Curve Pilot 24.03

User Guide

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Contents

1. Copyright Notice **5**
1.1. Third Party Licensing 6

2. Preface **25**
2.1. What is Curve Pilot 25
2.2. Installation 25
2.3. Data Types 25
2.4. How to Read this Guide 26
2.4.1. Conventions 27

3. What is Dot Gain? **28**
3.1. Sources of Dot Gain 30

4. Dot Gain Compensation **32**
4.1. Dot Gain Compensation Curves 32
4.2. How Much Dot Gain Compensation to Apply 34

5. Press Fingerprinting **36**
5.1. What is Press Fingerprinting 36
5.2. How to Fingerprint a Press 36
5.3. Press Fingerprinting with Curve Pilot 37

6. Working with DGC Curves **38**
6.1. The Curve Pilot Editor 38
6.1.1. Create a DGC Curve 38
6.1.2. Save a DGC Curve 39
6.1.3. Import Measured Points from Text File 39
6.1.4. Preview a DGC Curve 40
6.1.5. Edit Measured & Calculated Data 41
6.1.6. Select a Desired Dot Gain Curve 41
6.1.7. Create a Desired Dot Gain Curve 42
6.1.8. Edit a Desired Dot Gain Curve 42
6.1.9. Swap Measured Points 43
6.2. Advanced Curve Editing 44
6.2.1. Import Tone Curve Exchange Data (ISO 18620) 44
6.2.2. Smooth Curve 45
6.2.3. Minimum and Maximum Values 45
6.2.4. Keep 0% to: Parameter 46
6.2.5. Keep 100% Parameter 47
6.2.6. Bump Highlights 48
6.2.7. Fit PressSync Curve 49

6.3. Working with DGC Strategies....50
6.3.1. What is a Strategy?....50
6.3.2. Creating a Strategy....52
6.3.3. DGC Strategies and PressSync Curve Sets....54
6.3.4. How the RIP Retrieves the Right DGC Curve....55

7. Working with PressSync....57
7.1. What is PressSync?....57
7.1.1. What is a PressSync Curve?....57
7.1.2. What is a Flexible PressSync Curve?....60
7.1.3. What is a PressSync Curve Set?....66
7.1.4. What is a PressSync Template?....66
7.2. Getting Started with PressSync....68
7.3. Creating a PressSync Curve Set for Your Press....70
7.3.1. Setting Up Your PressSync Curve Set....70
7.3.2. Measuring with PressSync....72
7.3.3. Interpreting PressSync Results....78
7.3.4. Saving PressSync Results....99
7.3.5. Generating Report of PressSync Results....100
7.3.6. Exporting PressSync Results....100
7.3.7. History of PressSync Results....101
7.4. Customizing PressSync Templates....102
7.4.1. Add or Remove Spot Colors....103
7.4.2. Select the Desired Dot Gain Metric....103
7.4.3. Select the Desired Printing Condition....104
7.4.4. Select the Desired Dot Gain Curves....104
7.4.5. Select the Desired Measurement Condition....105
7.4.6. Select the Desired Density Filter Standard....106
7.4.7. Set the Desired Density Paper Relative....106
7.4.8. Set the Desired Values of Paper and Solid....107
7.4.9. Set Custom Targets for Gray Balance....108
7.4.10. Set the Desired DeltaE Formula and Tolerance....108
7.4.11. Set Custom Verification Tolerances....109

8. Working with Curves from the Print Control Wizard....118
8.1. Advanced Workflow....118
8.1.1. Adding Measurements to a Printing Condition's Curve Set....119
8.1.2. Inspecting your Curves....120
8.1.3. Fine-tuning Your Measurements....125
8.1.4. Fine-tuning Your Adjustment Curves....127

9. The Preview Combined Curves Tool....131
9.1. Previewing a Combination of Curves....131
9.2. Previewing the Results of a Strategy....132
9.3. Previewing the Stochastic Range of SambaFlex Screens....134

10. Archiving DGC Data **135**

11. Appendices **136**

11.1. Location of Data Files 136
11.2. Dot Gain Metrics 136
11.3. Application Preferences 137
11.4. Print Chart Layouts 138
11.4.1. The Universal Target 138
11.5. Control Strips for Equinox 139
11.5.1. New Control Strips for Spot Colors 141
11.6. Measuring Devices 141
11.7. Measurement Conditions 142
11.8. The .it8 (CGATS) File Format 143
11.8.1. Control Strip Layouts and .it8 (CGATS) Files 144
11.9. Curve Fitting Options 144
11.10. Tone Curve Exchange Data (TED) Files 145
11.11. PressSync Templates 146
11.11.1. PressSync Templates Based on the ISO 12647 Standards 146
11.11.2. PressSync Templates Based on the G7 Calibration Method 149
11.11.3. PressSync Templates Combining the G7 and ISO Calibration Methods 150
11.11.4. Linear Dot Gain PressSync Templates 153
11.11.5. Balanced Tone and Gray PressSync Template 153
11.12. User Defined Dot Gain Curves for Process Colors 154
11.13. User Defined Dot Gain Curves for Spot Colors 154
11.14. Migration Tool for SCRDGC Files 155
11.15. Neutral Gray CMY Triplet Table 156

12. Glossary **158**

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Section: pkg.m4 - Macros to locate and utilise pkg-config.


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2. Preface

2.1. What is Curve Pilot

Curve Pilot is a software tool that calculates **Dot Gain Compensation (DGC) curves** from measured data. Curve Pilot helps you correct the dot gain characteristics of your system towards desired printing targets through the adaptation of intensities used during the RIP phase and the plate-making process.

Curve Pilot provides:

- A **DGC Curve Editor** for calculating single dot gain compensation curves from measured data and (optionally) desired / reference dot gain targets.
- **PressSync** for calculating sets of ink-based dot gain compensation curves (**PressSync Curve Sets**) from measured data and a variety of printing conditions based on industry specifications or ISO standards.
- A **DGC Strategy Editor** for combining single DGC curves and PressSync curve sets into complete compensation strategies; using strategies enables you to assign multiple DGC curves to the same ink / separation based on varying screening parameters.

2.2. Installation

Curve Pilot is installed as part of the Imaging Engine Installation DVD. Please see the installation chapter in the *Imaging Engine documentation* for more details.

Note: You can also find the link to the **Imaging Engine Installation Guide** in the Installation DVD

If you have a PressSync license, Curve Pilot is installed as two applications:

Application Name	Icon	Description
Curve Pilot		All Curve Pilot functionality + PressSync functionality
PressSync Pilot		PressSync functionality only

Note: You do not need to run PressSync Pilot separately. With a PressSync license, you can access all PressSync functionality from within the Curve Pilot user interface.

2.3. Data Types

Curve Pilot works with the following types of data files:

File Type	Description
`.dgc`	A `.dgc` file contains measured data, calculated data, and optionally reference (target) dot gain data for a **single** DGC curve.
`.prsync`	A `.prsync` file contains measured data, calculated data, and reference (target) dot gain data for **multiple** DGC curves; each DGC curve corresponds to a specific ink/separation.
`.icpro`	An `.icpro` file combines **multiple** DGC curves (saved in multiple `.dgc` files) into a *DGC strategy*.
`.scrdgc` (legacy)	A `.scrdgc` file combines **multiple** DGC curves (saved in multiple `.dgc` files) into a screen-based DGC strategy. **Note:** Curve Pilot can only read existing `.scrdgc` files. A `.scrdgc` file is converted to `.icpro` upon import. See also *Migration Tool for SCRDGC Files* on page 155.

2.4. How to Read this Guide

This guide assumes no prior experience in calculating dot gain compensation (DGC) curves or setting up DGC-related workflows.

If you are not familiar with the concepts of dot gain, dot gain compensation, and press fingerprinting, you are encouraged to read the relevant sections on *What is Dot Gain?* on page 28 and *Dot Gain Compensation* on page 32, the topics under *Press Fingerprinting* on page 36, and also the concepts behind *What is a Strategy?* on page 50 first.

If you are an experienced pre-press or press professional, you can safely skip this introductory material and start at *Press Fingerprinting with Curve Pilot* on page 37, to learn more about the distinct Curve Pilot and PressSync Pilot features.

If you want to generate DGC curves manually, read *Working with DGC Curves* on page 38; start with *The Curve Pilot Editor* on page 38, then move on to *Advanced Curve Editing* on page 44.

If you are a pre-press manager seeking an integrated process for managing the DGC needs of your print setup based on printing standards or specifications, read *Working with PressSync* on page 57. PressSync functionality can be studied independently without prior knowledge of using the Curve Pilot DGC curve editor.

PressSync presents a systematic way of calculating ink-based curve sets conforming to a variety of printing standards; to leverage the full potential of PressSync, a better understanding of *What is PressSync?* on page 57, *Automated Measurements* on page 73, *PressSync Templates Based on the ISO 12647 Standards* on page 146, *PressSync Templates Based on the G7 Calibration Method* on page 149, and possibly *Gray Balance in CMYK Templates* on page 87, *Gray Balance Calculations* on page 88 and *Gray Balance Feather-Off* on page 89 will be required.

To devise combined ink-based and screen-based DGC strategies, read *Working with DGC Strategies* on page 50.

To understand the effect of applying multiple DGC curves on the same job, study the material on *The Preview Combined Curves Tool* on page 131.

This guide is complemented with a number of *Appendices* on page 136 providing mostly reference information on various features of the software. Depending on your level of knowledge and expertise, you may want to refer to these topics selectively on a need basis.

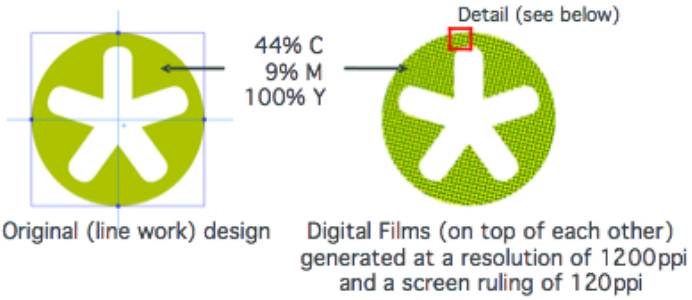
2.4.1. Conventions

A number of typographic conventions are used throughout this guide:

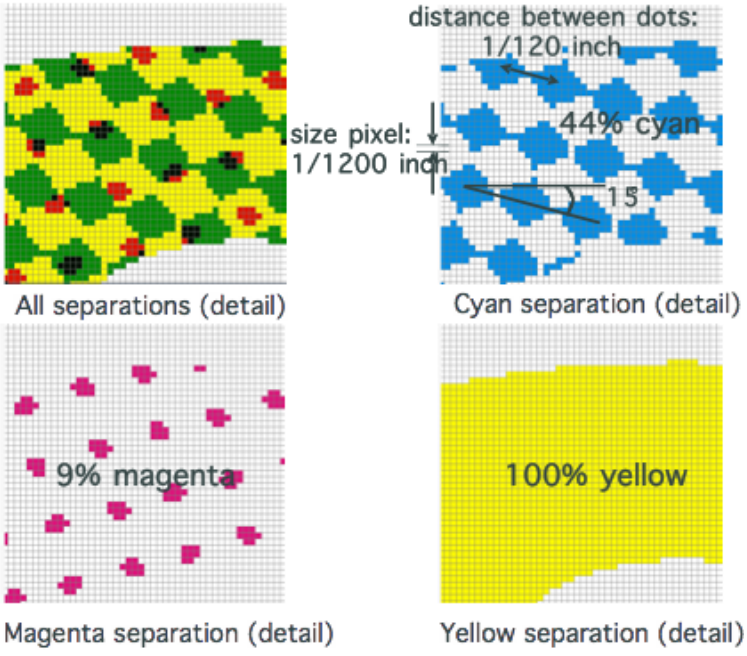
Example	Description
Dot gain	Terms introduced for the first time, terminology, important keywords may be displayed in bold for emphasis
Save As...	Menu items, window / dialog titles, user-interface elements are always displayed in bold
`User Defined`	User input is displayed in a monospace (typewriter) font
[0..100]	Numerical ranges are enclosed in brackets [ ]
<InkName>	Variable content is enclosed in angle brackets <>
"C|M|Y|K"	Mutually exclusive values are separated by |
`\\server\bg_data_dgc_v010\`	Application folders and directory paths are always displayed in a monospace (typewriter) font

3. What is Dot Gain?

Most printing processes convert high-level vector digital information (such as a PDF or PS file) into high-resolution raster or bitmap images, also known as **digital films**, one for each printing ink. A **Raster Image Processing (RIP)** application creates digital films with a **resolution** (expressed in **ppi**) that is supported by the imaging device.



For every printing ink, the RIP application puts a raster of pixels at the resolution of the imaging device on top of the original design. To take into account the intensity of the object, the **screening** raster is added. For every pixel of the object that is lying in a dot of the screen, the pixel is set to black in the final digital film (for a positive film).



The distance between the dots in this screening raster is expressed in **lpi** (lines per inch), **lpcm** (lines per cm) or **lpmm** (lines per mm). This is called the **screen ruling**.

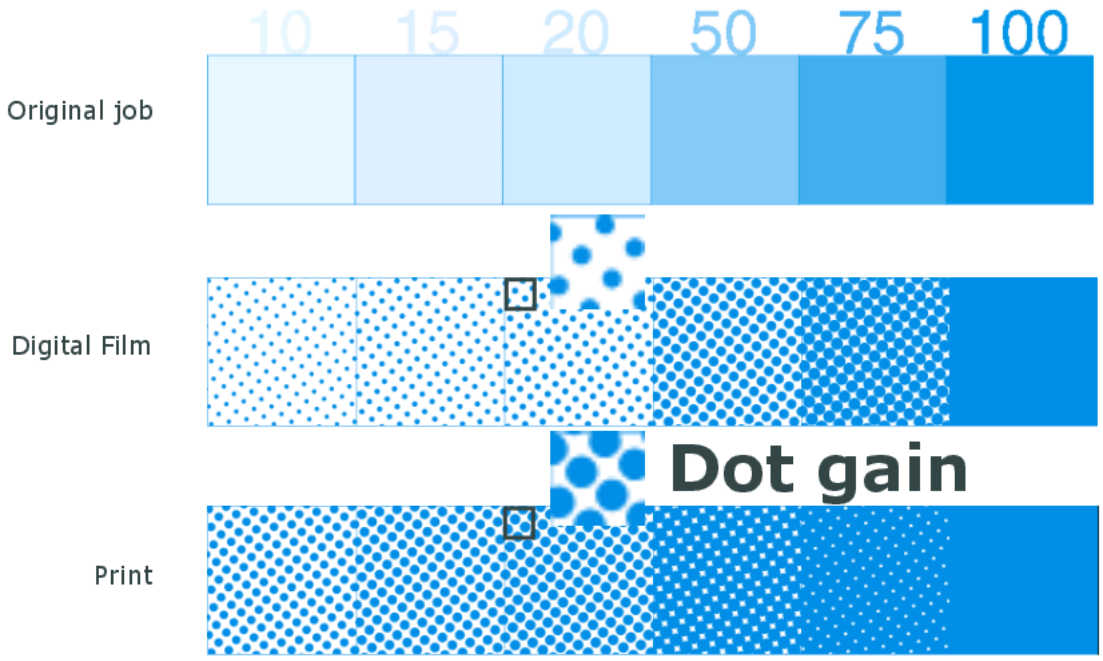
After the ripping phase, films and/or plates are created and put on the press. The file is printed and... is (much) darker than the original file in the desktop program.

The reason for this will be no surprise to most people: dots on the press always print **fatter** than the original dots on the film or plate, they increase in size. This phenomenon is known as **Dot Gain**.

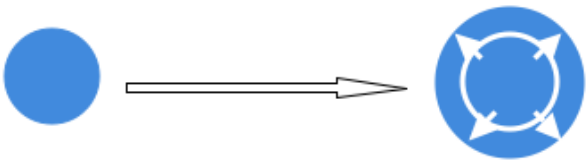
Take a look at an example design:

Original image	
Printed result	

Take a closer look and observe the differences in between the design, the digital film, and the final print result:



On microscopic level, dot gain would look like this:



3.1. Sources of Dot Gain

The amount and type of dot gain are influenced by different factors. Especially the type of press (offset, flexo, gravure...), the type of substrate (coated paper, uncoated paper....) and the type of ink have a large influence on the dot gain.

Four different sources of **manufacturing** dot gain can be distinguished:

1. **Plate making dot gain**

   In the case of an offset process, the image on the film is transferred photographically to the plate. This is typically done by exposing a pre-sensitized plate, masked by the film, to intense UV-light. For several reasons, the image is always slightly overexposed. This causes a 50 percent screen dot to result in a 45% dot on the plate, if a positive masking film is used, and a 55% dot if a negative film is used.

   In the case of a flexo-process, exposing the negative film in the copy frame also results in dots on the plate that are significantly bigger than the white dots on the negative film, sometimes even 10%.

In case of direct-to-plate imaging, there is no copy phase from film to plate. As a result, plate-making **dot gain** or **dot loss** is completely avoided. Possible fluctuations in dot gain during plate-making are avoided as well. This is one of the main advantages of direct-to-plate technology. However, plate-making through a direct-to-plate process has a different dot gain behavior than plate-making for which a frame copy from film is used.

Plate making dot gain is difficult to control because several factors are involved: longer or shorter exposure times, the nature of the light source, the film and the plate.

2. **Printing-pressure of the ink**

   On the press, due to the pressure (flexo!) and to the fact that the ink is fluid, a 50 % dot on the plate will cover a paper area equivalent to a 60 % dot.

3. **Paper type**

   The surface roughness and porosity of the paper cause internal light reflections around the ink boundaries, making the border areas look darker. On smooth coated paper, a 50 % covered area will perhaps only reflect 40 % of the incident light, resulting in an apparent 60 % dot. On uncoated paper it would look even darker.

4. **Type of press**

   There are different printing methods (flexo, offset, gravure...), so it is logical that there are also a lot of variations in the dot gain.

   a. **Offset Printing**

      For a typical offset press, with a positive film to plate, and a 50% dot on film:

      - The plate-making will lose 5%
      - The press will add 10% (dependent on the pressure)
      - Coated paper reflections will add another 12%

      Which will give a final result of 67%, or 17% apparent dot gain.

   b. **Flexographic Printing**

      We have already explained that the printing pressure of the ink has a huge influence on the amount of dot gain: the more pressure, the more dot gain. That is why, generally, **flexo** presses have higher dot gain values, for example:

Film	Print
40%	78%
80%	98%

   c. **Gravure Printing**

      Gravure presses are characterized by a type of dot gain that is similar to that of offset presses for small dot sizes (up to circa 30%), but sharply increasing at higher percentages. Solid areas are printed with an effective cylinder dot area of 60 to 70%.

4. Dot Gain Compensation

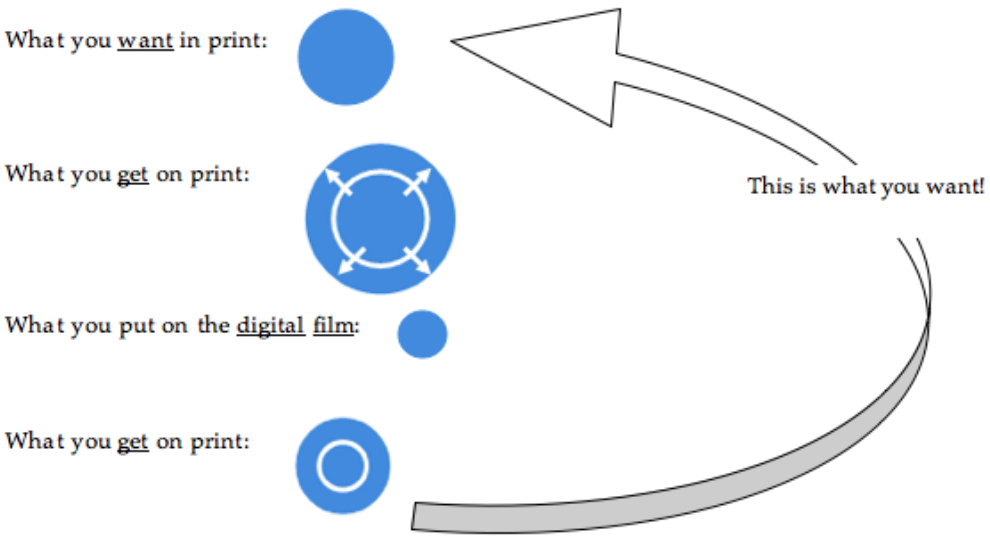
For many print buyers dot gain has an unexpected and above all unwanted quality effect on the prints:

- Because of the increase in the printed dot, the general aspect will be too dark.
- Dot gain in screened densities also causes huge changes in hue and saturation.

  Another example: a color made up of 100% cyan and 50% magenta will suffer from dot gain in the magenta, but not in the cyan. The color will be too dark but also too red.

Print buyers want predictable and correct printed results that are up to a standard or correspond to the contract proof. That is why **Dot Gain Compensation (DGC)** is definitely needed.

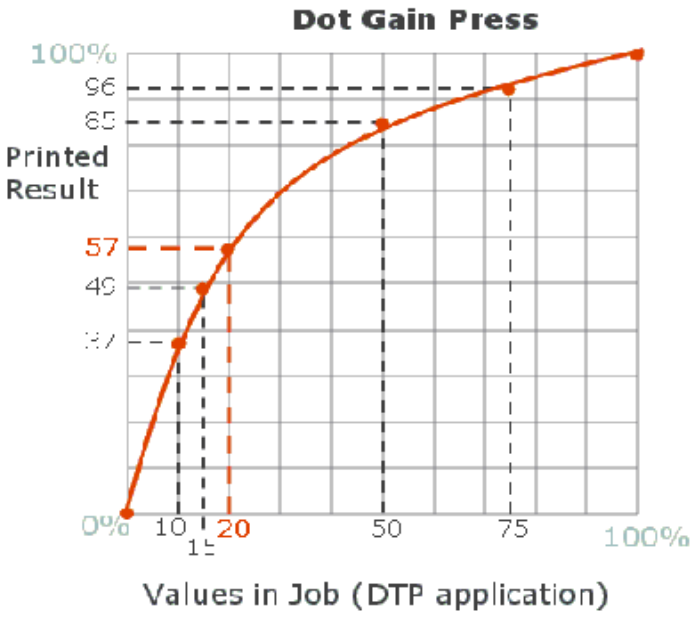
The basic principle of dot gain compensation is very simple. Take a look at the following picture:



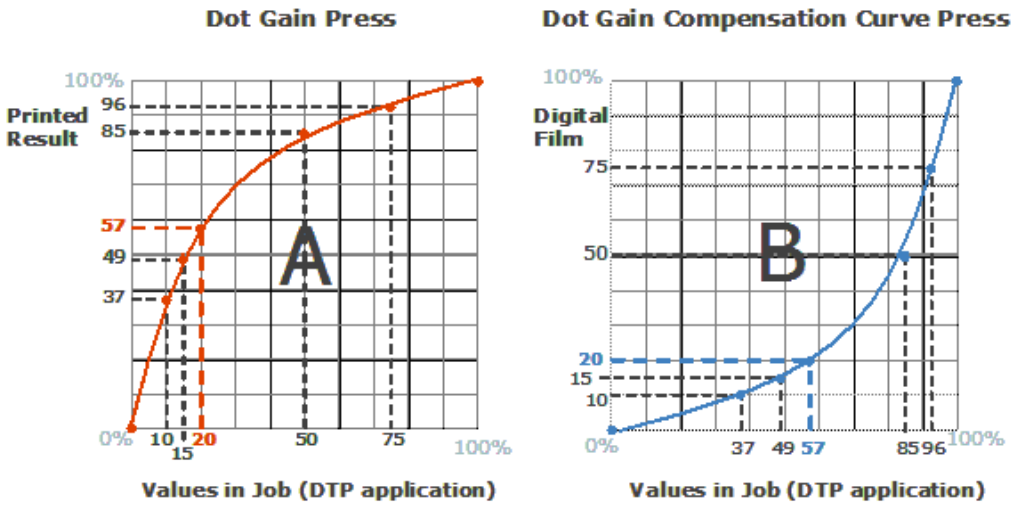
This picture explains that, in order to obtain a dot of the right size in print, a smaller dot has to be put on the digital film. In other words, applying dot gain compensation means that the original dot is **compensated** (usually reduced) to a certain extent **on the digital film**.

4.1. Dot Gain Compensation Curves

We can compute dot gain curves by relating tone values (intensities) in the input to tone values in the output. In the sample dot gain curve below, we can see that a tone value of 20% in the input (digital film) measures 57% in the output (printed result), while a tone value of 50% in the input measures 85% in the output.

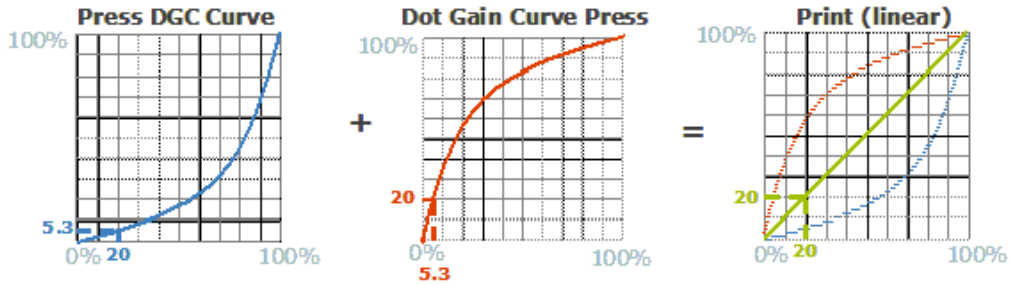


If we want to print linearly, i.e. eliminate all dot gain in the output, then we need to apply a dot gain compensation curve that is the "mirror image" of the dot gain curve for our process. This curve is shown below next to the dot gain curve for contrast.

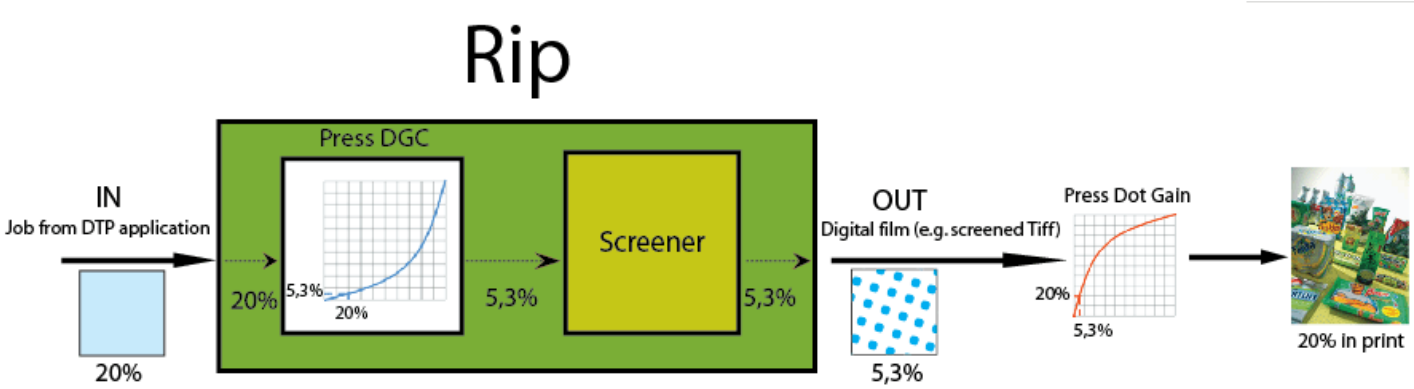


We can easily tell that data points on the dot gain compensation curve have been inverted: a tone value of 57% in the input becomes 20% in the output, while a tone value of 85% in the input becomes 50% in the output.

The combined effect of both curves on our print job is full dot gain compensation (linearization). This is clearly shown in the third graph (green line) below.



This is the principle applied during ripping and printing. Prior to screening, all intensity values are pulled down by the dot gain compensation curve (blue), leading to smaller dots on the digital film. The press "adds" its usual dot gain (red), resulting in intensity values that correspond to the original design.



However, eliminating all dot gain from a print job is not always desirable. This is explained further in *How Much Dot Gain Compensation to Apply* on page 34.

4.2. How Much Dot Gain Compensation to Apply

Let us take another look at our example design, and compare the printed results with no dot gain compensation and full dot gain compensation (linearization) below.

Original image	

Printed result with no dot gain compensation	
Printed result with full dot gain compensation (linearized)	

Take a good look at the picture above, and ask yourself the following question: "Am I happy with this result?" The answer will probably be "No", because the printed result is too light. The human eye is used to expect a certain amount of dot gain in printouts, and the amount of dot gain present in print jobs has historically grown. The standard offset dot gain (50% prints as 68.5%) has always been considered visually acceptable.

Full dot gain compensation (in other words, linearization) clearly produces prints that are too light. In order to obtain a visually pleasing print result, a certain amount of dot gain must be retained in the final printout. This amount is specified in a **target**. The target defines a **desired**, or **reference**, printing condition.

Matching a target involves tuning / **syncing** the printing process so that the amount of dot gain present in the final print follows the amount of dot gain specified in the target within acceptable margins. Very often standard offset dot gain is used as the target (or reference condition) to match.

5. Press Fingerprinting

5.1. What is Press Fingerprinting

The process to determine how a press prints and to quantify dot gain values is commonly known as press fingerprinting. Following a fingerprint run, a dot gain compensation (DGC) curve or curve set (for different inks) is created, so that the printed tone values can match a standard.

Fingerprinting is an essential validation step of the prepress and press settings. Without fingerprinting, the task of printing to a desired printing condition or standard becomes increasingly difficult.

Fingerprinting does not replace, and should not be confused with, routine preventative maintenance. In fact, a press should be in top operating condition prior to the fingerprinting process, so that fingerprinting results (measured densities, DGC curves, etc.) can be reproducible and reliable.

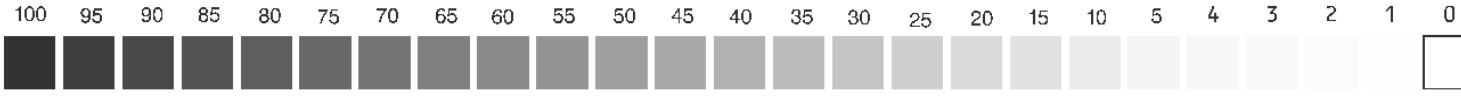
Production jobs may contain control strips that are measured manually or automatically to check print consistency. If the control strips are consistently measuring the same but not within the desired print condition or standard tolerance, the DGC curve(set) for the press will have to be adjusted.

Press fingerprinting depends on most operating parameters and will have to be repeated if there is a change to these parameters, including substrate type, ink, plate, run speed, screening (dot shapes, ruling, screen angles), and even operator experience / skill level. In general, there should be a DGC curve(set) for each set of operating parameters commonly employed with a specific press.

5.2. How to Fingerprint a Press

To fingerprint your press for a given set of operating conditions and match its performance to a desired printing condition or standard, you generally have to:

1. Create test jobs that contain patches with different tones, e.g.: 1%, 2%, 3%, 4%, 5%, 10%, 20% ... 80%, 90%, 95%, 100%. The picture below shows a typical control strip of CMY-generated gray tones and CMY-solid.



2. Rip the test job(s) using the procedures outlined in your Imaging Engine or equivalent RIP application manual.
3. If applicable to your printing application, expose the film/plate. Make sure that the normal workflow is applied and that the image-setter is calibrated correctly: 50% in the job must measure 50% on the film, or the black mask in case of a CDI®. Small deviations (up to 1%) are acceptable.

4. Print the test job(s) using a well-defined set op operating conditions (substrate, inks, press speed, screening parameters, etc.)
5. Measure the printed patches.
6. Compare the dot gain present in the print(s) with the reference dot gain set in your desired printing conditions or standards.
7. Adjust the dot gain compensation curves used in your print job(s) if necessary.

5.3. Press Fingerprinting with Curve Pilot

With Curve Pilot, you can fingerprint your press in two distinct ways: (a) using the Curve Pilot dot gain compensation editor for single dot gain compensation (DGC) curves, or, (b) using PressSync functionality to calculate ink-based curve sets from desired printing conditions and/or standards.

If you wish to create DGC curves one by one manually, you can use the *Curve Pilot DGC curve editor*. You will have to measure control strips from production runs manually, and import your measured data into the application as text files or type them in manually. For each DGC curve to calculate, you will have to select the desired printing target (reference dot gain curve) manually. You will be able to combine individual DGC curves into *strategies*, but you will have to calculate and save each DGC curve separately before you can generate a strategy.

With *PressSync*, your workflow will be significantly simplified. You will be able to create and save a dot gain compensation curve set for all process / spot inks present in your job at once. You will typically select a template for your curve set first, based on a number of desired printing conditions extracted from printing specifications or industrial printing standards. You will then measure sample jobs either manually or automatically. Curve Pilot / PressSync Pilot will calculate the best fitting dot gain curve set for matching your preferred standard(s) automatically.

You can also combine using PressSync with the Curve Pilot editor. For example, you can always *export* a DGC curve from a PressSync curve set into the Curve Pilot editor and refine it further manually.

6. Working with DGC Curves

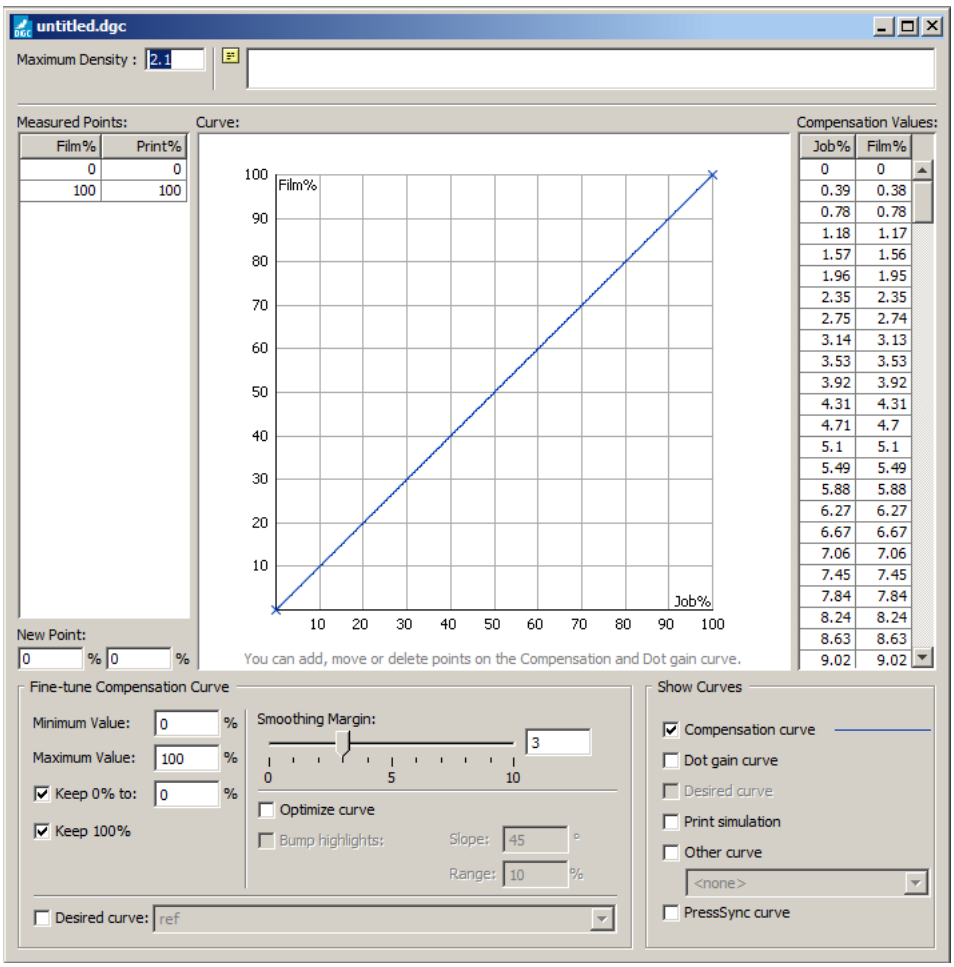
6.1. The Curve Pilot Editor

The Curve Pilot editor lets you create and modify single dot gain compensation (DGC) curves from measured data and an optional desired (reference) dot gain curve.

Advanced curve editing features include the ability to import precalculated DGC curves, and to customize the shape of calculated DGC curves in a variety of ways. For the details, see *Advanced Curve Editing* on page 44.

6.1.1. Create a DGC Curve

To create a new dot gain compensation (DGC) curve, you need to enter measured data first. Select **New** > **DGC (.dgc)** from the main **File** menu.



Add your measured data in **New Point:** you can use the **Tab** key to quickly switch from Film% to Print% input data. Hitting **Enter** after you have entered a Print% value takes you back to the Film% input box.

Follow this procedure to enter sample [Film%,Print%] data, e.g. [10%,15%], [30%,40%], [50%,62%], [70%,80%], [90%,95%].

Note:

If you want to enter density print data instead of % values:

- Select **Edit** > **Preferences...** on the Curve Pilot main menu and change the DGC **Densitometer measures:** setting from **Percentages** to **Densities**.
- Enter the maximum density of your measurements in the **Maximum Density** input text box.

  Note that the maximum density in certain flexo applications is not necessarily the density of the solid (100%) patch.

  Curve Pilot will convert your density values into percentages using the Murray-Davies equation.

6.1.2. Save a DGC Curve

When you are done entering measured data, select **File** > **Save As...** on the Curve Pilot main menu. Enter the desired name for your file without specifying a file extension and click **OK**. A `.dgc` file will be saved under the folder shown in the main window title of your Curve Pilot application. See also *Location of Data Files* on page 136 in the Appendix.

At this point you have not specified a *desired (reference) dot gain curve*. The saved `.dgc` file contains your measurements and a dot gain compensation (DGC) curve calculated from your measured data so that full dot gain compensation (linearization) is achieved in the final print result.

6.1.3. Import Measured Points from Text File

As an easier alternative to entering data points into Curve Pilot manually, you can import measured data from a data file.

To import your data, select **File** > **Import Measured Points from Text File**.

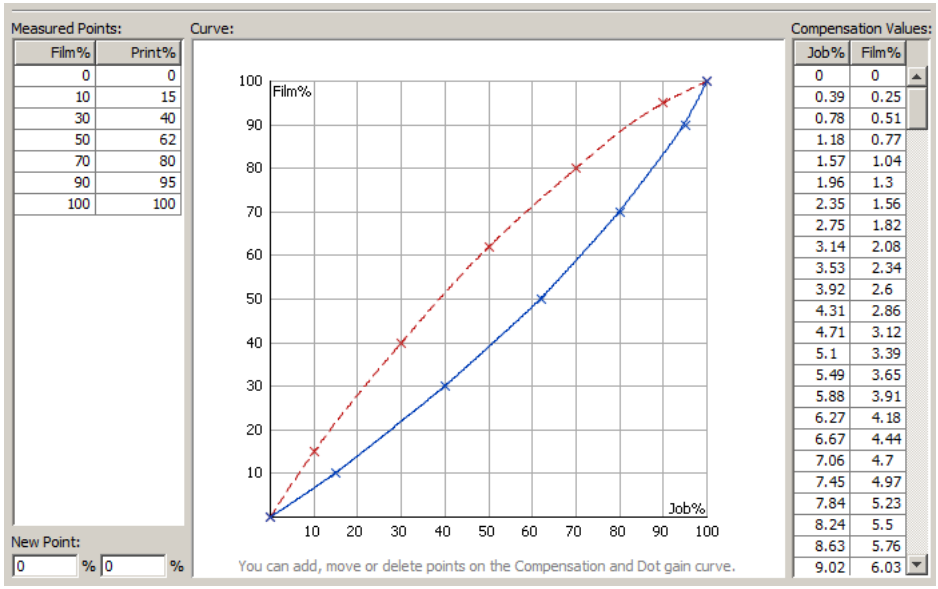
Data points in the file should be in a simple two-column, tab-delimited format as shown below:

```
0 0
10 15
20 25
… ...
70 80
90 95
100 100
```

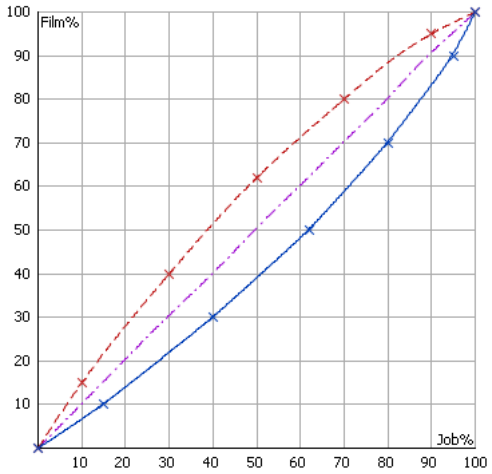
The data file name can have any extension, but the file itself must be saved as a simple text file.

6.1.4. Preview a DGC Curve

Make sure that **Compensation curve** under **Show Curves** is selected. Select **Dot gain curve** as well. You will see two curves on your graph. The red curve is your dot gain curve from the measurements you have entered. The blue curve is your dot gain compensation (DGC) curve. Curve Pilot has calculated the best DGC curve possible to achieve full dot gain compensation (linearization) in your print result.



You can verify this by selecting **Print simulation** under **Show Curves**. The purple line is the expected dot gain curve in your final print result. It is a straight line indicating no dot gain in your print result.



6.1.5. Edit Measured & Calculated Data

You can edit dot gain data points (measured) and dot gain compensation data points (calculated) by dragging them on the curve with the mouse.

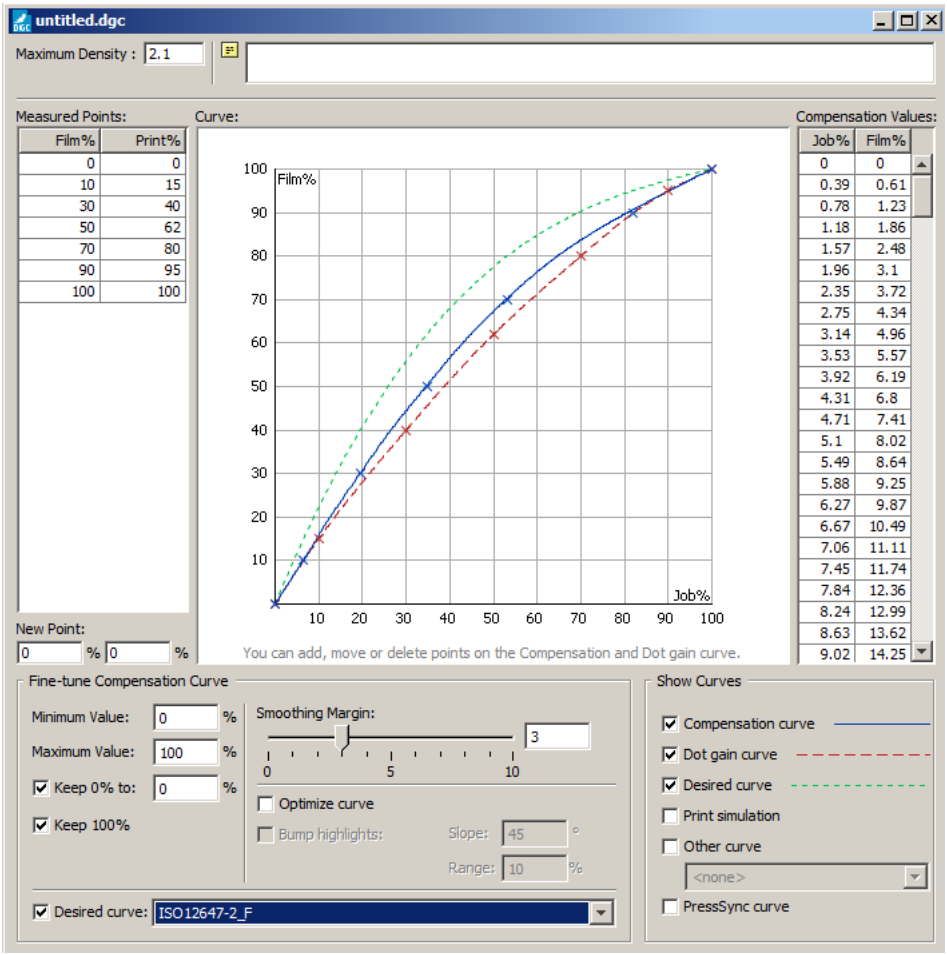
To delete a data point, select the point and click **Ctrl + D**.

Finally, to add a data point, click on the desired location of the graph where you wish to add the new data point.

Note: Whenever you edit measurements graphically, the dot gain compensation curve is recalculated to continuously match your *desired dot gain curve* (target).

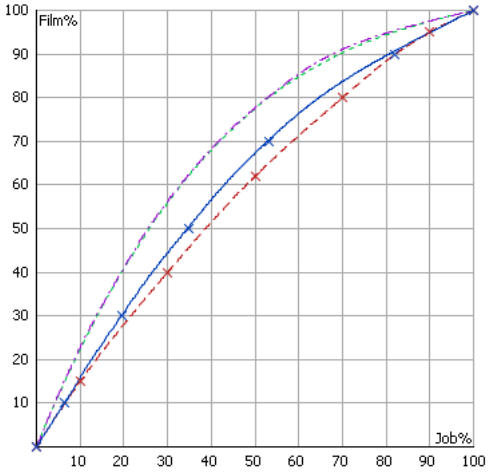
6.1.6. Select a Desired Dot Gain Curve

You can select a different (non-linear) dot gain curve as your printing reference (target). Make sure that **Desired curve** is selected, and pick the desired (reference) dot gain curve from the **Desired Curve** list.



The green curve added to the graph is the desired (reference) dot gain curve. Notice how the blue compensation curve has been recalculated automatically. It now adds dot gain to the input (measured) data to match the desired target.

Select **Print simulation** to verify that the estimated dot gain in the final print result (purple curve) closely matches the desired dot gain (green curve). In fact the two curves practically overlap.



Saving your `.dgc` file saves the measured data, the calculated compensation curve, and the desired (reference) curve all in the same file.

6.1.7. Create a Desired Dot Gain Curve

You can create desired curves in addition to the ones provided with your Curve Pilot installation. To do this, simply enter your data and save them under a unique name (i.e. `testdgc`). Save your data again under a different name (i.e. `testdgc-ref`), but this time make sure that you select **Save as desired (reference) curve** in the **Save DGC** dialog. Curve Pilot will create the new reference curve as read-only and will automatically close your editor window after that.

Note: You cannot load a desired curve directly from the **File** > **Open...** menu item of the Curve Pilot main menu.

6.1.8. Edit a Desired Dot Gain Curve

Curve Pilot saves all desired (reference) dot gain curves under `\\server \bg_data_dgc_v010\refdgc`, where `server` is the central location of automation data.

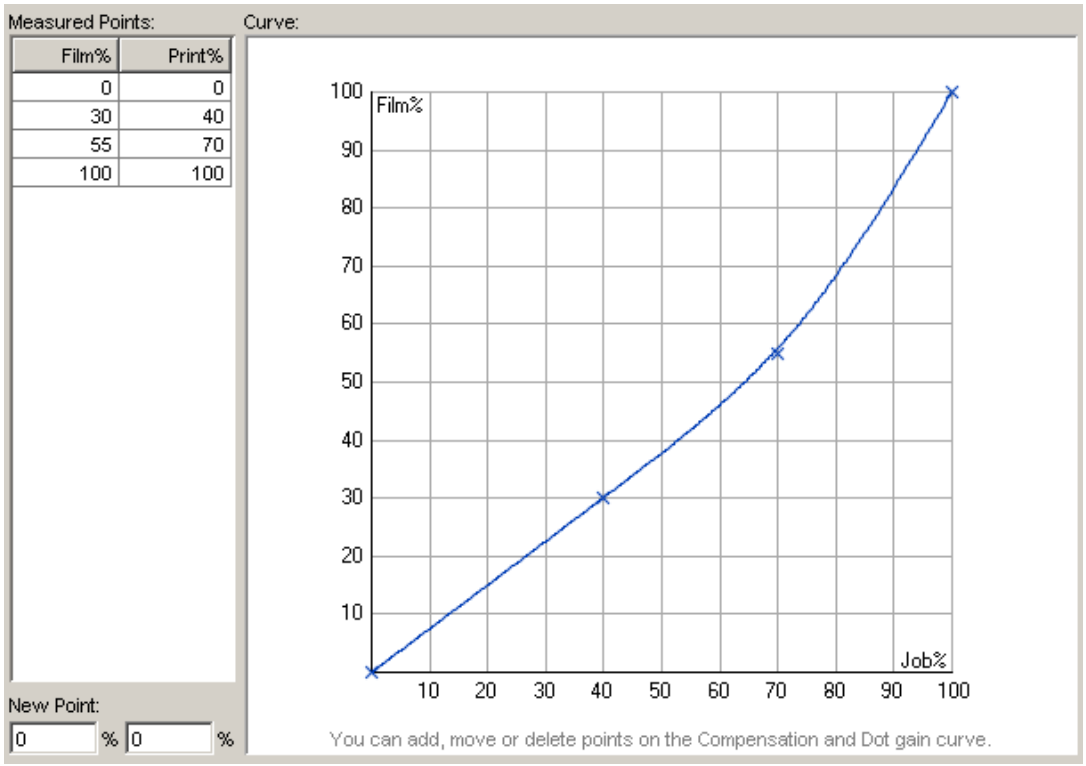
You cannot load `.dgc` files located in the `refdgc` subfolder directly into Curve Pilot. As a result, you cannot edit desired (reference) curves directly.

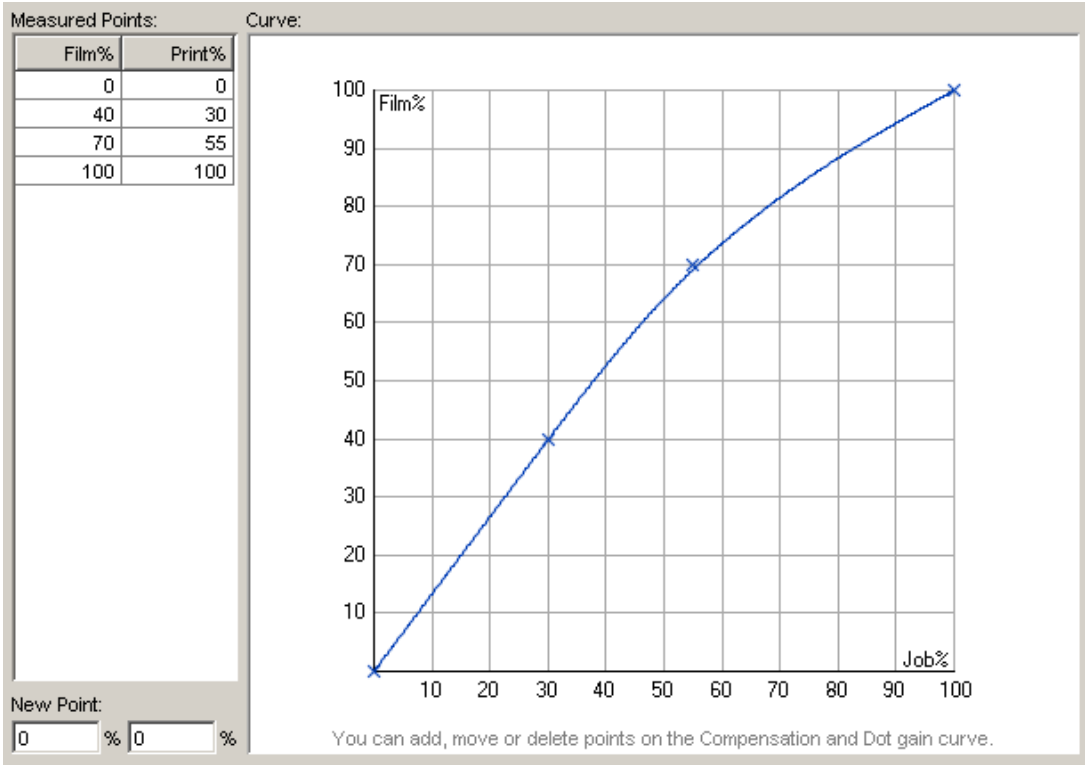
To overcome this limitation, copy the desired (reference) curve in the `bg_data_dgc_v010` folder, edit the curve as usual, save it, and move it back in the `refdgc` subfolder.

6.1.9. Swap Measured Points

To swap the columns of the measured points, select **Edit** > **Swap Measured Points** from the Curve Pilot main menu.

This action results in the inverted compensation curve. The inverted compensation curve can be used to "undo" the compensation on pre-compensated images for proofing.





6.2. Advanced Curve Editing

6.2.1. Import Tone Curve Exchange Data (ISO 18620)

Curve Pilot supports importing Tone curve Exchange Data (ISO 18620) from a file.

To import your data, select **File** > **Import Tone curve Exchange Data (TED)**. You can only import well-formed files with the extension `.ted`. Importing an improperly formatted `.ted` file may crash the application without warning.

A `.ted` file can contain any number of tone curves. The curve(s) imported from a `.ted` file are always interpreted by Curve Pilot as dot gain compensation curves, not measured data.

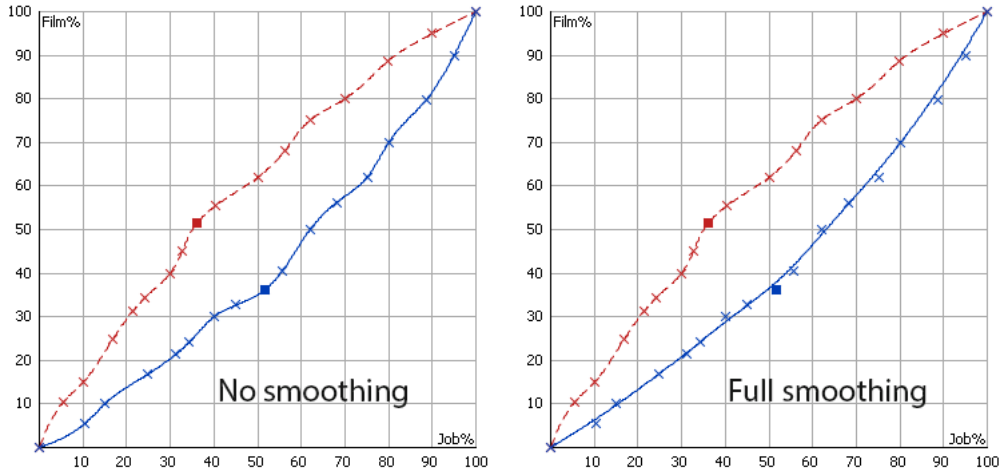
Curve Pilot generates an *.icpro strategy* in memory from the imported curves, and saves all `.dgc` files present in the strategy in the *central location of DGC data*. You need to save the `.icpro` strategy separately.

For more information on `.ted` files and their conversion into `.icpro` strategies, see *Tone Curve Exchange Data (TED) Files* on page 145.

6.2.2. Smooth Curve

You can influence the way a dot gain compensation (DGC) curve is calculated by changing the **Smoothing Margin** parameter value. The default value is `3` and the default permissible value range is `[0..10]`.

For more aggressive smoothing, select **Optimize curve**. The permissible value range becomes `[0..20]`. A higher value indicates a smoother curve.



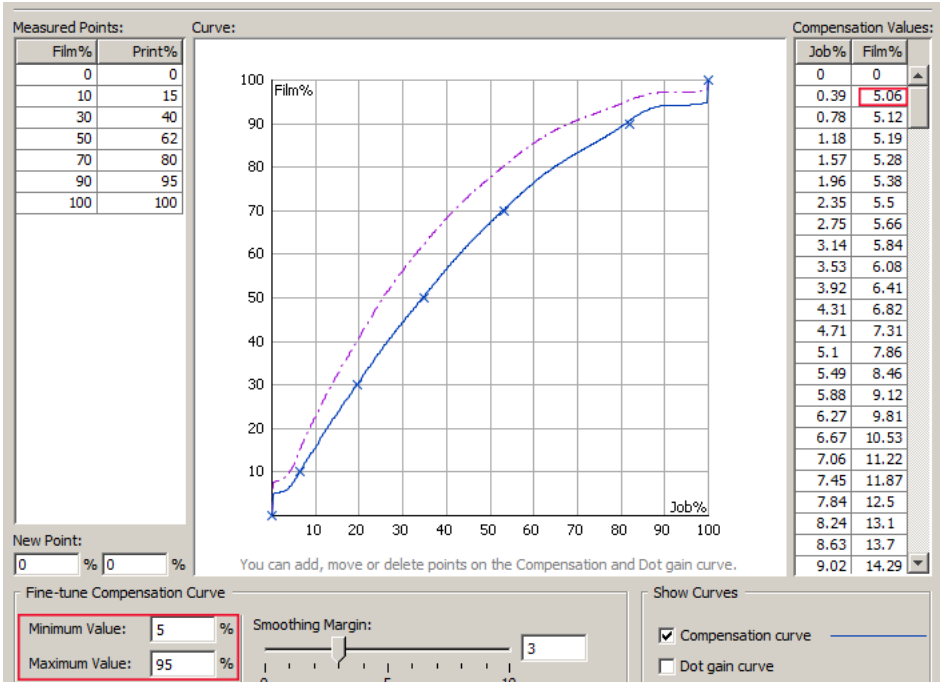
6.2.3. Minimum and Maximum Values

Setting the **Minimum Value** and **Maximum Value** parameters refines the shape of a dot gain compensation curve in the highlights and in the shadows respectively. This may be desirable in certain applications of flexography.

With a non-zero Minimum Value, the first non-zero tone / intensity in the job is corrected / compensated at the Minimum Value. The Minimum Value setting does not affect the 0% tone, which remains at 0% and is never screened.

With a Maximum Value smaller than 100, the 100% (solids) tone /intensity in the job is corrected / compensated at the Maximum Value. A Maximum Value setting smaller than 100 implies that the 100% (solids) tone will be screened.

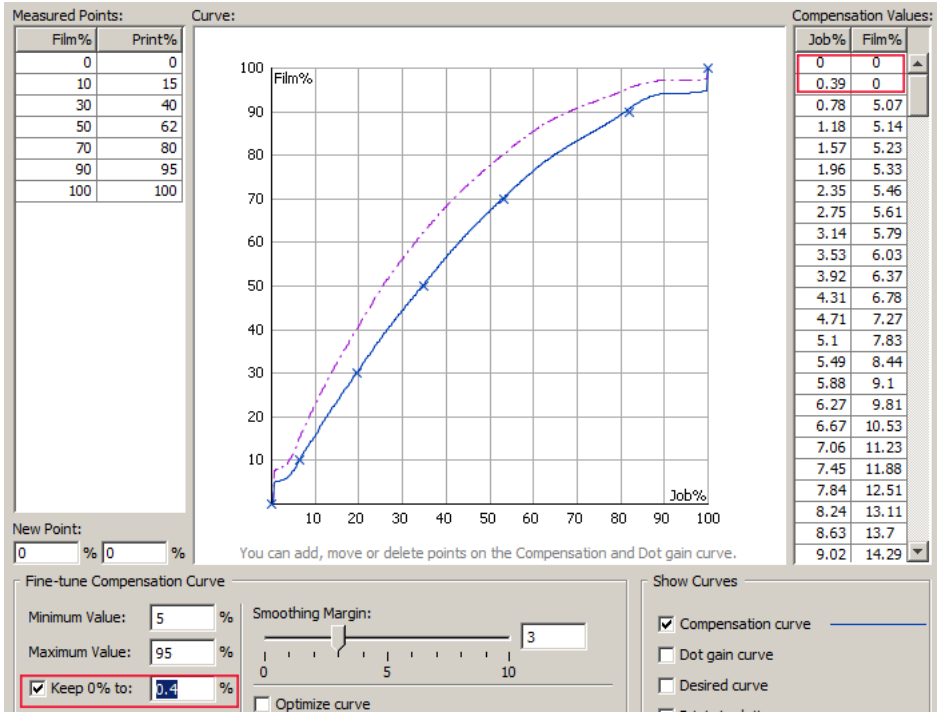
You can examine the effect of these parameters on your DGC / print simulation curves and in the **Compensation Values** Table.



6.2.4. Keep 0% to: Parameter

There may be small intensity values in your job that you can safely discard as digital noise. Equivalently, there may be small dot % values on your uncompensated film/plate that you want to disregard as dust.

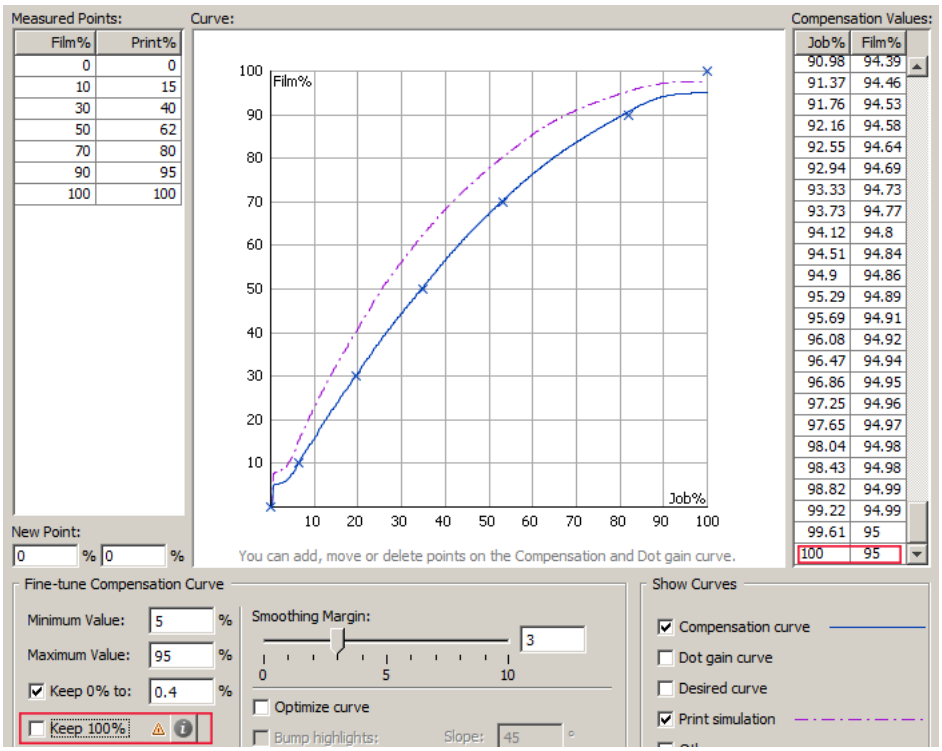
You can do this by setting the **Keep 0% to:** parameter to a small value, typically `0.4%` or lower. Curve Pilot will treat all input below that value as zero and will set the corresponding corrected / compensated values to zero.



6.2.5. Keep 100% Parameter

The **Keep 100%** option instructs Curve Pilot to not apply a correction / compensation value for the 100% tone in the job. As a result, solids are not screened.

If you don't select **Keep 100%**, the 100% tone will be corrected / compensated to the value set in **Maximum Value** (if that value is less than 100%).



Note:

You can also apply curves that use the **Keep 100%** option on jobs using a surface screening effect (a pattern used in the solids to improve ink lay-down). In this case:

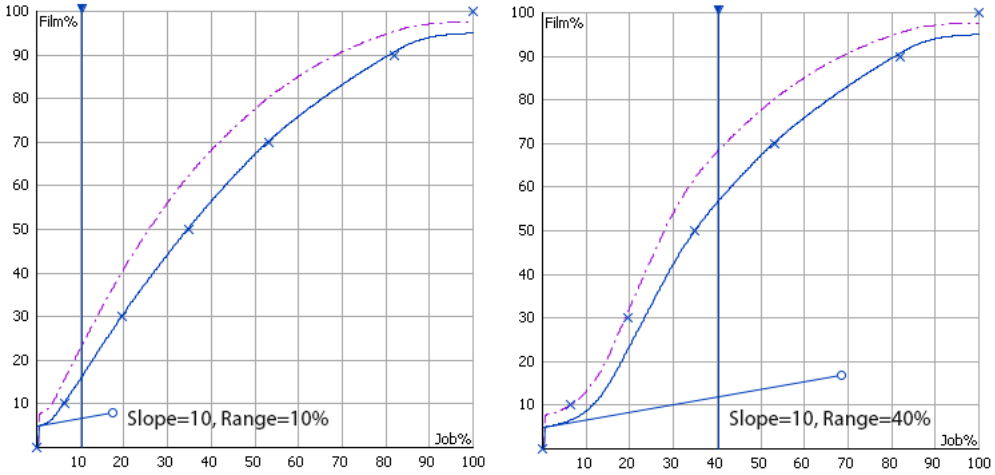
- If you select **Keep 100%** in the curve, the 100% areas of the job will be screened with the surface screening effect.
- If you don't select **Keep 100%**, the 100% areas will be screened at your **Maximum Value** percentage. The surface screening effect will not be used.

6.2.6. Bump Highlights

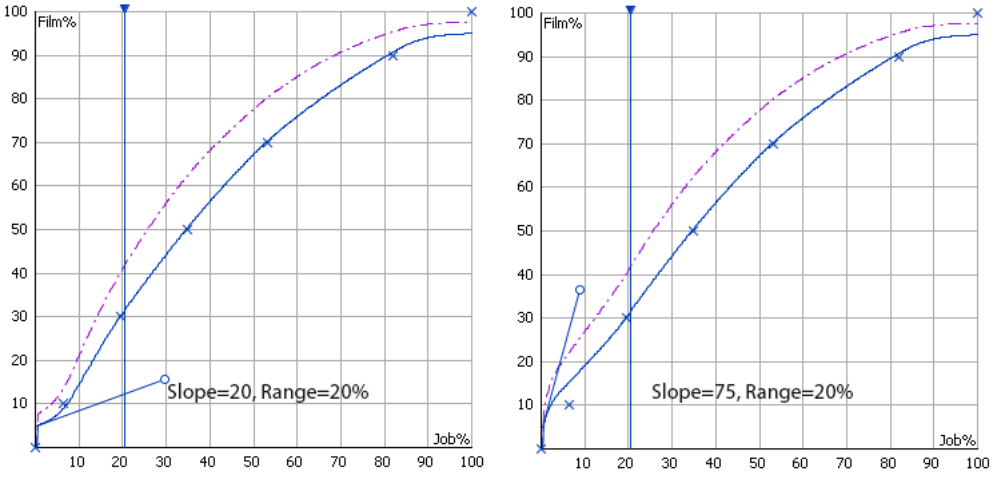
You can further modify the shape of the DGC curve in the highlights. To do this:

1. Select **Optimize curve**
2. Select **Bump highlights**
3. Enter a value for the **Slope** parameter
4. Enter a value for the **Range** parameter

If you want to influence the shape of the DGC curve over a wider range of input values, select a large value for the **Range** parameter:



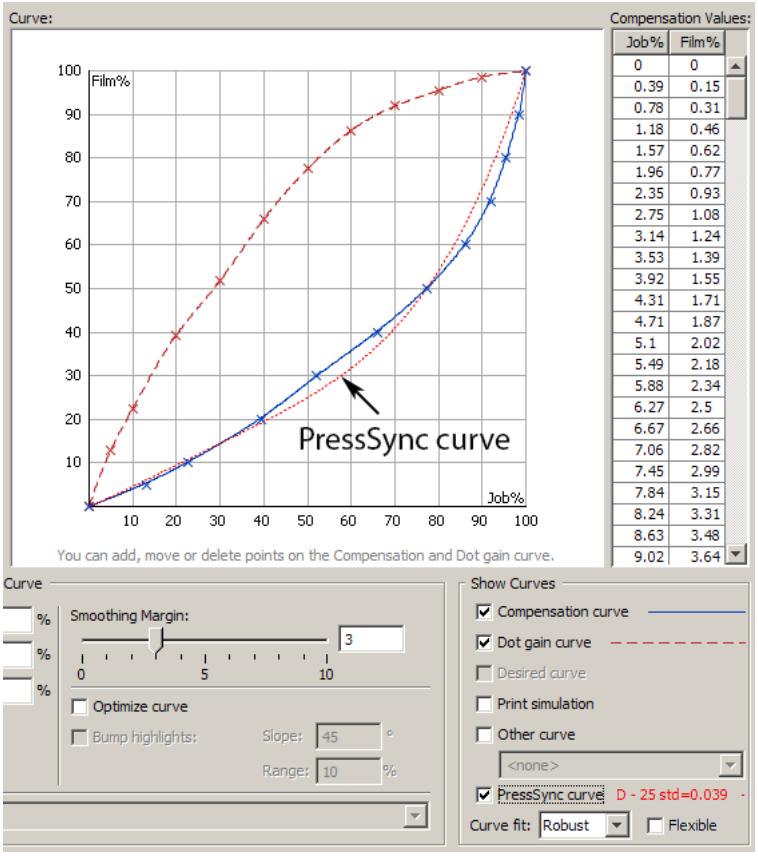
To radically change the shape of the DGC curve in the highlights, select a large value for the **Slope** parameter:



Curve Pilot lets you change the slope (and range) by dragging the slope end point with your mouse.

6.2.7. Fit PressSync Curve

While we have not discussed *PressSync compensation curves* yet, it is worth mentioning at this point that you can fit a PressSync dot gain compensation curve to the DGC curve calculated by Curve Pilot. To do this, select **PressSync curve** under **Show Curves**.



The best-fitting PressSync curve is displayed in red next to the **PressSync curve** check box. The curve is displayed dotted in red.

You can influence the **Curve fit** by switching between **Standard** and **Robust**. For the differences between these two settings, see *Curve Fitting Options* on page 144.

You can also select **Flexible** to use a flexible PressSync curve, that allows fine-tuning of the highlights and shadows. See *What is a Flexible PressSync Curve?* on page 60 for more information.

6.3. Working with DGC Strategies

6.3.1. What is a Strategy?

Dot gain within the same print job can vary depending on the screening parameters, inks, and other factors.

A dot gain compensation **strategy** allows you to use different DGC curves on different areas of the film or plate, taking into account different inks (separations), screening parameters, and compensation requirements for continuous tone images (CT) vs. line work (LW).

A complete DGC strategy provides a compensation curve for every practical combination of inks, screens, and/or any other operating parameters affecting dot gain used on your press, and links the right compensation curve to each applicable set of operating conditions.

Note:

Curve Pilot saves DGC strategies in the `.icpro` file format.

If you are familiar with former versions of Curve Pilot, you have already created screen-based strategies in the `.scrdgc` file format. It is not possible to create `.scrdgc` files any more, but you can still use them by importing them (**File** > **Import** > **SCRDGC**).

It is also possible to migrate `.scrdgc` files in one go with the Migration Tool. For more information on this topic, see *Migration Tool for SCRDGC Files* on page 155.

You do not need a separate DGC strategy for each new print job. Well-designed strategies are applicable to many jobs as long as the printing circumstances / operating conditions are similar.

In many cases one strategy per press and per resolution of the image setter is sufficient, and most prepress operators require no more than 10-30 strategies in total.

Simple Ink-Based Strategies

You can employ simple ink-based strategies when you are primarily interested in compensating dot gain on different separations/inks differently.

In practice this is often the case with yellow, where dot gain compensation is much less needed, and with black, where for example softer flexo plates may require different *bump-up settings in the highlights*.

But you can also employ more complex strategies to distinguish between parts of the job based on dot shapes, screen rulings and angles, or the presence of contones (CT) and linework (LW). These are combined ink- and screen-based strategies.

Combined Ink- and Screen-Based Strategies

You can use combined ink- and screen-based strategies to apply specialized dot gain compensation curves to parts of your job based on additional screening parameters. The screening parameters that you can use to specialize your strategy, and a few representative use cases, are shown in the Table below.

Screening Parameter	Use Case(s)
Dot Shape	Apply different DGC curves to different parts of your job requiring different dotshapes (square, round, elliptic, etc.) Apply different DGC curves to stochastic screens (e.g. Monet), which are known to produce more dot gain in the midtones than conventional screens.
Screen Ruling	Apply more aggressive DGC curves to higher rulings (keeping in mind that dot gain occurs on the perimeter of printed dots, and double ruling practically doubles dot gain).
CT or LW	Do not apply DGC curves to contones, if they have already been compensated during an image retouching step.

Screening Parameter	Use Case(s)
	Extra Info: • In some cases, bump-ups are not needed for contones because contone highlights have been cleaned out with an editor. • Contones and line work may also require a different approach with respect to smoothness versus precision. In spite of identical measurement values, it is possible that contones will be compensated with a different smoothing setting. • Other constraints may be set differently for contones and for line work. For example, *Keep 100%* is usually turned on for line work but turned off for contones. • Groovy screens may require different treatment of contones and line work as well; for the details see the Groovy Screens manual.

6.3.2. Creating a Strategy

To create a new strategy, select **File** > **New** > **Strategy (.icpro)** from the main Curve Pilot menu. In the strategy editing dialog that comes up, you can create a rule-based (decision) tree by inserting nodes for different inks, dot shapes, screen rulings, screen angles, and contone/linework. Select **File** > **Save As...** to save your strategy with a desired name.

Type of Action	Click	Function	Notes
Add ink rule		Add any number of inks from any ink book known to the system that require a separate DGC curve.	This action generates an **Other Inks** node by default, if one is not already present at the same level.
Add process inks rules		Use as a shortcut for adding C,M,Y,K ink branches to the tree.	This action generates an **Other Inks** node by default, if one is not already present at the same level. **Note:** Use the **Other Inks** node to group all inks requiring the same DGC curves.
Add dotshape rule		Add any number of dot shapes that require a separate DGC curve from the list.	This action generates an **Other Dotshapes** node by default, if one is not already present at the same level.
Add screen ruling		Add any number of screen rulings (lpi) that require separate DGC curves.	The default lpi for a new node is **100**. Double click on it to edit the value. Permissible values are **[10..10000]** lines per inch.

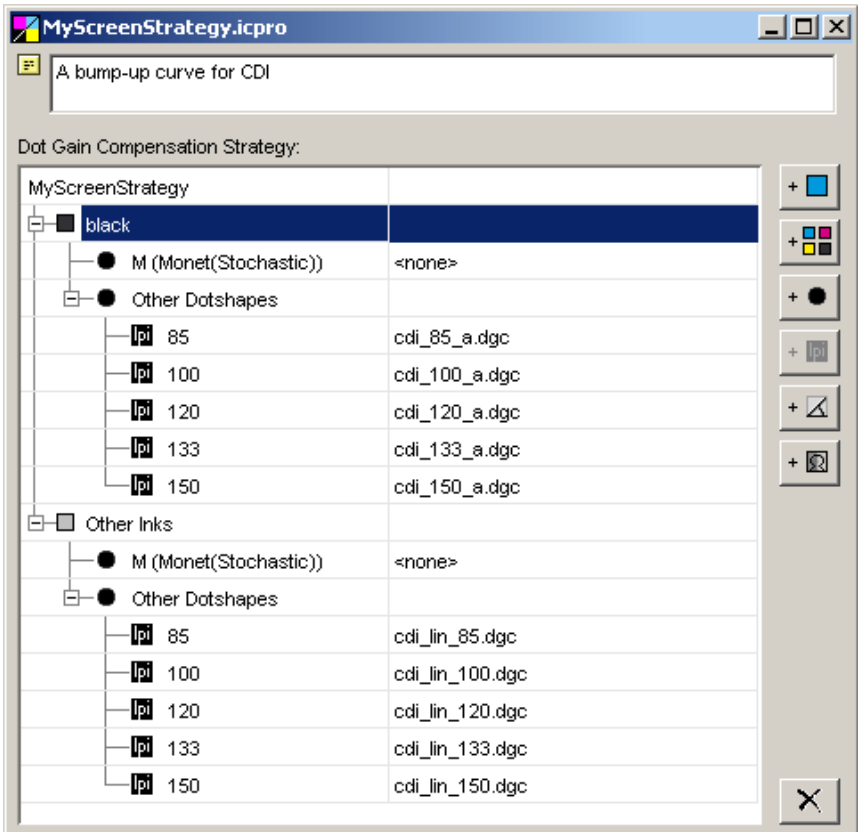
Type of Action	Click	Function	Notes
Add screen angle		Add any number of screen angles that require separate DGC curves.	The default angle for a new node is **7.5**. Double click on it to edit the value. Permissible values are [**0..180**] degrees.
Add images / linework rule		Add different DGC curves for contones (images) and linework.	This action generates a **CT** and a **LW** node by default.
Delete node		Delete the selected node.	This action may delete all nodes below the currently selected one.

For each new rule / node in the tree, the default DGC curve is set to **<none>**, implying no compensation. Click on **<none>** to select a different compensation curve from the list.

The order of adding / deleting nodes in the tree is not important, but a few ground rules apply:

1. All top level nodes must be of the same type.
2. All subsequent level nodes under the same parent node must be of the same type.
3. Deleting a node may automatically delete its children to ensure that rules (1) and/or (2) still apply.
4. A new node is added:
   a. At the same level with the currently selected node, when both nodes are of the same type.
   b. Below the currently selected node, when the new node and the children of the currently selected node are of the same type.
   c. Above the currently selected node, when the new node and the parent of the currently selected node are of the same type.

With these simple rules in mind you can create complex strategies for your particular operational needs. The picture below shows a strategy treating black and other inks differently, and making use of stochastic and classic screening with various lpi's in the case of classic screening.

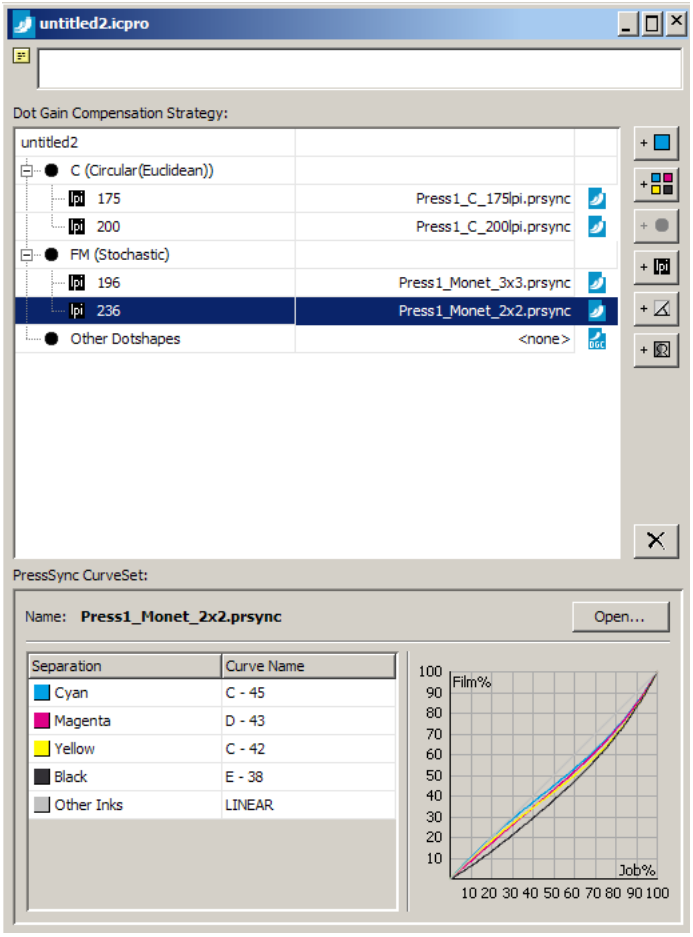


6.3.3. DGC Strategies and PressSync Curve Sets

Curve Pilot lets you use PressSync curve sets within strategies. This way you do not need to create ink-based strategy rules one by one.

To use an existing PressSync curve set within a strategy rule, make sure that you select as the curve type for your strategy rule first.

You can find an example of a strategy built from PressSync curve sets below:



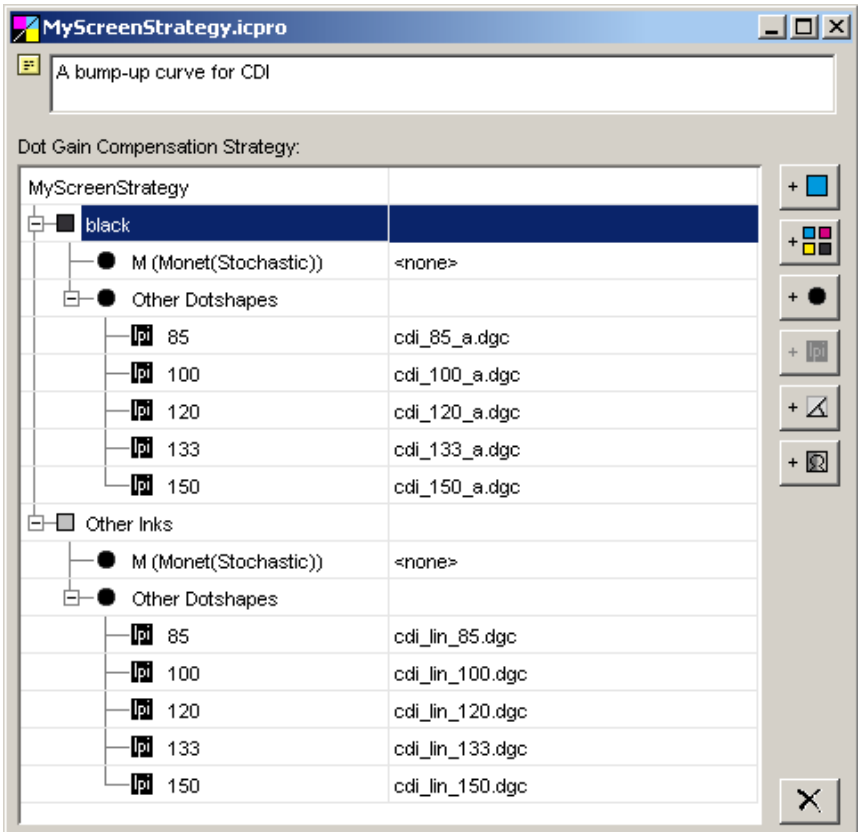
In the highlighted strategy rule, a PressSync curve set is used, avoiding the need to create separate rules for each process color.

6.3.4. How the RIP Retrieves the Right DGC Curve

It is important to understand how a RIP application interprets an `.icpro` strategy.

Your job contains objects characterized by a set of attributes: CT/LW, separation, dot shape, ruling (lpi), screen angle. Depending on your editing application, these may be set on a job-wide basis, or on an object-specific basis. Either way, the RIP application goes over all objects in your job and determines the best matching compensation curve in the strategy for each object present in the job.

The strategy shown below distinguishes between black and other separations, then distinguishes again between stochastic (Monet/FM) and classic (AM) dot shapes. The strategy defines different DGC curves for different rulings (lpi values) in the case of classic dot shapes.



When the RIP application encounters a cyan object, it searches for additional object attributes under 'Other Inks'. If the object's dot shape attribute is set to 'Monet', no DGC curve is applied in rasterizing the object; if the object's dot shape attribute value is 'Circular (Euclidean)', the best matching DGC curve is selected based on ruling (lpi).

If the object's ruling attribute is set to a value other than the exact ones specified in the strategy (that is, one of 85/100/120/133/150), then the closer lpi value determines the DGC curve to use in rasterizing the object. In our particular example, an object with lpi set to 110 is processed with `cdi_lin_100.dgc`, as lpi=100 is the closest lpi value specified in the strategy.

To preview which DGC curve is applied on parts of your job based on context (CT/LW, separation, dot shape, ruling, screen angle), you can use the *Preview Combined Curves* tool in Curve Pilot.

7. Working with PressSync

7.1. What is PressSync?

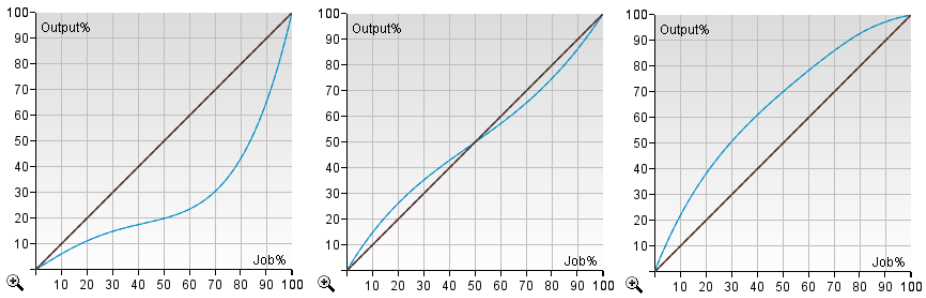
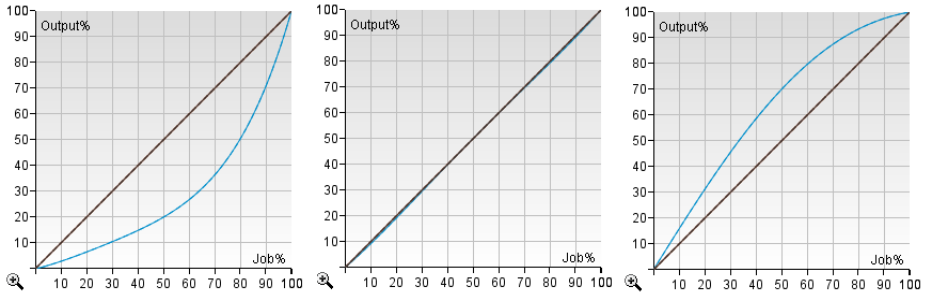
7.1.1. What is a PressSync Curve?

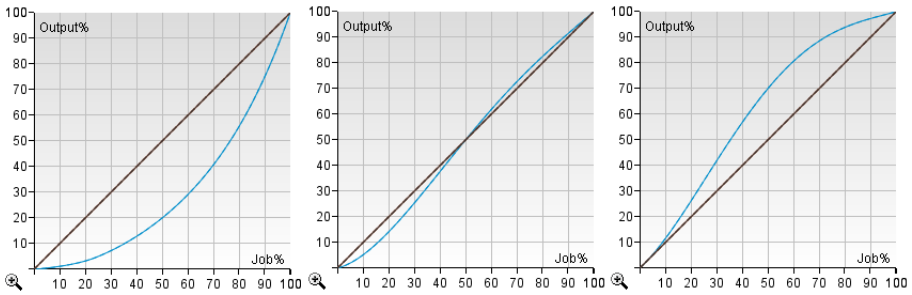
Curve Pilot / PressSync Pilot comes bundled with 400 PressSync curves. Those are pre-defined dot gain compensation curves of various forms and shapes that can fit the dot gain compensation needs of most presses.

Using PressSync curves significantly reduces the complexity of dot gain compensation in workflows.

PressSync Curve Names

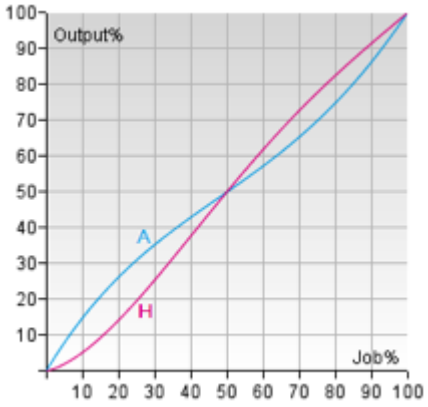
PressSync compensation curves are defined by a letter (A to H) and a number (20 to 70): A40, D20, F30, etc. The letter indicates the general shape of the curve in the highlights and in the shadows. The number indicates the compensation value for the 50% dot (midtone).

	20	50	70
A			
E			

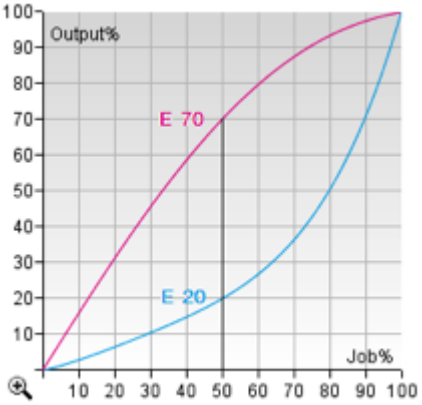
	20	50	70
H			

PressSync Example Curves

The A50 curve increases dot gain in the highlights (forcing the press to print darker in the highlights), and reduces dot gain in the shadows (thus forcing the press to print lighter in the shadows). The H50 curve exhibits the opposite behavior. Both curves exhibit an inflection point (where their slope changes sign) in the midtone.



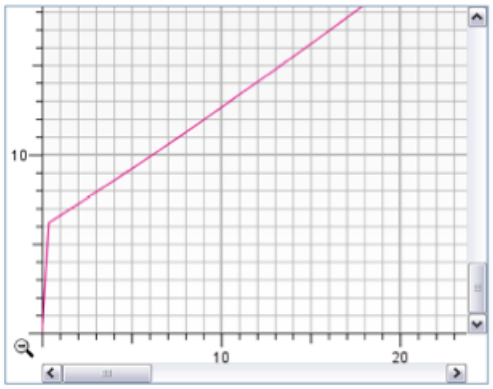
The E70 curve increases dot gain throughout the tonal range, correcting the midtone to 70%. The E20 curve decreases dot gain throughout the tonal range, forcing the midtone to 20%.



Minimum and Maximum Values

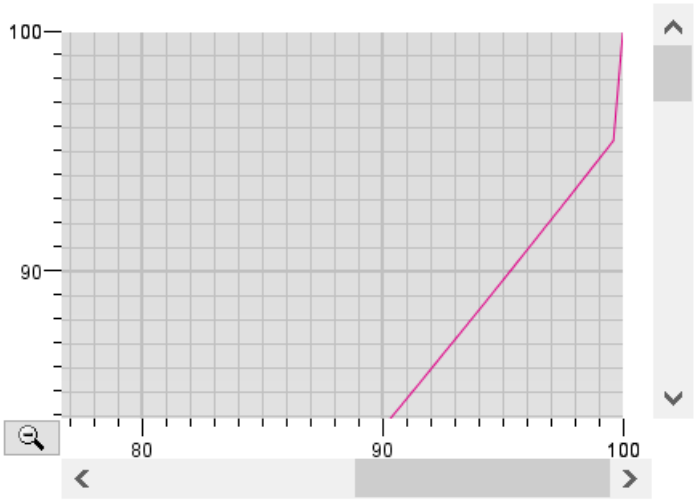
A PressSync curve can also contain information about a minimum and a maximum value.

The minimum value is the correction / compensation for the first non-zero tone. For example, if the minimum is set at 6%, the first tone value after zero will be adjusted to 6% as shown below.



Note: Regardless of the minimum value you choose, the 0% tone remains at 0%. As a result, the 0% tone will not be screened.

The maximum value is the correction / compensation for the tone just below 100%. For example, if the maximum value is 96%, a tone of 99.5% for example will be corrected to 96% and screened as shown below.



Note:

The 100% tone (the solids) will use the 100% level of the screen. This means that:

- for screens that do no use surface screening, solids will be kept as solids (not screened),
- for screens that use surface screening, solids will use the surface screening pattern defined for 100% in the screen.

Tip:

If you want to use your maximum value to screen the solids (so 100% is screened at 96% for example), you should:

- use a *flexible PressSync Curve*,
- set the *Maximum Value* you want to use for screened your 100% tones,
- deselect the *Keep 100%* option in your curve.

7.1.2. What is a Flexible PressSync Curve?

A flexible PressSync curve is a specific type of *PressSync curve* made for managing the tone reproduction of flexo printing environments.

Note: To work with flexible PressSync curves, you need to enable this feature in the Preferences: go to **Edit** > **Preferences...** and select **Enabled** next to **Flexible PressSync**.

On top of the *letter and number* defining the standard PressSync curves, flexible PressSync curves contain options to address specific flexo printing challenges.

Reproducing Highlights

Flexo highlights are often too sharp against the substrate and/or unstable, which can be difficult to adjust using standard PressSync curves:

- For some ink/substrate combinations, the contrast between the substrate and the lightest printed tone is high: even a very small halftone dot leaves a strong ink impression.
- On top of that, very small dots often don't print in a stable way on flexible substrates, so the minimum dot size is increased to get stable highlights.

Flexible PressSync curves contain parameters to address those highlight issues. See *Highlights Parameters* on page 61.

Reproducing Shadows

The most common issue with shadows in flexo is tone reversal, where a high percentage (for example 95%) prints darker than the solid (100%).

Surface screening effects (special screen patterns used in the solid areas to improve ink lay-down and avoid tone reversal) are often used in offset, but not always available for, or compatible with, a flexo printing environment.

Flexible PressSync curves also contain parameters to address tone reversal issues in the shadows. See *Shadows Parameters* on page 63.

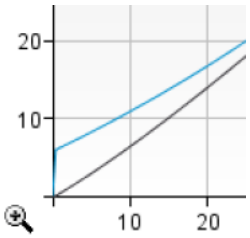
Highlights Parameters

To address typical flexo *highlight issues*, you can use the following parameters in your Flexible PressSync curves:

Minimum Value

Enter the minimum tone that you want to print.

For example, if you noticed that your press only prints in a stable way from 3%, you can set your minimum dot (the first percentage after 0%) to print at 3%, and gradually increase the tones from there.



Keep 0% to

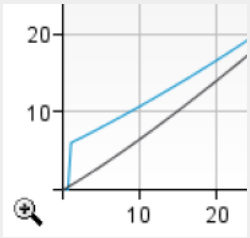
Choose the highlights level you don't want to print.

For example, if the tones up to 0.8% print in a very unstable way, you can choose to turn those into 0% so they won't be printed.

Note:

You can combine the **Keep 0% to** and **Minimum Value** options. If for example you want to drop all percentages below 0.8%, and have your minimum printed tone be 3%, then:

- input percentages between 0% and 0.8% will not be printed,
- input percentages above 0.8% will be printed starting from an output percentage of 3%.



Attention:

- If you want to apply these options to curves that you will use in Imaging Engine, make sure that you:
  - apply the **Keep 0% to** option to the **press curve**,
  - apply the **Minimum Value** option to the **plate curve**.

  If you apply these options differently, your output could be unpredictable!
- If you are working with a single curve (for example in a printing condition *from the Print Control Wizard*), you can apply both **Keep 0% to** and **Minimum Value** options to this curve.

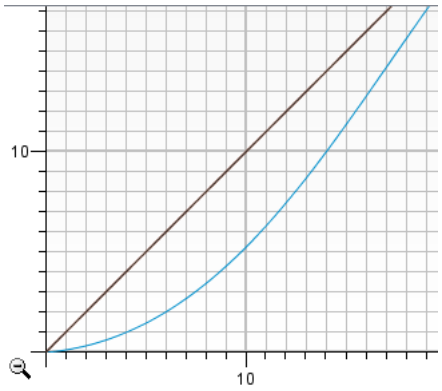
Highlight Shape

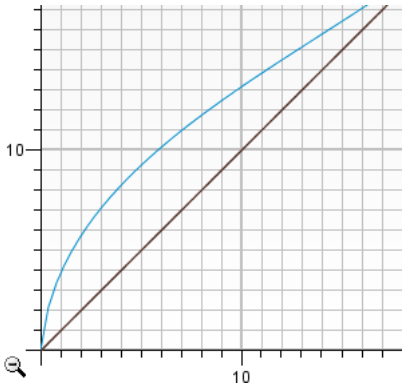
Add a specific highlights correction, to either increase or reduce dot gain in the highlights.

You can choose how much correction to apply, and over how much of the highlights, by setting the **Slope** and the **Range** of the correction.

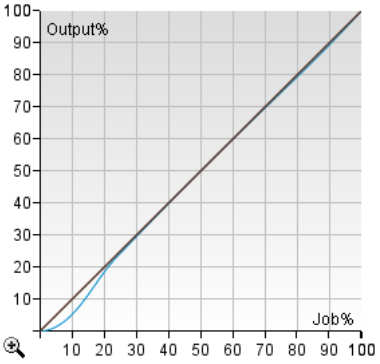
- The **Slope** defines whether the correction increases or decreases the printed tone, and by how much.

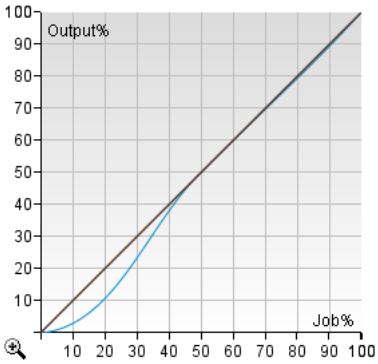
  You can set a slope of 1 to 9: 1 is the maximum tone decrease and 9 the maximum tone increase.





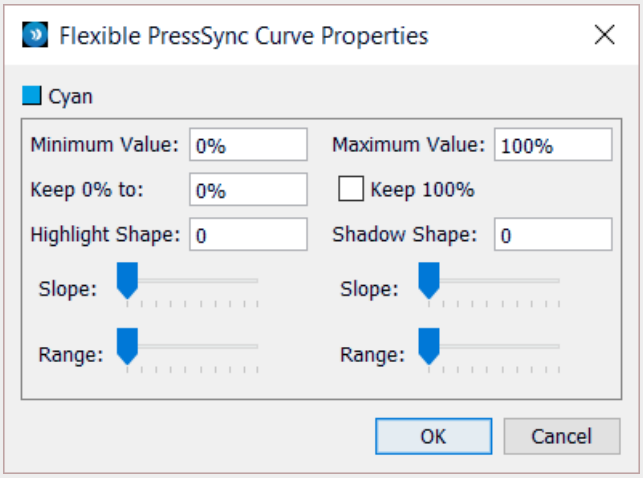
- The **Range** is the magnitude of the correction (over how much of the highlights it is applied): 1 is the smallest range and 9 the biggest (up to the mid-tones).





Tip:

When working with a flexible PressSync curve, use the **Slope** and **Range** sliders to define your highlights correction, and you will see the correction factor in the **Highlight Shape** field.



For example, for a slope of `1` and a range of `3`, the **Highlight Shape** will show `31` (the first digit being the range and the second one the slope).

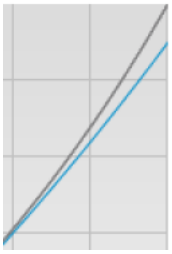
Shadows Parameters

To address the shadows' *tone reversal issues* in flexo printing, you can use the following parameters in your Flexible PressSync curves:

Maximum Value

Enter the maximum non-solid tone that you want to print.

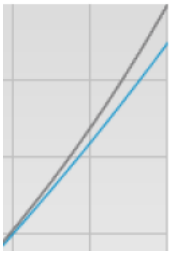
For example, if you noticed that 95% gives you the highest density, you can choose to print your shadows with a maximum of 95% instead of 100% (percentages between 95% and 100% will be recalculated to have a maximum of 95%).



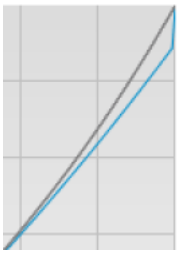
Keep 100%

Choose whether solids should be printed as solids (100%), or as your maximum non-solid tone (**Maximum Value**).

- If you are using a **Maximum Value** but are not keeping the solid tones to 100%, your solids will be screened to your maximum value (for example 95%).



- If you are both using a **Maximum Value** and keeping the solid tones to 100%, your shadows (up to the last tone before the solid, for example 99.9%) will be reproduced using your maximum non-solid tone (for example 95%) as maximum, but your solids will stay solid and unscreened.



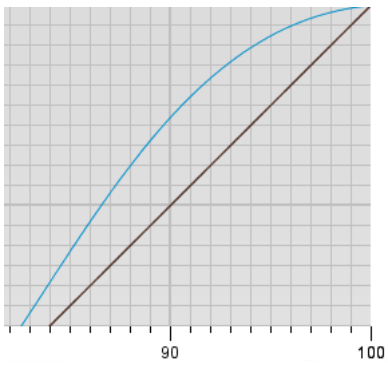
Shadow Shape

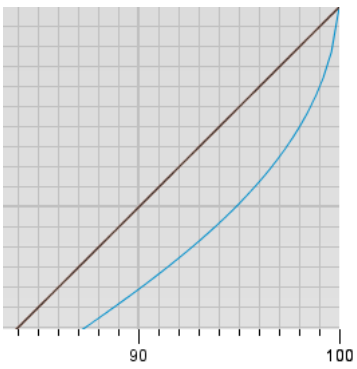
Add a specific shadows correction, to either increase or reduce dot gain in the shadows.

You can choose how much correction to apply, and over how much of the shadows, by setting the **Slope** and the **Range** of the correction.

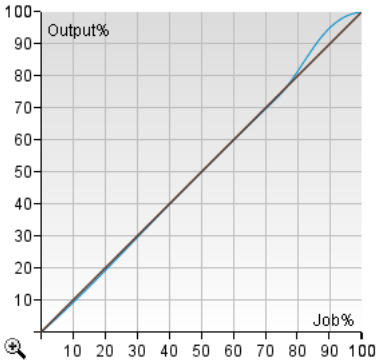
- The **Slope** defines whether the correction increases or decreases the printed tone, and by how much.

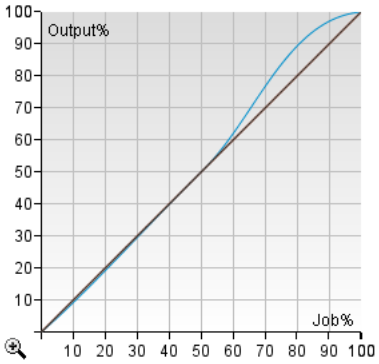
  You can set a slope of 1 to 9: 1 is the maximum tone increase and 9 the maximum tone decrease.





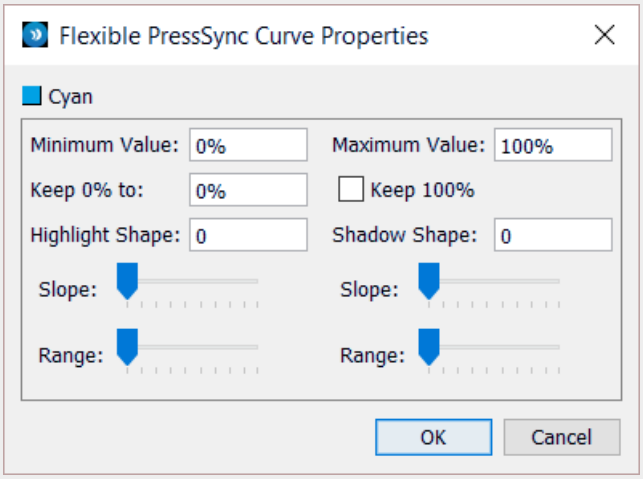
- The **Range** is the magnitude of the correction (over how much of the shadows it is applied): 1 is the smallest range and 9 the biggest (down to the mid-tones).





Tip:

When working with a flexible PressSync curve, use the **Slope** and **Range** sliders to define your shadows correction, and you will see the correction factor in the **Shadow Shape** field.



For example, for a slope of `2` and a range of `1`, the **Shadow Shape** will show `12` (the first digit being the range and the second one the slope).

Flexible PressSync Curve Name

The name of a flexible PressSync curve reflects the parameters it contains. Parameters that are not used are not part of the flexible PressSync curve name.

Example

The following flexible PressSync curve uses all possible parameters:

```
E 50 k0.8% min3.0% h31 max95.0% s12 k100
```

This notation...	indicates...	see also:
`E 50`	the letter and number of the standard PressSync curve it is based on	*PressSync Curve Names* on page 57
`k0.8%`	that the highlights between 0% and 0.8% are dropped	*Keep 0% to* on page 61
`min3.0%`	a minimum printable value of 3%	*Minimum Value* on page 61
`h31`	a highlight shape correction with a slope of `1` and a range of `3`	*Highlight Shape* on page 62
`max95.0%`	a maximum non-solid tone of 95%	*Maximum Value* on page 63
`s12`	a shadow shape correction with a slope of `2` and a range of `1`	*Shadow Shape* on page 64
`k100`	that the solids are kept to 100% and unscreened	*Keep 100%* on page 64

7.1.3. What is a PressSync Curve Set?

A PressSync curve set is a collection of predefined dot gain compensation curves, each attached to an ink (a process ink or a spot color defined in Esko's CMS database).

Curve Pilot / PressSync Pilot creates and saves PressSync curve sets in the `.prsync` file format. A `.prsync` file contains information about the desired printing condition, measurement data, the actual dot gain compensation curves, and history data related to curve set setup and/or measurement actions.

When sending a print job to your RIP application, you typically associate one or more `.prsync` files with it. This way, every separation in your job is compensated with the appropriate PressSync curve. For the details please refer to your RIP application manual.

7.1.4. What is a PressSync Template?

The easiest way to generate PressSync curve sets is to make use of predefined PressSync **templates** available with your Curve Pilot application.

Every predefined PressSync template is linked to a **desired printing condition**, meaning a color profile (ICC or Esko) or a Fogra characterization data set.

This desired printing condition is used to extract desired (target) Lab values for the solids, and desired dot gain curves, defined in an **international printing standard** or an **industry specification**.

Note: You can find a list of all available templates below. For a more detailed description of each template, please consult the *PressSync Templates appendix*.

The following types of PressSync templates are available:

- **PressSync templates based on the ISO 12647 standards**:

Without tolerances	With tolerances
cmyk_Equinox.prsync	TVI_cmyk_Equinox.prsync
cmyk_Fogra51.prsync	TVI_cmyk_Fogra51.prsync
cmyk_Fogra52.prsync	TVI_cmyk_Fogra52.prsync
cmyk_ISO_Newsprint.prsync	TVI_cmyk_ISO_Newsprint.prsync
cmyk_ISO_PT1&2 (NP).prsync	TVI_cmyk_ISO_PT1&2 (NP).prsync
cmyk_ISO_PT1&2.prsync	TVI_cmyk_ISO_PT1&2.prsync
cmyk_ISO_PT3.prsync	TVI_cmyk_ISO_PT3.prsync
cmyk_ISO_PT4.prsync	TVI_cmyk_ISO_PT4.prsync
cmyk_ISO_PT5.prsync	TVI_cmyk_ISO_PT5.prsync
cmyk_ISO_web.prsync	TVI_cmyk_ISO_web.prsync

Those contain dot gain targets based on the ISO 12647-2 standard for offset printing. There is a desired (target) dot gain curve for each process color (C,M,Y,K).

See *PressSync Templates Based on the ISO 12647 Standards* on page 146.

- **PressSync templates based on the G7 calibration method**:

Without tolerances	With tolerances
3ck_Equinox.prsync	G7_3ck_Equinox.prsync
3ck_GRACoIG7.prsync	G7_3ck_GRACoIG7.prsync
3ck_SNAP.prsync	G7_3ck_SNAP.prsync
3ck_SWOP.prsync	G7_3ck_SWOP.prsync

Those contain dot gain targets based on the GRACoL specification for commercial offset lithography.

There is a desired (target) dot gain curve for CMY-composed gray (3c) and black (k). The exact values are calculated using the G7 calibration method.

See *PressSync Templates Based on the G7 Calibration Method* on page 149.

- **PressSync templates allowing a combination of the G7 and the ISO calibration method:**

Without tolerances	With tolerances
SWOP_G7.prsync	G7_CGATS21-2-CRPC1.prsync
SNAP_G7.prsync	G7_CGATS21-2-CRPC2.prsync
GRACoI_G7.prsync	G7_CGATS21-2-CRPC3.prsync
	G7_CGATS21-2-CRPC4.prsync
	G7_CGATS21-2-CRPC5.prsync
	G7_CGATS21-2-CRPC6.prsync
	G7_CGATS21-2-CRPC7.prsync
	G7_GRACoL2006.prsync
	G7_SNAP.prsync

These templates are similar to the **3ck_** templates, but on top of having desired NPD (Neutral Print Density) curves for Black (k) and CMY-composed gray (3c), these templates also allow you to have desired curves for the individual process colors C,M,Y.

The desired (target) dot gain curves for the individual process colors for each of these templates are set to match their specific desired profile. See *Adjustment Curves* on page 92.

See *PressSync Templates Combining the G7 and ISO Calibration Methods* on page 150.

- **Linear dot gain templates**:

Without tolerances	With tolerances
cmyk_LinearColor.prsync **cmyk_LinearDensity.prsync**	**TVI_cmyk_LinearColor.prsync** **TVI_cmyk_LinearDensity.prsync**

Those contain target curves for linear dot gain. They are not based on a specific standard but will give good results in most cases (and a dot gain close to most standards).

See *Linear Dot Gain PressSync Templates* on page 153.

- **PressSync template balanced between tone and gray balance adjustment**:

  TVI_BalancedToneAndGray.prsync

  This template has the same target curve settings as the `cmyk_Fogra51.prsync` and `TVI_cmyk_Fogra51.prsync` templates, but with **Select Curves based on** set to **Both Tone And Gray Balance Measurements**.

  See *#unique_79/unique_79_Connect_42_cmykbasedcurvesetsandgraybalancecalculations* on page 87.

  See *Balanced Tone and Gray PressSync Template* on page 153.

  This template includes tolerances.

Working with Custom Templates

If you want to work with a custom PressSync template, see *Customizing PressSync Templates* on page 102.

7.2. Getting Started with PressSync

This section explains how to create your first PressSync curve set using a PressSync template and automated measurements.

For other options and more in-depth explanations, please see *Creating a PressSync Curve Set for Your Press* on page 70.

1. Select **File** > **New** > **PressSync CurveSet (.prsync)** from the Curve Pilot top menu.
2. In the **Create New Curve Set** dialog, select a PressSync template for your new curve set from the selection list available for **A standard**.

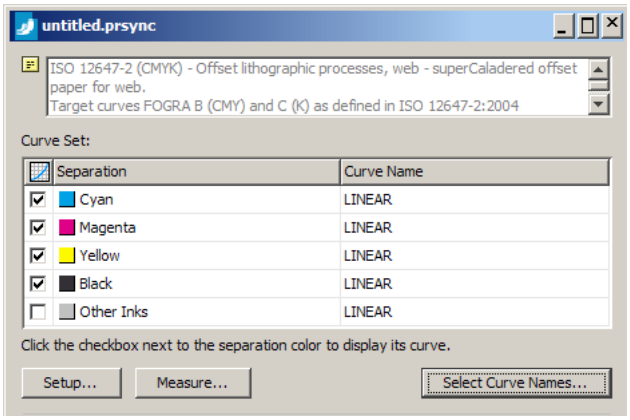
   See *What is a PressSync Template?* on page 66 for more information.

Note:

Never pick **An empty curve set** if you are planning to perform measurements and calculate PressSync curves afterwards.

An empty curve set does not contain any desired printing conditions (targets) and it does not support measurements. It is simply a collection of dot gain compensation curves from the PressSync curve library.

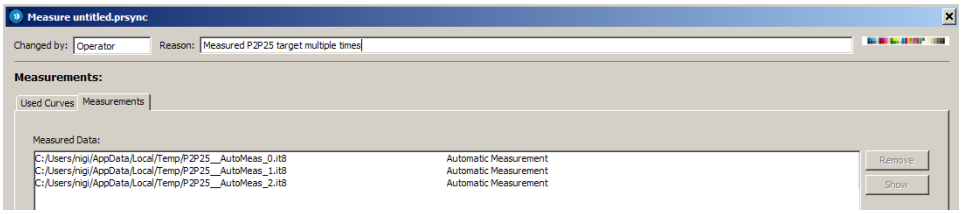
3. Click **Select Curve Names...** in the main PressSync window.



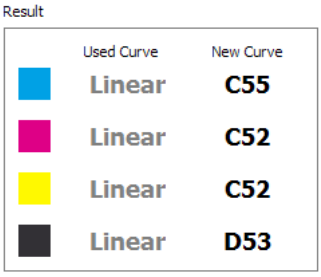
If you have printed your test job without any dot gain compensation, make sure that all curves under **Curve Name** in the **Select Curve Names** dialog are **Linear**.

Otherwise, enter the *PressSync curve(s)* or *flexible PressSync curve(s)* used for printing.

4. Click **Measure** > **Measure Automatic** from the main menu.
5. In the **Automatic Measurement** dialog, select the chart type used in your print job from the **Layout** selection list.
6. **Reconnect** your measuring device (if necessary), and click **Start**. Follow the instructions in the dialog to complete your measurement. You may have to click **Start** several times.
7. If you want to keep a separate record of measurements only, click **Save Measurement...** to export your measurement in the *.it8 (CGATS)* file format and save it in the desired location.
8. You can measure a test job multiple times. Click **OK** when you are done. Notice that each measurement is listed separately under the **Measurements** tab.



9. Click on **Go To Results** to inspect your measurements against the desired (target) dot gain values. A summary of the calculated dot gain compensation curves is included in the rightmost **Result** panel under the **Process Colors** tab.



10. Click **Save...** and select **Save curves** to save measured data and calculated PressSync curves, and to set the calculated PressSync curves as the active ones for printing subsequent test jobs. This way you do not need to repeat step (3) above before measuring your next test job.

    If you do not want to save / update the PressSync curves, select **Save measurements only** instead.
11. Select **File** > **Save As...** from the top menu to save measurements and PressSync curves in a different **.prsync** file under the *central location of DGC data*.

7.3. Creating a PressSync Curve Set for Your Press

To compensate your press' dot gain using a set of PressSync curves, do the following:

1. Create a PressSync curve set indicating the curves you used for printing.

   See *Setting Up Your PressSync Curve Set* on page 70.
2. Print a control strip or universal target and measure your press print out.

   See *Measuring with PressSync* on page 72.
3. Curve Pilot calculates the correction your press needs based on your measurement results.

   Review your results and save your PressSync curve set.

   See *Interpreting PressSync Results* on page 78 and *Saving PressSync Results* on page 99.

   You can also *export your results*, and view the *results history*.

You can now use your PressSync curve set when RIP'ing your files in *Imaging Engine*.

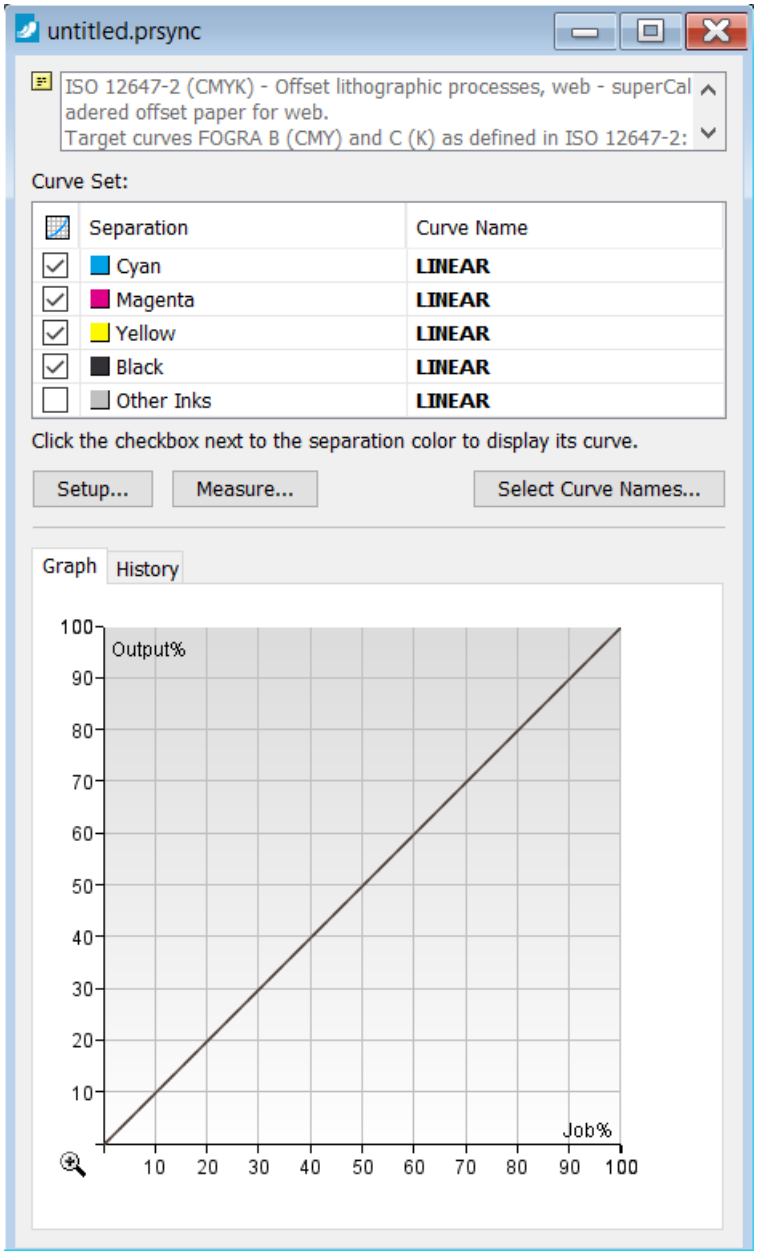
7.3.1. Setting Up Your PressSync Curve Set

1. Select **File** > **New** > **PressSync CurveSet (.prsync)** from the Curve Pilot top menu.
2. In the **Create New Curve Set** dialog, select the template to use for your new curve set.
   - In most cases, you should start from **A standard** PressSync template.

     See *What is a PressSync Template?* on page 66 for more information about PressSync templates.
   - If you have previously created another PressSync curve set for similar printing conditions and you want to use it as a starting point, select it in the **An existing curve set** list.
   - If you are planning to perform measurements and calculate PressSync curves afterwards, do not select **An empty curve set**.

An empty curve set does not contain any desired printing conditions (targets) and it does not support measurements. It is simply a collection of dot gain compensation curves from the PressSync curve library.

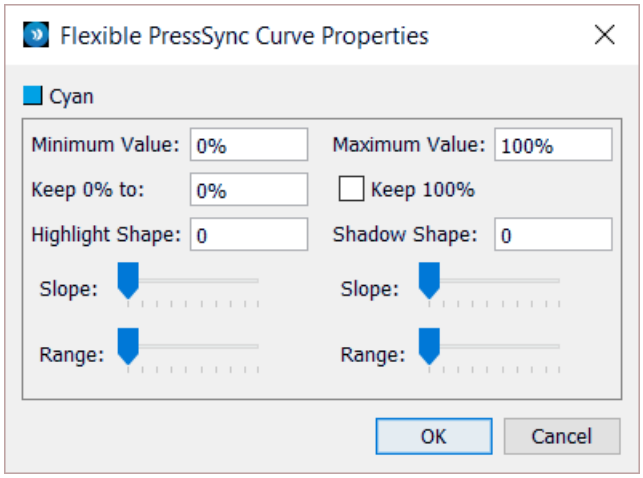
3. This opens the PressSync curve set editor, showing information about the template you selected.



4. Click **Select Curve Names...** and select the curves you have used to print the test job that you want to measure.

   - If you have printed your test job without any dot gain compensation, select **Linear** for all curves.
   - If you used *standard PressSync curve(s)*, select their *letter and number*, and the *minimum and maximum values* you used (if applicable).

- If you used *flexible PressSync curve(s)*, select their letter and number, and click the triangle ▷ to enter the flexible PressSync parameters you used.



See *Highlights Parameters* on page 61 and *Shadows Parameters* on page 63 for more information.

Your changes are reflected immediately in the graph at the bottom of the **Select Curve Names** dialog, and you see the *flexible PressSync curve name* derived from the parameters you enter.

5. When you are done setting the initial curves, you can start *measuring* your test job.

7.3.2. Measuring with PressSync

To start performing measurements, click **Measure...** in the *PressSync curve set editor*.

In the **Measure Curve Set** dialog, you have the options to:

1. *Measure a control strip automatically*; select **Automated measurements**. This option is also available from the main menu (**Measure** > **Measure Automatic**).

   Curve Pilot understands a number of industry standard *print chart layouts* and you can even *define your own*. See also *Control Strips for Equinox* on page 139.
2. *Measure the universal target manually*; select **Universal Target**. This option is also available from the main menu (**Measure** > **Measure Universal Target**).

   The *universal target* is a limited type of print chart containing a small number of patches. Measuring the universal target can serve as a starting point for press fingerprinting.
3. *Measure a control strip of a production sheet manually*; select **A control strip of a production sheet**. This option is also available from the main menu (**Measure** > **Measure Control Strip**).

   The control strip contains a limited number of patches and may not be sufficient for a thorough investigation of the dot gain behavior of your system.
4. Resume an incomplete measurement session; select **Your last (incomplete) measurement**. This option is also available from the main menu (**Measure** > **Continue Incomplete Measurement**).

   This option is not available if you have no incomplete measurements pending. You can review your incomplete measurement actions under the *History* tab of the PressSync curve set editor.

If you have access to a *supported spectrophotometer* for automated measurements, using **Automated measurements** is the preferred measurement method in Curve Pilot.

Automated Measurements

To perform automated measurements in Curve Pilot:

1. Click **Measure...** in the PressSync curve set editor.
2. Select **Automated measurements** in the **Measure** dialog.
3. In the **Automated Measurements** dialog, verify that the PressSync curves listed in the **Used Curves** tab are the ones that were used for printing your test job/chart.

   If not, select **The sheet is printed with different PressSync Curves** and enter the correct *PressSync curve(s)* or *flexible PressSync curve(s)* (including the relevant parameters).
4. Go to the **Measurements** tab and either:
   - *measure a control strip, wedge or chart you printed*,
   - *add previously measured data*,
   - *add a profile you measured for your press*.

   Note: You can add any number of measurements, measured data sets or profiles to the list. The resulting compensation curves will be based on all measurements averaged.
5. Each time you perform a new automatic measurement or add measured data or a profile from a file, it is added to the **Measured Data** list.

   You can **Remove** some of the measurements if needed, or **Show** more details about a measurement.

   See *Measurement Details* on page 75.
6. When you are done, click **Go To Results** to view the measurement results and the compensation curves that Curve Pilot calculated.

   See *Interpreting PressSync Results* on page 78.

Measuring a Control Strip, Wedge or Chart

To measure a control strip, wedge or chart you printed:

1. Click **Add Automatic Measurement...** on the **Measurements** tab of the **Automated Measurements** dialog.

   This option is also available from the main menu (**Measure** > **Measure Automatic**).
2. In the **Automatic Measurement** dialog, select the *chart type* used in your print job from the **Layout** selection list.
3. If you want to measure your chart or test job strip patch by patch (instead of line by line), select **Patch Mode**.
4. Measure your chart/strip:
   a) **Reconnect** your measuring device (if necessary), and click **Start**.
   b) Follow the instructions in the dialog to complete your measurement; you may have to click **Start** several times.

   If needed, you can **Pause** or **Stop** your measuring device, or click **Load Measurement** to use previously measured data.

You can also measure a test job multiple times if desired.

5. If desired you can view detailed information about the patches you measured.

   Select a patch on your layout to view more information about the patch and under which conditions you measured it. See *Measurement Details* on page 75.

6. If desired, you can click **Save Measurement...** (and browse to your desired location) to export your measurement in the *.it8 (CGATS)* file format.
7. When you are done, click **OK** to return to the **Measurements** tab.

Note: The data you have measured appears in a temporary system folder using a descriptive file name containing the `AutoMeas_x.it8` suffix, where `x` is an incremented counter.

Adding Previously Measured Data

To add previously measured data to your curve set:

1. Click **Add Measured Data...** on the **Measurements** tab of the **Automated Measurements** dialog.

   This option is also available from the main menu (**Measure** > **Load Measured Data (CGATS)**).

2. Browse to your measurements file and click **Open**.

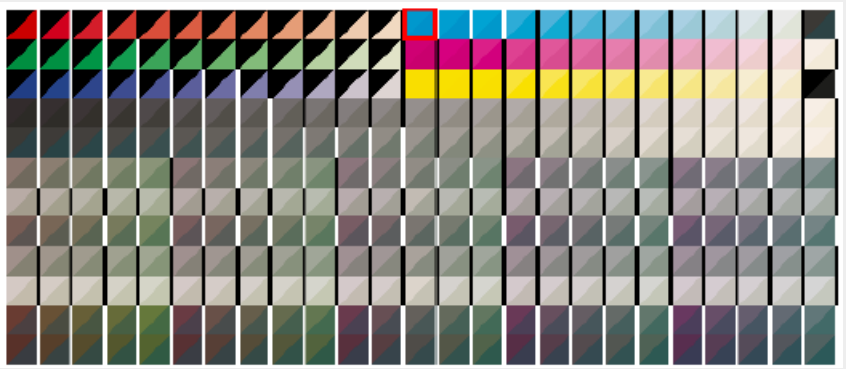
   Note: Your measurements file should be in the *.it8 (CGATS)* format.

3. To inspect the measurements, select the measurements file you added and click **Show**.

   This also shows the **Measurement Condition**, the **ΔE** formula used for the process or spot colors, the **Density** metric used...

   Select a patch in the measurements view to show colorimetric information about this patch: the percentages of the different inks, and **Desired** versus **Measured** values (**Lab** and, if applicable, **Density**, **%DotArea**, **SCTV** and/or **%ΔE_P**).

   Note: Patches overlaid with a black triangle are not used to calculate the curves.



Adding a Measured Profile

If you have measured a profile for your press, you can add it to your curve set, so that Curve Pilot can use the measured data to calculate compensation curve for your press.

1. Click **Add Measured Profile...** on the **Measurements** tab of the **Automated Measurements** dialog.

   This option is also available from the main menu (**Measure** > **Load Measured Profile**).
2. In the **Add Measured Profile** dialog:
   a) Select the **Profile Type** (**Esko Profile** or **ICC Profile**).

      You can information about those profile types in the *Color Pilot documentation*.
   b) Select your desired profile from the list.

      This lists the profiles saved in your color database (which is on the same server share as your curves database). If you have measured a profile using Color Pilot, it is automatically saved in your color database.
   c) Click **Add Profile**.

Measurement Details

When performing an automatic measurement or viewing measurement data, you can see:

- the layout of the control strip, wedge or chart used,
- information about any selected patch on the layout, and details about how it was measured.

Patch Details

When selecting a patch, you can see:

- The number of the selected patch (or **Sample**) on your strip layout (if applicable), and its composition in your strip layout's ink set.
- The **Desired** and **Measured** values for your patch: **Lab** values, **Density** and the relevant dot gain metrics (from the standard or existing curve set you *created your curve set from*).
  - The **Desired** density values are taken from your desired printing condition (if you want to change the desired printing condition for your curve set, see *Select the Desired Printing Condition* on page 104).
  - The **Measured** density values are taken from your spectral measurements, and indicate the filter that resulted in the largest density value: (R), (G), (B), or (K).

  Note: It is not always possible to calculate desired density values from a printing condition, because the printing condition may lack spectral data. In this case the **Density** and **%DotArea** fields will be left blank.
- The **Measurement Condition** used to measure your strip (this the measurement condition from your curve set setup, that Curve Pilot set automatically on your measuring device; to change the measurement condition in your curve set setup, see *Select the Desired Measurement Condition* on page 105).

  Note: If your device doesn't support the measurement condition you selected in your curve set setup, it will use a measurement condition it supports instead. You will see this indicated.

  For information about the different measurement conditions, see *Measurement Conditions* on page 142.
- The **Metric Preferences** used:
  - *Δ# (CMYK)* is used to calculate the color difference between process colors.
  - *Δ# (SPOT)* is used to calculate the color difference between spot colors.

- Measured densities depend on the *filter setting* (ANSI A or similar) and may be absolute or paper relative.

Note: You can set the metric preferences by going to **Edit** > **Preferences...** on the main Curve Pilot menu. See *Application Preferences* on page 137 for details.

Measuring the Universal Target Manually

To perform manual measurements on the universal target:

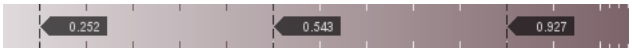
1. Click **Measure...** in the PressSync curve set editor.
2. Select **Universal Target** in the **Measure** dialog.
3. Verify that the PressSync curves listed in the **Used Curves** tab are the ones that were used for printing the universal target.

   If not, select **The Universal Target is printed with different PressSync Curves** and enter the correct *PressSync curve(s)* or *flexible PressSync curve(s)* (including the relevant parameters).
4. Measure the *process color vignettes* on the **Process Colors** tab.
5. Measure the *paper and gray squares* on the **Gray Balance** tab.

Process Colors

To measure process color vignettes on the universal target:

1. Make a note of the *measured quantity for process colors in your setup*. Verify that your measuring device is set to measure the same quantity. This is commonly **%DotArea** in **cmyk_** templates and **density** in **3ck_** templates, but *another metric* may be used instead.
2. For each process color vignette (Cyan, Magenta, Yellow, and Black if you are working with a **cmyk_** template; CMY (3c gray) and Black if you are working with a **3ck_** template) on the universal target:
   a. Locate the solid patch at position 100 on the vignette and measure it. Enter the measured value in the **Measured Solid <quantity>** input field.
   b. For each intermediate patch composition (i.e. 25%, 50%, 75%):
      - Make a note of the desired value. Desired values are displayed on the vignette:



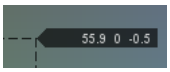
      - Measure around the intermediate composition until you have found the desired value.
      - Note the position on the vignette where you have located the desired value.
      - Enter this position in the corresponding **<quantity> of < desired value> found at** input field.

Note: Press **Tab** to quickly move from one input field to the next.

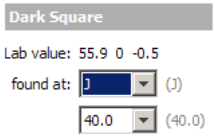
Gray Balance

On the **Gray Balance** tab for the universal target:

1. Measure the Substrate (Paper) and enter the measured Lab values in the **L**, **a**, and **b** input fields. Press **Tab**.
2. Note the desired Lab value for the **Dark Square**. This is shown on the square:



3. Measure around this area on the **Dark Square** until you have found the desired Lab value.
4. Enter the coordinates of the **Dark Square** where you have located the desired Lab value.



5. Repeat steps (2)-(4) for the **Light Square** on the universal target.

Measuring a Control Strip Manually

To perform manual measurements on a control strip:

1. Click **Measure...** in the PressSync curve set editor.
2. Select **A control strip of a production sheet** in the **Measure** dialog.
3. Verify that the PressSync curves listed in the **Used Curves** tab are the ones that were used for printing your control strip.

   If not, select **The production sheet is printed with different PressSync Curves** and enter the correct *PressSync curve(s)* or *flexible PressSync curve(s)* (including the relevant parameters).
4. Measure the *process color patches* on the **Process Colors** tab.
5. Measure the *gray patches* on the **Gray Balance** tab.
6. If your control strip contains spot colors, measure the *spot color patches* on the **Spot Colors** tab.

Process Colors

To measure process color patches on a production control strip:

1. Make a note of the *measured quantity for process colors in your setup*. Verify that your measuring device is set to measure the same quantity. This is commonly **%DotArea** in **cmyk_** templates and **density** in **3ck_** templates, but *another metric* may be used instead.
2. If you are working with a **cmyk_** template, measure the 0% patch, the 100% (solid) patch, and all intermediate patches for Cyan, Magenta, Yellow, and Black.
3. If you are working with a **3ck_** template, measure the 0% patch, the 100% (solid) patch, and all intermediate patches for CMY (3c gray) and Black.
4. Enter your measurements in the **Process Colors** tab. Press **Tab** to quickly move from one input field to the next.

Gray Balance

To measure gray patches on a production control strip:

1. Measure the 0% patch and enter the measured Lab values in the **L**, **a**, and **b** fields. Press **Tab**.
2. Measure the 100% (solid) patch and enter the measured Lab values in the corresponding **L**, **a**, and **b** fields. Press **Tab**.
3. Measure each intermediate gray patch and enter the measured Lab values in the corresponding **L**, **a**, and **b** fields.

Spot Colors

To measure spot color patches on a production control strip:

1. Make a note of the *measured quantity for spot colors in your setup*.

   Verify that your measuring device is set to measure the same quantity. This is commonly **ΔE-P**, but **%ΔE-P** or *another metric* may be used instead.
2. Enter your measurements in the **Spot Colors** tab.

   Press **Tab** to quickly move from one input field to the next.

7.3.3. Interpreting PressSync Results

To view your PressSync measurements and results, click **Go to Results** in the **Measure** dialog.

1. At the top of the dialog, next to **Results**, you can see the best PressSync curve to use as compensation curve for each measured ink.

   See *PressSync Curve Names* on page 57 for more information about what the PressSync curve names refer to.
2. In **Select View**, choose to view your **Measured Curves**.

   You can also choose **Measured and Adjustment Curves** if you want to see both side by side.

   a) Check how the measurements of the ink solids compare to the desired values on the **Overview Ink Solids** tab.

   See *Overview Ink Solids*.

   Important: Inspect the **Overview Ink Solids** results first. Large deviations of the measured ink solids values from the desired ink solids values imply that the calculated PressSync dot gain compensation curves should be used with extreme caution.

   b) On the **Process Colors** tab, you can check the measurements for **All Inks**, each individual ink, and **Gray Balance Measurements**.

   See *Process Colors* on page 79.

   c) Click the **Spot Colors** tab and compare your spot color measurements to your desired values.

   See *Spot Colors* on page 91.
3. In **Select View**, choose **Adjustment Curves**.

   You can also choose **Measured and Adjustment Curves** if you want to see both side by side.

   a) If desired, you can set some curve fitting options in the dialog's top right area:

   - In **PressSync Curve Fit**, choose to calculate which PressSync curves to use based on either a **Robust** or a **Standard** fit of your measured points.

     See *Curve Fitting Options* on page 144 for more information.

   - Choose to use either a standard or a *flexible PressSync curve* (select **Flexible Curves**).

   Curve Pilot will recalculate the best PressSync curves to use as compensation curves based on what you select here.

Note: This applies to all inks.

b) Below, you can see ink measurements for **All Inks** and individual process inks.

See *Adjustment Curves* on page 92.

4. In **Select View**, choose **Verification**.

   In this view, you can see the verification results and the details of measured and verified ink solids, gray scales, process inks and spot colors if tolerance had been set for them.

   See *Verification View* for more details

5. Click **Verification report** or **Measurement Report** to generate a report of your verification results or a combined report of all your measurements results and adjustment curves.

   You will be able to print this report if desired. See *Generating Report of PressSync Results* on page 100 for more details.

Measured Curves

Process Colors

Measurements and Curves Details

On the **Process Colors** tab, you can find additional tabs containing more information about:

1. *ink measurements* (for **All Inks** and individual process inks),
2. *gray balance measurements*.

Curves Selection Parameters

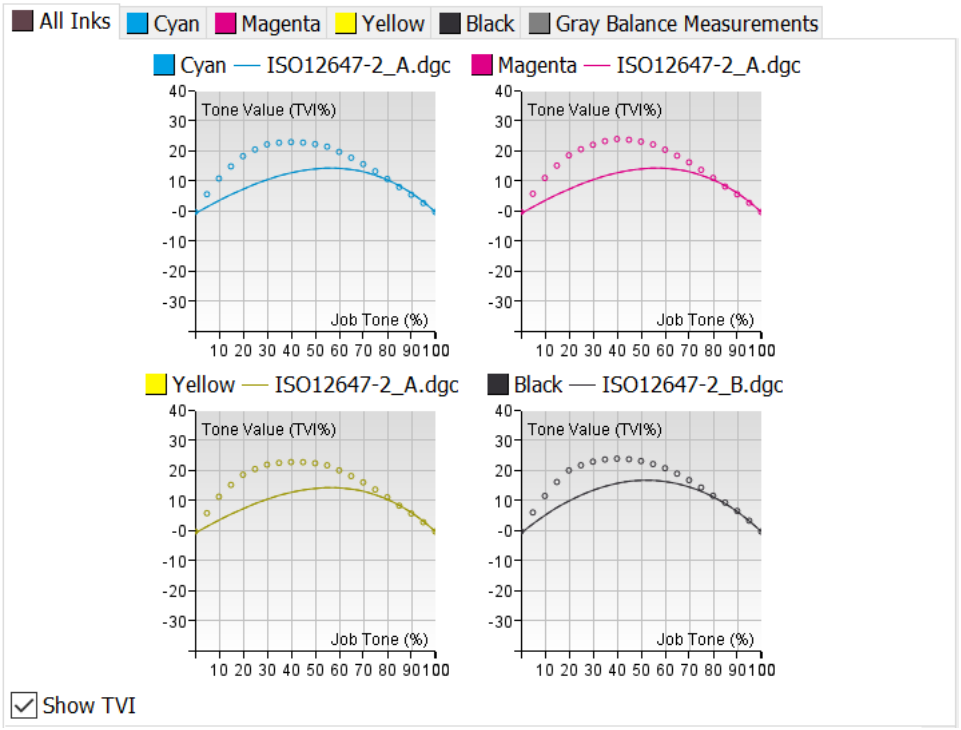
At right you can see and edit some parameters that influence which compensation curves are selected for your process colors. See *Advanced PressSync Settings* on page 83.

Note: The resulting compensation curves are affected by both the *advanced settings* and your *curve fitting choices*.

Ink Measurements

On the **Process Colors** tab, you can see ink measurements for **All Inks** and individual process inks.

You can see the measured versus desired data displayed in graphs. On each graph, solid lines indicate desired values; data points indicate measurements.



For individual inks, you can set some options to control the highlights and shadows reproduction:

- Under **Lightest Printable Dot**, indicate the characteristics of your lightest stable highlight level.

  For example, if you noticed that your press only prints in a stable way from 3%, you can set your minimum dot (the first percentage after 0%) to print at 3%, and gradually increase the tones from there.

  - Enter the input **Gray Level** that produces your lightest stable highlight level. You can find it on the *curve you used* to print that separation.
  - Enter the **Tone Value** that this gray level prints to (this is the minimum tone that you can print in a stable way, for example 3%).

    Tip: You can enter the **Tone Value** first and the **Gray Level** will be calculated automatically (and vice-versa).

  - In **Print**, enter the value you measured for this **Gray Level**/**Tone Value**, in the *metric* defined in your template (for example ΔE-P, %DotArea...). You can also find this value by zooming in on the measurements graph.

- Under **Darkest Printable Dot**, you can find the characteristics of your darkest shadow level. Those are calculated from your measurements by Curve Pilot.
  - You can see the input **Gray Level** that produces your darkest shadow level. If this is not the solid patch, you will see a warning that your measurements show tone reversal.
  - You can also see the **Tone Value** that this gray level prints to.
  - In **Print**, you can see the value measured for this **Gray Level**/**Tone Value**, in the metric defined in your template.

- In **Solid**, you can see the value measured for your solid patch, in the metric defined in your template.
- If your print out shows tone reversal, you can compensate it by screening the solid to the **Gray Level** of your darkest shadow.

  In this case, enter that gray level in **Solid Screen**.

  Otherwise, keep **Solid Screen** to 100%.

The resulting curve for that ink will be adjusted to start printing only from your **Lightest Printable Dot**, and to print your shadows using your **Solid Screen** percentage as maximum.

When using *flexible PressSync curves*:

- the **Gray Level** you set for your **Lightest Printable Dot** will be used as *Minimum Value*,
- the **Gray Level** of your **Darkest Printable Dot** will be used as *Maximum Value*,
- the percentage you use as **Solid Screen** will determine the *Keep 100%* parameter (whether you keep the solid at 100% or screen it to your maximum value).

The *highlight* and *shadow* shape of the flexible PressSync curve will also be calculated to compensate your measurements.

At the bottom of each tab, you can see measured versus desired data in a tabular format (for all inks or individual inks).

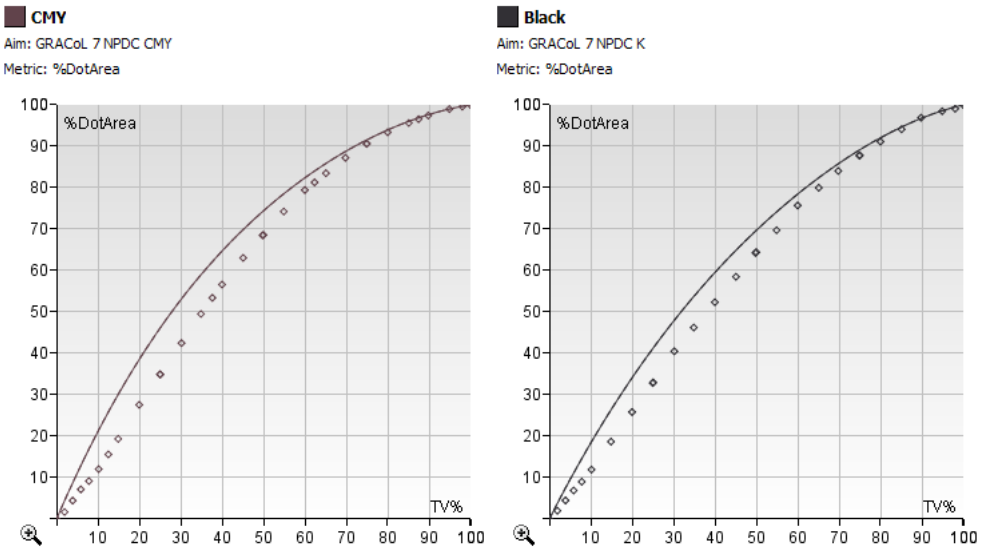
	Paper	5%	10%	20%	25%	30%	40%	50%
Cyan								
Measured %DotArea	(0.036)	4.7%	10.3%	23.7%	29.8%	36.0%	48.9%	61.7%
Desired %DotArea		6.6%	14.3%	27.6%	34.3%	41.0%	53.0%	64.1%
Magenta	Paper	5%	10%	20%	25%	30%	40%	50%
Measured %DotArea	(0.051)	4.6%	10.0%	23.6%	30.6%	37.8%	49.6%	62.1%
Desired %DotArea		6.6%	14.3%	27.6%	34.3%	41.0%	53.0%	64.1%
Yellow	Paper	5%	10%	20%	25%	30%	40%	50%
Measured %DotArea	(0.014)	4.0%	9.3%	23.2%	29.8%	37.0%	49.5%	62.8%
Desired %DotArea		6.6%	14.3%	27.6%	34.3%	41.0%	53.0%	64.1%
Black	Paper	2%	4%	6%	8%	10%	15%	20%
Measured %DotArea	(0.041)	2.0%	4.5%	6.9%	9.0%	12.0%	18.7%	25.9%
Desired %DotArea		3.1%	6.2%	9.3%	12.3%	15.9%	23.0%	30.2%

Solid black lines of text indicate measured results. Gray lines of text indicate desired values.

The numerical values displayed depend on the measurement metric chosen on the **Process Colors** setup tab (see *Select the Desired Dot Gain Metric* on page 103).

- When working with a **cmyk** template, and the setting for **Measure** on the **Process Colors** setup tab is **%DotArea** or **%ΔE-P**, tone value increase (TVI%) graphs are shown by default.

  To switch to the usual dot gain graphs, deselect the **Show TVI** option.
- TVI graphs are not relevant in the case of **3ck_** templates.



CMY	Paper	2%	4%	6%	8%	10%	13%	15%	20
Measured %DotArea	(0.041)	1.7%	4.5%	7.2%	9.2%	12.1%	15.6%	19.4%	27.6
Desired %DotArea		4.5%	8.8%	12.9%	16.9%	21.5%	25.9%	30.1%	38.6
Black	Paper	2%	4%	6%	8%	10%	15%	20%	25
Measured %DotArea	(0.041)	2.0%	4.5%	6.9%	9.0%	12.0%	18.7%	25.9%	32.8
Desired %DotArea		3.8%	7.5%	11.1%	14.6%	18.7%	26.4%	34.1%	41.2

Note:

Curve Pilot calculates tone value increase based on the measurement metric.

- For %DotArea: TVI% = %DotArea - %TV, where **%TV** is a tone value percentage (patch composition), and **%DotArea** is the measured dot area at that tone value.
- For %ΔE-P: TVI% = %#E-P - %TV, where **%ΔE-P** is the measured colorimetric value at **%TV**.

Gray Balance Measurements

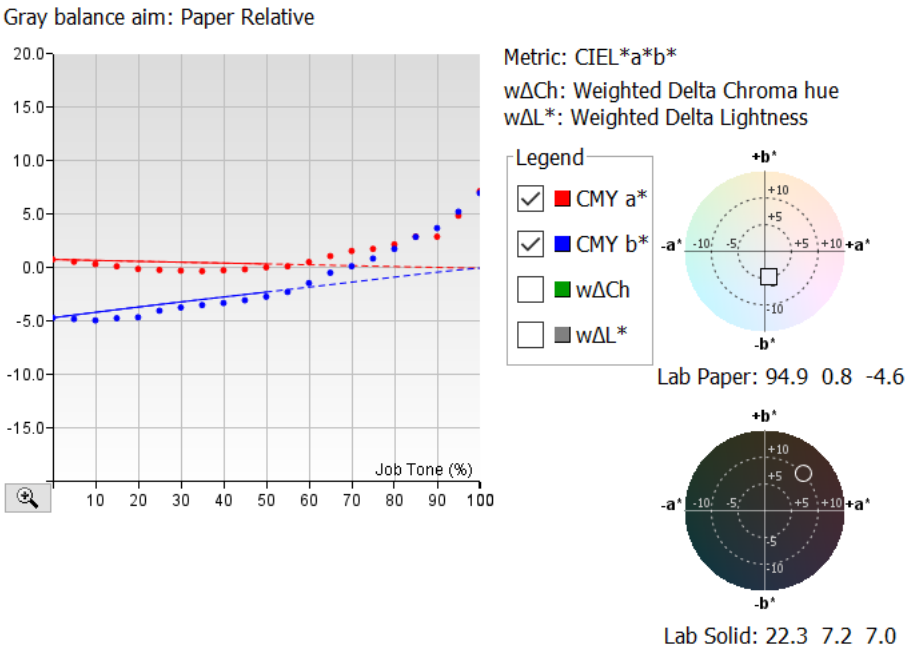
The **Gray Balance Measurements** tab summarizes measured versus desired values for CMY-composed gray patches. See *Gray Balance Calculations* on page 88 for the details.

The top half of the **Gray Balance** tab displays measured and desired values graphically.

- Measured a* values are shown as data points in red; desired a* values are shown as a solid / dashed line in red.
- Measured b* values are displayed as data points in blue; desired b* values are shown as a solid / dashed line in blue.
- The transition of these target a*, b* lines from solid to dashed indicates the gray balance feather-off start (a user-defined tone value that marks the start of gradual reduction for gray balance compensation).

  For the details see *Gray Balance Feather-Off* on page 89.
- The difference between measured and desired L* values is displayed as a weighted delta Lightness line in black.
- The difference between measured and desired Chroma/hue is displayed as a weighted delta Chroma/hue line in green.

These can be useful in assessing how far the measured patches are from the perceived natural color scales specified in the desired printing condition (target). Ideally they should be straight horizontal lines close to zero.



Gray	Paper	5%	10%	15%	20%	25%	30%	35%
L	94.9	90.5	86.1	81.9	77.9	74.1	70.4	67.1
Desired L		90.9	86.9	83.0	79.2	75.5	71.8	68.1
a	0.8	0.6	0.4	0.2	-0.1	-0.2	-0.2	-0.3

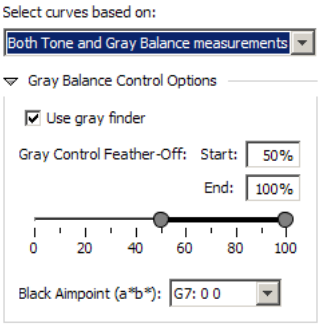
The bottom half of the **Gray Balance** tab displays measured versus desired data in a tabular format.

Solid black lines of text indicate measured results. Gray lines of text indicate desired values.

The numerical values displayed are colorimetric (Lab values).

Advanced PressSync Settings

At right you can see and edit some parameters that influence which compensation curves are selected for your process colors.

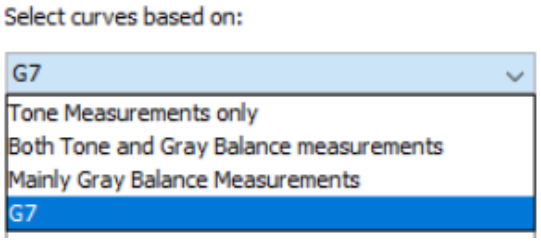


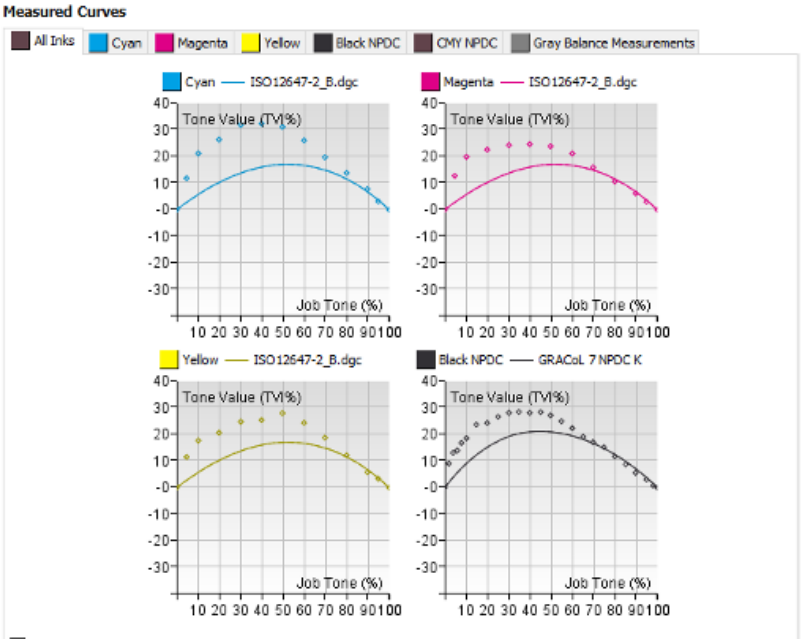
Note: The resulting compensation curves are affected by both these advanced settings and your *curve fitting choices*.

Curves Selection

In **Select curves based on**, you can see what measurements are used to calculate the compensation curves for process colors.

Depending on the chosen selection, different measurement channels are used to calculate curves from. These channels are shown as different tabs in the **Measured Curves** panel: **Cyan**, **Magenta**, **Yellow**, **Black NPDC**, **CMY NPDC** and **Gray Balance Measurements**.





- **Tone Measurements only**

  The resulting curves compensate towards desired dot gain for each single color. This method uses the single tone measurement channels Cyan, Magenta, Yellow and Black.

  This option is only available when `.prsync` templates are used that have the single color channels available, i.e. the templates that are prefixed with `cmyk_` and the G7 templates (see the **G7** option).

- **Mainly Gray Balance Measurements**

  The curves compensate for gray balance. This method uses the Gray Balance Measurements channel to calculate adjustment shifts for Magenta and Yellow, and the measurement channel to adjust towards proper density or lightness.

  This option is only available when `.prsync` templates are used that have the single cyan color available, i.e. the templates that are prefixed with `cmyk_` and the G7 templates (see the **G7** option).

- **G7**

  The curves compensate according to the G7 method, which uses the Gray Balance Measurements channel to calculation adjustment shifts for Magenta and Yellow. To adjust density, this method uses the Neutral Print Density (NPD) measurements for Black and CMY, from the Black NPDC and the CMY NPDC channels.

  This option is only available when `.prsync` templates are used that have the NPD channels, i.e. the templates that are prefixed with `3ck_` (for example `3ck_equinox.prsync`) and templates with all 5 channels enabled (`GRACol_G7.prsync`, `SWOP_G7.prsync` and `SNAP_G7.prsync`).

- **Both Tone and Gray Balance Measurements**

  The curves compensate partly for tone and partly towards gray balance.

  This method first calculates curves that compensate towards desired dot gain for each single color. For that it uses the single tone measurement channels Cyan, Magenta, Yellow, and Black.

  Next it uses the 'Gray Balance Measurements' channel to calculate adjustment shifts for Magenta and Yellow.

  Finally, it averages the curves obtained from the previous two steps.

This option is only available when `.prsync` templates are used that have the single color channels available, i.e. the templates that are prefixed with `cmyk_` and the G7 templates (see the **G7** option).

Note: By default, Curve Pilot selects the most appropriate option based on your measurements. However, if you want to change it, see *Gray Balance in CMYK Templates* on page 87 for more information.

Gray Balance Control Options

Note: In most cases, we recommend using the default settings provided by Curve Pilot. However, if you want to change those settings, use the links below to find more information.

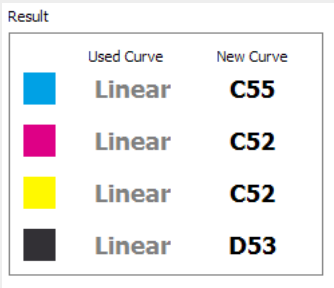
Setting	Description
Use gray finder	Control how compensation for gray balance is calculated. See *Gray Finder Method* on page 88 and *Linear Method* on page 88.
Gray Control Feather-Off Start	Define the range of tonal values where compensation for gray balance will be gradually reduced (feathered-off). See *Gray Balance Feather-Off* on page 89.
Gray Control Feather-Off End	
Black Aimpoint (a*b*)	Determine the method used in feathering-off compensation for gray balance. See *Black Aimpoint Set to 'G7:0 0'* on page 89 and *Black Aimpoint Set to 'Measured'* on page 90.

Curves

- You can see the initial curve used for printing (**Used Curve**) and the resulting compensation curve (**New Curve**) for each ink.

Note:

The resulting compensation curve set will automatically replace the *currently used curve set* in Curve Pilot.



The compensation curves shown under **New Curve** in the results become the updated **Used Curve** set for the next measurement action.

- Click **Show Selected Curves** to show the information from the *Selected Curves* tab at right.

- Click **Export Curves...** to export your resulting PressSync Curve set as a `.icpro` curve strategy and `.dgc` curves. See *Exporting PressSync Results* on page 100.

Gray Balance in CMYK Templates

The way Curve Pilot calculates compensation points for tone and compensation points for gray balance is different depending on the *PressSync template* used. These differences are summarized in the following table.

PressSync Template	Tone Compensation	Gray Balance Compensation
ISO 12647-based templates	Compensation is calculated from desired tone value increase (TVI) curves specified in an ISO standard	Compensation is calculated from desired a, b values, and also L target values extracted from G7 neutral print density curves (NPDC)
G7-based templates	Compensation is calculated from density or L target values extracted from G7 neutral print density curves (NPDC)	Compensation is calculated from desired a, b values only (see *Gray Balance Calculations* on page 88)
Templates based on both ISO 12647 and G7	Compensation is calculated from desired tone value increase (TVI) curves specified in an ISO standard	Compensation is calculated from desired a, b values only (see *Gray Balance Calculations* on page 88)
Linear dot gain templates	Compensation is calculated from target curves for linear dot gain	Compensation is calculated from target curves for linear dot gain
Balanced tone and gray template	Compensation is calculated from the target characterization data in FOGRA51_Spectral.txt (not DGC curves)	Compensation is calculated from the target characterization data in FOGRA51_Spectral.txt (not DGC curves)
Custom templates	Compensation is calculated from your chosen desired curves or target characterization data	Compensation is calculated from your chosen desired curves or target characterization data

CMYK Based Curve Sets and Gray Balance Calculations

When creating new curve sets from a CMYK template, by default Curve Pilot calculates compensation curves for tone only. You can verify this when viewing results: the setting for **Select curves based on** should be **Tone Measurements only**.

To obtain compensation curves taking into account gray balance, change the default setting to either **Mainly Gray Balance Measurements** or **Both Tone and Gray Balance Measurements**.

- **Mainly Gray Balance Compensation in CMYK Curve Sets**

  With this setting, you can influence compensation towards gray balance in the highlights, and switch to compensation towards tone in the midtones and/or shadows. The transition point will depend on the gray balance feather-off method used. See also *Gray Balance Feather-Off* on page 89.

  When the black aim point is set to **G7:0,0** in the **Black Aimpoint (a*,b*)** selection box (see *Black Aimpoint Set to 'G7:0 0'* on page 89), compensation for gray balance starts to fade out at the Feather-Off Start tone. After that tone, compensation gradually moves towards the desired TVI curves.

  When the black aim-point is set to **Measured** (see *Black Aimpoint Set to 'Measured'* on page 90),compensation for gray balance starts to fade out at the Feather-Off End tone. After that tone, compensation gradually moves towards the desired TVI curves.

When you examine press test runs with compensation curves calculated towards mainly gray balance targets, you may notice two distinct areas in the *Tone Measurements* TVI graphs: a highlights / midtones area where the desired tone values are not met very well, and a midtones / shadows area where measured dot gain follows the desired TVI curves very well.

- **Both Tone and Gray Balance Compensation in CMYK Curve Sets**

  With this setting, compensation towards both tone and gray balance will applied over the whole tonal range and averaged evenly.

Gray Balance Calculations

The G7 calibration method is based on adjusting curves towards perceived neutral gray scales. The measured data used by this method is mainly colorimetric.

When the measured color of a *neutrally composed gray patch* (made of equal percentages of C, M, Y) deviates from the desired neutral color, you have to correct / shift the individual C, M, Y components to bring the color back to neutral. This is the principle behind **compensation towards gray balance**.

Curve Pilot has two different methods for obtaining curves that compensate towards gray balance: a linear method and a 'gray finder' method. Both are available on the *Gray Balance Control Options panel* when viewing results.

To use the linear method, deselect **Use gray finder**. The **Use gray finder** control will be disabled if your measurements were made on control strip(s) not containing enough neutrally composed gray patches and/or enough 'gray finder' patches around them; see *Gray Finder Method* below.

Linear Method

The linear method assumes a linear relationship between changes in color Lab values and changes in CMY components. Coefficients for this relationship are derived from the a and b values measured for the ink solids.

This method takes measurements from neutrally composed gray patches. The measured Lab values are compared to the desired Lab values that give neutral perceived scales. Compensation is calculated from the difference, using a linear relationship.

Note:

This method is **not** suited for printing conditions that use inks with non-linear profiles, i.e. for inks whose measured a, b values do not scale linearly with tone.

Also, if the measured a, b values are too far away from the desired/aim values, the calculated curves may not immediately result in neutral scales, and different print iterations may be required.

Gray Finder Method

The gray finder method relies on additional 'gray finder' patches around the neutrally composed ones.

It measures Lab values for the different CMY compositions around each neutral triplet, and constructs a lookup table of CMY compositions into Lab values. Finding the correct CMY triplet is then equivalent to looking up the desired a, b values in the table.

The *P2P25* calibration target is especially suited for this method: it contains several neutrally composed gray patches, and 'gray finder' patches around them.

This method can also be used when profiles are used as measurement data. The Lab values of gray finder patches are then extracted from the profile by interpolation.

Relative Lightness

Curve Pilot uses the latest G7 method for calculating desired/aim a, b values for any neutrally composed CMY-triplet. In simple terms, this method multiplies the a, b values of the standard paper by the relative lightness of the CMY-triplet.

The relative lightness (RL) of each triplet is calculated by the following formula:

```
RL = (L_ triplet - L_300) / (L_paper - L_300)
```

where L_triplet is the desired/aim L value of the triplet, L_paper is the L value of the standard paper, and L_300 is the desired/aim L value of the 100% CMY patch (Cyan=100%, Magenta=100%, Yellow=100%).

The effect on the **Gray Balance Measurements** graph is that a, b aim lines in the graph may not be perfectly straight lines. The a, b aim lines will be more curved (or piecewise straight) when using paper with more color (higher a or b).

Gray Balance Feather-Off

Why Feather-Off Gray Balance

The G7 method specifies that color of neutral scales should go from paper to perfectly achromatic; the 100% CMY patch (C=100%, M=100%, Y=100%) should measure a=b=0.

On most real printing conditions, the 100% CMY patch is not perfectly achromatic. To compensate for that, one or more of the C, M, Y components of the 100% CMY patch would need to be screened, and this is mostly unwanted (screened solids are generally undesirable).

Because we do not want to screen at 100% CMY, and because we want a smooth transition towards slightly colored 100% CMY, we have to **feather-off** (gradually reduce) gray balance correction in the shadows.

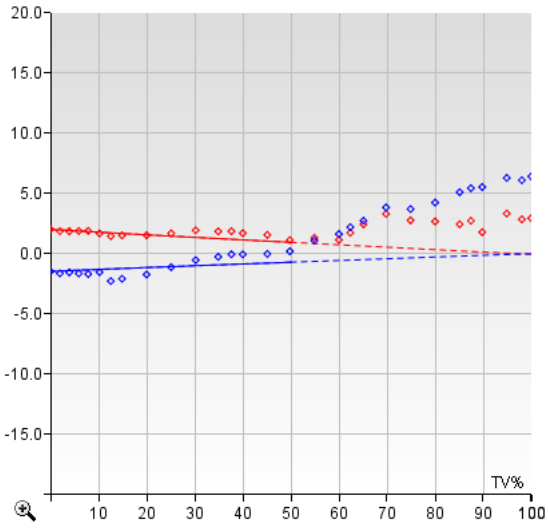
Curve Pilot provides two different methods to this end. The first method gradually reduces the required CMY shifts / corrections. The second method gradually scales the aim values. Both are available on the *Gray Balance Control Options panel* when viewing results.

To use the first method, select **G7:0 0** in the **Black Aimpoint (a*,b*)** list. To use the second method, select **Measured** in the **Black Aimpoint (a*,b*)** list.

Black Aimpoint Set to 'G7:0 0'

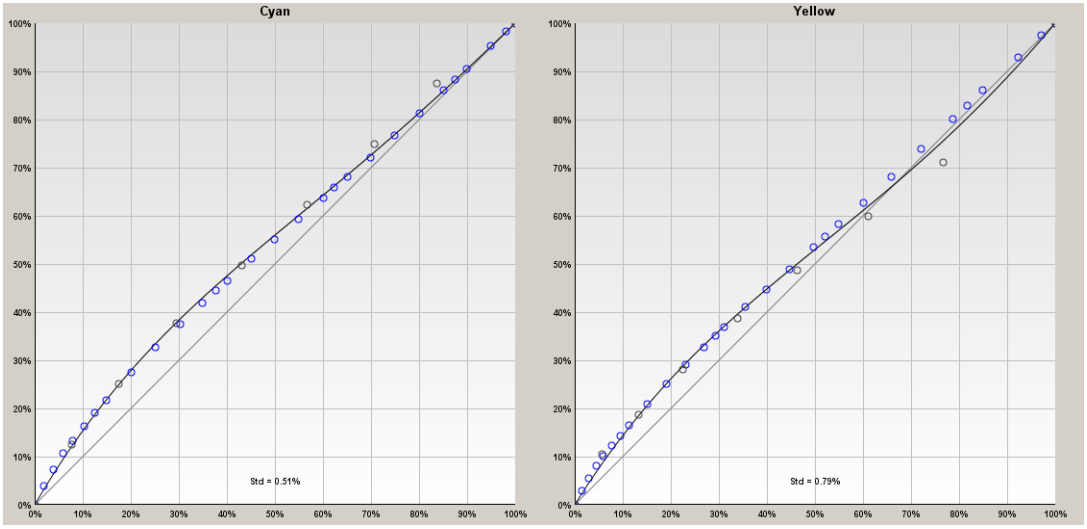
This method keeps the a and b aims over the whole tonal range as specified by the G7 method, but from a certain gray tint onwards (the **Gray Control Feather-Off Start**) gradually reduces the required CMY shifts / corrections. The feather-off start is set at 50% by default. There is also a **Feather-Off End** tint, which is set at 100% by default.

On the *Gray Balance Measurements* chart you will notice that the a, b aim lines change into dashed lines at the tone value specified in Feather-Off Start.



The compensation curves obtained with this method fully correct gray balance in the highlights and mid tones; in the shadows, gray tints gradually follow the natural overprint behavior of the inks.

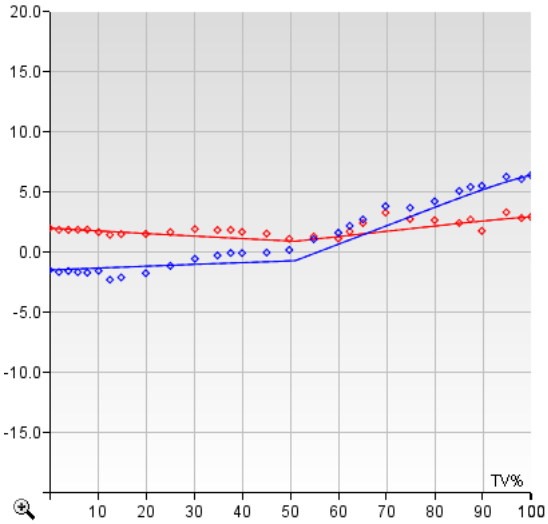
You can verify this in the *Calculated Curves* graphs in Curve Pilot, by selecting the **Show tone and gray compensation points** option. Tone compensation points are shown in blue, gray compensation points are shown in gray. The final adjustment curve fits the gray compensation points very well up to the feather-off tone; after the feather-off tone, it gradually fits the tone compensation points (in blue) better.



Black Aimpoint Set to 'Measured'

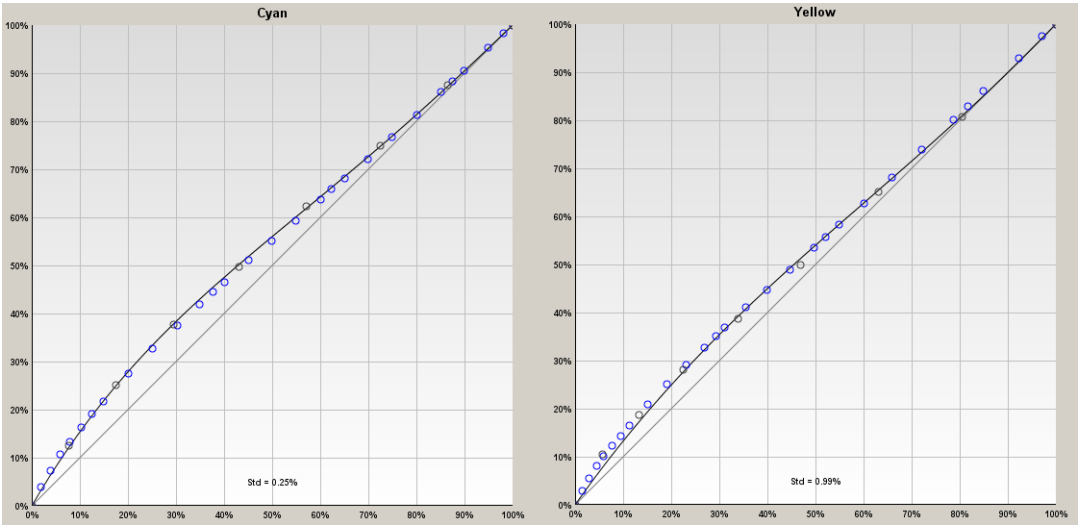
This method linearly scales the a, b aim values towards the a, b values measured for the 100% CMY patch.

On the *Gray Balance Measurements* chart you will notice that the a, b aim lines remain solid, but their slope changes at the tone value specified as feather-off start .



The curves obtained from this method give rise to neutral color scales in the highlights and mid tones, and to colors linearly shifting towards the measured 300% CMY patch from the feather-off tone onwards.

On the adjustment curves calculated from this method, you will notice that the curves now fit the gray points (the compensation points towards gray balance) over the whole tonal range. You will also notice that past the feather-off start, these gray points gradually become linear (X=Y). That is expected; as aim values gradually go towards measured values, required compensation diminishes.



Spot Colors

Curve Pilot displays tone measurements for spot colors in the same way as for process colors. See the section on *ink measurements for process colors* for details.

Compensation curves are also calculated and displayed in a similar way, see *Selected curves* for details.

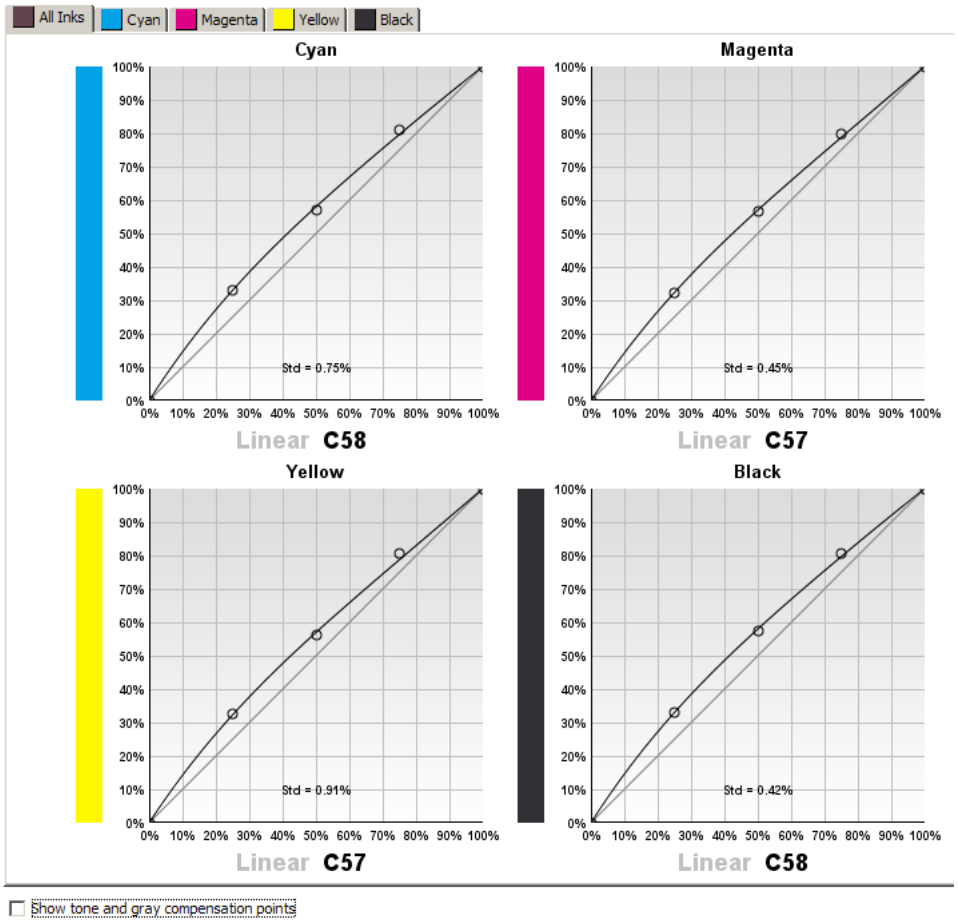
Note: *Advanced gray balance options* are not applicable to spot colors: compensation curves are calculated from compensation points for tone only.

Adjustment Curves

The **Adjustment Curves** tab shows the compensation curves calculated by Curve Pilot for each process ink present in your setup.

The curves' calculation is affected by your *curve fitting choices* and by whether they compensate your *tone and/or grey measurements*.

The compensation curves are shown for **All Inks** under the same tab, and for each process ink on separate tabs.



Select **Show tone and gray compensation points** to view tone compensation points (in blue) and gray compensation points (in gray) on any compensation graph. For the details see *Gray Balance in CMYK Templates* on page 87.

Curves from Tone and/or Grey Measurements

- When using a **cmyk_** template, these curves are calculated from compensation points for tone only by default.

- When using a **3ck_** template, they are calculated from compensation points for gray balance only by default.

It is possible to change this but we recommend you keep the default. See *Curves Selection* on page 84 for more information.

Verification

What is Verification?

You can use verification to check the color accuracy of the ink solids (and substrate) you measured. To do this, Curve Pilot compares your measurements to the target values taken from your curve set setup.

For each metric to verify, Curve Pilot uses a verification tolerance, which is the maximum color difference allowed between your measurement values and the target values.

Your curve set measurement will pass verification if the difference between your measurement values and the target values is smaller than the tolerance, and fail verification if it is bigger.

Note: For more information about verification tolerances, and how to add custom tolerances to your curve set setup, see *Set Custom Verification Tolerances* on page 109.

Verification Results

To see the verification results, select the **Verification** view in your *measurement results dialog* (if your PressSync curve set has verification tolerances set up, you see this view by default when opening the results dialog for the first time).

At the top of the dialog, you can see the overall verification **Results**:

in green with a check mark ✅	**Verification Passed!**	The differences between what you measured and your target are below the corresponding tolerances.
	Verification Passed – not all metric measured	The differences between what you measured and your target are below the corresponding tolerances, but you have also set up tolerances for metrics which were not measured.
	Verification Passed with Substrate Corrected Colorimetric Aim (SCCA)!	The verification only passed when correcting for optical brightening agents in the substrate (see *Correction for Optical Brighteners in the Substrate* on page 94).
in orange	**Verification Passed - modifications made to curve set**	All the measured metrics are within tolerance but you have made some changes to the desired curve, the curve calculation options or the curve adjustment options.
in red with a cross ❌	**Verification Failed!**	The differences between what you measured and your target are above the corresponding tolerances. If the verification fails when *using SCCA to correct for optical brighteners*, you will also see this message.

in black	**No verification results because there are no tolerances set up**	You have not set any tolerances for the curve set.

Correction for Optical Brighteners in the Substrate

When printing on a substrate containing optical brightening agents (OBAs):

- the measured substrate color is different from what it would be without the OBAs, and different from the desired substrate color,
- the ink measurements are also different (as the substrate color affects the color of the inks on this substrate).

This can cause verification to fail.

To correct for the effect of the optical brighteners, Curve Pilot automatically uses SCCA (Substrate Corrected Colorimetric Aim), a correction method defined in the ISO standard, during the verification if needed.

This means that if the verification fails, Curve Pilot applies the SCCA correction automatically, and shows the verification result with SCCA (this can be a pass or fail depending on your data). You can still display the verification result without the SCCA correction if desired (see *Overview Ink Solids*).

Note:

By default, Curve Pilot uses the SCCA method defined in ISO 15339-1: 2015 Annex A.

In some particular cases, you may want to adjust this (if for example you are using both Curve Pilot and Curve 4, and you want to set your verification up as in Curve 4, rather than as in the ISO standard). If this is the case, please contact an Esko Solution Architect for assistance.

Note that the Delta E differences between the different SCCA methods are minimal (no more than 0.3 Delta E in Esko R&D tests).

Verification Details

You can see more detailed results for your measurements in the dialog's tabs (you may only have some of these, depending on which types of tolerances you have in your curve set setup):

- *Overview Ink Solids*
- *Gray Scales*
- *Tone Scales Process Inks*
- *Tone Scales Spot Colors*

You can also print a report of your verification results. See *Generating Report of PressSync Results* on page 100.

Overview Ink Solids

The **Overview Ink Solids** tab details the color difference between measured and desired paper and ink solids colors. You always see this tab if you have measured the ink solids, even if you don't have verification tolerances for them in your curve set setup.

Curve Set Setup Data

At the top of the tab, you can see some data taken from your curve set setup:

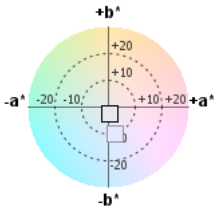
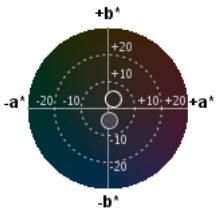
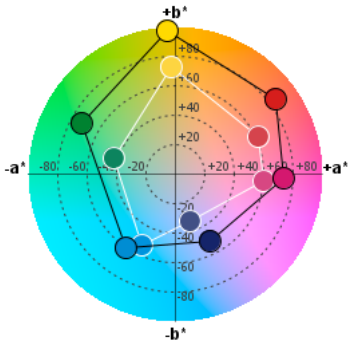
- your **Desired Printing Condition** (you can click the info button to see more information about it) (see also *desired printing condition*),
- the **Measurement Condition** you used when measuring your sample (if it is unknown, you see the **Desired** one from your curve set setup in brackets) (see also *measurement conditions*),
- the **Verification Metrics** (how the differences between your measurements and the desired values are calculated). These are:
  - the Delta E formula used to calculate the difference between your measurements values and your desired values for process colors, in **ΔE (CMYK)**.
  - the Delta E formula used to calculate the difference between your measurements values and your desired values for spot colors, in **ΔE (SPOT)**.

    Note: The Delta E formulas used for process and spot colors may be different.

  - the density filter used, and whether the ink solids densities are **Absolute** or **Paper Relative**, in **ΔDensity**.

Visual Representation of Color Differences

You can see the differences between your measured and desired values represented graphically on three color wheels:

Paper	CMY solid	Colors (single ink solids)
		

Note: If the verification uses *SCCA*, the position of the desired values on the color wheels is adjusted. See *Substrate Correction* on page 95.

Substrate Correction

Substrate correction (SCCA) is a method to correct for the effect of optical brighteners in the substrate (which could otherwise make verification fail). See *Correction for Optical Brighteners in the Substrate* on page 94.

If the verification (without SCCA) fails, Curve Pilot applies the SCCA correction automatically, and shows the verification result with SCCA.

- If the verification then passes, you will see **Verification Passed with Substrate Corrected Colorimetric Aim (SCCA)!** as *verification result*.
- If the verification still fails, you will see **Verification Failed!**

In both cases, you can display the results details with or without SCCA correction:

- By default, you see the results with SCCA (**Show substrate correction (SCCA)** is selected).
- To see the results without substrate correction, deselect **Show substrate correction (SCCA)**.

Note: In *other cases* (the verification passes without SCCA, there are no tolerances set up so the measurements aren't verified, etc.), you will not see this option.

This affects:

- the desired value for the substrate (Curve Pilot uses the measurement of the substrate with optical brighteners as desired value),
- the desired values for the ink solids (they are recalculated to take into account the new substrate desired value, which makes them more likely to pass verification).

When changing this option, you can see the desired substrate and ink solids values change both in the *color wheels* above and in the *result details tables*.

This is also shown differently in the *report* details:

- If you display the results with SCCA, you will only see the results with SCCA in the report.
- If you display the results without SCCA, you will see both the results with and without SCCA in the report.

Important: Changing this option does not affect the *overall verification result*!

Results Details

You can see more details in the tables at the bottom of the dialog, for the **Paper** and **Colors** (the single ink solids, the secondary colors and the CMY solid).

- You can see the **Measured** values in **Lab/Ch** (Lab, Chroma and Hue).

  Note: If you didn't measure an ink, it is not displayed in the tables.

- You can see the **Desired** values in **Lab/Ch** (defined in your desired printing condition), as well as the **ΔE** between each measured and desired color (calculated using the *corresponding formula above*).

  Note:

  - If there is no **Desired** value for a specific measurement (for example if you measured a spot color that isn't profiled in your color database), then Curve Pilot cannot calculate a **ΔE** value and shows **—**.
  - If the verification used *substrate correction (SCCA)*, you see the desired values corrected with SCCA (**Desired (SCCA)**) instead.

    For the **Paper**, the desired value is then equal to the measured value and the **ΔE** is 0.

    ΔE values for the **Colors** are also recalculated using the **Desired (SCCA)** values.

- If you have set up Delta E tolerances in your curve set setup, you can see them in a tolerances column (marked **Tol.**) next to the **ΔE** column.

  If the **ΔE** value is higher than its corresponding tolerance, it is displayed in red with a warning sign . The verification fails for this measurement.

  Note: If there is no tolerance set for a specific measurement, you can see **-** in the tolerances column, and this measurement isn't verified.

- You can see the **Density** information for each color: the **Measured Density**, the **Desired Density** (defined in your desired printing condition), the **ΔDensity** (between the measured and desired densities), and the **Filter** used on the densitometer.

  Note:

  - If your measurements don't contain spectral data, Curve Pilot cannot calculate the **Measured Density** and shows **—**.
  - If you are using a spectral profile as desired printing condition in the setup, the **Desired Density** is automatically extracted from the spectral data.

    If not, the desired density cannot be extracted, and you will see **—** in the **Desired Density** and **ΔDensity** columns, unless you have entered desired density values manually (see *Set the Desired Values of Paper and Solid* on page 107 for how to do that).

- If you have set up density tolerances in your curve set setup, you can see them in a tolerances column (**Tol.**) next to the **ΔDensity** column.

  If the **ΔDensity** value is higher than its corresponding tolerance, it is displayed in red with a warning sign ⚠. The verification fails for this measurement.

  Note: If there is no tolerance set for a specific measurement, you can see **-** in the tolerances column, and this measurement isn't verified.

Gray Scales

You will only be able to see the **Gray Scales** tab if your PressSync template contains gray scale tolerances.

On the top, you will find a table of the average and maximum of Weighted Delta Lightness on Black (w ΔL*K), Weighted Delta Lightness on CMY(w ΔL*CMY), Weighted Delta Chroma/hue on CMY and their tolerances.

Below the table you will find:

- **K Gray scale** tab

  You can see the measured, desired and average values of Black(K) displayed graphically.

  - **Measured w ΔL*K** values are shown as data points in black.
  - **Desired average w ΔL*K** values are shown as a solid / dashed line in black.
  - **Average w ΔL*K** tolerance values are shown as a solid / dashed line in grey.
  - **Maximum wΔL*K** value is shown as a grey region.

  At the right of the tab, you will see the measured versus desired Lightness values of Black and it's weighted ΔL*K in a tabular format. Red lines of text in the table with the warning symbol indicate that the values are above tolerance.

- **CMY Gray Scale** tab

  You can see the measured, desired and average values of Cyan Magenta and Yellow (CMY) displayed graphically.

  - **Measured a*** values are shown as data points in red; desired a* values are shown as a solid / dashed line in red.

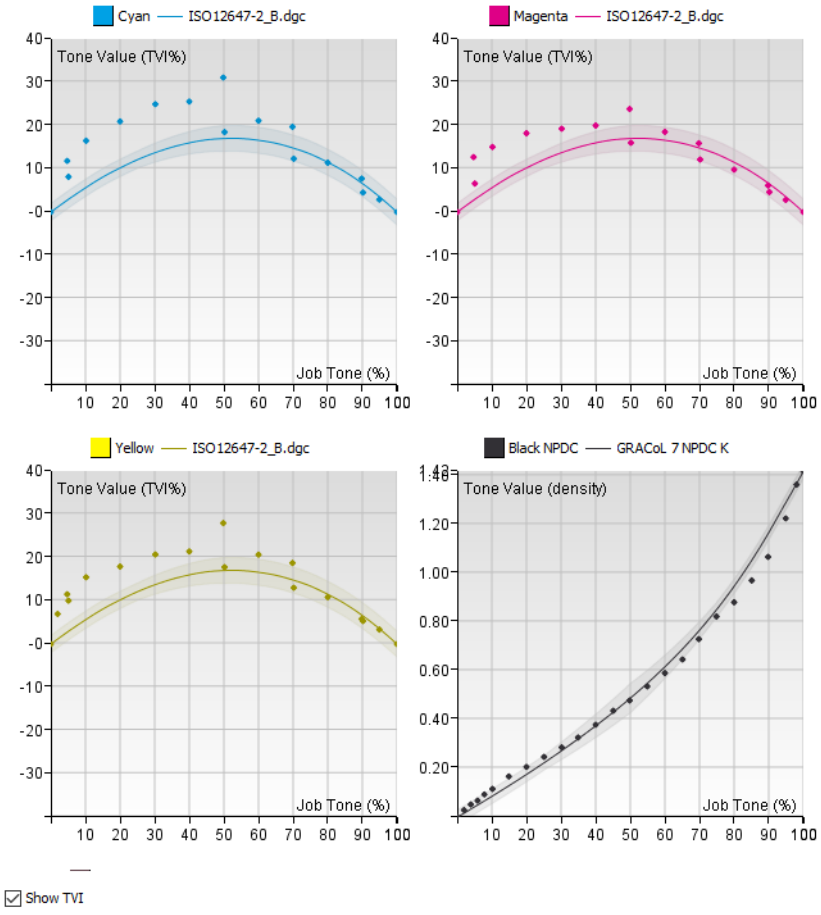
- **Measured b*** values are displayed as data points in blue, desired b* values are shown as a solid / dashed line in blue.
- **Measured wΔCh CMY** values are shown as data points in green, average w ΔCh*CMY values are shown as a solid / dashed line in green.
- **Maximum wΔCh CMY tolerance** is shown as a green region.
- **Measured wΔL CMY** values are shown as data points in black, average w ΔL CMY values are shown as a solid / dashed line in black.
- **Maximum wΔL CMY tolerance** is shown as a grey region.

At the right of the tab, you will see the measured versus desired Lab values of CMY, weighted ΔL* and weighted ΔL*Ch in a tabular format. Red lines of text in the table with the warning symbol indicate that the values are above tolerance.

Tone Scales Process Inks

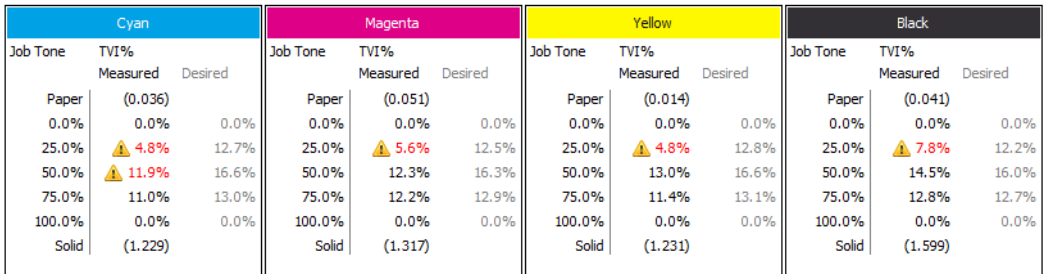
You will only be able to see the **Tone Scales Process Inks** tab if you have set tolerances for the process inks.

You can see the measured versus desired values displayed in graphs. On each graph, solid lines indicate desired values; data points indicate measurements. You can also see a grey tolerance region based on the tolerance values set up of each ink.



At the right of the tab, you can see measured versus desired tone value displayed in a tabular format.

Solid black lines of text indicate measured results. Gray lines of text indicate desired values. Red lines of text with the warning symbol indicate that the difference between the measured and desired values are above tolerance.



Cyan			Magenta			Yellow			Black		
Job Tone	TVI% Measured	Desired	Job Tone	TVI% Measured	Desired	Job Tone	TVI% Measured	Desired	Job Tone	TVI% Measured	Desired
Paper	(0.036)		Paper	(0.051)		Paper	(0.014)		Paper	(0.041)	
0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
25.0%	⚠ 4.8%	12.7%	25.0%	⚠ 5.6%	12.5%	25.0%	⚠ 4.8%	12.8%	25.0%	⚠ 7.8%	12.2%
50.0%	⚠ 11.9%	16.6%	50.0%	12.3%	16.3%	50.0%	13.0%	16.6%	50.0%	14.5%	16.0%
75.0%	11.0%	13.0%	75.0%	12.2%	12.9%	75.0%	11.4%	13.1%	75.0%	12.8%	12.7%
100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%	100.0%	0.0%	0.0%
Solid	(1.229)		Solid	(1.317)		Solid	(1.231)		Solid	(1.599)	

The numerical values displayed depend on the measurement metric chosen on the **Process Colors** setup tab (see *Select the Desired Dot Gain Metric* on page 103).

When working with a cmyk template, and the setting for Measure on the Process Colors setup tab is %DotArea or %ΔE-P, tone value increase (TVI%) graphs are shown by default.

To switch to the usual dot gain graphs, deselect the Show TVI option.

- TVI graphs are not relevant in the case of 3ck_ templates.

Tone Scales Spot Colors

You will be able to see this tab only if you have set tolerances for the spot colors.

Under this tab, you will find tone measurements for spot colors in the same way as for process colors. See the section on *Tone Scales Process Inks* on page 98 for details.

7.3.4. Saving PressSync Results

To save PressSync results, click **Save** in the **Measure** dialog. You will be prompted to **Save Verification**,**Save curves** or **Save measurements only**.

- **Save Verification** saves the measurements and the verification results but does not update the adjustment curves.

  This action generates an active ( ) record item in the history log. See *History of PressSync Results* on page 101 for the details.

  Note: This option is only available if the verification passes.

- **Save curves** saves the measurements in memory and sets the calculated DGC curves as the *used curves*.

- **Save measurements only** does not update the used curve set.

This action generates an incomplete ( ) record item in the history log. See *History of PressSync Results* on page 101 for the details.

7.3.5. Generating Report of PressSync Results

To generate a report of the verification results or measurement results and adjustment curves, select the **Verification Report...** or **Measurement Report...** button in the measurements results dialog.

You will be able to print this report if desired.

Verification Report

You will be able to see the **Verification Report...** button in the **Verification view** of the measure dialog.

All the data shown in the verification view will be available in the report along with highlighted results about whether the ink solids, gray scales, process inks or spot colors passed verification or not.

Note:

- If the verification passed without using *SCCA*, the report shows the original desired values and verification differences (under **Ink Solids - Verification Details**).
- If the verification used SCCA, the report shows the desired values and verification differences corrected using SCCA.
  - If you *chose to display the verification results* with SCCA, you only see the results with SCCA in the report.
  - If you chose to display the results without SCCA, you see both the results with and without SCCA in the report.

Measurement Report

You will be able to see the **Measurement Report...** button in the **Measurement Curves**, **Adjustment curves** and **Measurement and Adjustment curves** views.

A combined view of all your measurements results and adjustment curves will be shown in the report.

7.3.6. Exporting PressSync Results

Curve Pilot can export calculated dot gain compensation curves for each process and spot color in your setup in the `.dgc` file format, and a combined compensation *strategy* for all colors in the `.icpro` file format.

The `.prsync` curve set and its corresponding `.icpro` strategy can be used interchangeably within the Imaging Engine application. However, an `.icpro` strategy can be expanded by adding specialized DGC rules for different sets of screening parameters. For the details see *Creating a Strategy* on page 52.

To export PressSync results:

1. Click **Export Curves...** on the **Process Colors** tab of the Curve Pilot window when viewing results.

2. In the **Export Curves** dialog, enter a common **Prefix** for all `.dgc` files and for the `.icpro` file. You can **Overwrite existing files**, or enter a unique **Prefix**. All files will be saved in the *central location of DGC data*.
3. Click **OK**. Curve Pilot will display the list of generated files in the **Info Export Curves** dialog.

Note:

Curve Pilot composes file names from the prefix, the name of the `.prsync` file, the type of PressSync template (cmyk/tone or 3ck/gray), and the color name:

```
<prefix>_<prsyncFileName>.icpro
<prefix>_<prsyncFileName>_Comp_<Tone|Gray>_<colorName>.dgc
```

For the example file `myprsync.prsync` based on a CMYK template without spot colors, the following files are generated by default:

```
tmp_myprsync.icpro
tmp_myprsync_Comp_Tone_Cyan.dgc
tmp_myprsync_Comp_Tone_Magenta.dgc
tmp_myprsync_Comp_Tone_Yellow.dgc
tmp_myprsync_Comp_Tone_Black.dgc
```

7.3.7. History of PressSync Results

The **History** tab displays a list of previously saved *setup changes*, *manual curve changes*, and *measurement actions*.

For each item on the history list, you can review its 'state' (column), type of action (**Action** column), resulting compensation curves (**Curves** column), and timestamp (**Date** column). Most recent items are shown first.

The action type can be one of **Setup Change**, **Manual Curve Change**, **Measured Automatic**, **Measured Universal Target**, or **Measured Control Strip**.

A history item can be active ( ), active but incomplete ( ), inactive and incomplete ( ), or inactive and disabled (grayed-out) because it is superseded by a more recent setup change.

Only items of type **Measured Automatic**, **Measured Universal Target**, and **Measured Control Strip** can be indicated as active but incomplete ( ) or inactive and incomplete ( ); this means that the measuring action was completed but the resulting (computed) compensation curves were not set as the ones used for printing subsequent jobs.

You can select an item on the history list and:

- Make it the active item; click **Set Active**.

Note:

Setting a disabled but completed measurement action (grayed-out) into active ( ) sets the resulting (computed) compensation curves as the compensation curves to be used for subsequent measurement actions.

Setting an inactive and incomplete measurement action ( ) into active (in this case) does **not** set the resulting (computed) compensation curves as the compensation curves to be used for subsequent measurement actions.

You can always view the curves used in measurements in the **Select Curve Names** *dialog*.

- View information on the item; click **Show Info**.

Note: For a setup change, a read-only version of the *Setup* dialog will be displayed. For a measurement action, the usual window for *viewing results* will be displayed.

- Delete the item; click **Remove**.

Note: You cannot delete the active item ( ) or the last setup change linked to the active item, or a setup change linked to a measurement action (you have to delete the measurement action first).

7.4. Customizing PressSync Templates

Curve Pilot lets you set up your PressSync template in a variety of ways. The following table summarizes the most common template customizations and a few representative use cases:

Setup Change	Use Case
Add or remove spot colors from the template	Printing to Equinox or another custom system requiring special inks.
Select the desired dot gain metric for process or spot colors	Adjusting the measured dot gain metric to in-house measuring device capabilities and standards; see also *Application Preferences* and *Dot Gain Metrics* in Curve Pilot.
Select the desired printing condition for the PressSync template	Using a recently developed profile or a new data characterization set; generating custom in-house PressSync templates based on the ones provided with the application.
Select the desired DGC curves for any process or spot color in the template	Customizing DGC curves for flexo printing; adjusting ISO 12647-2/3 curves (offset) to another printing technology.
Select the desired measurement condition for your spectrophotometer	Setting a specific *measurement condition* automatically on your *spectrophotometer* to follow a particular *standard* and/or make sure all your measurements are consistent.
Set the desired values of paper and solid for any process or spot color in the template	Using a desired printing condition (profile or data characterization set) that does not provide spectral data.
Set custom targets for gray balance	Customizing desired colorimetric values employed in dot gain compensation for gray balance; setting custom

Setup Change	Use Case
	in-house gray balance targets; see also *Gray Balance Calculations* in Curve Pilot.
Set verification tolerances	Adding or editing tolerances used for verifying measured values against desired values. See also *Verification* on page 93.

To start customizing your PressSync template, click **Setup...** in the PressSync curve set editor.

7.4.1. Add or Remove Spot Colors

To add or remove a spot color in your PressSync template, go to the **Spot Colors** tab of the **Setup** dialog.

To add a spot color to your curve set, click and follow the instructions in the **Choose Ink...** dialog.

To remove a spot color from your curve set, select it and click .

7.4.2. Select the Desired Dot Gain Metric

Curve Pilot understands dot gain measurements in a variety of units. You can find the details under *Dot Gain Metrics* on page 136.

Setting the Desired Dot Gain Metric for Process Colors

1. Go to the **Process Colors** tab of the **Setup** dialog.
2. Select the desired metric in the **Measure** list. The default metric depends on the type of template you chose.

Template	Default metric
Templates based on ISO 12647	**%DotArea**
Templates based on G7	**density**
Linear dot gain templates	• **%DotArea** for **cmyk_LinearDensity.prsync** • **ΔE-P** for **cmyk_LinearColor.prsync**

Setting the Desired Dot Gain Metric for Spot Colors

1. Go to the **Spot Colors** tab of the **Setup** dialog.
2. Select a spot color in the **Spot Colors** pane.
3. Select the desired metric in the **Measure** list. The default value is **SCTV** (for all template types).

You can set different dot gain metrics for different spot colors.

7.4.3. Select the Desired Printing Condition

A desired printing condition is a characterization of how your press should ideally print. You can change the desired printing condition of your PressSync template to:

- generate a PressSync template for a printing specification / standard not implemented in Curve Pilot,
- combine printing targets from more than one printing specifications / standards (e.g. GRACoL and ISO 12647-2 Type 1, SWOP and ISO 12647-2 Type 3).

1. Go to the **General** tab of the **Setup** dialog.
2. Click **Change...** next to the **Desired Printing Condition** field.
3. Select the **Profile Type** for the new Desired Printing Condition. This can be an **ICC Profile**, an **Esko Profile**, or a Fogra **Characterization Data** set.

   Note: Profiles are stored in the central color management database, `\\[servername]\bg_data_cms_v010\`.
4. Click to review a summary of the profile.
5. Enter a short description for your new curve set in the **Curve Set Description** area.

   A useful curve set description includes information about your printing standard, desired dot gain values, paper type, screen/ruling parameters, and/or any other specific operating conditions.

7.4.4. Select the Desired Dot Gain Curves

By default, Curve Pilot extracts desired dot gain curves from the printing standard associated with your curve set template.

If you are working with a **cmyk_** template, you can set desired (target) dot gain curves for each process color (C,M,Y,K) separately.

If you are working with a **3ck_** template, you can only set desired dot gain curves for CMY-composed gray (3c) and black (k).

If you select **Extract curves from desired printing condition**, desired curves will be extracted automatically from the profile (or data characterization set) specified as the **Desired Printing Condition** under the **General** tab.

The resulting dot gain curves will be very close to the ones extracted directly from the template's standard, but not identical.

Note: You may want to select **Extract curves from desired printing condition** if your desired printing condition is a profile containing spectral data. This way, reliable density values will be calculated from the spectral data.

Changing the Desired Dot Gain Curve for a Process Color

1. Go to the **Process Colors** tab of the **Setup** dialog.
2. If the **Desired Curves** panel is collapsed, click on to expand it.
3. If you are working with a **cmyk_** template, select the desired (reference) dot gain curve from the list for **Cyan**, **Magenta**, **Yellow**, or **Black**.

If you are working with a **3ck_** template, select the desired (reference) dot gain curve from the list for **CMY** (3c gray) or **Black**.

In both cases, you can select a custom desired dot gain curve specified in a `.dgc` file, a **Linear** dot gain curve, or a **User Defined** dot gain curve.

Note:

Generating a **User Defined** dot gain curve for a process color requires entering target dot gain values manually. For details, see *User Defined Dot Gain Curves for Process Colors* on page 154.

This process is deprecated and no longer recommended. You can always import custom reference dot gain curves specified in `.dgc` files instead.

4. Click to preview the curve.

Changing the Desired Dot Gain Curve for a Spot Color

1. Go to the **Spot Colors** tab of the **Setup** dialog.
2. Select a spot color from the **Spot Colors** list.
3. Select the desired (reference) dot gain curve for the selected spot color from the **Desired Curve** list.

   You can choose between a **Linear** curve, a **User Defined** curve, or the curve that Curve Pilot will **Calculate from ink profile** automatically.

   Note: Generating a **User Defined** dot gain curve for a spot color requires entering target dot gain values manually. For details, see *User Defined Dot Gain Curves for Spot Colors* on page 154.

4. Click to preview the curve.

7.4.5. Select the Desired Measurement Condition

You can set the *measurement condition* to use when measuring test jobs/charts for your curve set, so that all your measurements are consistent.

Note:

If you have created your curve set from a *template* that specifies a measurement condition (for example cmyk_FOGRA51 specifies M1), the template's measurement condition is set here in your curve set setup automatically.

In this case, we recommend you don't change it (to keep adhering to the standard in the template).

The measurement condition you select here will be set automatically on your measuring device.

Note: Make sure you select a measurement condition supported by your measuring device, otherwise it will use a measurement condition it does supports instead. If this happens, you will see it indicated when performing measurements.

To set a measurement condition:

1. Go to the **General** tab of the **Setup** dialog.
2. In **Measurement Mode**, select the measurement condition to use.

See *Measurement Conditions* on page 142 for information about the different measurement conditions.

7.4.6. Select the Desired Density Filter Standard

This is the density filter or 'response' used by densitometers, determining the reflected light captured over a specific range of wavelengths. It is important to select the density filter that is used by your measurement device. The following table provides a quick reference.

Filter	Application Notes	ISO Equivalent
ANSI A	Wide-band color reflection and transmission response; used mainly in the photographic industry for measuring prints and slides	ISO STATUS A
ANSI T	Wide-band color reflection response; used mainly in the US	ISO STATUS T
DIN	Wide-band color reflection response; used mainly in Europe; produces higher values for yellow than ANSI T / ISO STATUS T	ISO STATUS E
DIN NB	Narrow-band densitometer response; rarely used	ISO STATUS I
ISO STATUS A	ISO version of ANSI A	
ISO STATUS M	Wide-band color transmission response; used mainly in the photographic industry for measuring negatives	
ISO STATUS T	ISO version of ANSI T	
ISO STATUS E	ISO version of DIN	
ISO STATUS I	Narrow-band densitometer response; rarely used	

To set a density filter standard:

1. Go to the **General** tab of the **Setup** dialog.
2. In **Density Filter Standard**, select the Density Filter to use.

7.4.7. Set the Desired Density Paper Relative

Choose if the density values displayed in the *Overview Ink Solids* tab, in the *Automatic Measurement dialog*, and in *reports* should be relative to the paper or not.

1. Go to the **General** tab of the **Setup** dialog.
2. In **Density Paper Relative**,
   - Select **Relative**if you want the values to be relative to the paper.

- Select **Absolute** if you don't want the values to be relative to the paper.

7.4.8. Set the Desired Values of Paper and Solid

You can change the target values for the paper and solid in your chosen *dot gain metric*.

Note: These values do not affect the final dot gain compensation curves calculated by Curve Pilot.

You may want to do this if your desired printing condition is:

- an ICC profile,

  a characterization data set without spectral data.

Note:

You do not need to enter desired density values for paper or solid if your *desired printing condition* is a profile containing spectral data. Curve Pilot will calculate reliable density data from the spectral data automatically.

To quickly check if your profile contains spectral data, click next to the **Desired Printing Condition** field on the **General** tab of the **Setup** dialog.

To Change the Desired Values of Paper and Solid for Process Colors

1. Go to the **Process Colors** tab of the **Setup** dialog.
2. If the **Desired [value] of Paper and Solid** panel is collapsed (where [value] is your dot gain metric), click on to expand it.
3. If you are working with a **cmyk_** template, enter the desired densities for **Cyan**, **Magenta**, **Yellow**, or **Black** under **Paper** and **Solid**.

   If you are working with a **3ck_** template, enter the desired densities for **CMY** (3c gray) or **Black** under **Paper** and **Solid**.

To Change the Desired Values of Paper and Solid for Spot Colors

1. Go to the **Spot Colors** tab of the **Setup** dialog.
2. Select a spot color from the **Spot Colors** list.
3. Under **Desired [value] for Paper and Solid** (where [value] is your dot gain metric), enter the desired **Paper** and **Solid** values for the selected spot color.

Note:

For both process and spot colors, make sure to enter values corresponding to your chosen *dot gain metric*:

- if you are working with the **density** or **%DotArea** metric, enter **density** values for process colors paper and solid,
- if you are working with the **ΔE-P** or **%ΔE-P** metric, enter **ΔE-P** values,
- if you are working with the **SCTV** metric, enter **SCTV (Absolute)** values (paper and solid SCTV values relative to the absolute white point).

7.4.9. Set Custom Targets for Gray Balance

To modify the desired Lab values (colorimetric targets) of CMY-composed gray patches, go to the **Gray Balance** tab of the **Setup** dialog.

If you are working with a **cmyk_** template and you will be compensating for tone only, you do not need to worry about these settings. For the details, see *Advanced PressSync Settings* on page 83 and *Gray Balance in CMYK Templates* on page 87.

If you are working with a **3ck_** template (or if you are working with a **cmyk_** template and want to compensate for gray balance in addition to tone):

1. If you set your gray balance **Aim** to the profile serving as the **Desired Printing Condition** under the **General** setup tab, desired values are extracted from the profile by default.

   In this case you can only modify the number of intermediate **Patches** (excluding paper and solid) on the control strip, and the compositions of these intermediate patches.
2. If you set your gray balance **Aim** to **Paper Relative** or **User Defined**, you can also:
   a. Modify the Lab values for paper and solid under the **Desired Values on the Universal Target** and **Desired Values on a Control Strip** panels.
   b. Modify the desired Lab values for Cyan, Magenta, and Yellow solids under the **Desired Values of the Solid Process Colors** panel.
3. If you set your gray balance **Aim** to **User Defined**, you can additionally modify the desired Lab values of all gray patches under the **Desired Values on the Universal Target** and **Desired Values on a Control Strip** panels.

Note: Setting your gray balance **Aim** to **User Defined** allows you to enter CMY triplets for gray patches that do not conform to the *Neutral Gray CMY Triplet Table* on page 156.

7.4.10. Set the Desired DeltaE Formula and Tolerance

Setting the DeltaE Formula and Tolerance for Process colors

ΔE (CMYK) Formula:

This is the color difference formula to use when comparing process colors (C,M,Y,K). Colors are compared in the *Overview Ink Solids* tab, in the *Automatic Measurement dialog*, and in *reports*.

The following color difference formulas are supported: CIELAB Delta E (Classic), Delta E 94, Delta E 2000, CMC (1:1), CMC(2:1).

Selection of the right formula depends on the printing process control standard used in your environment. Most ISO printing standards specify color difference tolerances based on the Classic ΔE formula for process colors, and on the Delta E 2000 formula for spot colors.

ΔE (CMYK) Tolerance:

This is the maximum color difference allowed between measured and desired process colors. This value is used in the *Overview Ink Solids* tab and in *reports*. When the color difference between the measured ink solid and the desired ink solid exceeds the ΔE (CMYK) tolerance value, the values in these panels are marked in red.

1. Go to the **Process Colors** tab of the **Setup** dialog.
2. Select the desired **ΔE Formula** for the process colors.
3. Set the desired **Paper, K(Black), Max CMY, Max RGB Tolerances**.

Setting the DeltaE Formula and Tolerance for Spot colors

ΔE (SPOT) Formula:

This is the color difference formula to use when comparing spot colors, i.e. any non-CMYK colors. The same formulas as ΔE (CMYK) are supported.

ΔE (SPOT) Tolerance:

This is the maximum color difference allowed between measured and desired spot colors. It works similarly to the ΔE (CMYK) Tolerance.

1. Go to the **Spot Colors** tab of the **Setup** dialog.
2. Select the desired **ΔE Formula** for the spot colors.
3. Set the desired **ΔE Tolerance**.

7.4.11. Set Custom Verification Tolerances

What is a Verification Tolerance?

A verification tolerance is the maximum difference allowed between your measurement values and the target values (taken from your PressSync template), when verifying your measurements. For example, you may have a tolerance of (+ or -) 3% on the desired %DotArea value of your 25% Cyan patch.

- If the difference between your measurement values and the target values is smaller than the tolerance, the measurements are said to be "within tolerance", and the verification passes.
- If the difference is bigger than the tolerance, the verification fails.

Note: All values that have a tolerance attached will be verified. Values with no tolerances attached won't be verified.

Please see *Verification* on page 93 for more information about verification.

Predefined Verification Tolerances in PressSync Templates

Certain PressSync templates (either related to international printing standards, industry specifications, or designed by Esko) come with predefined verification tolerances (the tolerances specified in the standards themselves where available).

For many templates, Curve Pilot provides a version of the template that includes tolerances, and one that doesn't. See *What is a PressSync Template?* on page 66 for a complete list.

The templates without tolerances are identical to the ones available in previous Curve Pilot versions (older than 20.1), so if you were using such a template and don't need verification, you can just keep working as before.

If you want to use verification, you can either:

- Use one of the new templates with tolerances included. You can either keep the predefined tolerances, or *customize them*.
- Keep using one of the older templates and *add tolerances to it* (note that these will be custom tolerances - if you want to use predefined tolerances, to follow a standard closely for example, it is easier to switch to a new template).

Depending on the template, there are different predefined verification tolerances available, *for process colors* and in some cases *for gray balance*. There are no predefined *tolerances for spot colors*, but you can add some if desired.

The following PressSync template types come with the following types of tolerances:

Template type	Name starting with	Includes tolerances for
templates based on the ISO 12647 standards	**TVI_**	• *process colors tone scales* • *process colors ink solids*
templates based on the G7 calibration method	**G7_**	• *process colors ink solids* • *gray balance*
templates combining the G7 and ISO calibration methods	**G7_**	• *process colors ink solids* • *gray balance*
linear dot gain templates	**TVI_**	• *process colors tone scales* • *process colors ink solids*
balanced tone and gray template	**TVI_**	• *process colors tone scales* • *process colors ink solids* • *gray balance*

Using Custom Verification Tolerances

When setting up a PressSync curve, you can change any of the predefined verification tolerances from the PressSync template you are using (or add tolerances to a template that didn't contain any).

The tolerances are in the green fields next to the corresponding values.

	Patch 1		Patch 2		Patch 3	
Tones:	25%		50%		75%	
Cyan:	7.7%	3.0%	5.6%	4.0%	8.0%	3.0%
Magenta:	7.5%	3.0%	5.3%	4.0%	7.9%	3.0%
Yellow:	7.8%	3.0%	5.6%	4.0%	8.1%	3.0%
Black:	7.2%	3.0%	5.0%	4.0%	7.7%	3.0%

If no tolerance is available for a certain value, you will see **-** in the tolerance field. To add a tolerance, replace **-** by your desired tolerance, and press **Enter** or **Tab**.

	Patch 1		Patch 2		Patch 3	
Tones:	25%		50%		75%	
	5.0%	-	0.0%	-	5.0%	-

To remove an existing tolerance, type 0 and press **Enter** or **Tab**.

For details on the different tolerances, please see:

- *Tolerances for Process Colors* on page 111
- *Tolerances for Gray Balance* on page 113
- *Tolerances for Spot Colors* on page 114

Tolerances for Process Colors

For process colors, you can set tolerances on the desired values of tone scales and ink solids (often measured from a control strip). Certain PressSync templates include some or all of these tolerances predefined (see *Predefined Verification Tolerances in PressSync Templates* on page 110 for an overview).

To add/change tolerances for process colors:

1. After opening your PressSync curve set, click the **Setup...** button.
2. Go to the **Process Colors** tab in the **Setup** dialog.
3. Set up your process colors' tone values tolerances:
   a) Go to the **Desired [Metric] on a Control Strip** section.

      The exact heading depends on the measuring metric set up in your PressSync template (for example **%DotArea**, or **Density**).
   b) *Add or edit* tolerances for your process color's tone scale values in the green tolerances fields.

Note:

- If your template uses the **Density** metric, your tolerances can be between 0.001 and 5.

  For all other metrics, they can be between 0.1 and 100.

- If you set a tolerance for one ink tint, Curve Pilot will automatically calculate tolerances for the remaining tints, so that all of the ink's tints can be verified (and so you don't have to enter every tolerance if for example they are all the same).
  - If you have set up only one tolerance, it will be used for the other tints (for example, if you have 3 tints and you enter a 2% tolerance for the 50% tint, the 25% and 75% tints will also have a 2% tolerance).
  - If you have set up at least two tolerances, the remaining tints will be calculated accordingly (for example, if you have a 2% tolerance for the 25% tint, and a 3% one for the 75% tint, your 50% tint will have a 2.5% tolerance).

  This happens when you close the setup. You can see the calculated tolerances when reopening the setup.

- If you don't want to verify a particular ink, make sure that there are no tolerances set for this ink.

4. Set up your paper and ink solids tolerances:
   a) Go to the **Verify Solids** section, that shows the desired paper and ink solid values.

Note:

The metric used for these values depends on your template.

Metric	Values expressed as
Density or %DotArea	densities
DeltaE_P or %DeltaE_PS	DeltaE_P
SCTV (Abs) or SCTV	SCTV (Abs)

See *Dot Gain Metrics* on page 136 for more information.

Note:

- If your curve set has a *desired printing condition* based on a spectral color profile (for example when using a Fogra51 template), the desired density values are taken from that profile, and they are read-only in the curve set setup.

- If this is not the case, you can edit the desired density values in the curve set setup.

   b) Set tolerances for the desired paper and ink solid values.
   - The tolerance is in the same metric as the desired value.
   - There is no minimum, but the maximum tolerance is 5 (in the metric used).

These tolerances will be used in the *Ink Solid Verification* panel when verifying your measurements.

5. At the bottom of the **Process Colors** tab, you can also set colorimetric tolerances (calculated in Delta E) for the paper and process ink solids.

   You can see the desired Lab values for the paper and process ink solids above. They are taken from the *desired printing condition*, and are read-only.

   a) To set tolerances on these values, you first need to select the **ΔE Formula** that will be used to calculate the difference between measured values and desired values.

      You can choose between:

      - **CIELAB Delta E (Classic)**
      - **Delta E 94**
      - **Delta E 2000**
      - **CMC(1:1)**
      - **CMC(2:1)**
      - **Delta E 2000 (2:1:1)**

   b) You can then set tolerances in Delta E for:

      - the substrate (**Paper**),
      - solid Black (**K**),
      - solid Cyan, Magenta and Yellow (**Max CMY**): the Delta E between measured and desired ink solid needs be within this tolerance for all three inks for the verification to pass,
      - Red, Green and Blue solid overprints (**Max RGB)**: the Delta E between measured and desired values needs be within this tolerance for all Red, Green and Blue solid overprints for the verification to pass.

      The tolerances can be between 0.1 and 99 Delta E.

Tolerances for Gray Balance

Gray balance tolerances come predefined in certain PressSync templates (see *Predefined Verification Tolerances in PressSync Templates* on page 110 for an overview).

1. After opening your PressSync curve set, click the **Setup...** button.
2. On the **Gray Balance** tab, go to the **Grayscale Tolerances for G7** section.
3. *Add or edit* the gray balance tolerances as desired.

   Gray balance tolerances are colorimetric tolerances using two metrics:

   - **wΔL** ("weighted Delta L"): Delta L is the difference in lightness between the measured and desired colors. Weighted means that the lightness differences in the tones above 50% are given less weight than those below 50% (the darker a tone is, the less weight it is given).

- **wΔCh** ("weighted Delta Ch"): Delta Ch is the difference in chroma and hue between the measured and desired colors. Weighted means that the chroma and hue differences in the tones above 50% are given less weight than those below 50% (the darker a tone is, the less weight it is given).

Note: For more details on how the weighting is calculated throughout the tone range, please see *the G7 specification*.

You can set tolerances for:

- **Average wΔL on K**: the average ΔL (lightness difference) of all the black tints, taking the weight into account (lighter black tints are given more weight).
- **Max wΔL on K**: the maximum lightness difference of all the black tints, taking the weight into account (lighter black tints are given more weight, so if for example a dark black tint has a slightly higher ΔL than a light one, the light one's ΔL might still be taken as the maximum).
- **Average wΔL on CMY**: the average lightness difference of all the CMY tints, taking the weight into account (lighter tints are given more weight).
- **Max wΔL on CMY**: the maximum lightness difference of all the CMY tints, taking the weight into account (lighter tints are given more weight, so if for example a dark tint has a slightly higher ΔL than a light one, the light one's ΔL might still be taken as the maximum).
- **Average wΔCh on CMY**: the average chroma and hue difference of all the CMY tints, taking the weight into account (lighter tints are given more weight).
- **Max wΔCh on CMY**: the maximum chroma and hue difference of all the CMY tints, taking the weight into account (lighter tints are given more weight, so if for example a dark tint has a slightly higher ΔCh than a light one, the light one's ΔCh might still be taken as the maximum).

Tolerances for Spot Colors

For spot colors, you can set tolerances on the desired values of tone scales and ink solids.

To add tolerances for spot colors:

1. After opening your PressSync curve set, click the **Setup...** button.
2. Go to the **Spot Colors** tab and select your desired spot color in the left column.
3. Set up your spot colors' tone values tolerances:
   a) Go to the **Desired [Metric] on a Control Strip** section.

      The exact heading depends on the measuring metric set up in your PressSync template for spot colors (for example **SCTV**).
   b) *Add tolerances* for your spot color's tone scale values in the green tolerances fields.

Note:

- If your template uses the **Density** metric, your tolerances can be between 0.001 and 5.

  For all other metrics, they can be between 0.1 and 100.

- If you set a tolerance for one ink tint, Curve Pilot will automatically calculate tolerances for the remaining tints, so that all of the ink's tints can be verified (and so you don't have to enter every tolerance if for example they are all the same).
  - If you have set up only one tolerance, it will be used for the other tints (for example, if you have 3 tints and you enter a 2% tolerance for the 50% tint, the 25% and 75% tints will also have a 2% tolerance).
  - If you have set up at least two tolerances, the remaining tints will be calculated accordingly (for example, if you have a 2% tolerance for the 25% tint, and a 3% one for the 75% tint, your 50% tint will have a 2.5% tolerance).

  This happens when you close the setup. You can see the calculated tolerances when reopening the setup.

- If you don't want to verify a particular ink, make sure that there are no tolerances set for this ink.

4. Set up your ink solid tolerance:
   a) Go to the **Verify Solids** section, that shows the desired ink solid value for your spot color.

   The metric used for these values depends on your template.

Metric	Values expressed as
Density or %DotArea	densities
DeltaE_P or %DeltaE_PS	DeltaE_P
SCTV (Abs) or SCTV	SCTV (Abs)

See *Dot Gain Metrics* on page 136 for more information.

Note:

If the curve set's *desired printing condition*	then the spot color's desired density value	and the density value
is based on a spectral color profile that includes your chosen spot color (for example when using an Equinox template)	is taken from the spectral color profile	is read-only in the curve set setup
is based on a spectral color profile that doesn't include your chosen spot color, but the spot color is a profiled ink (it has tints values) in your color database	is taken from the spot color's ink profile	is read-only in the curve set setup
is not based on a spectral color profile, but the spot color is a profiled ink	is taken from the spot color's ink profile	is read-only in the curve set setup
is not based on a spectral color profile, and the spot color is not a profiled ink	is editable in the curve set setup	

b) You can set a tolerance for your spot color's desired ink solid value.

- The tolerance is in the same metric as the desired value.
- There is no minimum, but the maximum tolerance is 5 (in the metric used).

These tolerances will be used in the *Ink Solid Verification* panel when verifying your measurements.

5. At the bottom of the **Spot Colors** tab, you can also set a colorimetric tolerance (calculated in Delta E) for the ink solid.

You can see the desired Lab values for the ink solid above. They are taken from the *desired printing condition* as detailed in the table above (except when there is no spectral profile or ink profile, there are no desired Lab values available), and are read-only.

a) To set a tolerance on these values, you first need to select the **ΔE Formula** that will be used to calculate the difference between measured and desired Lab values.

You can choose between:

- **CIELAB Delta E (Classic)**
- **Delta E 94**
- **Delta E 2000**
- **CMC(1:1)**
- **CMC(2:1)**
- **Delta E 2000 (2:1:1)**

Note: Your chosen formula will be used to calculate colorimetric differences for all spot colors, not only the one you currently selected.

b) You can then set a **ΔE Tolerance** for the ink solid's Lab values.

The tolerance can be between 1 and 100 Delta E.

6. Repeat this for any other spot color you want to set verification tolerances for.

8. Working with Curves from the Print Control Wizard

What is the Print Control Wizard?

The Print Control Wizard is a set of tools in the Color Pilot application, designed to help you optimize your print quality.

Based on your exact production workflow, your current print quality and the standard you want to print towards, the Print Control Wizard calculates the best possible screens and curves that you can use to achieve great results on press.

This helps you avoid common problems, for example a lack of smoothness in the transition from highlights to paper, or from shadows to solids, and makes getting good printing quality time after time easier.

See *Print Control Wizard* for more information.

Printing Condition and Curves

The Print Control Wizard generates a **printing condition** based on your production workflow settings and the measurement results of a print sample made with those settings.

This printing condition:

- describes your exact production workflow (plate-making workflow and printing setup) and the way it prints,
- includes the standard you want to print towards (an ISO standard, G7, linear printing...),
- results in the best possible **curve(s) and screen(s)** to achieve the quality of that standard with your production workflow.

The Print Control Wizard generates *flexible PressSync curves*, collected in a *PressSync curve set*.

PressSync curve sets created by the Print Control Wizard are automatically saved to your curves database, as any other PressSync curve set.

8.1. Advanced Workflow

The Print Control Wizard is intended to be easily usable, and to give you great results whether you are a novice or an expert user.

You can find a detailed explanation of the basic Print Control Wizard workflow in the *Print Control Wizard documentation*.

However, if you are an expert user, we understand that you may want to inspect and in certain cases further fine-tune the results from the Print Control Wizard.

In this advanced workflow, you will need to use the Print Control Wizard, Imaging Engine and Curve Pilot.

1. Fully calibrate a printing condition in Color Pilot.

Important: The screen and curves for the condition must be *obtained from measurements* and not by manually specifying the screen!

See the *Print Control Wizard documentation* for details.

2. Use the printing condition generated by the Print Control Wizard to RIP a 4 color job in Imaging Engine.

   We recommend you use a P2P25 chart as your test job, as it contains a 4 color tone scale.

   See the *Imaging Engine documentation* for details.
3. Print your test job using the exact plate-making workflow and printing setup you used to make your printing condition.
4. From within Color Pilot, start Curve Pilot and open the `.icpro` file that corresponds to the printing condition, from which you printed the test job.

   The Print Control Wizard in Color Pilot generates an `.icpro` file for each printing condition. This `.icpro` file refers to the different PressSync curve sets, one for each calibrated screen ruling.
5. Select and open the curve set that corresponds to the screen ruling that you have used for the printed test job.
6. From this curve set, start a new **Measurement** and measure your printed test job in Curve Pilot.

   See *Adding Measurements to a Printing Condition's Curve Set* on page 119.
7. Inspect your new curves (created from the Print Control Wizard curves and your new measurements) for each separation.

   See *Inspecting your Curves* on page 120.
8. If necessary, you can fine-tune your measurements and your adjustment curves to:
   - adjust the minimum printable dot and the tone it produces on print,
   - adjust the level of FM in your highlights,
   - adjust the shadows (if you are still experiencing tone reversal).

   See *Fine-tuning Your Measurements* on page 125 and *Fine-tuning Your Adjustment Curves* on page 127.
9. Use your fine-tuned curve set in production.

8.1.1. Adding Measurements to a Printing Condition's Curve Set

After *printing a test job with your printing condition*, you can measure it and add the measurements information to your printing condition's curve set.

Tip:

You can either:

- measure the job then open the curve set in Curve Pilot and add the measurements,
- open the curve set in Curve Pilot and measure the job from there.

1. As the Print Control Wizard generates *flexible PressSync curves*, you need to first enable flexible PressSync curves in the Curve Pilot Preferences.

   See *Flexible PressSync* on page 137.

2. From within Color Pilot, start Curve Pilot and open the `.icpro` file that corresponds to the printing condition, from which you printed a test job.

   The Print Control Wizard in Color Pilot generates an `.icpro` file for each printing condition. This `.icpro` file refers to the different PressSync curve sets, one for each calibrated screen ruling.
3. Select and open the curve set that corresponds to the screen ruling that you have used for the printed test job.
4. In the PressSync curve set editor window, click the **Measure...** button, then select **Automated measurements**.
5. In the **Automated Measurements** dialog, either:
   - Click **Add Automatic Measurement...** to measure your 4 color test job.
   - Click **Add Measured Data...** to add a measurements file if you have already measured your job elsewhere.

   See *Automated Measurements* on page 73 for more details.
6. Click **Go To Results** to see your new curves (created from the Print Control Wizard curves and your new measurements).

   See *Inspecting your Curves* on page 120.

8.1.2. Inspecting your Curves

After *adding 4 color measurements* to your Print Control Wizard curve set, you can inspect your measurement data in the **Automated Measurements** dialog.

1. At the top of the dialog, you can see the *names* of your new adjustment curves next to **Results**.

   Those curves are based on:
   - the *initial adjustment curves* generated by the Print Control Wizard, that you used to *print your P2P25 chart*,
   - your *P2P25 chart measurements*.

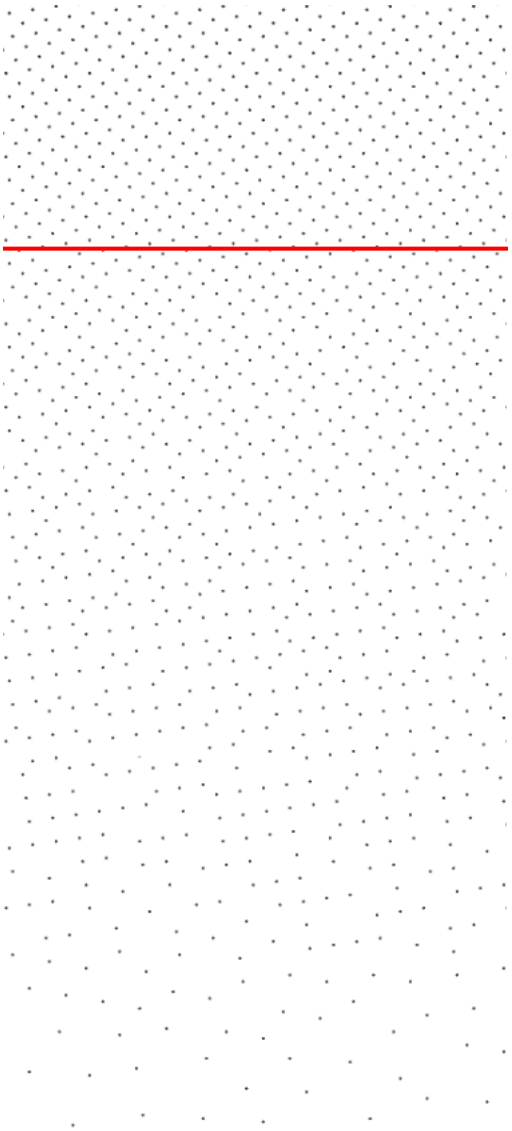
   Your new curves may be identical to or different from your initial curves (they may be a little different because of the interaction between different inks in the P2P25 chart's overprints, which mimics the complexity of a real life print job more closely than the Print Control Wizard's single separation chart).
2. On the **Overview Ink Solids** tab, check the color values of the solid patches you measured, and how close they are to the desired values for your separation's solids.

   See *Overview Ink Solids*.

   Attention: If the measured values are significantly different from the desired values, you will see a warning sign ⚠. In this case, you should stop and troubleshoot your printing process.
3. Check the transition point for all your separations.

   The **transition point** is the point at which your screen transitions from AM (conventional screening) to FM (stochastic screening) when going into the finer highlights.

   You can see this indicated in red below.



To check the transition point, do the following:

a) Make sure that the **Select View** option (above the tabs) is set to **Adjustment Curves**.
b) Click the **Process Colors** tab, then the **All Inks** sub-tab.
c) You can see the new adjustment curves for CMYK, with the **Bump** and transition point (**TP**) used for each curve mentioned next to the separation name.

4. Inspect each transition point's grey level on your Print Control Wizard's test charts.

   You need to:

   - Check the transition point's grey level of the Magenta, Cyan and Yellow adjustment curves on the Magenta test chart.
   - Check the transition point's grey level of the Black adjustment curve on the Black test chart.

   See *Inspecting the Test Chart's Transition Point* on page 122.

5. If:

   - you are satisfied with the recommended levels of FM for all separations, you can just save your curve set and use it in production,
   - you want to use a different level of FM, enter the gray level of your desired transition point as **Desired Transition Point**. See *Transition Point adjustment*.

   Note: Use your desired transition point grey level from the Magenta test chart for the Magenta, Cyan and Yellow adjustment curves, and the one from the Black test chart for the Black adjustment curve.

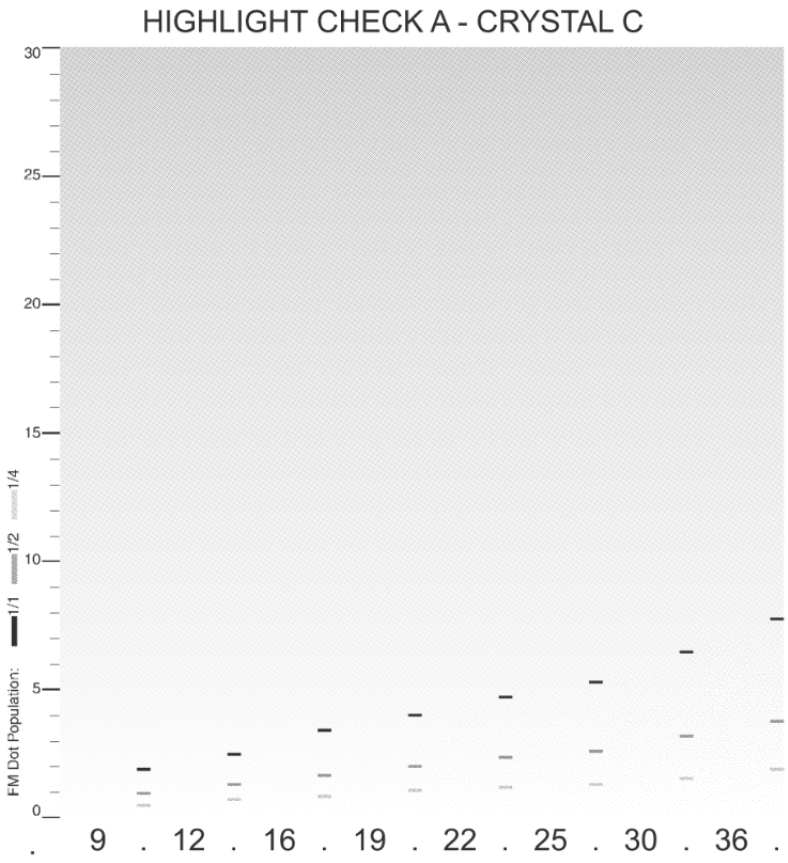
You can also view more details or fine-tune your (measurement or adjustment) curves further. See:

- *Fine-tuning Your Measurements* on page 125,
- *Fine-tuning Your Adjustment Curves* on page 127.

Inspecting the Test Chart's Transition Point

On your Print Control Wizard's test chart, the **HIGHLIGHT CHECK A** area contains several highlight gradients (from 0 to 30%) for your screen technology:

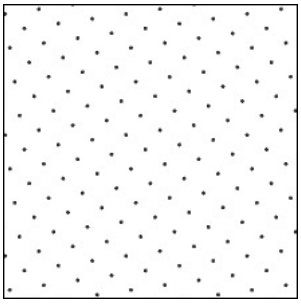
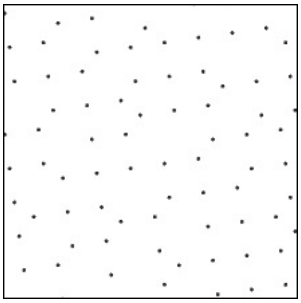
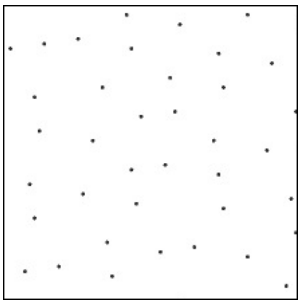
- the Crystal and Crystal C screens if you made a *printing condition* for printing on flexible materials,
- the Crystal screen if you made a printing condition for printing on labels.



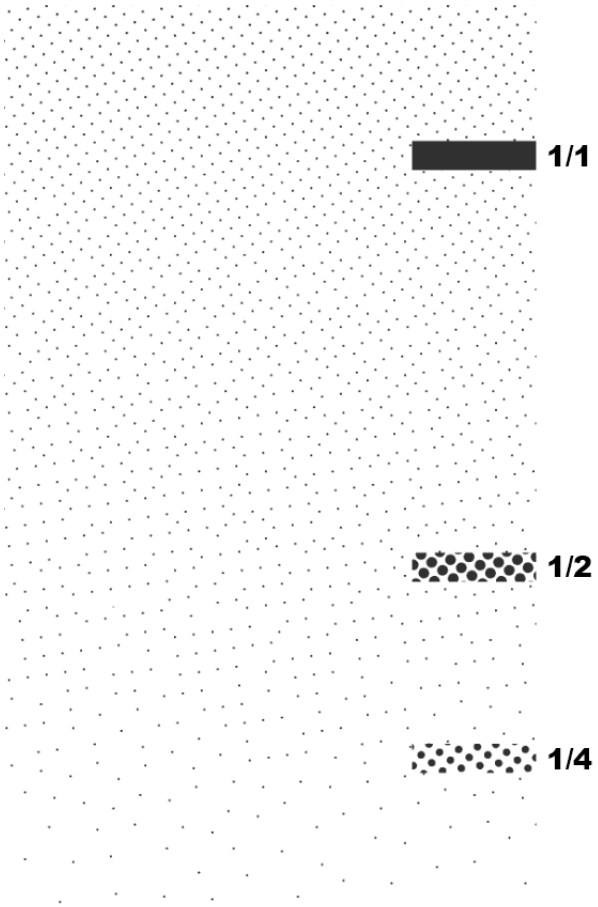
Each gradient uses a different minimum dot (the number of pixels composing the minimum dot is indicated at the bottom of the gradient).

For each gradient, you can see the **FM Dot Populations** available in the Print Control Wizard (1/1,1/2 and 1/4) indicated by gray dashes.

The FM dot population indicates the amount of dots used to print the lightest highlights.

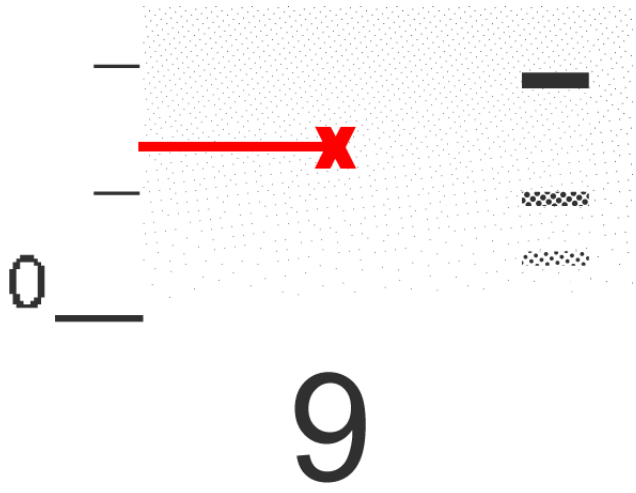
	**1/1** means that all the dots are kept (the screen doesn't use FM screening)
	**1/2** means that half of the dots are kept (resulting in FM screening)
	**1/4** means that a quarter of the dots are kept (resulting in FM screening) A lower FM dot population gives lighter highlights, but may increase graininess.

Find the minimum dot and FM dot population chosen by the Print Control Wizard for that separation, and check whether you are satisfied with the lightness and graininess of that area. We recommend you use a magnifier (of 12x magnification factor or more) and a light booth.



If you are not satisfied with it, check the different gradients to examine the lightness and graininess for different minimum dots and levels of FM, and find a better transition point.

In the Print Control Wizard you could choose to use either a 1/1, 1/2 or 1/4 FM dot population for the lightest highlights, but with Curve Pilot you can choose any level of FM that looks good to you.

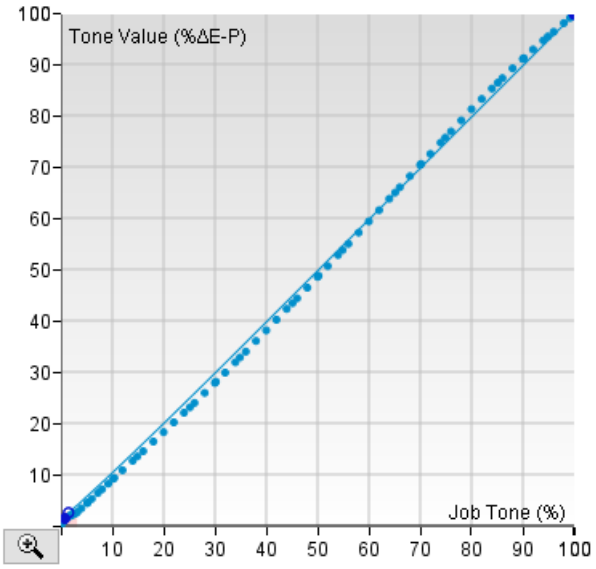


If you want to use a different level of FM for your lightest highlights, note the gray level that it corresponds to. You can change it in Curve Pilot (see *Transition Point adjustment*).

8.1.3. Fine-tuning Your Measurements

After *adding 4 color measurements* to your Print Control Wizard curve set, you can inspect your measurement data and fine-tune it if necessary (for example if you think that some of the measurements are not representative of how your press prints).

1. To check your measurements in detail:
   a) Make sure that the **Select View** option (above the tabs) is set to **Measured Curves** (or **Measured and Adjustment Curves** if you want to see both curves side by side).
   b) Click the **Process Colors** tab, then the sub-tab of the separation you want to inspect.
   c) On the graph, you can see your measured points, and the desired curve taken from the standard you have chosen to use in the Print Control Wizard.



   d) You can zoom in on the graph to inspect:
      - the highlights,
      - the shadows,
      - the *transition point*.
   e) Under the graph, you can see the desired and measured values for each point in a table.
2. Next to the graph, you can see the characteristics of the screen generated by the Print Control Wizard for that separation in the **Screen Info** area.

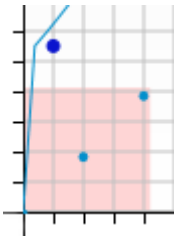
   You can see the screen's **Name**, **Ruling**, **Highlight Dot** (the minimum dot it uses in the highlights, in number of pixels and corresponding screen percentage), and whether or not is uses **Surface Screening** on the solids.
3. If desired, you can fine-tune your minimum tone using the **Lightest Printable Tone** options.

The application zooms in on the highlights automatically when using this set of options so you can examine this area better.

You can:

- change the minimum printable dot / lightest good quality patch found on print (in the **Found At** field),
- change the tone it produces on print (in the **Measured Tone Value** field).

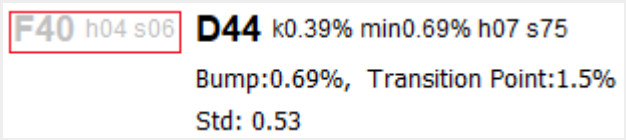
You can see your changes reflected immediately on the graph: the larger dark blue dot moves horizontally when changing the **Found At** percentage, and vertically when changing the **Measured Tone Value**.



Note:

The minimum printable dot (**Found At**) is the minimum grey level possible with your initial curve applied. This corresponds to the *absolute minimum gray level*, adjusted by the curve used to print your measured sample.

You can see this curve greyed out at the bottom of the dialog.



4. The **Darkest Printable Tone** area shows you:
   - whether there is tone reversal in the shadows (you will see a warning sign ⚠),
   - the maximum input percentage (in **Found At**),
   - the tone it produces on print, measured in the metric defined in your chosen *standard* (for example **Darkest ΔE-P** if your standard uses ΔE-P),
   - the value produced on print by the solid tones, measured in the metric defined in your chosen standard (for example **ΔE-P at 100%**).

   You cannot fine-tune the shadows' measurements. However, if you experience tone reversal, you can fine-tune the adjustment curve's shadows. See *Maximum*.

Note:

Fine-tuning the shadows is not recommend when working with Crystal screens based on the **Pixel+** technology, as those screens contain surface screening in the 100% tones to prevent tone reversal.

The Print Control Wizard generates such Crystal screens for printing on flexible materials, but it is also possible to generate them for printing on labels.

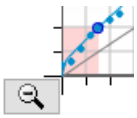
See the *Print Control Wizard documentation* for more information.

5. Under **Transition Point**, you can fine-tune the level of FM in your highlights.

   The application zooms in on the highlights automatically when using this set of options so you can examine this area better.

   On the graph, you can see:

   - the transition point indicated by a dark blue circle (that may be around a blue dot if it corresponds to a measured point),
   - the part of the highlights reproduced with FM screening indicated by a pink area.



   The **Measured Tone Value** is the tone at which the AM to FM transition happens.

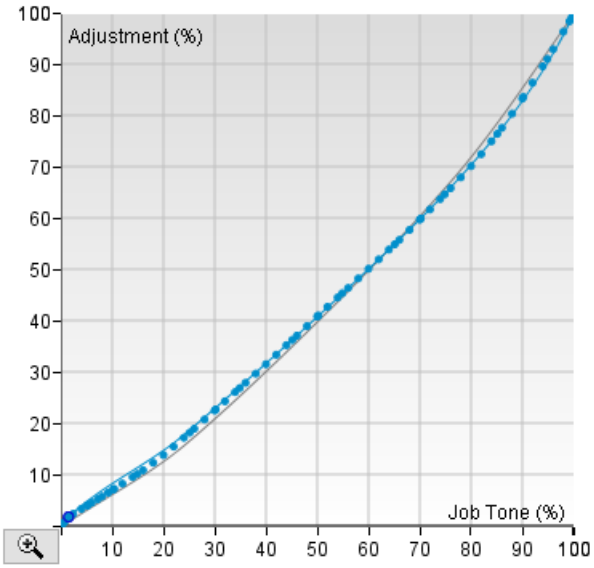
   To fine-tune the transition point:

   1. Select **Adjust FM Range**.
   2. Under **Desired Transition Point**, you can either:
      - keep **Default (Optimal highlights)** selected to keep the transition point calculated as optimal by the Print Control Wizard,
      - select **User Defined** if you want to change it (enter the tone value at which you want the transition from AM to FM to happen).

8.1.4. Fine-tuning Your Adjustment Curves

You can also inspect and if necessary fine-tune your adjustment curves' highlights, shadows and transition point.

1. To inspect your adjustment curves:
   a) Make sure that the **Select View** option is set to **Adjustment Curves** (or **Measured and Adjustment Curves** if you want to see them side by side).
   b) Click the **Process Colors** tab, then the sub-tab of the separation you want to inspect.
   c) On the graph, you can see the adjustment points (adjusting your *measured points* to have them print like your chosen standard), and the adjustment curve made by these points.



The new adjustment curve (and adjustment points) are in blue, while the previous adjustment curve (generated by the Print Control Wizard) is shown in grey.

d) As with the measurements graph, you can see the *characteristics of the screen* generated by the Print Control Wizard.

2. If desired, you can change some general curve fitting options:

a) At the top right of the dialog, choose whether you want a **Standard** or **Robust PressSync Curve Fit**.

See *Curve Fitting Options* on page 144 for more information.

b) Choose whether to use **Flexible Curves** or regular PressSync curves.

Flexible PressSync curves contain additional options to address specific flexo printing challenges.

3. If you want to fine-tune the highlights or shadows of the adjustment curve, use the **Adjustment Options** next to the **Adjustment Curve** graph.

The application zooms in on the highlights automatically when using this set of options so you can examine this area better.

- The **Minimum** value is the absolute minimum gray level (the first tone after 0%, as the 0% tone always remains at 0%).

  For example, you can decrease the minimum value from 1% to 0.5% if you want finer highlights.

- You can use the **Keep 0% until** option to eliminate the highlights level you don't want to print.

  For example, if the tones up to 0.8% print in a very unstable way, you can choose to turn those into 0% so they won't be printed.

- The **Maximum** value is the absolute maximum gray level (the tone just below 100%).

  If you experience tone reversal (you will see a warning sign), you can decrease this value.

Note:

Fine-tuning the shadows is not recommend when working with Crystal screens based on the **Pixel+** technology, as those screens contain surface screening in the 100% tones to prevent tone reversal.

The Print Control Wizard generates such Crystal screens for printing on flexible materials, labels, or corrugated materials.

See the *Print Control Wizard documentation* for more information.

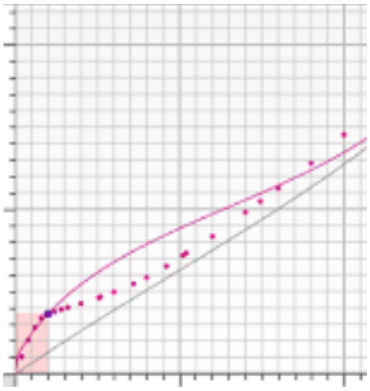
4. Under **Transition Point**, you can fine-tune your transition point, and change how your adjustment curve fits your transition point.
   a) Enter your **Desired** transition point (at which percentage you want the transition between AM and FM to happen in your output).

      By default, this shows the transition point that the Print Control Wizard calculated as optimal, but you can for example lower it if you prefer having less FM in the highlights.

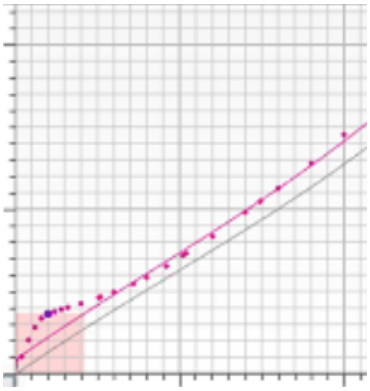
      Tip: Enter the gray level you have chosen *on your test chart* here.

   b) Choose what you want to **Prioritize** when fitting the adjustment curve:

      - the **Transition Point** (if you want the curve to go very closely through the transition point you defined, at the expense of the individual adjustment points),



      - the **Adjustment Points** (if you want the curve to go very closely through the individual adjustment points, at the expense of the transition point you defined).



c) The **Actual** transition point is calculated based on what you prioritized.

9. The Preview Combined Curves Tool

The **Preview Combined Curves** tool lets you preview the combined compensation result of multiple curves on a print job. The tool lets you select one compensation strategy (`.icpro`) or PressSync curve set (`.prsync`) for the press, an additional dot gain compensation curve (`.dgc`) for the press, as well as a separate compensation strategy (`.icpro`) or curve set (`.prsync`) for the plate.

You can use **Preview Combined Curves** to *preview a combination of curves* and to simulate a print job compensated by multiple curves, in a fashion similar to performing a simple (one curve) *Print simulation* in the Curve Pilot editor.

Additionally, you can use **Preview Combined Curves** to look into complex strategies (`.icpro`) and determine *which compensation curve is used based on context* (job parameters such as images / linework, separation, dot shape, ruling, and screening angle).

Finally, you can use **Preview Combined Curves** to *preview the stochastic range of SambaFlex screens* and the shifting of their transition points from stochastic to conventional grids. For more information about SambaFlex screens, please refer to the Esko screening manual(s).

9.1. Previewing a Combination of Curves

Add the desired curves, strategies, and/or PressSync curve sets under **Rip Dot Gain Compensation**:

1. Add an `.icpro` ink-based strategy or `.prsync` curve set for the press in the **Automatic Press** list.
2. Add a single `.dgc` press compensation curve in the **Single Curve Press** list.
3. Add an `.icpro` ink-based strategy or `.prsync` curve set for the plate in the **Automatic Plate Making** list.
4. Leave all settings under **Context** to default.

You can preview the resulting combined compensation curve in the **Combined Curves** area. Compensation data points are shown in the **Compensation Values** Table.

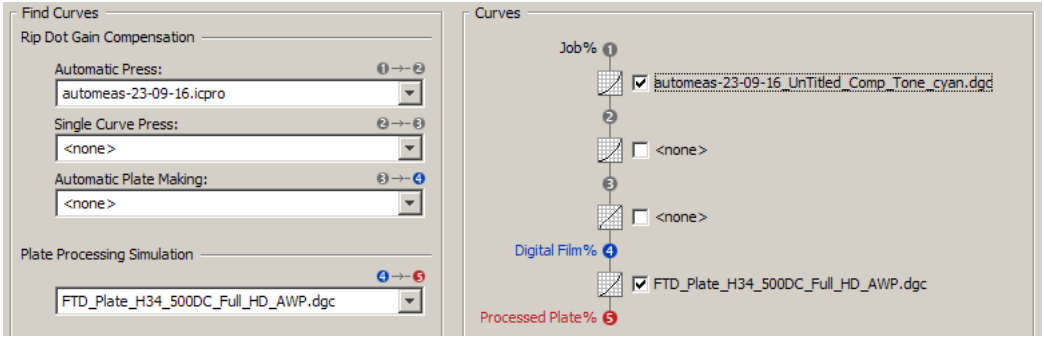
The order of evaluating compensation curves is shown in the **Compensation Values** Table and also in the **Curves** area:

1. The main press curve (**Automatic Press**) is applied first.
2. The extra press curve (**Single Curve Press**) is applied second.
3. The plate compensation curve (**Automatic Plate Making**) is applied last.

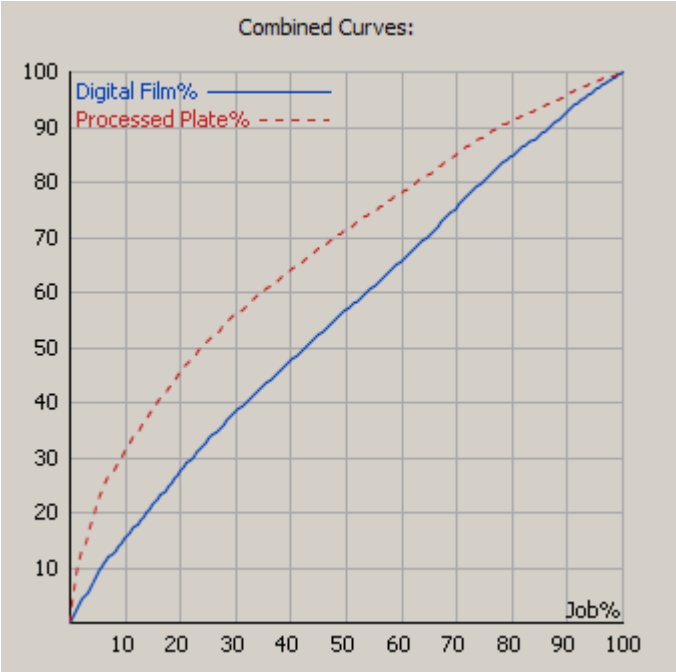
Note: You cannot change this evaluation order in Curve Pilot. If you are using Imaging Engine, you can change the order of applying the extra press curve; for the details, see your Imaging Engine manual.

Print Simulation

Add measured dot data saved in a `.dgc` file in the **Plate Processing Simulation** list. Select the compensation curves to use under **Curves**. Make sure that step (4)->(5) under **Curves** is selected.



The **Combined Curves** graph now displays two curves: a combined compensation curve in blue, and a simulated dot gain curve in red. The simulated dot gain curve in red is the result of applying the combined compensation curve (blue) on the measured (normally uncompensated) data.



These measured data will normally form a dot gain curve that characterizes the plate processing phase of your workflow, but they can also appear in the form of a **dot loss** curve in the case of flexo printing, specifying how the plate wash-out process behaves.

Note: This preview is purely informative and final RIP results may not coincide with preview data.

9.2. Previewing the Results of a Strategy

An `.icpro` strategy can be complex and the compensation curve selected for a specific context (set op operating parameters) may not be immediately obvious by examining the strategy (see *How the RIP Retrieves the Right DGC Curve* on page 55).

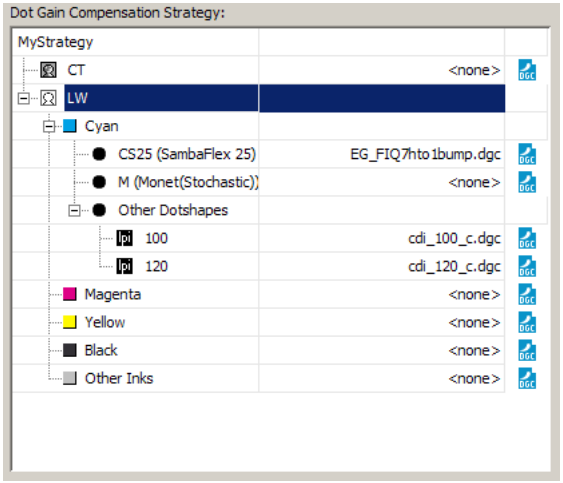
The **Preview Combined Curves** tool lets you determine which compensation curve is used based on job parameters such as images / linework, separation, dot shape, ruling, and screen angle.

To use this feature:

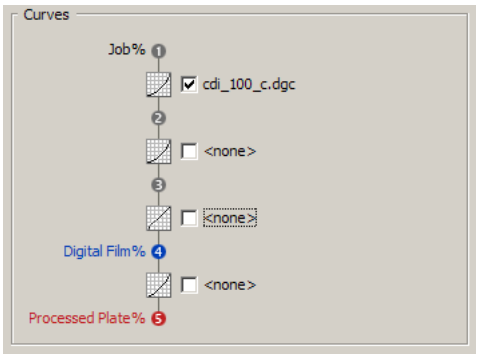
1. Add the `.icpro` ink-based strategy for the press in the **Automatic Press** list.
2. Under **Context**, enter the job parameters for which you want to discover the compensation curve that will be used by the RIP application:
   a. Select between **Images (CT)** or **Linework (LW)**.
   b. Select the **Ink Name** from an **Ink Book**.
   c. Select the **Dot Shape**.
   d. Enter the desired **Ruling** and **Angle**.

Example

A sample `.icpro` strategy contains special compensation curves for linework (all process inks) at 100 lpi and 120 lpi. You want to discover the compensation curve used for linework at 110 lpi.



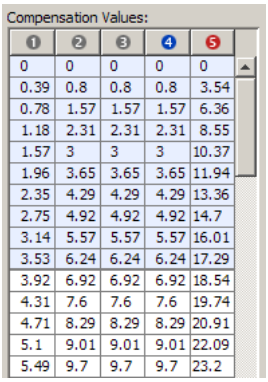
Select the strategy name in **Automatic Press**, then under **Context** select **Linework (LW)** and enter `110` for **Ruling**. The right compensation curve is displayed in **Curves**.



Note: Curve Pilot selects the compensation curve with the smallest lpi.

9.3. Previewing the Stochastic Range of SambaFlex Screens

In the **Compensation Values** Table of the **Preview Combined Curves** dialog, you can preview the stochastic range of SambaFlex screens in the highlights and (possibly) in the shadows; both ranges will be highlighted in blue.


Compensation Values:

❶	❷	❸	❹	❺
0	0	0	0	0
0.39	0.8	0.8	0.8	3.54
0.78	1.57	1.57	1.57	6.36
1.18	2.31	2.31	2.31	8.55
1.57	3	3	3	10.37
1.96	3.65	3.65	3.65	11.94
2.35	4.29	4.29	4.29	13.36
2.75	4.92	4.92	4.92	14.7
3.14	5.57	5.57	5.57	16.01
3.53	6.24	6.24	6.24	17.29
3.92	6.92	6.92	6.92	18.54
4.31	7.6	7.6	7.6	19.74
4.71	8.29	8.29	8.29	20.91
5.1	9.01	9.01	9.01	22.09
5.49	9.7	9.7	9.7	23.2

This feature is only available when you select a **Dot Shape** under **Context** from the HDFlexo family of screens (**HD01...**), or the SambaFlex family of screens (**SC01...**), or any other hybrid screen generated by the Screen Manager application (**SCR01...**). Make sure that **Show stochastic range** under **SambaFlex Details** is selected as well.

Under **SambaFlex Details**, you can preview key parameters of the selected screen: **Resolution** in ppi, **Dot Shape** (same as the dotshape selected above), **Actual Ruling** in lpi, and **Minimum Dot Size** in pixels.

You can edit the values of **Resolution** and **Minimum Dot Size** to get an idea of the shifting of transition points. You may observe a trend: lower resolution to minimum dot size ratios give rise to broader stochastic ranges both in the highlights and in the shadows. This is to be expected; with a coarser setup (a lower resolution and/or a higher minimum dot size), the stochastic ranges have to move more into the midtones for the desired dot gain compensation effects to materialize.

10. Archiving DGC Data

You can pack any number of `.dgc`, `.icpro`, `.scrdgc`, and `.prsync` files into a single `.icpack` archive.

To create the archive, select **File** > **Pack...** from the top Curve Pilot menu, and follow the instructions in the **Pack** dialog. You can add any number of files to the archive and save it under the desired name and folder. You do not need to specify a file extension for the archive; the `.icpack` file extension will be appended automatically.

To unpack the archive, select **File** > **Unpack...** from the top Curve Pilot menu and follow the instructions in the **Unpack** dialog. The archived files will be extracted to the *central location of DGC data*. If you do not wish to overwrite files in that location, make sure that **Overwrite existing files** in the **Unpack** dialog is disabled (unchecked).

11. Appendices

11.1. Location of Data Files

The following table summarizes the location of most common data files used by Curve Pilot. All paths are absolute. `\\root` denotes the root installation folder of Curve Pilot, and `\\server` denotes the central location of automation data. `\\root` and `\\server` may be identical.

The central location of DGC data is `\\server\bg_data_dgc_v010\`.

File Type	Extension	Location
Characterization data set	`.txt`	`\\root\bg_data_intellicurve_v160\`
Control strip layout description	`.it8`	`\\root\bg_data_intellicurve_v160\`
Control strip file	`.pdf`	`\\root\bg_prog_intellicurve_v160\dat\doc`
Dot gain compensation file	`.dgc`	`\\server\bg_data_dgc_v010\`
Dot gain compensation strategy file	`.icpro`	`\\server\bg_data_dgc_v010\`
Dot gain compensation target (reference) file	`.dgc`	`\\server\bg_data_dgc_v010\refdgc`
Press sync curve set	`.prsync`	`\\server\bg_data_dgc_v010\`
Screen dot gain compensation strategy	`.scrdgc`	`\\server\bg_data_dgc_v010\`

11.2. Dot Gain Metrics

Curve Pilot can work with different types of dot gain measurements. You can find some information about these in the table below.

Metric	Description	Usage	Values
Density	The optical density of reflected light	Use a densitometer set to the desired density filter for your region / specifications (see *Curve Pilot Preferences*)	From `0` (no maximum)
%DotArea	The amount of reflected light from a screened area, compared to paper and solid	Use a densitometer that can calculate %DotArea using the Murray-Davies equation	`0%` to `100%`
SCTV (Spot	The tone of a color tint calculated from Lab values (based on measured	Use a spectrophotometer with ΔE calculations set to CIE-1976 or more	`0%` to `100%`

Metric	Description	Usage	Values
Color Tone Value)	spectral data) instead of density values	recent standard (see *Curve Pilot Preferences*)	
ΔE-P	A colorimetric measurement indicating the color difference between a color patch and the paper	Use a spectrophotometer with ΔE calculations set to CIE-1976 or more recent standard (see *Curve Pilot Preferences*)	From `0` (no maximum)
%ΔE-P	A colorimetric measurement indicating the color difference between a color patch and the paper, relative to the color difference between solid and paper	Use a spectrophotometer with ΔE calculations set to CIE-1976 or more recent standard (see *Curve Pilot Preferences*)	`0%` to `100%`

11.3. Application Preferences

Densitometer measures:

Choose between **Percentages** and **Densities**. This setting must be consistent with the setting used in your measuring device, so that Curve Pilot can calculate dot gain compensation curves correctly.

Number of Compensation Values:

Set the number of calculated compensation points when generating dot gain compensation curves.

Flexible PressSync

Select **Enabled** if you want to work with *flexible PressSync curves*. You can then:

- use flexible PressSync curves parameters when *making a curve set*,
- use the flexible PressSync curves shapes to *fit other curves*,
- open curve sets containing flexible PressSync curves (for example curve sets *created by the Print Control Wizard*).

Decimal Separator:

Select the desired decimal separator (point/dot or comma) when importing/exporting numerical values in plain text files.

Using a "Dummy" Spectrophotometer

If you want to demonstrate how to use Curve Pilot with a spectrophotometer (for example to a customer or colleague) but don't have one connected, you can enable the **Use dummy spectro** option.

This simulates an X-Rite i1i0 spectrophotometer.

Note: Don't forget that you will only be able to simulate measurements with this option. To perform real measurements, you will need to connect a real spectrophotometer to your application.

11.4. Print Chart Layouts

Predefined chart layouts are provided with Curve Pilot to support automated measuring of prints. When *measuring a control strip, wedge or chart*, these can be selected from the **Layout** list.

Chart layouts are text files with the `.it8` extension. The actual charts are `.pdf` files; some are provided with your Curve Pilot installation. See *Location of Data Files* on page 136 in Curve Pilot.

The following table summarizes the chart layouts (`.it8`) currently supported by Curve Pilot in automated measurements mode. When `.pdf` files are available, this is clearly indicated in the table. A separate section discusses *Control Strips for Equinox* on page 139.

Chart Layout	PDF Available	Notes
`ECI_GrayConL_v2.it8`	No	www.eci.org
`ECI_GrayConM_v2.it8`	No	
`ECI_MediaWedge_v30.it8`	No	www.fogra.org
`ECI_MediaWedge_v30a.it8`	No	
`ECI_MediaWedge_v30b.it8`	No	
`IDEAlliance ISO 12647-7_Control Strip 2009.it8`	Yes	www.idealliance.org
`IDEAlliance ISO 12647-7_Control Wedge 2013.it8`	Yes	
`IT874_cmyk_Visual.it8`	No	
`IT874_cmyk_Random.it8`	No	
`MASA_7c_Control_Strip_1x35.it8`	No	
`P2P25.it8`	Yes	
`From Layout`	No	

The selection entry **From Layout** generates a chart layout from the settings used in the *curve set's Setup dialog*.

This layout takes into account:

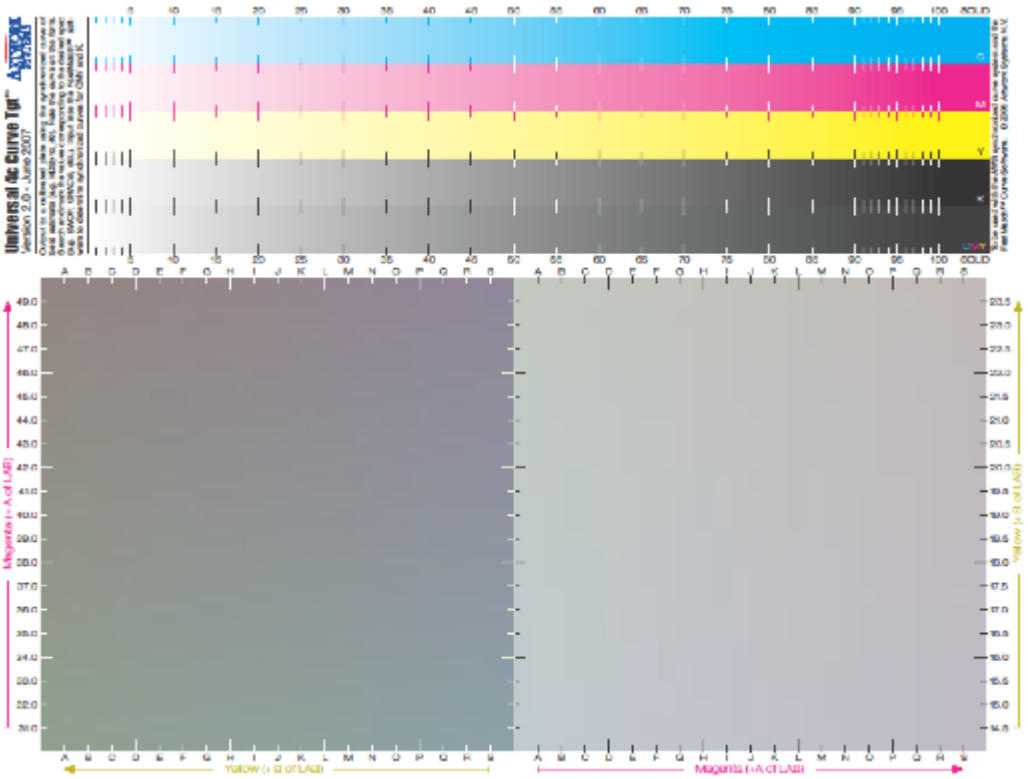
- the *number of patches for process colors* set in the **Process Colors** tab,
- the *number of patches for CMY-composed gray* set in the **Gray Balance** tab,
- the *number of patches for spot colors* set in the **Spot Colors** tab.

11.4.1. The Universal Target

The Universal Target is available as `.pdf` file. You can use it to manually measure process colors (C,M,Y,K) and CMY-composed gray.

Universal Target	Location
`Universal4cTarget.v2.1.pdf`	See *Location of Data Files* on page 136

The Universal Target provided with your Curve Pilot installation contains vignettes for the process colors (C,M,Y,K), a CMY-composed gray vignette, and two gray square areas composed of a fixed cyan percentage with varying magenta and yellow compositions. These two gray squares(dark and light) are used in estimating gray balance.

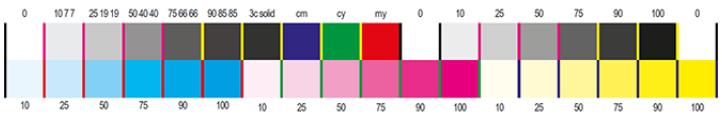
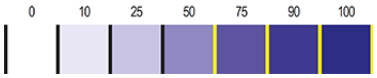
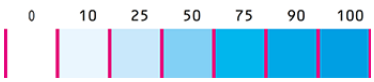


Note: The Universal Target provided with your Curve Pilot installation does **not** include vignettes of spot colors for Equinox (o,g,b,..). If you need to measure spot colors for Equinox or any other special inks, perform *automated measurements* using the *appropriate chart layout*.

11.5. Control Strips for Equinox

The following table summarizes the control strips provided with Curve Pilot to support Equinox printing conditions. When starting an *automated measurement*, these control strip layouts can be selected from the **Layout** list.

Strip	
Layout	`ESKO_CMYK_Gray_Control_Strip_i1iO_1row_Sep_value.it8`
PDF	`ESKO_CMYK_Gray_Control_Strip_i1iO_1row_Sep_value.pdf`
Type	Single-row (suitable for the i1iO measuring device)
Comments	Contains patches for C, M, Y, K tones and ink solids, G7 composed CMY gray and CMY solid, Red (M+Y), Green (C+Y), Blue (C+M)

Strip	
Layout	ESKO_CMYK_Gray_Control_Strip_i1_1row_Sep_value.it8
PDF	ESKO_CMYK_Gray_Control_Strip_i1_1row_Sep_value.pdf
Type	Single-row (suitable for the i1 measuring device)
Comments	Contains patches for C, M, Y, K tones and ink solids, G7 composed CMY gray and CMY solid
Strip	
Layout	ESKO_CMYK_Gray_Control_Strip_i1_2rows_Sep_value.it8
PDF	ESKO_CMYK_Gray_Control_Strip_i1_2rows_Sep_value.pdf
Type	Double-row (suitable for the i1iO and i1 measuring devices)
Comments	Contains the same patches as ESKO_CMYK_Gray_Control_Strip_i1iO_1row_Sep_value.it8 spread over two rows
Strip	
Layout	ESKO_Single_Ink_Control_Strip_Sep.it8
PDF	ESKO_Single_Ink_Control_Strip_Blue_Sep_value.pdf ESKO_Single_Ink_Control_Strip_Green_Sep_value.pdf ESKO_Single_Ink_Control_Strip_Orange_Sep_value.pdf
Type	Single-row, single-ink
Comments	Contains different tints and the solid patch for one ink. **Note:** There are PDF files available for orange, green, and blue, but the control strip can also be used to print other inks. Curve Pilot will detect the ink automatically from the ink solid patch on the strip. However, this ink must be one of the inks available in the ClassicColors CMS ink book. This strip can be measured in combination with Esko CMYK strips, to derive curves for process colors and one or more Equinox colors (o,g,b,v,...)
Strip	
Layout	ESKO_Spot_Control_Strip_Sep.it8
PDF	ESKO_Spot_Control_Strip_Sep_value.pdf
Type	Single-row, single-ink
Comments	Contains different tints and the solid patch for one spot color ink.

	Note: The layout file is a sample for Pantone 7452C. You should make separate layout files for each spot color that is going to be measured following the procedure in *New Control Strips for Spot Colors* on page 141.

11.5.1. New Control Strips for Spot Colors

To create a new control strip layout for a spot color and add it to Curve Pilot:

1. Open the Curve Pilot data folder, i.e. `C:\Esko\bg_data_intellicurve_v160`.
2. Make a copy of the `ESKO_Spot_Control_Strip_Sep.it8` layout file.
3. Make sure that the spot color code is reflected in the file name, e.g. name the file `ESKO_Spot_Control_Strip_P7462C.it8` if you are creating a layout file for Pantone 7462C.
4. Edit this file with a standard text editor, and change the value of the PROCESSCOLOR_ID field, which defines the spot color. For Pantone 7462C, the PROCESSCOLOR_ID line should read:

   ```
   PROCESSCOLOR_ID "pms1000c/7462"
   ```

   where **pms1000c** is the inkbook name.
5. Save the file, and use it with Curve Pilot. You will need to close and reopen the **Automatic Measurement** dialog so that the **Layout** list is updated.

11.6. Measuring Devices

Curve Pilot can work with densitometers, spectrophotometers, or spectrodensitometers.

- You can use a densitometer for measuring *a universal target* or *a control strip of a production sheet* manually.
- For *automated measurements*, you need a spectrophotometer.
- If you have a spectrodensitometer, you can use it either as a densitometer (using its density measurement function) or as a spectrophotometer (using its spectral measurement function).

Note: For consistency and accuracy, we recommend you always use the same measuring device in your workflow (with the same *measurement condition* set on it, if it supports several measurement conditions).

Supported Spectrophotometers

You can use one of the following spectrophotometers to perform automated measurements in Curve Pilot / PressSync Pilot:

- X-Rite i1,
- X-Rite i1iO,
- X-Rite eXact / eXact Scan.

Note:

- You need to calibrate the eXact Scan on your substrate before each measurement / set of measurements (for all *measurement conditions* except M1).
- If your eXact spectrophotometer doesn't have scan support (or a manual scan mode), you can only perform single measurements with it.

  You cannot use it to measure large charts (such as IT874 charts).

11.7. Measurement Conditions

Your *measuring device* can have one or more measurement conditions.

What is a Measurement Condition?

Measurement conditions have been introduced by the printing industry to correct measurement variations caused by optical brightening agents in newer substrates.

Measuring a substrate containing optical brightening agents with a light source containing ultraviolet radiation causes fluorescence, making the substrate appear "whiter than white". The more UV is in the light source, the higher the fluorescence, and the whiter the substrate appears.

Different measurement conditions correspond to different amounts of UV, and will give different Lab values for the white point (which also affects printed inks).

- **M0** represents an incandescent lamp close to CIE's (Commission Internationale de l'Eclairage) "Standard Illuminant A", with a color temperature of about 2856 K.

  This is the measurement condition still used by most of the world's spectrophotometers and densitometers.

  As M0 does not define how much UV is in the light source, it is not recommended to use it to measure substrates with optical brightening agents (that cause fluorescence), especially if you need to exchange measurement data between facilities (that may use different types of spectrophotometers).

- **M1** represents a light source matching CIE's "Illuminant D50", but with a controlled amount of UV radiation, and compensating for the fluorescence caused by that radiation. Note that this compensation is only valid for measuring optically brightened papers, but not for measuring fluorescent inks or toners.

- **M2** represents a light source that excludes UV radiation (like a UV filter), so that substrates with optical brightening agents can be measured without fluorescence under this measurement condition.

- **M3** excludes UV radiation too, but also contains a polarization filter, which reduces the measurement differences between wet and dry samples, by minimizing the extra reflection from the "glossy" surface of the wet ink.

Attention:

For consistent results, we recommend you always use the same measurement condition (also when exchanging measurement data between facilities).

This is especially critical when measuring your substrate several times (as different measurement conditions will give different Lab values for the white point), but also when measuring profiles, spot colors...

Different spectrophotometers have different measurement conditions available. For example, older versions of the X-Rite i1 and i1iO spectrophotometers only support M0.

11.8. The .it8 (CGATS) File Format

The `.it8` (*CGATS*) file format is text-based. Curve Pilot can use the `.it8` file format to save/export and import measured data.

Imported `.it8` data files may contain LAB, XYZ, and/or spectral data. Multi-channel data files or files that contain spot colors are also supported.

When non-CMYK inks are used, the inks must be specified as extra fields in the file. These inks must be known to the CMS, and each ink must be defined in the file in a separate line. The required syntax is:

```
PROCESSCOLOR_ID "inkbook/inkname"
```

The data file shown below comes from an automatic measurement system that measured 5 inks: the process inks C,M,Y,K and the Pantone 722 Coated.

```
ORIGINATOR Cartonnages - AutoMeasurementFromPress
FILE_DESCRIPTOR Jobname: OF23408, SheetNumber: 1, Press Name:R706
CREATED 13-Jan-2012 11:36:16
TARGET_TYPE ANSI     IT8.7/4
COPYRIGHT            NA
PRINT_CONDITIONS     See ANSI CGATS/GRACoL TR 006-2007
ILLUMINANT           D50
MEASUREMENT_GEOMETRY 0/45
OBSERVER             CIE 2 degree
SAMPLE_BACKING       White
PROCESSCOLOR_ID      Cyan
PROCESSCOLOR_ID      Magenta
PROCESSCOLOR_ID      Yellow
PROCESSCOLOR_ID      Black
PROCESSCOLOR_ID      "PMS1000C/722"
NUMBER_OF_FIELDS     40
BEGIN_DATA_FORMAT
SAMPLE_ID            PC5_1 PC5_2 PC5_3 PC5_4 PC5_5 LAB_L LAB_A LAB_B NM_400 ...
END_DATA_FORMAT
NUMBER_OF_SETS       224
BEGIN_DATA
1   0   0   0 100   0  17.67  1.87     0.13   1.78   2.73   1.84  2.48
2 100   0   0   0   0  57.79  -33.52 -45.33  33.58  43.77  51.84  57.92
3   0 100   0   0   0  50.11  68.93   -6.62  20.81  22.64  24.23  26.27
4   0   0 100   0   0  85.62  -2.7   100.91   2.37   2.43   1.66   2.09
5   0   0   0   0 100  77.54  13.79   24.3   32.92  32.83  33.89  33.3
6   0  75   0   0   0  58.13  56.66  -10.33  30.17  31.77  35.12  37.29
7   0   0  75   0   0  87.12  -6.06   74.24  12.84  10.79   9.39   9.11
8   0   0   0   0  25  86.55  4.94     6.98  51.66  55.72  61.14  63.33
9   0   0   0 100   0  16.39  1.32     0.25   0.95   1.76   2.16   2.26
```

The Pantone color is defined last with PROCESSCOLOR_ID "`PMS1000C/722`", and its composition in the patches (%) is shown in the 5th column (`PC5_5`) of the measured data.

To calculate dot gain compensation curves for all inks in the data file, there must be enough patches composed from single inks, and a solid (100%) patch for each ink defined in the `.it8` file.

Similarly, if you want to base dot gain compensation on gray balance, there must be enough gray patches in the file. These gray patches need to have neutral CMY compositions as defined in the *Neutral Gray CMY Triplet Table* by G7. Only patches that are close to neutral gray compositions (+/- 1%) will be extracted from the `.it8` file.

11.8.1. Control Strip Layouts and .it8 (CGATS) Files

To use an `.it8` strip layout with Curve Pilot, some extra data must be defined in the file:

Field Name	Example Value	Unit	Description
CGATSKEY_LAYOUT_TYPE	Esko		
NUMBER_OF_STRIPS	12		Number of rows to measure
NUMBER_OF_COLS	25		Number of columns to measure
PATCH_WIDTH	9	mm	Width of a patch, including border and gaps
PATCH_HEIGHT	8	mm	Height of a patch, including border and gaps
GAP_SIZE_X	1	mm	Gap between patches in a row
GAP_SIZE_Y	0	mm	Gap between patches in a column
MIRROR_X	1	mm	Indicates if columns need to be mirrored
BORDER_PATCHES	0	mm	Border around patches

Each patch must have a proper C,M,Y,K composition, and the order of patches listed in the `.it8` file must be the same as the order of patches on the chart, starting from the first row and continuing for each column in a left-to-right direction.

You can learn more about the `.it8` format by examining one of the control strip layouts provided with your Curve Pilot installation. See *Location of Data Files* on page 136 in Curve Pilot.

11.9. Curve Fitting Options

You can influence the way a PressSync curve is matched to a calculated DGC curve (calculated compensation points). Select either **Robust** or **Standard** under the **Curve fit** list in the Curve Pilot *curve editing window*.

You can decide on the most suitable fitting method based on the number of data points in your measured data sets. The following table can be used as a guideline.

You measure...	Other factors	Use
Control strips containing a limited number of patches	NA	Standard

You measure...	Other factors	Use
Profiles or control strips containing a large number of patches	Measured data are relatively smooth; printing conditions are stable and measurements reliable	Standard
	Measured data are not smooth due to printing instabilities and/or measurement errors	Robust

For detailed information, see *Robust Fit* and *Standard Fit* below.

Robust Fit

A PressSync curve is selected so that the sum of absolute deviations between y values of the calculated compensation points and y values on the PressSync curve is minimal:

```
Mean Deviation (MD) = min Σ|Ydata-Ycurve|
```

The result of this fit is that adjustment points following a normal trend relative to a PressSync curve will fit the curve very well, while other points that deviate from this trend will be left aside. The PressSync curve will tend to follow common points and ignore outliers.

With this method, multiple solutions are possible for some groups of points. This can result in unstable curve fitting.

Standard Fit

A PressSync curve is selected so that the sum of squared deviations between y values of the calculated compensation points and y values on the PressSync curve is minimal:

```
Standard Deviation (SD) = min Σ((Ydata-Ycurve)^2)
```

The result of this fit is a curve that fits all data points equally well. The PressSync curve will tend to follow all points (equally weighted). Data points that do not follow the average behavior of other points will have a significant impact on the shape of the curve.

With this method, fitting may not be robust with respect to outliers. But there will be only one solution (optimal curve) for a given group of points, so fitting will be stable.

11.10. Tone Curve Exchange Data (TED) Files

A `.ted` file is an xml file based on international standards (ISO 18620) for the exchange of tone curve data between software applications.

A `.ted` file can contain any number of tone curves corresponding to any number of inks/separations. Tone curves are also known as 'transfer' curves or 'plate' curves.

The key xml element within a `.ted` file is `TransferCurve` and its key attribute (property) is `Separation`. Data are specified as x, y pairs in the `[0-1]` range.

The rules for converting `.ted` files into *.icpro strategies* are simple:

1. A `TransferCurve` element with `Separation="Cyan|Magenta|Yellow|Black"` is converted into a Curve Pilot dot gain compensation (DGC) curve for the separation value (Cyan, Magenta, Yellow, or Black).

2. A `TransferCurve` element with `Separation="All"` is converted into a Curve Pilot DGC curve for *Other Inks*.
3. A `TransferCurve` element with `Separation="<InkName>"` is converted into a Curve Pilot DGC curve for the `<InkName>` ink in the Designer inkbook.

Below is a sample `.ted` data file for reference.

```
<?xml version="1.0" encoding="UTF-8"?>
<TransferCurveSet xmlns="http://www.npes.org/schema/ISO18620/"
 Creator="My Press Calibration Software"
 CreationDate="2013-04-09T17:08:30-05:00"
 OperatorName="Samuel Adams"
 PressName="My Printing Press"
 MediaName="Standard Coated paper"
 Side="Front"
 MeasurementFile="d:\tmp\data.txt"
 TransferCurveSetID="CRD-24-3">
 <FormPreparationDetails Description="Euclidean screen"/>
 <PrintingCondition PrintingConditionID="Fogra39"/>
 <TransferCurve Separation="Cyan" TransferCurveID="C_0100"
  PrintingUnitNumber="1"
  Curve="0.0 0.0 0.5 0.4 1.0 1.0" />
 <TransferCurve Separation="Black"
  TransferCurveID="K_0100"
  PrintingUnitNumber="2"
  Curve="0.0 0.0 1.0 1.0" />
 <TransferCurve Separation="KitKat Red"
  TransferCurveID="KKR_0100"
  Curve="0.0 0.0 0.1 0.2 0.5 0.6 0.8 0.9 1.0 1.0" />
 <TransferCurve Separation="All" TransferCurveID="All_0100"
  Curve="0.0 0.0 0.1 0.15 0.5 0.65 0.8 0.95 1.0 1.0" />
</TransferCurveSet>
```

Note: Make sure you use a period (".") and not a comma (",") for decimals.

11.11. PressSync Templates

In the pages below, you can find a detailed description of each *PressSync template*.

11.11.1. PressSync Templates Based on the ISO 12647 Standards

Curve Pilot provides a number of PressSync templates based on desired printing conditions (profiles) derived from the ISO 12647-2 or ISO 12647-3 standards.

Within this family of PressSync templates, the desired Lab values for CMYK patches, paper, and solids are calculated using *Fogra* characterization data for standardized printing conditions.

The templates below starting with **TVI_** include tolerances for ink solids and tone value increase.

PressSync Template	**cmyk_Equinox (without tolerances)** **TVI_cmyk_Equinox (with tolerances)**
Application	Offset Lithography
Paper Type	ISO 12647-2 Types 1&2: high weight coated (HWC) matte, semi-matte, or glossy; typical density 80-250 g/m2

PressSync Template	cmyk_Equinox (without tolerances) TVI_cmyk_Equinox (with tolerances)
Desired Printing Condition	ISOcoated_v2_300_eci.icc
Target DGC curves	FOGRA A (CMY) and B (K) as defined in ISO 12647-2:2004

PressSync Template	cmyk_FOGRA51 (without tolerances) TVI_cmyk_FOGRA51 (with tolerances)
Application	Offset
Paper Type	ISO 12647-2:2013 Print Substrate 1: premium coated with moderate fluorescence (8 to 14 Delta B according to ISO 15397); typical density 115 g/m2
Desired Printing Condition	PSOcoated_v3.icc (measured with the M1 *measurement condition*)
Target curves	extracted from the characterization data in FOGRA51_Spectral.txt

PressSync Template	cmyk_FOGRA52 (without tolerances) TVI_cmyk_FOGRA52 (with tolerances)
Application	Offset
Paper Type	ISO 12647-2:2013 Print Substrate 5: wood-free uncoated white with high fluorescence (more than 14 Delta B according to ISO 15397); typical density 120 g/m2
Desired Printing Condition	PSOuncoated_v3_FOGRA52.icc (measured with the M1 *measurement condition*)
Target curves	extracted from the characterization data in FOGRA52.txt

PressSync Template	cmyk_ISO_Newsprint (without tolerances) TVI_cmyk_ISO_Newsprint (with tolerances)
Application	Heatset Web Offset Printing
Paper Type	Standard News Print (SNP): standard newspaper; typical density 40-52 g/m2
Desired Printing Condition	PSO_SNP_Paper_eci.icc
Target DGC curves	FOGRA C (CMY) and D (K) as defined in ISO 12647-2:2004

PressSync Template	cmyk_ISO_PT1&2 (NP) (without tolerances) TVI_cmyk_ISO_PT1&2 (NP) (with tolerances)
Application	Offset Lithographic Processes
Paper Type	ISO 12647-2 Types 1&2: high weight coated (HWC) matte, semi-matte, or glossy; typical density 80-250 g/m2
Desired Printing Condition	PSO_Coated_300_NPscreen_ISO12647_eci.icc

PressSync Template	cmyk_ISO_PT1&2 (NP) (without tolerances) TVI_cmyk_ISO_PT1&2 (NP) (with tolerances)
Target DGC curves	FOGRA F (CMYK) as defined in ISO 12647-2:2004
Notes	For typical stochastic (non-periodic/NP) screening

PressSync Template	cmyk_ISO_PT1&2 (without tolerances) TVI_cmyk_ISO_PT1&2 (with tolerances)
Application	Offset Lithographic Processes
Paper Type	ISO 12647-2 Types 1&2: high weight coated (HWC) matte, semi-matte, or glossy; typical density 80-250 g/m2
Desired Printing Condition	ISOcoated_v2_300_eci.icc
Target DGC curves	FOGRA A (CMY) and B (K) as defined in ISO 12647-2:2004

PressSync Template	cmyk_ISO_PT3 (without tolerances) TVI_cmyk_ISO_PT3 (with tolerances)
Application	Offset Lithographic Processes, Web
Paper Type	ISO 12647-2 Type 3: standard light weight coated (LWC) paper; typical density 48-80 g/m2
Desired Printing Condition	PSO_LWC_Standard_eci.icc
Target DGC curves	FOGRA B (CMY) and C (K) as defined in ISO 12647-2:2004

PressSync Template	cmyk_ISO_PT4 (without tolerances) TVI_cmyk_ISO_PT4 (with tolerances)
Application	Offset Lithographic Processes, Web
Paper Type	ISO 12647-2 Type 4: wood free uncoated white paper; typical density 80-250 g/m2
Desired Printing Condition	PSO_Uncoated_ISO12647_eci.icc
Target DGC curves	FOGRA C (CMY) and D (K) as defined in ISO 12647-2:2004

PressSync Template	cmyk_ISO_PT5 (without tolerances) TVI_cmyk_ISO_PT5 (with tolerances)
Application	Offset Lithographic Processes, Web
Paper Type	ISO 12647-2 Type 5: uncoated yellowish recycled paper; typical density 110-120 g/m2
Desired Printing Condition	ISOuncoatedyellowish.icc
Target DGC curves	FOGRA C (CMY) and D (K) as defined in ISO 12647-2:2004

PressSync Template	cmyk_ISO_WEB (without tolerances) TVI_cmyk_ISO_WEB (with tolerances)
Application	Offset Lithographic Processes, Web
Paper Type	Super calendered (SC) offset paper for web; typical density 38-60 g/m2
Desired Printing Condition	ISOwebcoated.icc
Target DGC curves	FOGRA B (CMY) and C (K) as defined in ISO 12647-2:2004

Note:

To use one of these templates successfully:

- make sure that you use the ICC profile defined as "Desired Printing Condition" as reference profile in your color management (import it in your color database if it doesn't contain it yet - see *Importing Profiles* in the Color Pilot documentation for details),
- if a measurement condition is specified in the template, make sure you use a measuring device that supports that measurement condition.

  When *creating a curve set* from such a template, its measurement condition is saved *in the curve set setup*, and automatically set on your measuring device when *performing measurements* for that curve set (unless your measuring device doesn't support this measurement condition).

  See *Measurement Conditions* on page 142 for information about the different measurement conditions.

For example, when using **cmyk_FOGRA51**, you need to use PSOcoated_v3.icc as reference profile, and a device supporting M1.

11.11.2. PressSync Templates Based on the G7 Calibration Method

Curve Pilot provides a number of PressSync templates based on desired printing conditions derived from industry specifications such as *GRACoL*, *SNAP*, and *SWOP*.

Within this family of PressSync templates, desired Lab values for gray patches, paper, and solid are gray-balanced and calculated using the G7 calibration methodology.

The templates below starting with **G7_** include tolerances for ink solids and gray balance.

PressSync Template	3ck_Equinox (without tolerances) G7_3ck_Equinox (with tolerances)
Application	Commercial Offset Lithography
Paper Type	ISO 12647-2 Types 1&2: high weight coated (HWC) matte, semi-matte, or glossy; density 80-250 g/m2
Desired Printing Condition	GRACol2006_Coated1v2.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	3ck_GRACoIG7 (without tolerances) G7_3ck_GRACoIG7 (with tolerances)
Application	Commercial Offset Lithography
Paper Type	ISO 12647-2 Types 1&2: high weight coated (HWC) matte, semi-matte, or glossy; density 80-250 g/m2
Desired Printing Condition	GRACoI2006_Coated1v2.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	3ck_SNAP (without tolerances) G7_3ck_SNAP (with tolerances)
Application	Newsprint & Advertising
Paper Type	As per ISO 12647-3:2005 (newsprint paper)
Desired Printing Condition	SNAP2007.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	3ck_SWOP (without tolerances) G7_3ck_SWOP (with tolerances)
Application	Web Offset Publications
Paper Type	ISO 12647-2 Type 3 : light weight coated (LWC) paper, web
Desired Printing Condition	SWOP2006_coated3_GCR_bas.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

11.11.3. PressSync Templates Combining the G7 and ISO Calibration Methods

G7 calibration methods are based on obtaining neutral print density scales for Black and CMY-composed tints. This method provides targets for Black and CMY-composed tones (gray balance).

With the G7 calibration method it is easier to obtain gray balanced printed artwork, even if a condition is not calibrated according to a specific standard. However, this method does not allow control of individual process colors.

In flexography there are limitations in reproducing tone scales: plates need to have a minimal dot to print stable, ink transfer is in larger volumes and can result in over inking and tone reversal. So for flexo it is more important to have control over each individual tone scale to characterize and monitor specific aspects of a flexo printing condition.

Therefore Curve Pilot also contains templates that allow you to calibrate towards G7 methods but also to control the tone scales of individual process colors.

Templates without Tolerances

PressSync Template	GRACoL_G7
Application	Commercial Offset Lithography
Paper Type	ISO 12647-2 Types 1&2: high weight coated (HWC) matte, semi-matte, or glossy; density 80-250 g/m2
Desired Printing Condition	GRACol2006_Coated1v2.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	SNAP_G7
Application	Newsprint & Advertising
Paper Type	As per ISO 12647-3:2005 (newsprint paper)
Desired Printing Condition	SNAP2007.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA C target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	SWOP_G7
Application	Web Offset Publications
Paper Type	ISO 12647-2 Type 3 : light weight coated (LWC) paper, web
Desired Printing Condition	SWOP2006_coated3_GCR_bas.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

Templates with Tolerances

The templates below include tolerances for ink solids and gray balance.

PressSync Template	G7_CGATS21-2-CRPC1
Application	Universal ColdsetNews Newsprint
Desired Printing Condition	CGATS21-2-CRPC1.txt
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_CGATS21-2-CRPC2
Application	Universal HeatsetNews Improved Newsprint

PressSync Template	G7_CGATS21-2-CRPC2
Desired Printing Condition	CGATS21-2-CRPC2.txt
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_CGATS21-2-CRPC3
Application	Universal Premium Uncoated Utility printing
Desired Printing Condition	CGATS21-2-CRPC3.txt
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_CGATS21-2-CRPC4
Application	Universal Supercalendared General printing on supercal paper
Desired Printing Condition	CGATS21-2-CRPC4.txt
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_CGATS21-2-CRPC5
Application	Universal Publication Coated Typical publication printing
Desired Printing Condition	CGATS21-2-CRPC5.txt
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_CGATS21-2-CRPC6
Application	Universal Premium Coated Large gamut (commercial) printing
Desired Printing Condition	CGATS21-2-CRPC6.txt
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_CGATS21-2-CRPC7
Application	Universal Extra Large Extra large gamut printing processes
Desired Printing Condition	CGATS21-2-CRPC7.txt

PressSync Template	G7_CGATS21-2-CRPC7
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_GRACoL2006
Application	Grade 1 coated paper (PT 1&2)
Desired Printing Condition	GRACol2006_Coated1v2.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA B target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

PressSync Template	G7_SNAP
Application	Newsprint
Desired Printing Condition	SNAP2007.icc
Target curves	GRACoL G7 Neutral Print Density Curves for K and CMY
	FOGRA C target curves for C,M,Y as defined in ISO 12647-2:2004
	GRACoL G7 Paper-neutral color scale for neutral composed CMY triplets

11.11.4. Linear Dot Gain PressSync Templates

Curve Pilot provides PressSync templates containing target curves for linear dot gain.

cmyk_LinearColor.prsync (without tolerances) **TVI_cmyk_LinearColor.prsync** (with tolerances)	This is a true linear curve, where 50% prints at 50%.
cmyk_LinearDensity.prsync (without tolerances) **TVI_cmyk_LinearDensity.prsync** (without tolerances)	This is a "classic" linear dot gain curve, where 50% prints at 68%.

Those curves are not based on a standard but will give you a good result in most cases (and a dot gain close to most standards).

The templates above starting with **TVI_** include tolerances for ink solids and tone value increase.

11.11.5. Balanced Tone and Gray PressSync Template

Curve Pilot provides a PressSync template that allows you to control the dot gain of each individual process ink with the aim to match ISO specifications (FOGRA51), but that also keeps gray in balance:

TVI_BalancedToneAndGray.prsync

For printing natural images, gray balance is important to keep the neutral tints in the artwork. When printing colored scales, having each ink's dot gain under control is important to keep linearity in density and color.

G7-based templates focus on gray balance, ISO-based templates focus on correct tones. With the **TVI_BalancedToneAndGray** template, a compromise between the two is obtained.

This template includes tolerances for ink solids, tone value increase and gray balance.

11.12. User Defined Dot Gain Curves for Process Colors

To generate a **User Defined** dot gain curve for a process color:

1. Go to the **Process Colors** tab of the **Setup** dialog.
2. If the **Desired <Value> on Universal Target** panel is collapsed, click on ▷ to expand it.

   Note: <Value> will be one of **density**, **%DotArea**, **ΔE-P**, or **%ΔE-P**, depending on the setting in the **Measure** list.
3. If you are working with a **cmyk_** template, enter the desired values for **Cyan**, **Magenta**, **Yellow**, or **Black** for the ¼ (25%), ½ (50%), and ¾ (75%) patches.

   If you are working with a **3ck_** template, enter the desired values for **CMY** (3c gray) or **Black** for the ¼ (25%), ½ (50%), and ¾ (75%) patches.
4. If the **Desired <Value> on a Control Strip** panel is collapsed, click on ▷ to expand it.
5. Edit the number of **Patches** present in the control strip layout. This number refers to intermediate patches only (excluding paper and solid). The default number of intermediate patches is **3**.
6. If you want to customize the intermediate patch compositions, enter the desired **Tones** under **Patch 1**, **...**, **Patch n**, where **n** is the number of intermediate **Patches** set above.
7. If you are working with a **cmyk_** template, enter the desired values for **Cyan**, **Magenta**, **Yellow**, or **Black** for **Patch 1**, **...**, **Patch n**.

   If you are working with a **3ck_** template, enter the desired values for **CMY** (3c gray) or **Black** for **Patch 1**, **...**, **Patch n**.

Note: Curve Pilot will calculate the best fitting desired dot gain curve from both data sets, i.e. the values entered for the Universal Target and the values entered for the Control Strip.

11.13. User Defined Dot Gain Curves for Spot Colors

To generate a **User Defined** dot gain curve for a spot color:

1. Go to the **Spot Colors** tab of the Setup dialog.
2. If the **Desired <Value> on Universal Target** panel is collapsed, click on ▷ to expand it.

   Note: <Value> can be one of **density**, **%DotArea**, **ΔE-P**, or **%ΔE-P**, depending on the setting in the **Measure** list.
3. Select a spot color under the **Spot Colors** list.
4. Enter the desired values for the ¼ (25%), ½ (50%), and ¾ (75%) patches.
5. If the **Desired <Value> on a Control Strip** panel is collapsed, click on ▷ to expand it.

6. Edit the number of **Patches** present in the control strip layout. This number refers to intermediate patches only (excluding paper and solid). The default number of intermediate patches is **3**.
7. If you want to customize the intermediate patch compositions, enter the desired **Tones** under **Patch 1**, **...**, **Patch n**, where **n** is the number of intermediate **Patches** set above.
8. Enter the desired values for **Patch 1**, **...**, **Patch n**.

Note: Curve Pilot will calculate the best fitting desired dot gain curve from both data sets, i.e. the values entered for the Universal Target and the values entered for the Control Strip.

11.14. Migration Tool for SCRDGC Files

The screen-based DGC strategy format (`.scrdgc`) has been replaced by the `.icpro` DGC strategy format. The selection and use of existing `.scrdgc` files in all Esko workflows is still supported, but you have to migrate them to `.icpro` if you want to edit them.

To migrate individual `.scrdgc` files, select **File** > **Import** > **SCRDGC** on the Curve Pilot main menu.

Importing screen-based strategies one by one can be time-consuming. The Migration Tool enables you to automatically upgrade all existing screen-based strategy files in the *central location of DGC data* to the `.icpro` strategy format in one go.

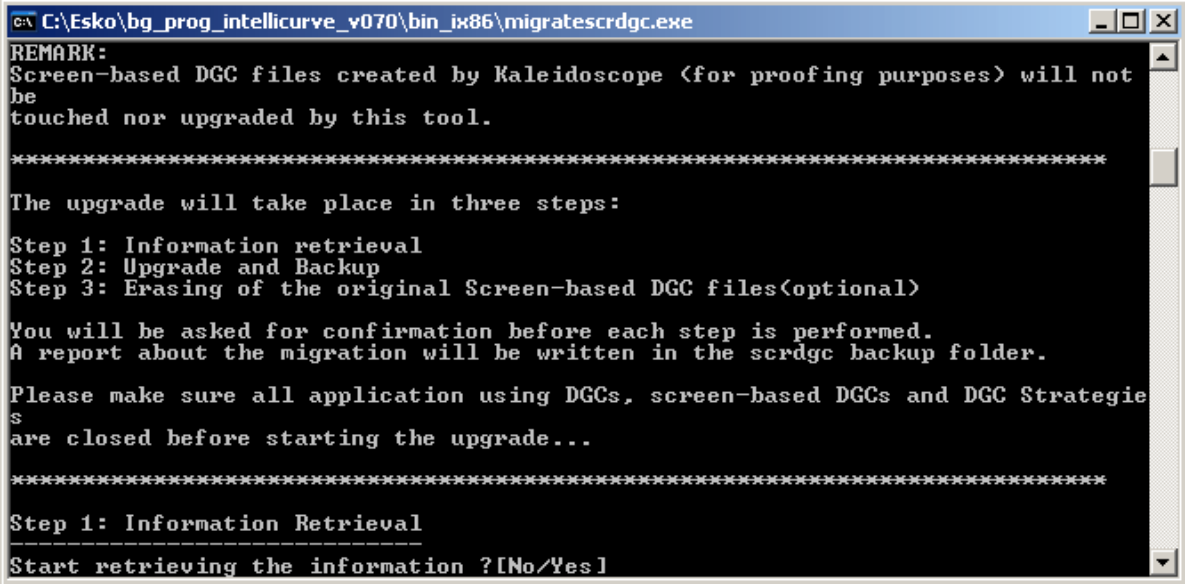
Your original `.scrdgc` files are first automatically backed up to a subfolder of the DGC data folder. Following conversion, the original `.scrdgc` files can be deleted from their original location. If you choose to do so, do not forget to update all references in your tickets and FlexRip configurations from the old `.scrdgc` files to the new `.icpro` ones. Your RIP output is guaranteed to remain the same.

Note: Screen-based DGC files created by Color Engine Pilot for proofing or factory screen-based strategies for proofing will not be touched or upgraded by this tool.

To migrate your `.scrdgc` files follow the procedure below. The instructions assume that your Curve Pilot application is installed locally under `C:\Esko`, and that DGC data are located centrally under `\\server\bg_data_dgc_v010`.

1. Run `C:\Esko\bg_prog_intellicurve_v160\bin_ix86\migratescrdgc.exe`.

   The following MS Dos window appears:



2. Follow the instructions on the screen for each step: type **y** for **yes** and **n** for **no**.
3. When you check the `\\server\bg_data_dgc_v010\scrdgcBackup` folder, you can see that the old `.scrdgc` files are backed up in that folder.

11.15. Neutral Gray CMY Triplet Table

Gray (%)	C (%)	M (%)	Y (%)
0.00	0.00	0.00	0.00
1.96	1.96	1.18	1.18
3.92	3.92	2.75	2.75
5.88	5.88	4.31	4.31
7.84	7.84	5.49	5.49
10.20	10.20	7.45	7.45
14.90	14.90	10.98	10.98
20.00	20.00	14.90	14.90
25.10	25.10	18.82	18.82
30.20	30.20	23.14	23.14
34.90	34.90	27.06	27.06
40.00	40.00	31.37	31.37
45.10	45.10	35.69	35.69
49.80	49.80	40.00	40.00
54.90	54.90	45.10	45.10

Gray (%)	C (%)	M (%)	Y (%)
60.00	60.00	50.20	50.20
65.10	65.10	55.29	55.29
69.80	69.80	60.39	60.39
74.90	74.90	65.88	65.88
80.00	80.00	71.76	71.76
85.10	85.10	78.04	78.04
89.80	89.80	84.31	84.31
94.90	94.90	92.16	92.16
98.04	98.04	96.86	96.86
100.00	100.00	100.00	100.00

12. Glossary

BLACK MASK

When making flexo plates with an Esko CDI, a black mask will come out of the machine. This is the non-processed black flexo plate which has not been washed out yet.

CGATS

CGATS is the Committee for Graphic Arts Technologies Standards.

CONTINUOUS TONE IMAGE (CT)

A continuous tone image (also called a contone image) is an unscreened image which is composed by pixels containing 256 possible gradient tones, varying from white (0) to black (256). The most common example is a photograph.

CONVENTIONAL SCREEN

A conventional screen, also called AM (amplitude modulated) or traditional screen, is a screen where the dots are placed on a fixed grid and where the dot sizes vary according to tonal differences: bigger dots simulate darker tonal values, while smaller dots simulate lighter tonal values.

The Esko variant of conventional screening is called Classic screening.

DOT GAIN (DG)

Dot gain is a phenomenon in printing where halftone dots are printed fatter than desired and/or expected. By applying a method of dot gain compensation, this phenomenon can be controlled.

DOT GAIN COMPENSATION (DGC)

Dot gain compensation is a technique that consists of reducing halftone dots on the film, in order to compensate the expected dot sizes on the print.

DGC STRATEGY

A DGC Strategy is a combination of various single Dot Gain Compensation Curves, which are applied accordingly to parts with different screens in a job. DGC Strategies replace the former Screen Based DGC curves.

DPI

DPI stands for dots per inch and refers to the output resolution of a printer or an image setter. However, DPI does not refer to the resolution of a halftone image, which is referred to as LPI.

FILM – DIGITAL FILM

The difference between a film and a digital film is the fact that a film refers to the physical film created by a film setter, while a digital film refers to a bitmap file created by a RIP, e.g. a screened Tiff file provided by FlexRipT4.

FLEXO PRINTING

Flexo printing or flexography is a rotary printing process that uses flexible photopolymer plates which contain a raised image (relief). The inked plates are rotated on a cylinder, in order to transfer the image to a substrate.

In flexo printing, fast-drying inks are used, so the process is ideal for printing on foils and plastics. Flexo is mainly used in the packaging market.

FOGRA

Fogra (full name Fogra Forschungsgesellschaft Druck e.V.) is a German-based graphic industry research association.

GRACoL®

GRACoL® (General Requirements for Applications in Commercial Offset Lithography) is a set of guidelines and recommendations to streamline the workflows between print buyers and print service suppliers.

GRAVURE PRINTING

Gravure printing (also rotogravure printing) is a rotary printing process whereby an image is engraved in a copper cylinder. The engraving of the image on the plate is done by a laser etching or a diamond tipped machine, which etches millions of small cells in the cylinder.

HALFTONE IMAGE

A halftone image is the printed simulation of a contone (continuous tone) image, using black or white dots, that can vary in size, to simulate the continuous tone image in the print. See also: screening.

ICC

ICC is the International Color Consortium.

LPI

LPI or Lines per inch is the resolution of a halftone print. The higher the LPI, the sharper the print. LPI is also referred to as the screen ruling.

OFFSET PRINTING

Offset printing is a printing technique that uses the principle of the lithographic process: the cylinder which carries the image contains two parts: one part that repulses water and attracts oil (the image part), and a part that repulses oil and attracts water (the non-printing part).

PIXEL

A pixel (or picture element) is the smallest component of an image reproduced on a screen, such as a TV screen or a computer screen. The combination of many pixels forms an image.

PLATE

A plate or printing plate is a plate which is provided by the plate setter and contains the positive or negative image that has to be transferred to the paper or other substrate. A plate can be made of metal (offset), rubber, polymer (flexo)...

To be ready to be put on a printing press, the plate needs to be processed or prepared by a chemical process. A processed plate is a plate that has been washed out and dried.

PPI

PPI stands for pixels per inch and refers to the resolution of a computer monitor, a scanner, a digital photo camera or a photograph.

SAMBAFLEX

SambaFlex by Esko is a hybrid (transitional) screening technology combining AM screening in the mid-tones and FM screening in the highlights and (optionally) in the shadows.

SCREENING

Screening is the process of converting a grayscale image into a pattern of small dots with a limited number of inks. Screening is sometimes called halftoning.

SNAP

SNAP (Specifications for Newsprint Advertising Production) is a set of specifications designed to improve reproduction quality in proofing and coldset printing by offset lithography on webs of newsprint grade paper (newspapers, pre-printed advertising inserts, etc.)

SWOP®

SWOP® (Specifications for Web Offset Publications) is a color reproduction specification for web offset lithography managed by IDEAlliance.

STOCHASTIC SCREEN

A stochastic or FM (frequency modulated) screen is a screen where the dots are placed randomly and not on a fixed grid. The number of dots varies according to the tonal differences: to simulate lighter tonal areas, less dots are placed, while more dots are placed to simulate darker tonal areas.

The Esko variant of stochastic screening is called Monet screening.

TRANSITION ZONE

Besides conventional and stochastic screens, there are also transitional screens, e.g. Esko's SambaFlex screens.

These are screens which have a stochastic part in highlights and shadows, and a conventional part in the midtones. In between is a transition zone, which contains a pattern that is gradually going from stochastic to conventional over a very big number of intermediate patterns.