses the gray balance L*a*b* target values from the published standard.

Dynamic G7 – adjusts the gray balance targets for the measured press sheet, compensating for the actual white point of the paper/substrate and the 300% CMY patch and represents the full intent of the G7 methodology.

SCCA (Substrate Corrected Colorimetric Aims) – When enabled, it adjusts the CMYK Solid and RGB Overprint L*a*b* target values compensating for the actual white point of the paper/substrate being used, versus the original CRPC target value. This also moves the paper

target value to the actual paper that is currently on press.

Select these methods under the Options button. Both features will be enabled, by default, if the selected color bar will support them.



Adjusting CMYK Inks

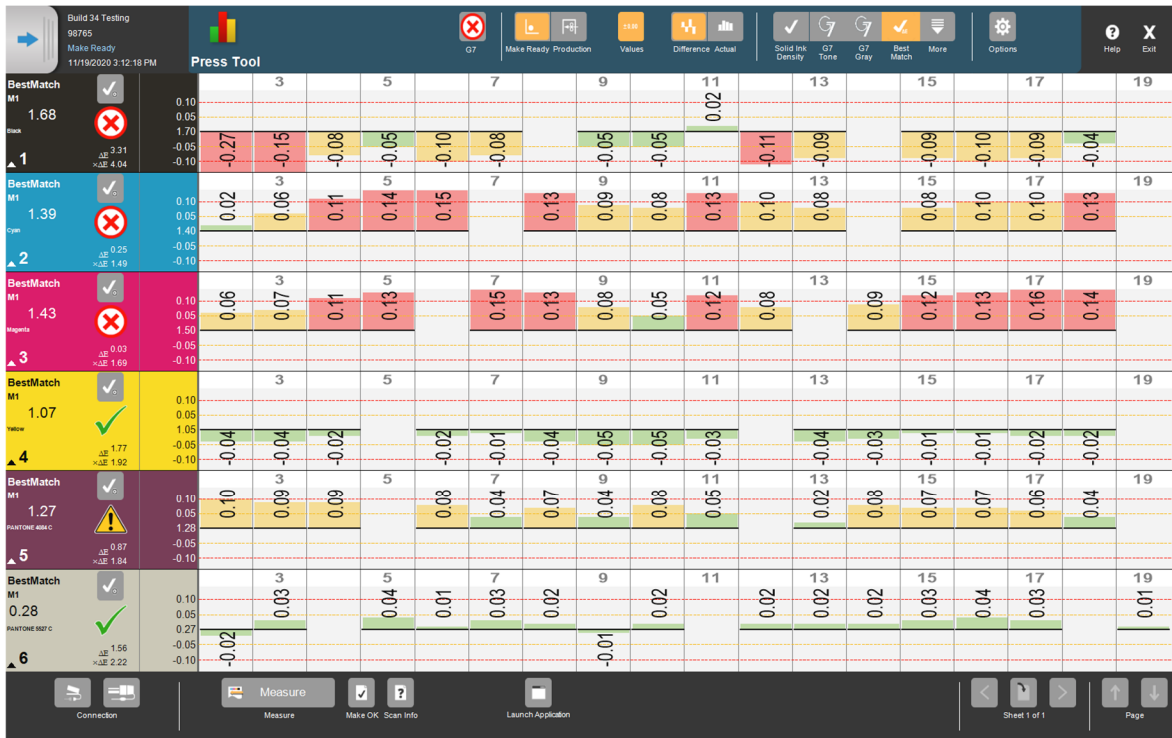
Modern print standards do not include density values. Instead, they use L*a*b* values. The best tool to start making density adjustments is **BestMatch**. This tool guides the press operator to adjust their ink film thickness to achieve the closest L*a*b* match, with the inks and paper that are being used.

Then the **G7 Gray** balance and tonality results help the operator to determine how to further adjust their ink film thickness or deal with other factors, that impact dot gain, to improve gray balance compliance.

The **G7 tonality** of the three CMY grey balance patches and the three K tint patches tells the operator if the tint values are overall too light or too dark. This can be due to dot gain issues on the press due to a variety of things like blanket conditions, or chemistry.

The following are the detailed steps in this process.

BestMatch Tool

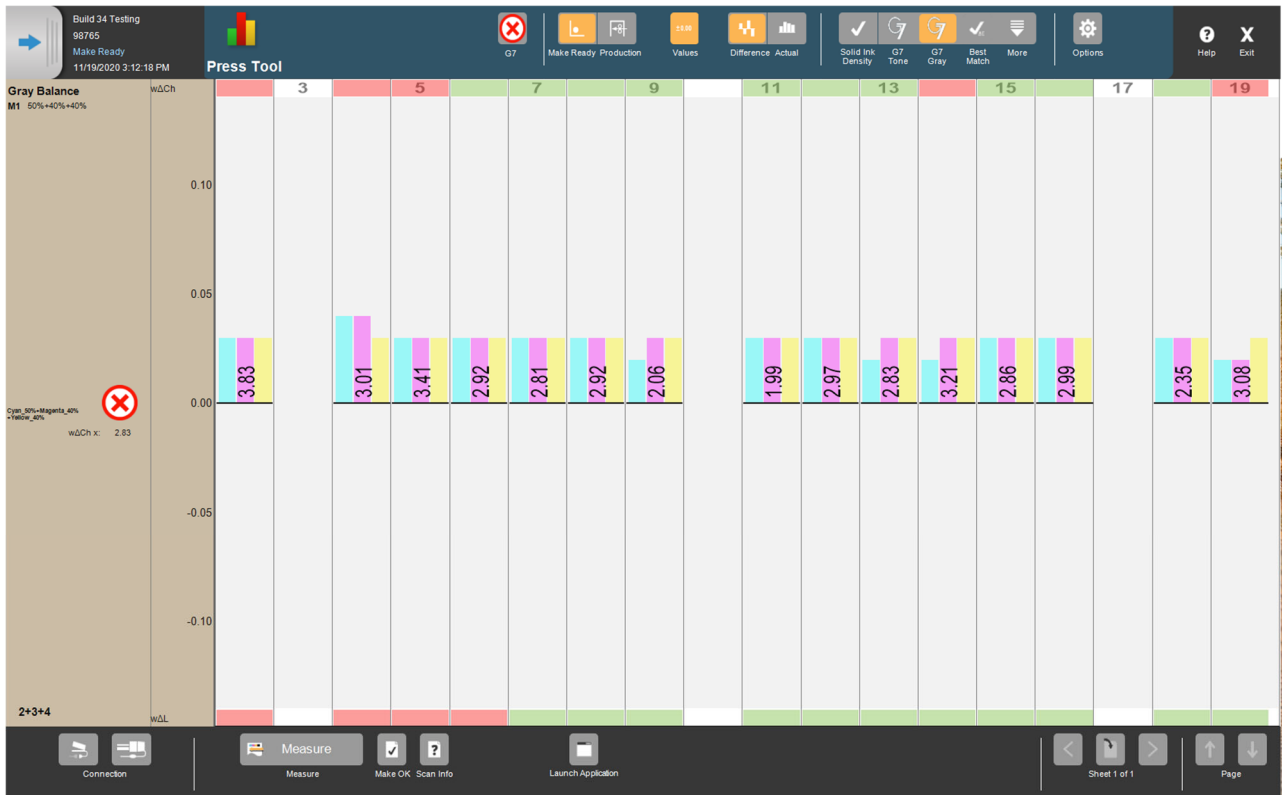


The values for any patches that were printed, in each zone, are displayed with a graphic demonstrating the density. Most users will select the *Difference* button to show how much too high, or to low the measured values is, compared with density that is predicted to achieve the best possible match to the $L^*a^*b^*$ color target. If the *Values* button is enabled, then the density error value is displayed numerically.

Density tolerances are set, by default, to traditional tolerance levels, and do not necessarily correspond with colorimetric tolerancing. Smaller bars that are green are within 0.05 to the density of the BestMatch. The bars that are in yellow within 0.10 to this density, and red bars indicate greater than 0.10 difference. (These density differences are common traditional best practice, but they do not necessarily indicate if the color is in or out of colorimetric tolerance. The user can confirm the colorimetric tolerance for each ink key, by selecting the ΔE window view, under the *More* pulldown list)

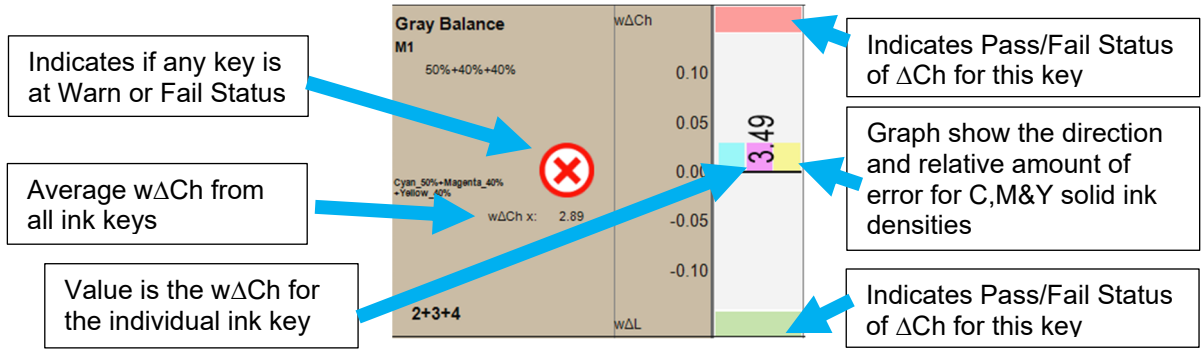
Note that if the predicted ΔE is still out of the desired tolerance, then this ink/paper combination is not capable of hitting the target. This may be due to ink contamination or using the wrong ink.

G7 Grey



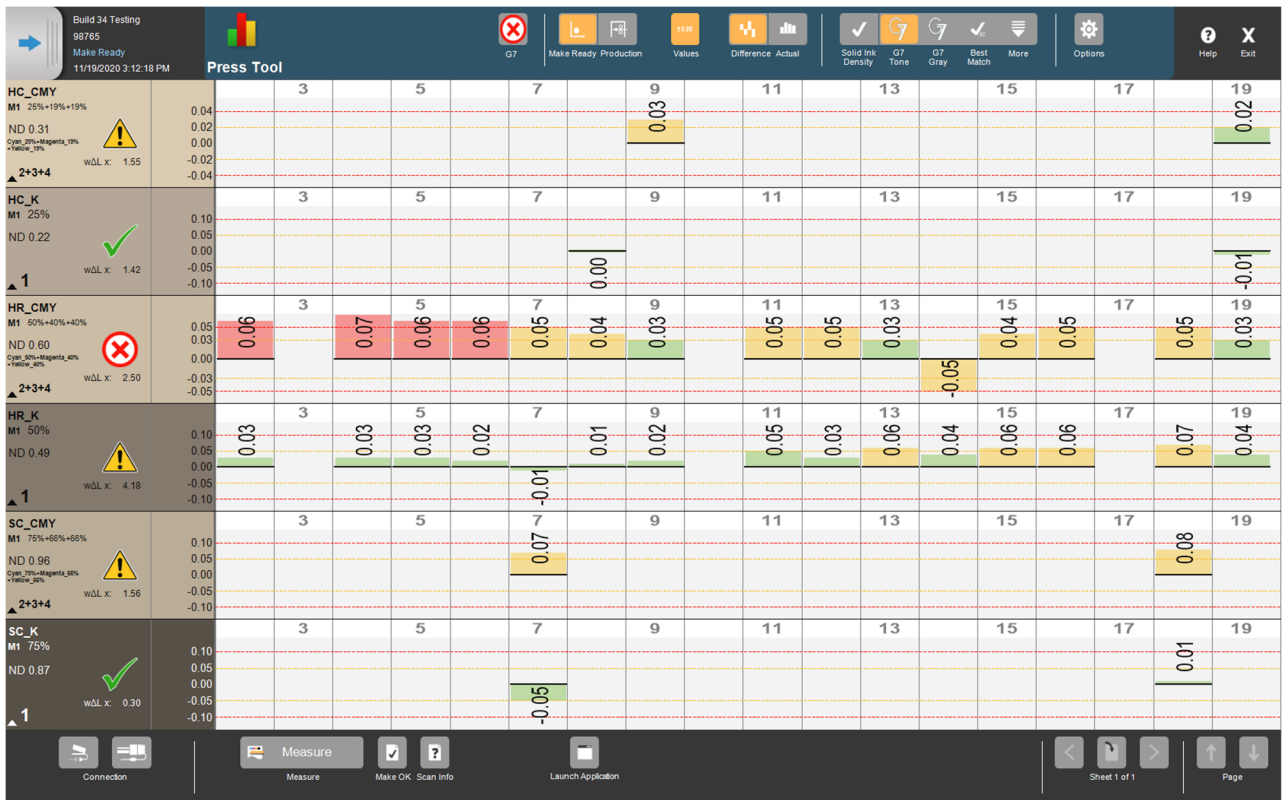
This window shows the grey balance of CMY HR 50, 40, 40 patch to evaluate for further fine tuning of the solid ink densities. The goal is to make small moves in the solid ink densities to get these bar graphs as close as possible to 0.00, while still keeping the graphs in the BestMatch window in tolerance. This will work to meet both G7 Tone and G7 Gray Balance requirements. In G7 Static mode, these target values do not change. In G7 Dynamic mode these target values will update with each measured sheet to compensate for the current sheet white point.

- The bars represent the direction and relative amount of the error for the C,M and Y solid ink densities that needs to be corrected to achieve the HR grey balance and tone.
- The numeric values displayed, in each zone, represent the $w\Delta Ch$ of the CMY_HR patch. ($w\Delta Ch$ is a measure of the neutrality of the color without regard to the lightness, of the grey patch)
- The red and green indicators at the top of the screen represent which zones are in or out of tolerance for grey balance $w\Delta Ch$.
- The red and green indicators at the bottom of the screen indicate what zones are in or out of grey tone $w\Delta L$ tolerance. ($w\Delta L$ considers the lightness of the gray patch, with no regard to the color)
- Clicking on the standard information box, in the left column will expand the view to display the HC and SC patches to confirm that they are also in tolerance.



This example shows that some of the keys are beyond the 3 ΔCh tolerance. The key shown is at 3.49. The bars show that all three inks are running at densities that are too high, and the yellow density needs the greatest reduction.

G7 Tone



While the G7 tonality pass/fail status is shown on the G7 Gray screen, it can be assessed in more detail in the G7 Tone screen.

Highlight Range (HR) is the most important tonality control point to watch. These patches are HR_K 50, and HR_CMY 50, 40, 40. After you have achieved good values in the HR patches, further assessment of the linearity of the press condition can be done with the Highlight and Shadow Contrast patches. The Highlight Contrast (HC) patches, HC_K 25 and HC_CMY 25, 19, 19; and the Shadow Contrast (SC) patches, SC_K 75 and SC_CMY 25, 19, 19.

G7 Report

Press Tool

G7
 Make Ready
 Production
 Values
 Difference
 Actual
 Solid Ink Density
 G7 Tone
 G7 Gray
 Best Match
 More
 Options

When all G7 metrics are in compliance, the G7 report button will show a green checkmark. When this button is clicked, a G7 Report will display.

G7 Summary X

✓ G7 Targeted Dynamic G7: On
✓ G7 Grayscale SCCA: On

Job Name: 0108246
Run Data: 1/8/2021 2:46:18 PM
Tols.: G7 Qualification
Color Target: CRPC6_GRACoL2013

Summary
Details

P/F	Measured Values					Reference Values				
	L*	a*	b*	ΔE00	Tols.	L*	a*	b*		
✓	Cyan	54.54	-35.97	-50.99	1.58	3.50	54.00	-36.29	-46.43	
✓	Magenta	46.41	75.64	-2.43	1.01	3.50	46.30	71.38	-2.73	
✓	Yellow	88.20	-7.58	93.89	2.02	3.50	85.90	-5.09	90.38	
✓	Black	17.97	1.68	3.32	4.03	5.00	16.00	0.00	0.00	
✓	Red	46.04	68.90	44.98	1.84	4.20	45.34	64.64	45.74	
✓	Green	49.00	-70.68	26.76	1.90	4.20	48.23	-63.74	25.66	
✓	Blue	22.12	22.19	-46.37	2.13	4.20	24.35	18.54	-42.79	
✓	White	91.70	-0.34	-1.75	0.00	3.00	91.70	-0.34	-1.75	
P/F	L*	a*	b*	wΔL	wΔCh	Tols.	L*	a*	b*	
✓	K 25%	76.24	-0.25	-1.41	1.42		3.00	74.82	-3.37	0.00
✓	CMY(HC)	73.90	-0.97	-1.88	1.10	0.91	3.00	72.79	-0.26	-1.31
✓	K 50%	56.22	-0.14	-0.84	1.69		3.00	57.91	0.46	-2.59
✓	CMY(HR)	54.96	-2.45	-1.99	0.21	2.54	3.00	55.18	-0.17	-0.87
✓	K 75%	39.90	0.23	-0.03	0.35		3.00	39.34	0.21	-1.49
✓	CMY(SC)	36.85	-1.58	-0.19	0.49	0.95	3.00	37.64	-0.09	-0.44
✓	CMY 100%	21.52	-0.72	-2.80	Informative		Informative			
P/F				Avg	Tols.	Max	Tols.			
✓	CMY wΔL			0.60	1.50	1.10	3.00			
✓	CMY wΔCh			1.47	1.50	2.54	3.00			
✓	K wΔL			0.58	1.50	1.69	3.00			

CMY Deviation

Solid Inks and Overprints ΔE2000

Close
Print
Print Label

G7 Pass/Fail Status

There are two possible levels of compliance that are tested. *G7 Grayscale* is the minimum G7 compliance, and it demonstrates that all of the grey patches are within tolerance for the tonality and neutrality of the neutral print targets. *G7 Targeted* compliance is achieved when the CMYK and RGB overprints are also within tolerance of a published a ISO15339_CRPC, GRACoL2006, SWOP2006, or a Substrate Corrected Colorimetric Aims (SCCA) version of one of those reference print conditions. A green check indicates that the G7 level has been demonstrated. A red "X" indicates that the level was not achieved. The G7 Targeted cannot be achieved unless the grayscale is also in compliance.

IntelliTrax2 Pro / eXact Auto-Scan Pro Software

Idealliance Press Control System ADS

Gray Balance CMY a* / b* Graph

The red line represents the a* values of the paper and grey balance patches. The blue line represents the b* values of those same patches. On the left side of this graph, the a*, b* values are those of the paper. In theory, a perfectly controlled press condition would result in a* and b* values, from left to right, progressively moving closer to the "0" line. Finishing up on the right side with a*=0 and b*=0. In the real world there will be some variation, but the shape of these lines should generally move in that direction.

TVI Curves

G7 does not specify targets for TVI, however the TVI curves can be used to troubleshoot print issues. These TVI curves are based on the industry standard Status-T Murray-Davies method. The spread value represents the difference between the cyan, magenta and yellow measured tone values at the 50% tint.

CMY wΔCh Graph

The lower the value for ΔCh, the more neutral it is. In a perfectly calibrated press, will theoretically have a perfect straight line showing the ΔCh is 0 at all of the gray balance patches. The red tolerance lines represent 3.0 ΔCh. Any value beyond this will fail to comply to G7.

CMY wΔL and K wΔL Graph

The wΔL values are plotted for the CMY gray patches and the K patches. The ideal graph would show all of these values plotted on the zero line. The tolerance for the maximum wΔL value is 3.0, represented by the red lines in this graph.

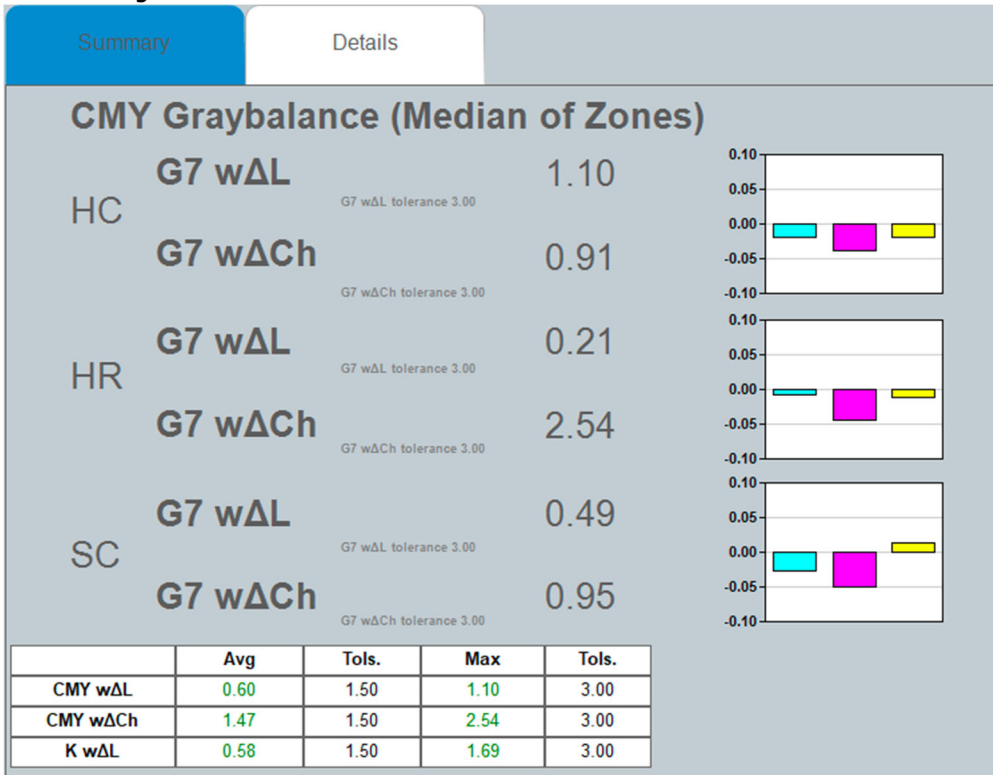
Solid Inks and Overprints Graph

The solid inks and overprints are plotted, along with any measure tint values to demonstrate the colors of the inks. The ellipses represent the tolerance around the target solid ink or overprint. If the end points of any of the plotted lines is outside of the ellipse then the job will fail G7. This can be used to help an experienced operator make decisions on adjusting ink density to compensate for overprint values, while still maintaining primary ink tolerances.

CMY Deviation

This graph plots the a*,b* location of the CMY grey patches. The closer these are to the center, the more neutral the print will appear.

Summary Tab



This provides the minimum requirements for achieving G7 Greyscale compliance. The HC, HR and SC sections show the median value for all of measured ΔL values and ΔCh values across all of the ink keys for HC, HR, and SC.

The graphs show the relative balance of the inks for each of those metrics. These bars represent the amount of adjustment of the ink solids is required to correct the gray balance at that point.

The table at the bottom, shows the Average and Maximum values, compared to the tolerances, to assess G7 gray balance compliance. These values only include the values in the color bar, so this will be different than those from a P2P target, which includes more samples for grey steps.

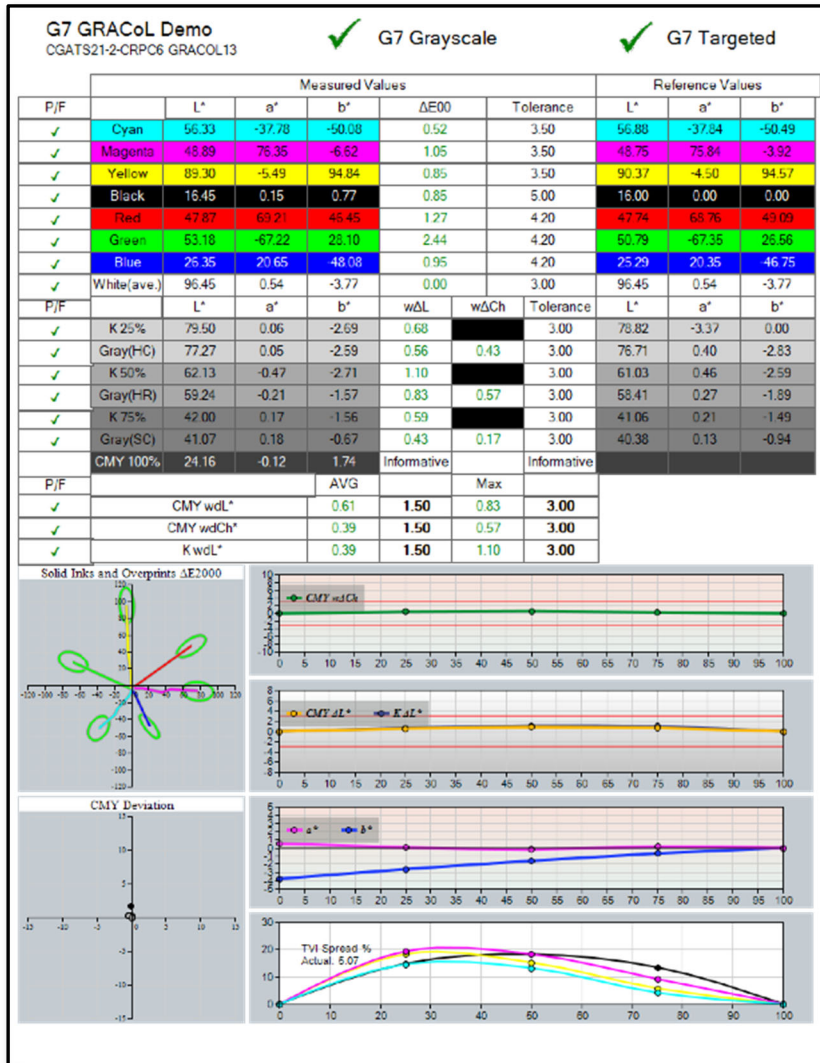
Details Tab

Summary		Details								
		Measured Values					Reference Values			
P/F		L*	a*	b*	ΔE_{00}	Tols.	L*	a*	b*	
✓	Cyan	54.54	-35.97	-50.99	1.58	3.50	54.00	-36.29	-46.43	
✓	Magenta	46.41	75.64	-2.43	1.01	3.50	46.30	71.38	-2.73	
✓	Yellow	88.20	-7.58	93.89	2.02	3.50	85.90	-5.09	90.38	
✓	Black	17.97	1.68	3.32	4.03	5.00	16.00	0.00	0.00	
✓	Red	46.04	68.90	44.98	1.84	4.20	45.34	64.64	45.74	
✓	Green	49.00	-70.68	26.76	1.90	4.20	48.23	-63.74	25.66	
✓	Blue	22.12	22.19	-46.37	2.13	4.20	24.35	18.54	-42.79	
✓	White	91.70	-0.34	-1.75	0.00	3.00	91.70	-0.34	-1.75	
P/F		L*	a*	b*	w ΔL	w ΔCh	Tols.	L*	a*	b*
✓	K 25%	76.24	-0.25	-1.41	1.42		3.00	74.82	-3.37	0.00
✓	CMY(HC)	73.90	-0.97	-1.88	1.10	0.91	3.00	72.79	-0.26	-1.31
✓	K 50%	56.22	-0.14	-0.84	1.69		3.00	57.91	0.46	-2.59
✓	CMY(HR)	54.96	-2.45	-1.99	0.21	2.54	3.00	55.18	-0.17	-0.87
✓	K 75%	39.90	0.23	-0.03	0.35		3.00	39.34	0.21	-1.49
✓	CMY(SC)	36.85	-1.58	-0.19	0.49	0.95	3.00	37.64	-0.09	-0.44
	CMY 100%	21.52	-0.72	-2.80	Informative		Informative			
P/F		Avg		Tols.	Max	Tols.				
✓	CMY w ΔL	0.60		1.50	1.10	3.00				
✓	CMY w ΔCh	1.47		1.50	2.54	3.00				
✓	K w ΔL	0.58		1.50	1.69	3.00				

This tab provides full information on all of the metrics for G7 Targeted compliance. Reference values will change to match the selected Static/Dynamic G7 and/or SCCA settings. The measured values are derived from the median values, across all ink keys, for each metric, so these will be different than measurements from a P2P target.

Print

The Print button will create a detailed report



Print Label

The print Label button will generate a simple label from a label printer in a 2 x 4 inch format.

✓ Substrate	0.00		Job Name: G7 GRACoL Demo
✓ CMY Primaries Max	2.09		Run Date: 12/15/2020 9:13:30 AM
✓ RGB Primaries Max	2.03		✓ G7 Targeted
✓ K	1.91		✓ G7 Grayscale
			Dynamic G7: On
			SCCA: On
	Avg	Max	
✓ CMYw L	0.26	0.35	
✓ CMYw Ch	1.19	2.36	
✓ Kw L	0.31	0.96	

Appendix A:

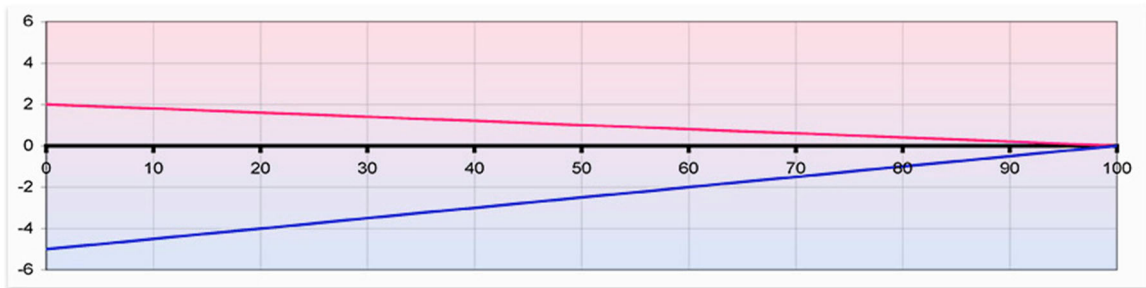
Appendix A: G7 Gray Balance

G7 Gray Balance formulae used in validating system are given in the document “CGATS TR015”, available free at www.idealliance.org. Note that TR015 contains two versions of gray balance formula. The formulae used for the G7 Press Control System Certification program are as follows: G7 defines gray balance as a function of substrate color (a^* , b^*) and Cyan percentage (C%) where the “wanted” a^* and b^* values for each gray scale step reduce towards zero in inverse proportion to C% according to the formulae;

$$a^*_{\text{wanted}} = a^*_{\text{substrate}} \times (100 - C\%) / 100;$$

$$b^*_{\text{wanted}} = b^*_{\text{substrate}} \times (100 - C\%) / 100;$$

Ideal G7 gray balance can be expressed graphically as two straight lines, one for a^*_{wanted} (shown in pink in the graph below) and one for b^*_{wanted} (blue), where both lines begin at the substrate a^* and b^* values when C=0, and terminate at zero a^* and b^* when C=100.



G7 gray balance graphs of a^* (pink) and b^* (blue) on substrate of $a^* = 2$, $b^* = -5$

Appendix B:

Appendix B: G7 NPDC (tonality) formulae

G7 NPDC formulae used in validating system are given in the document “TR015”, available free at www.idealliance.org.

Validating NPDC (CMY and K scales)

To validate NPDC correction, both the K-only scale and the CMY-only scale shall be measured with a densitometer or spectrophotometer and the relative neutral density (ND) values (measured in the “K” or “Visual” channel) shall be recorded for each patch. To obtain relative ND values, either the measuring device shall be zeroed on the substrate, or the white patch neutral density value shall be subtracted from itself and all other patches.

The (relative) ND values shall be converted to (relative) L^* by the standard CIE formula.

The Delta L^* (ΔL^*) error shall be computed for each patch compared to target values using the formula below.

Formulae

*Converting ND to L^**

$$Y = 1/10^{ND}$$

If: $Y > (6/29)^3$

$$L^* = 116 \times Y^{1/3} - 16$$

Else:

$$L^* = 116 \times (841/108 \times Y + 4/29) - 16$$

Calculating Delta L^ (ΔL^*)*

$$\Delta L^* = (L^*_{\text{sample}} - L^*_{\text{target}})$$