



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-pointes” for tonality (expressed in CIE L* or neutral density) and gray balance (expressed in CIE 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

MeasureColor

Testing procedure

MeasureColor system preparations

MeasureColor is a versatile system that can be used to measure and optimize print quality for any printing technology and printing condition. In order to measure a production job according to G7 specifications, a small number of preparations need to be made to the system configuration. After these one-time settings are complete, they can be used again on future G7 jobs easily.

Create a 'Tolerance set' that includes the G7 scoring rule

Go to MeasureColor's System Management, navigate to Conditions: Tolerance Sets' and create a Tolerance set that includes the G7 scoring rule. Set other rules like Solid delta-E, Substrate delta-E and overprint delta-E if you wish to check against G7 Targeted specification (preferred).

Import a CRPC or measured fingerprint as 'color reference'

In MeasureColor, open the 'Reference Manager' module and (if needed) import your color targets. You could either use one of the standardized CRPCs or measured fingerprint (ICC profiles preferred). By importing an ICC profile, MeasureColor generates an extended set of target color patches that are used to measure your print job against during production.

Create a 'color bar specification' for your color bar

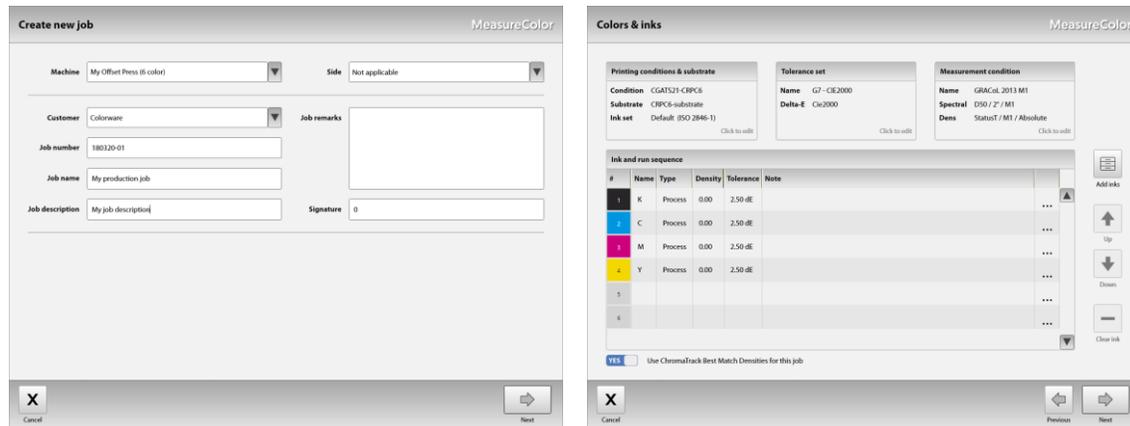
MeasureColor lets you use your own (existing) color bar. For G7, the color bar needs to include these key G7 attributes at minimum: Process solids and Substrate atches, a CMY100 patch, and a mid tone gray balance patch (HR: 50/40/40). For process control and quality analysis purposes it is advised to add 2-color overprint patches, tint patches and additional gray balance patches for high light (HC: 25/19/19) and shadow (SC: 75/66/66).

Note: MeasureColor can measure ink-zone based color bars or typical QA color bars without ink zones. The decision is up to the user.

Creating your MeasureColor job with G7 support

Setting up a job is a straight forward routine now that the preparations are done. In MeasureColor, open the 'ProcessControl' module. A job list is shown. Select a client folder and press the 'Create job' button to start the job setup procedure.

On the first screen, fill out the fields like machine, customer, job number, job name and description. Items like Printing side, Remarks and Signature are not mandatory.



Create new job

Machine: My Offset Press (6 color) | Side: Not applicable

Customer: Colorware | Job remarks: [Text Area]

Job number: 180120-01

Job name: My production job

Job description: My job description | Signature: 0

Colors & Inks

Printing conditions & substrate
 Condition: CGA321-C9PC6
 Substrate: C9PC6-substrate
 Ink set: Default (ISO 2846-1)

Tolerance set
 Name: G7-CE2000
 Delta-E: Cie2000

Measurement condition
 Name: GRACol_2013_M1
 Spectral: D50 / 2° / M1
 Dens: Status7 / M1 / Absolute

#	Name	Type	Density	Tolerance	Note
K		Process	0.00	2.50 ΔE	
C		Process	0.00	2.50 ΔE	
M		Process	0.00	2.50 ΔE	
Y		Process	0.00	2.50 ΔE	
S					
6					

Use ChromaTrack Best Match Densities for this job

Press 'Next' and you will be taken to the 'Job Presets' section. A Job Preset is a template that will speed up job setup and eliminate user errors. For the sake of this demonstration, we will setup the job manually to detail the required steps. Press 'Next' to continue.

The 'Colors & Inks' screen is where we setup all important color related details. First, we choose a 'Printing Condition' and a substrate. This will limit the amount of available inks later and avoid choosing uncoated color targets when we are actually printing on coated stock. Next, we choose a 'Tolerance Set' to use for this job. Select a tolerance set that includes the G7 scoring rule (see preparations above). Last but not least, select a 'Measurement Condition' to specify how we measure and calculate colors during production.

Now it is time to add your inks. Choose your inks from the library and put them in the correct printing unit. Note that only compatible inks will be shown, based on the Printing Condition and Measurement Condition chosen in the previous step. When done, press 'Next' to continue.

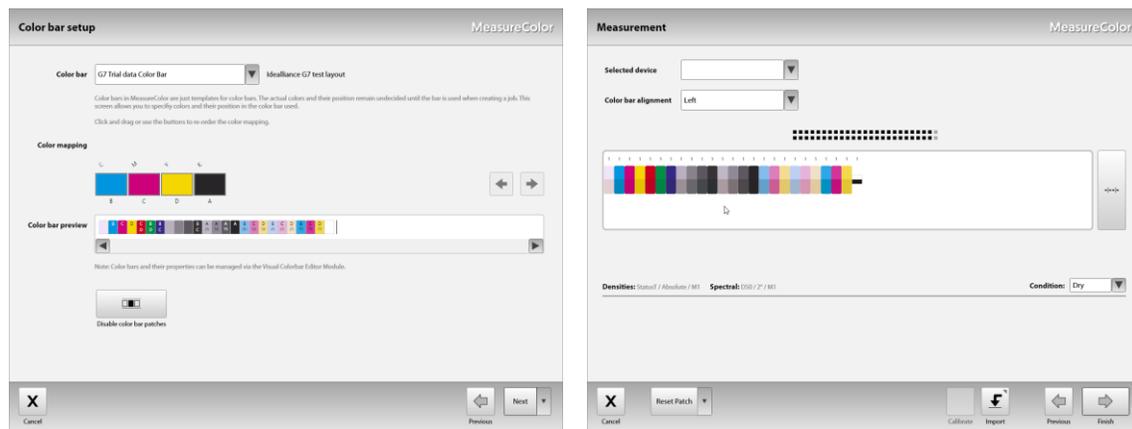
Now that we have setup the inks for each printing unit, it is time to select the color bar to use.

In the 'Color Bar Setup' view, select the colorbar from the drop-down menu and select the G7 compliant color bar that you have designed during the system preparations.

Check if the color mapping is set correctly (the sequence of the colors shown on screen are the same as the sequence of the colors shown of the printed sample). If needed, change the mapping to match your colorbar output.

You can now choose to save your job or continue to measure the color bar.

For this demonstration, we'll continue and measure the color bar.



When done, press 'Finish' to save the job and show the results of the first measurement.

Note: for this demonstration we generated a generic color bar based on the patch layout of the received Idealliance test data. Instead of measuring a color bar with a measurement device, we imported the measurement data after tweaking it to make it compliant with MeasureColor's import filters.

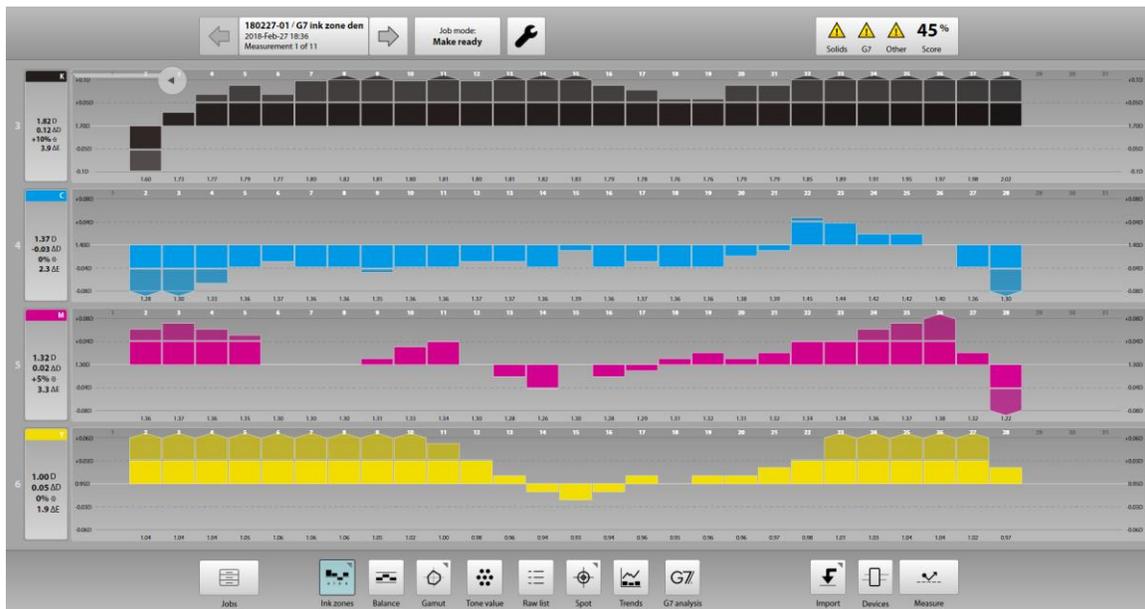
Note: during actual production situations, jobs are often prepared using job presets or the automated job setup routines in MeasureColor. Operators typically only need to open an existing job and start measuring.

Analyzing G7 (targeted) results using MeasureColor in Production

MeasureColor enables different analysis tools for the operator and quality manager depending on the color bar used. Please note that MeasureColor performs at its best when the press has been properly calibrated to G7 NPDC beforehand.

TOOLS FOR THE PRESS OPERATOR

Ink zone overview (solid inks)



If an ink-zone based color bar is used, the operator is shown how each individual ink key measures against the standard of the Solid color. The white line in the center is the 'target' for the operator. The bars show the status of each key, being too low or too high in ink film thickness. Target densities can be set manually, or you can use MeasureColor's ChromaTrack best match technology to keep an eye on the best possible target target densities (preferred).

Note: if no individual ink zones are measured, the default landing view 'Gamut view' is shown.

Gray balance overview



When an ink zone color bar is used, the operator can analyze Gray Balance (HR) and tonality (HR) for CMY and K at a glance. The top two bar graphs clearly show the tonality of the HR patches measured (too high, too low). Please note that the graphs are calculated dynamically based on the actual G7 NPDC target for this measurement.

The graph on the bottom shows the HR Balance, indicated using C/M/Y bars. The aim is the white line in the center, the graph shows the deviation to a perfect G7 gray balance. The C/M/Y corrections are calculated live by MeasureColor's GrayFinder technology which uses spectral/colorimetric analysis of the gray balance patch and displays a correction advise in dot size (%).

The operator first corrects their ink film thickness to match the desired solid ink colors as best possible. When running a proper ink film thickness (the same as during the G7 calibration) the Gray balance analysis will show informative results that the operator can decide when and how to correct their ink film thickness or influence their dot gain a bit to improve gray balance results.

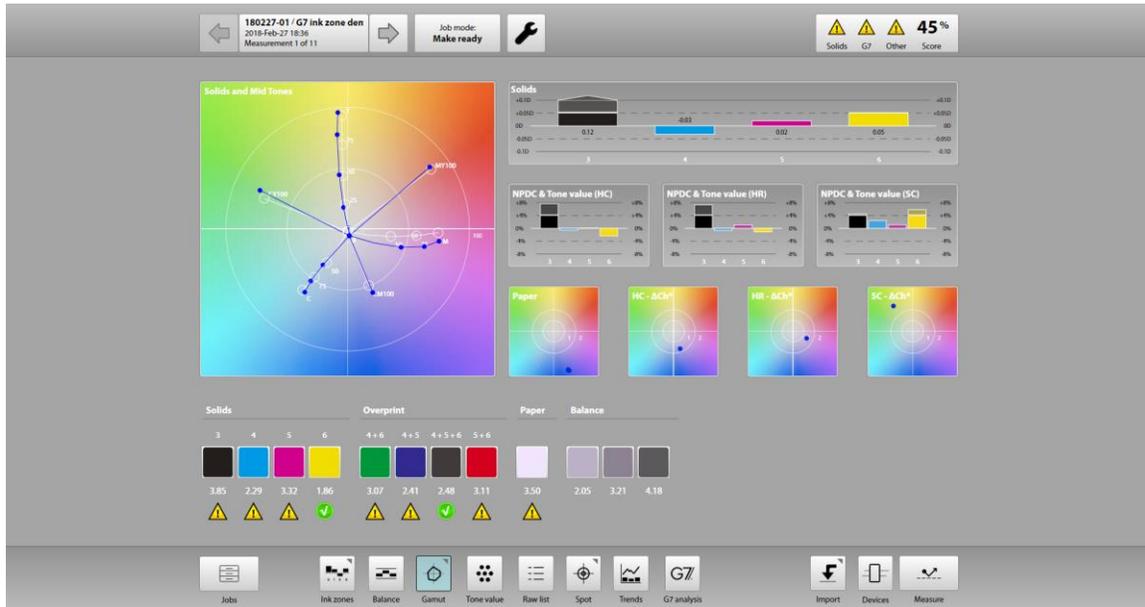
G7 pass/fail



To quickly see if the measurement passes G7 NPDC specifications, check the Score indicator on the top right of the screen. A warning sign means the measurement does not comply to G7 NPDC. Click on the score indicator itself to open a more detailed view of what is out of spec.

TOOLS FOR THE ADVANCED PRESS OPERATOR / QUALITY MANAGER

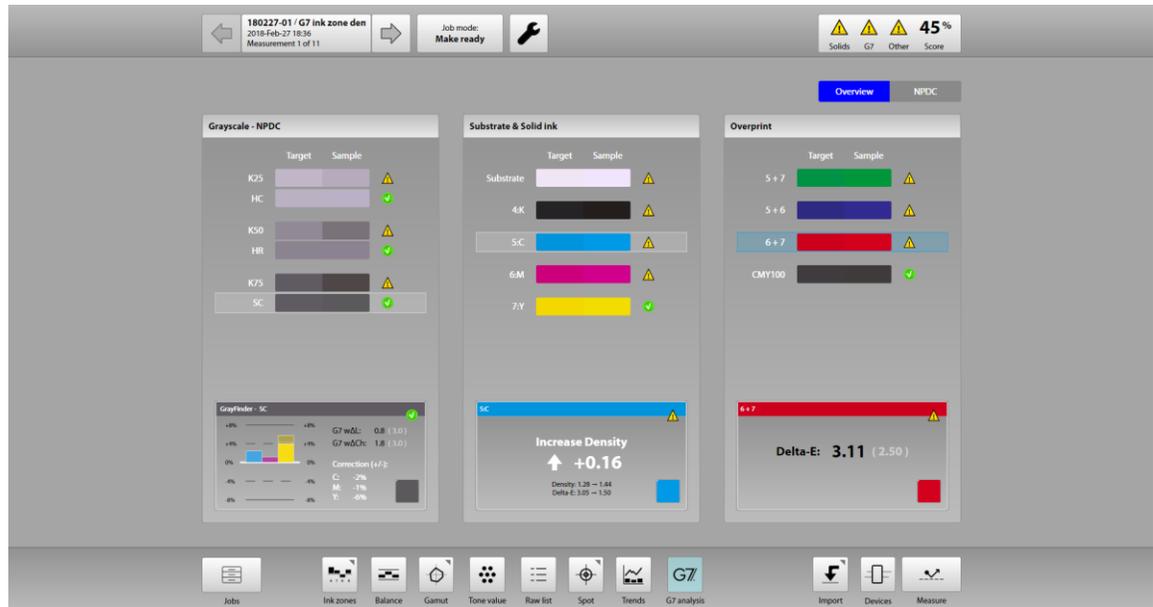
Gamut view



The Gamut view shows an overview of all the metrics including color gamut (CIE-ab diagram) Solid ink film thickness, tonality (both G7 NPDC and TVI for spot color if applicable), gray balance and substrate color cast and delta-Es for each metric. The Gamut view is aimed to be used by experienced operators and quality managers.

G7 analysis view

G7 analysis view: overview tab



The overview shows NPDC, solid ink & substrate, and overprint details. Users can click on each item to see its quality analysis below. For the measured NPDC patches (K and CMY) the difference to the calculated G7 NPDC target is displayed in % dot size.

The Solids section (G7 targeted) shows pass/fail indicators per ink. Click on each item to display the correction advise for the solids.

The Overprint section shows the measured overprint patches and their pass/fail indicators (if applicable). Click on each item to display delta-E.

G7 analysis view

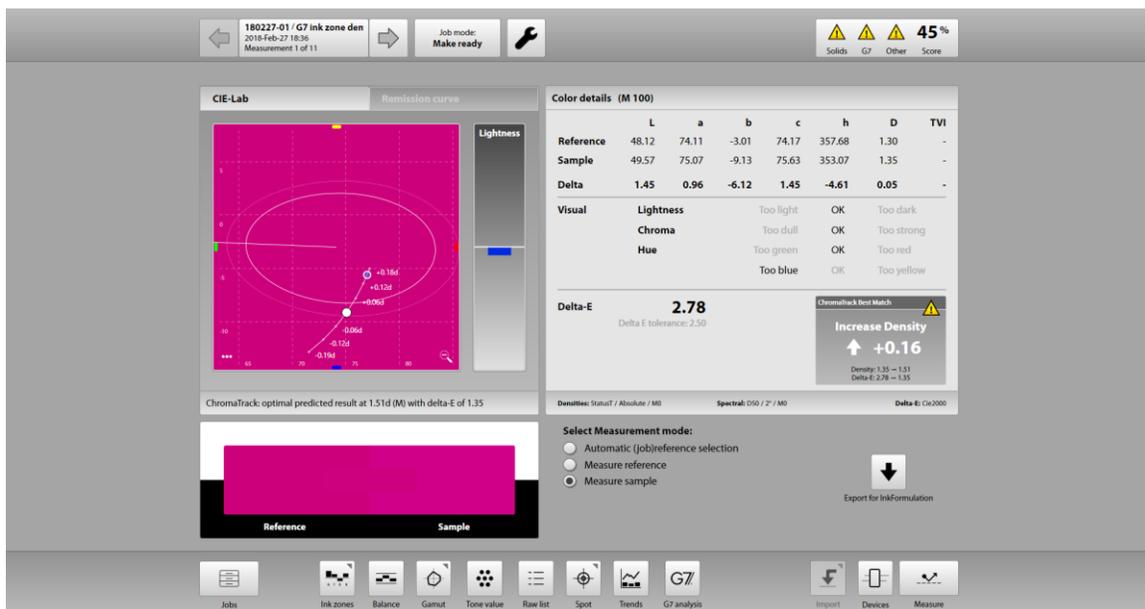
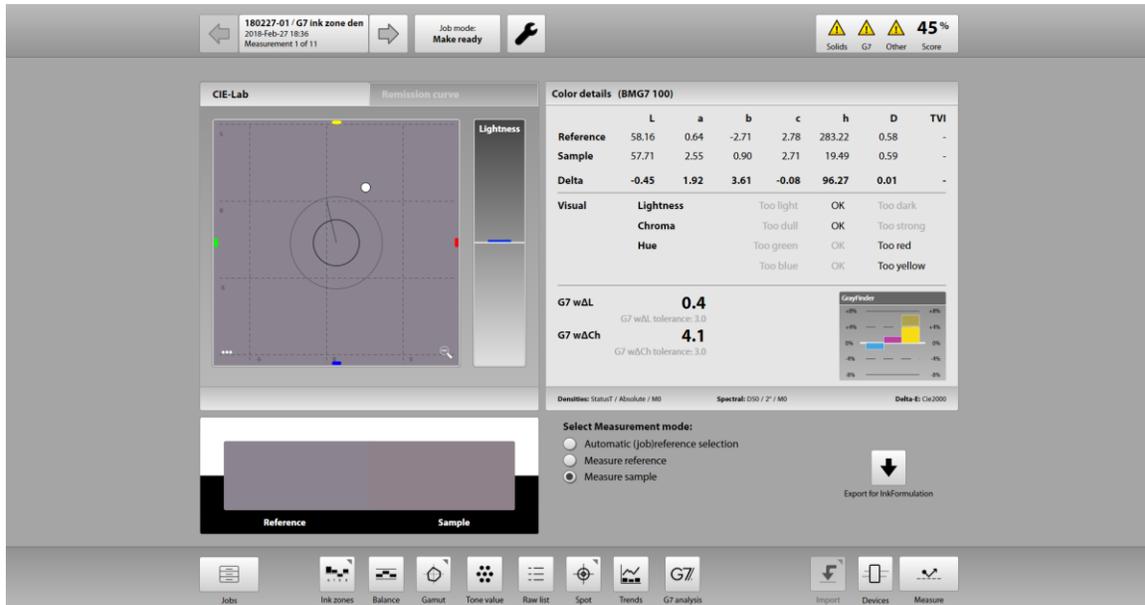
G7 analysis view: NPDC tab



The NPDC tab displays the actual G7 NPDC (target and measured) for K and CMY and also includes the graphs for weighted delta-L and weighted delta-Ch. It also shows average and peak deviations based on the job's tolerance set.

For clarity and ease of use, MeasureColor does not show a CIE-ab graph to display the color cast of the CMY patches but uses the easy to understand bullseye graphs to indicate color drift. The center of the graphs are the G7 NPDC neutral gray targets, the blue dot shows the deviation to the target.

Spot detail view



The Spot detail view zooms in on the details of any single measured patch. The view shows all colorimetric details like the ChromaTrack best match (solids), calculated deltas including G7 weighted delta-L and weighted delta-Ch if applicable. The Spot view also includes MeasureColor's GrayFinder to indicate the state of the printed gray balance.

Note: For NPDC related patches, all CIE-Lab targets and Densities are calculated dynamically based on the job's Densitometric settings Solid Black ink, CMY overprint and the measured substrate white.

Appendix A:

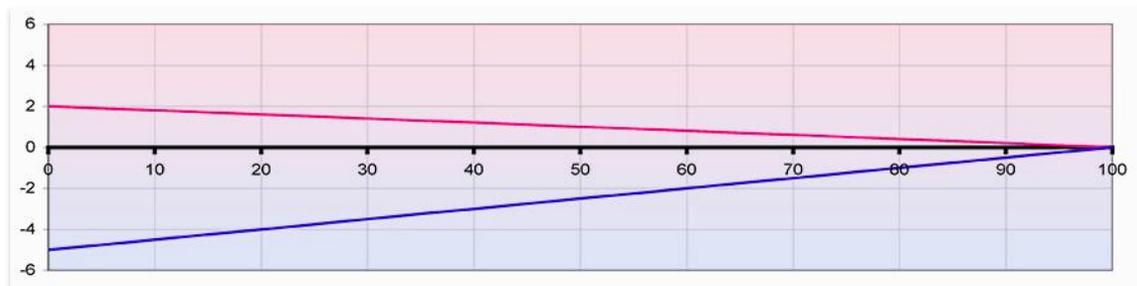
Appendix A: G7 Gray Balance

G7 Gray Balance formulae used in validating system are given in the document “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^*)

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