DTone G7

Process Control System

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 meet 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*.

This document constitutes the ADS (Application Data Sheet) required by the certification process.

Manufacturer

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Product Name:

DTone G7 Process Control System with DTone 1 Software

Overview

The DTone system consists of a unique process control strip, or press bar, that can be evaluated both visually and by instrumentation, and an automated software required for G7 Press Control System certification called DTone 1.

Process Control Strip (Press Bar)

The DTone G7 control strip is a revolutionary patented tool for controlling gray balance and tonality in a G7-calibrated printing process. The DTone Control Strip can also be used for non-G7 printing, with appropriate metrics and operating instructions.

DTone G7 Control Strip contents:

- Eight (8) patches of (100%) C, M, Y, K, R (M+Y), G (C+Y), B (C+M), C+M+Y

- Three (3) patches of 50c, 50m, 50y

- Multiple patches of G7 Neutral Gray; HR_cmy (50c, 40m, 40y), SC_cmy (75c, 66m, 66y), HC_cmy (25c, 19m, 19y)

- Multiple patches of G7 Black Tint; HR_k (50k), SC_k (75k), HC_k (25k)

- One "Paper White" patch (0c, 0m, 0y, 0k)

Unique Design Principle:

The DTone G7 Control Strip consists of large unbroken sections of alternating HR_k and HR_cmy patches, with only a small number of conventional solid ink patches. This unique design principle makes it the first press control strip to make judging gray balance and tonality by eye (visually) a practical alternative to traditional instrument-based measurement. Both instrumentation and visual judgment can be used together for best results.

Patch Layout:

The control strip can be created with a variety of different patch sizes or shapes. A typical design is shown here:

Patch design and placement may be altered to suit the needs of different measuring equipment or work content. For example, if important color imagery is located only on the left of the sheet, the solid ink patches would most logically be placed on the left.

Press Control DTone 1 Software Procedures

Step 1: Software Settings

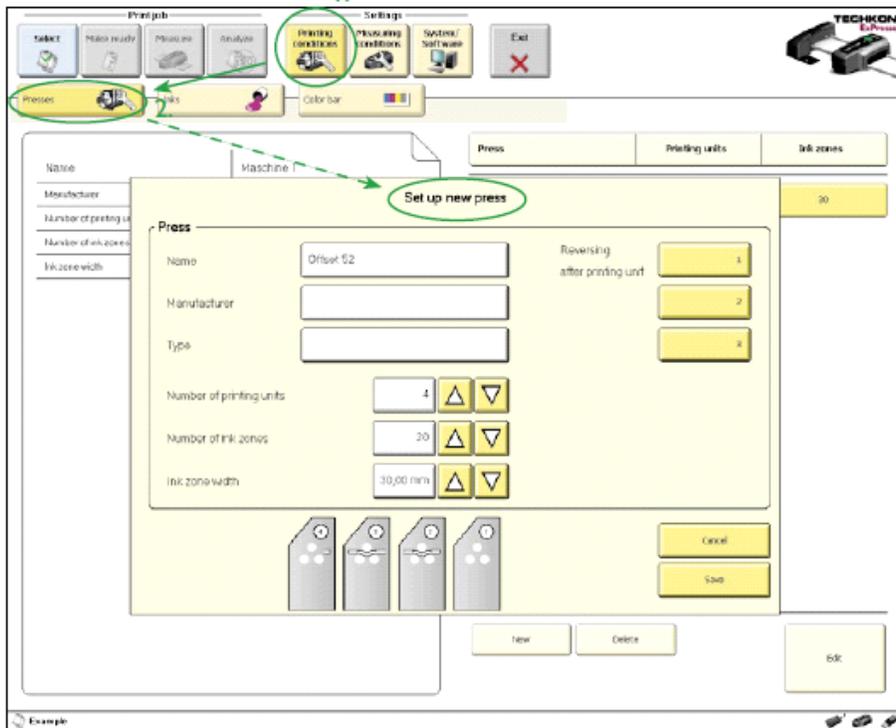The following screen (Figure 1) shows the set-up of a new printing press:

Figure 1: Setting for New Printing Press

All settings which were made, can later be recalled when defining a "Print job", where the screen will appear in blue color.

The following settings can be made:

Printing conditions - Presses

- Name: textbox to define a name of the printing press
- Manufacturer: textbox (not mandatory)
- Type: textbox (not mandatory)

- Number of printing units: 1-6 for ExPresso Basic, 1-16 for ExPresso Pro

- Ink zone width in mm

- Reversing unit if the printing press has a reversing unit, the location can be set

Printing conditions - Inks

The list of inks included in the database is displayed. As the buttons in the lower right corner indicate, new colors can be defined or imported and colors can be duplicated and deleted.

Printing conditions - Color bar

DTone 5040 G7 control strip is available here.

Step 2: Measuring Conditions

Measuring conditions - Target values / Tolerances

A list of data sets for target values and tolerances will be displayed. It is based on ISO 12647 color values for CMYK. Individual target and tolerance settings can be made as well.

Measuring conditions - Measurement devices

The measurement devices which can be connected to the DTone 1 software are shown. The "SpectroDrive simulator" is a virtual measurement device which can be used for tests and demonstrations when no real hardware device is connected. The "SpectroDrive simulator" will also be used when no hardware protection key (dongle) is connected and the software runs in demo mode. After selecting SpectroDrive from the list, the available settings are shown in Figure 2.
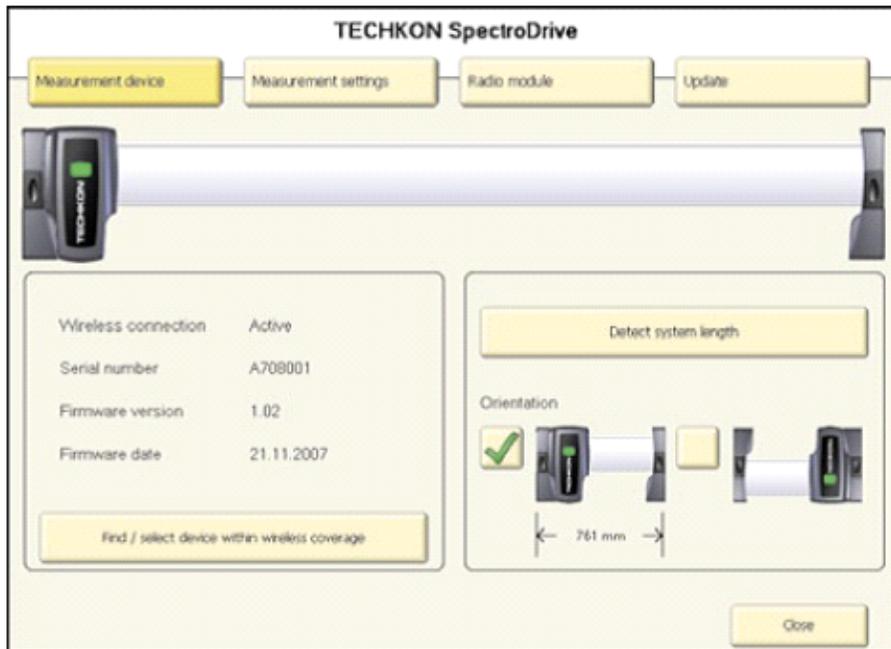

Figure 2: Hardware Selection

Step 2:   Defining and running a Print job

Before running a print job, certain selections have to be made. Everything related with a **Print job** is indicated by the **blue** screen color.

DTone 1 has an "Autosave" function. Every Print job will be saved automatically. This applies also for Print jobs which are not completed and will be resumed later.
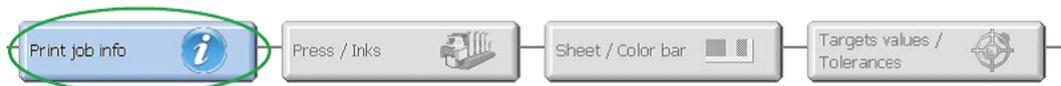
Selecting a Print job

The list contains Print jobs which have been made. A Print job can be resumed by selecting it. If a new Print job to be made resembles a job which is already in the list, it can be duplicated.

Preparing a Print job

Certain selections have to be made, before the measurements can be started.

Make ready - Print job info

Textual information about the Print job can be edited. The text entered in "Print job name" will be the title of the data set, which will be automatically saved by DTone 1. It can be selected from the "Print job - Select" menu. During measurements it will be shown in the lower left section of the status bar.

Make ready - Press / Inks

The press to be used is selected and the printing units are filled with ink. A inking unit can be kept empty as well; for example if a 6-color press is used only for CMYK-print, the last two printing units can be kept empty.

Make ready - Sheet / Color bar

The DTone G7 Control Strip which is printed on the sheet to be measured has to be selected.

By pressing on "Scan color bar length" SpectroDrive will make an automatic test scan and will detect the length of the color bar. As a default, the color bar will be centrally aligned. Additionally there can be defined in which ink zone the first measurement should start. The connection between the color bar and the ink zones of the printing press is also shown graphically.

## *Make ready - Target values / Tolerances*
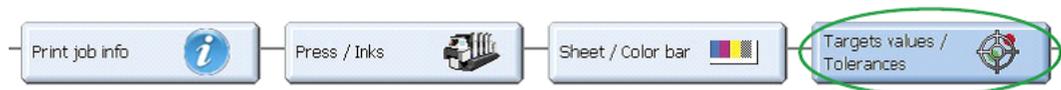
As the printing units have been filled with ink, now they are assigned with target and tolerance values; preferable tolerance sets according to the printing standard ISO 12647. Also, individual tolerances can be edited by pressing the Edit"-buttons and entering the desired values.

Measuring a Print job
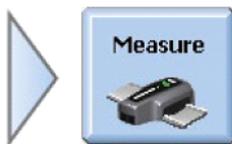
This screen will display all relevant information after a scan measurement. The scan measurement can be started by pressing the green measurement button on the device or on the screen.

Measure - Density
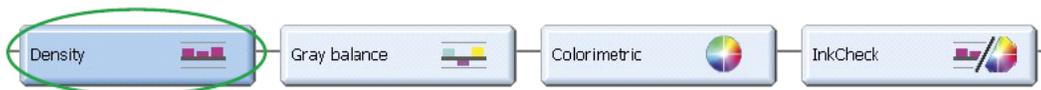
Measure - Ink Key Detail Information

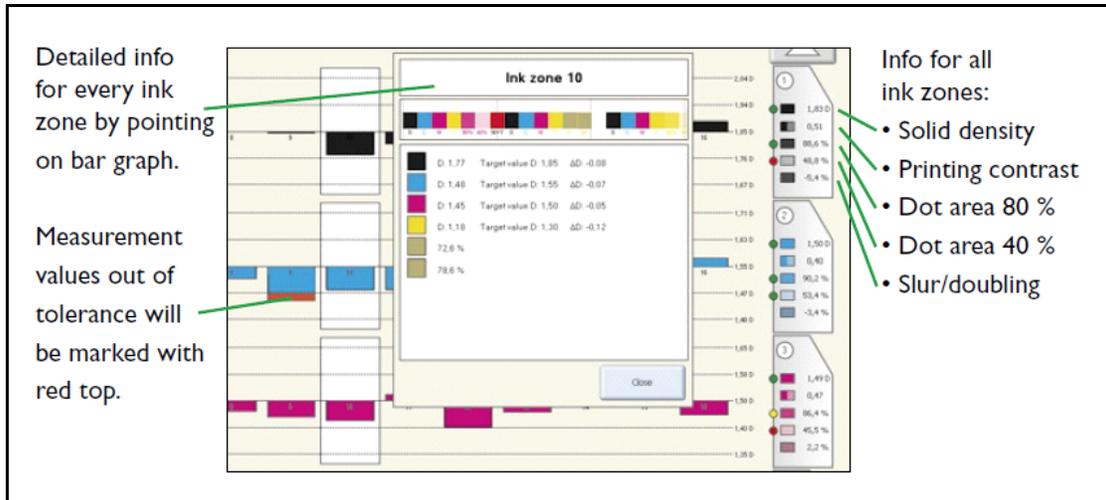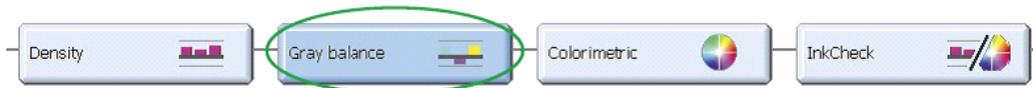Ink key detail information as shown in Figure 3.

Figure 3: Detail Information for every ink key

Measure - Gray balance (densitometric)

The color bars DTone G7 control strip include a gray balance patch compliant with ISO 12647 in every ink zone. The Gray balance display will show densitometric Gray balance values for CMY in a bar graph. At a glance there can be diagnosed if the overprint of CMY is a neutral gray or if it has a color cast.

Step 3: Setup View for non G7 compliance and G7 compliance files

Setting for G7 compliance job

For G7 compliance job, please choose with the checkbox for fixing the targets or dynamic targets. The dynamic target calculation is only possible if the color bar has a CMY 100% patch integrated. Figure 4 demonstrates the setting to compliance G7.
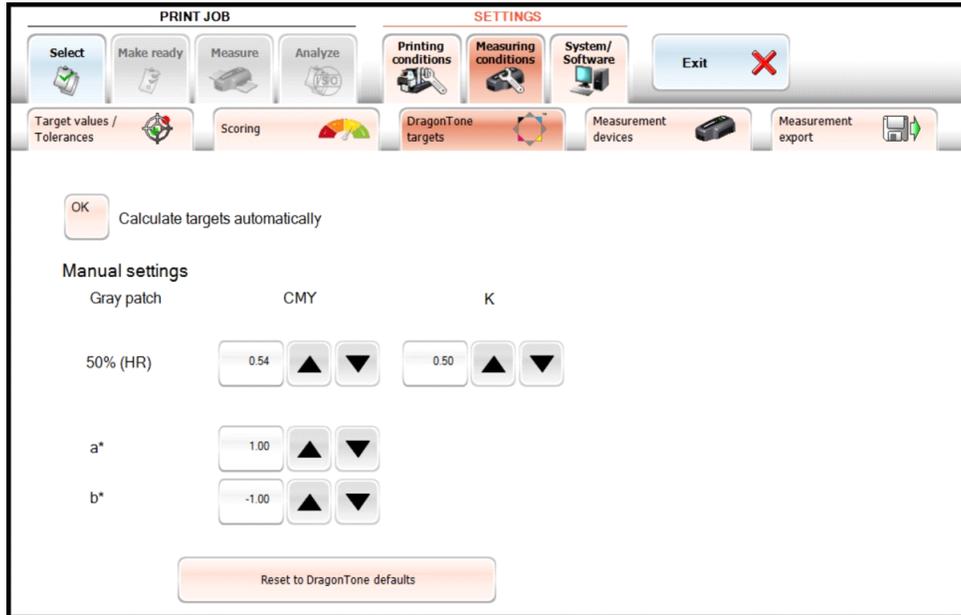
Figure 4: Setting for G7 compliance job

Manual setting for non G7 compliance job

The setup has required the input value of a* and b* target, also the target HR values for none G7 compliance job. Figure 5 demonstrates the manual setting.
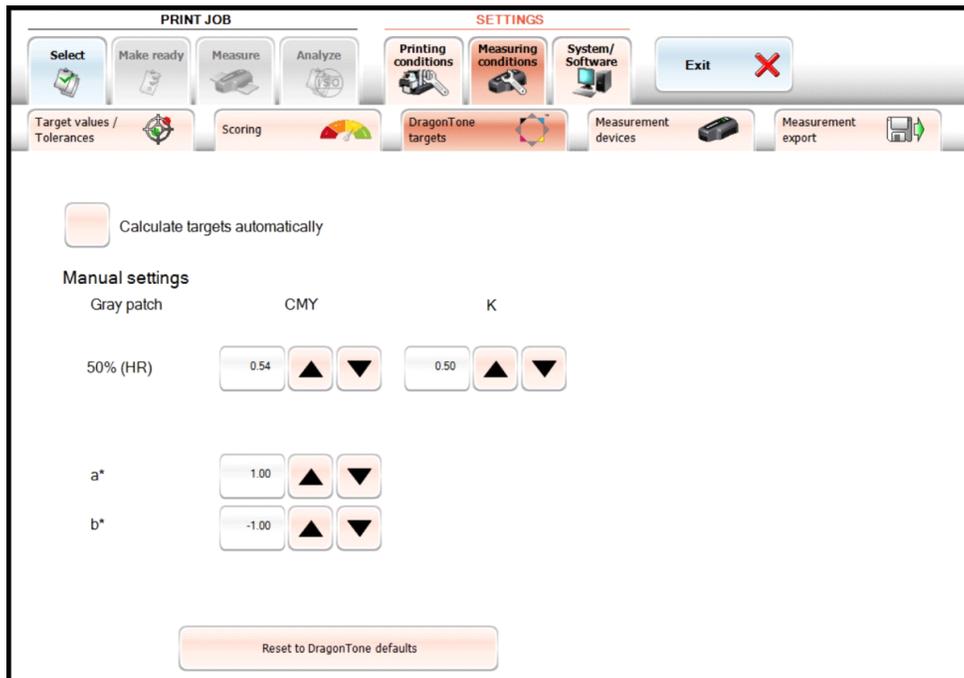

Figure 5: Manual setting for non G7 compliance job

Step 4: Measurement Results

The measurement objective is to compare the calculated values against the
TARGET CIELAB and TARGET ND; also indicates the CMYK CORRECTION
VECTOR values. Figure 6 indicates, all three process colors CMY have to be
increased, in order to achieve target values. Same screen also shows the K ink
zones, whether increase or decrease with recommendation in large or small
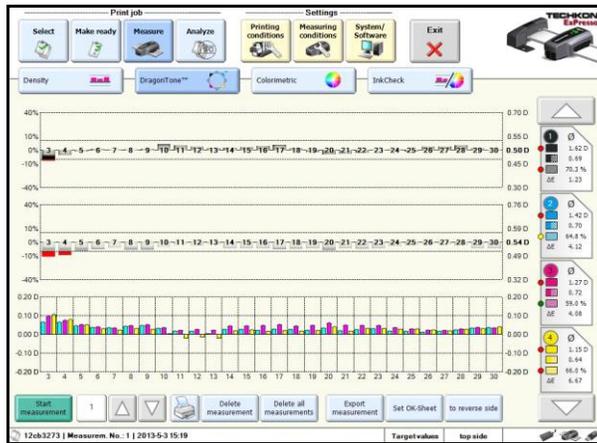adjustment by the height of the histogram.

Figure 6: Ink Zone Display

Step 5: Measurement Results

After a scan measurement is taken the following window will appear. By clicking
on the bar graph, the ink zone specific measurement data will be visible.

Figure 7 shows the ink zone magnifier displays, it indicates the measured and
target a* and b* values as well as the densities of HR K and CMY in Ink zone 11.
CMY arrows indicate the vector direction and the proposed amendment densities
for each ink. In this example, all three process colors CMY have to be reduced, in
order to achieve target values.

Figure 7: Ink Zone Magnifier Display

Appendix A: G7 Gray Balance

G7 Gray Balance formulae used in validating the system are given in the document "TR015", available free at www.idealliance.org.

Note that TR015 contains two versions of gray balance formula, one in the body of TR015 and one in an appendix. The formulae used for the G7 Press Control System Certification program is the one in the body of TR015, as follows:
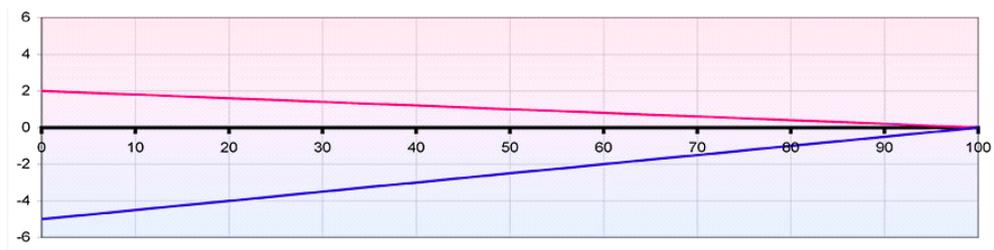
G7 Gray Balance formula

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;

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

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

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: G7 NPDC (tonality)

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.

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*)

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