GMG FlexoProof/DotProof
Creating an MX5 DotProof Profile

Imprint

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1. Getting Started

1.1 About this Tutorial

In this tutorial, you will learn how to create your own MX5 proof profile. Creating an MX5 proof profile requires a **gamut file** (*.csc) which is part of the **printer calibration** and defines the color space of the printer and the print medium. When creating a profile, the gamut file is computed with the target values to produce output values for the printer so that the printed colors will match the target values as closely as possible.

For most media supported in GMG ColorProof, printer calibrations (and thus gamut files) are included and ready to use. If there is no calibration set available for the printer-medium combination you are using, you need to create your own printer calibration before creating an MX5 profile.

Custom printer calibrations can be created as described in detail in our printer-specific **Starter Kit** tutorials available on our website (**Support Area** > **Downloads** > **Printer Utilities** >**Starter Kits**).

Tip Before starting, make sure the printer is running at its optimal level. Check to ensure the heads are clean and printing correctly.

See also:

- GMG-ColorProof-5_Tutorial_CustomMediaSupport_en.pdf
- GMG-ColorProof-5_Tutorial_MX4_en.pdf

1.2 Profile Building Blocks

Think of GMG ProfileEditor as a box of building blocks. Due to different printing technologies, you need specific building blocks to build your profile, for example, a specific calibration file format or specific test chart types.

Have a look at the following table to see which proof mode, separation mode, calibration file format and printer driver can be built on one another. Consider whether you just want to create an MX4 profile for ContoneProof or an MX5 profile for DotProof. Depending on your printer type and your print medium (GMG or custom), see what calibration file format you need and if it is supported in GMG ProfileEditor.

Profile Building Blocks

Printer Types	*Printer Driver*	*Proof Mode*	*Color Space*	*Profile*	*Separation Mode*	*Calibration*
4 color and multicolor printers based on CMYK inks such as **Epson Stylus Pro 4000**, **x400**, **x450**, **x600**, **x800**, **x880**, **x890**,**11880**, **HP Designjet 130**, **5000**, **5200**, **5500**, **Roland VersaUV**, **Roland VersaCAMM VS**, **Mimaki UJF-706**, Canon imagePROGRAF iPF6300S, iPF8300S, iPF6400S, and iPF8400S. Compatibility mode (for x880 printers) of the GMG Driver for **Epson Stylus Pro x900** series in 4/8 color mode.	GMG Driver	ContoneProof	CMYK	MX4	Inkjet	MX3
	GMG Driver	DotProof	1 Bit	MX5	Preserve Separations	MX3

Printer Types	*Printer Driver*	*Proof Mode*	*Color Space*	*Profile*	*Separation Mode*	*Calibration*
Multicolor printers with additional (non-CMYK) inks used together with GMG Driver such as **Epson Stylus Pro x900** series, **HP Designjet Z3200**, and Canon imagePROGRAF iPFx3x0, iPFx4x0. Please note that GMG ProfileEditor does **not** support MXC calibration files. This means that you cannot create a **custom** MXC calibration file for use with custom media and need to use GMG calibration sets with the GMG Driver.	GMG Driver	DotProof	1 Bit	MX5	Preserve Separations	MXC
Multicolor printers with additional (non-CMYK) inks used together with GMG Driver such as **Epson Stylus Pro x900**, **HP Designjet Z3200**, Canon imagePROGRAF iPFx3x0, iPFx4x0. Please note that GMG ProfileEditor does **not** support MXC calibration files. This means that you cannot create a **custom** MXC calibration file for use with custom media and need to use GMG calibration sets with the GMG Driver.	GMG Driver	ContoneProof	CMYK	MX4	Multicolor Inkjet	MXC
Epson Stylus Pro x890, **x900** series.	Epson Driver	ContoneProof	CMYK	MX4	Multicolor Inkjet	MX4
Multicolor printers with additional (non-CMYK) inks from HP such as **HP Designjet Z3200**, **Z6200**.	HP Driver	ContoneProof	CMY	MX4	No Key (CMY Only)	MX3
Multicolor printers with additional (non-CMYK) inks from Canon such as Canon imagePROGRAF iPFx3x0, iPFx4x0.	Canon Driver	ContoneProof	CMY	MX4	No Key (CMY Only)	MX3
4 color and multicolor printers based on CMYK inks such as Canon imagePROGRAF iPF6300S, iPF8300S, iPF6400S, and iPF8400S.	Canon Driver	ContoneProof	CMY	MX4	No Key (CMY Only)	MX3

1.3 What You Need from Your Printing Company

To create a profile that simulates a certain printing condition on your proof printer, you will need the following files from your printing company.

In this tutorial, we will use the **Flexo V2** test chart. You can also use a different test chart, for example **ECI2002 (Random)**, or **IT8/7.4.**

Required Files	*MX4*	*MX5*
4–5 prints of a test chart (e.g. ECI2002) for the measuring device you are using.	Yes	Yes
Test images or visual test charts (to visually optimize the profile).	Optional	Optional
1-bit TIFF files of a test chart (e.g. ECI2002), produced under exactly the same target printing conditions you want to simulate.	No	Yes
Compensation Curve from RIP.	No	Yes

1.4 Test Chart Types

GMG Color GmbH & Co. KG provides test charts for all supported printers and measuring devices.

GMG test charts use the following naming convention:
GMG_<test chart type>_<random/visual>_<measuring device> _<version No.>_<total No. of pages>_<page No.>

Placeholder	*Meaning*
GMG	**GMG** is used in the file name of all test charts created or optimized by GMG Color GmbH & Co. KG.
test chart type	Different test chart types are used for different steps when creating a printer calibration or proof profile.
random/visual	In **Random** test charts, patches have been randomized to avoid influences of inhomogeneous printings to the measurements. It is recommended to use **Random** test charts if available.
measuring device	Use only test charts intended for use with the measuring device you are using.
version No.	In some cases, multiple versions of a test chart, denominated as V1, V2, etc. are available. It is recommended to use the latest version.
total No. of pages	In some cases, a test chart does not fit the printable area of a printer or the readable area of the measuring device. In these cases, the test chart is provided tiled into multiple pages. For example, *2pages* means that the test chart is tiled into two separate test chart files.
page No.	Page number of a multi-page test chart file. Make sure you print all pages of a multi-page test chart.

Where to find test charts

- All test charts can be found in the **Testcharts** folder (*<GMG ColorProof installation path>\Testcharts*).
- Test charts for the **integrated measuring device** of Epson Stylus Pro **x900** and **WT7900** can be found in the **Epson Testcharts** folder.
- Test charts for the **integrated measuring device** of Canon imagePROGRAF **iPF 6450** can be found in the **Canon Testcharts** folder.
- Test charts for the **integrated measuring device** of HP Designjet **Z2100** and **3200** can be found in the **HPZx100 Testcharts** folder.
- **Templates** for measuring test charts in GMG ProfileEditor can be found in the **Templates** folder (*<GMG ColorProof installation path>\Templates*).

Test Chart Types

Type	*Usage*
TC4	Measuring the **full gamut** of a printer–medium combination. The TC4 test chart includes more color patches than the ECI2002 chart, with the focus on patches important for the printer calibration file.
CMY-Gamut	Measuring the **gamut** or **full gamut** of the printer–medium combination, only for **HPZ3200** + **HP Driver** and for **Canon imagePROGRAF** + **Canon Driver**.
TC3	Measuring the **target** or **current values** for an **MX3** printer calibration file.
Flexo V2	Measuring the **target** or **current** values when creating an **MX5 flexo** profile.
TC3-K	Measuring the **target** or **current values** for an **MX4** printer calibration file. TC3 with additional K patches, only for **Epson Stylus Pro 4900, 7900**, **9900** + **Epson Driver**
TC3-MXC	Used internally by the program when calibrating a printer with an **MXC** printer calibration file. (MXCs cannot be edited in GMG ProfileEditor.)
TC_Linearization	Used for creating an ink linearization and restriction for CMYK and special inks.
ECI2002	Measuring the **gamut** of a printer–medium combination. Also measuring the **target** or **current values** when creating an **MX** proof profile.
SpotColor	Measuring the **target** or **current values** when creating a **spot color** profile in GMG SpotColor Editor.

2. Creating an MX5 DotProof Profile—Checklist

The following checklist provides you with a summary showing all steps required for creating a new **DotProof** profile. Please follow the referenced topics or documents in the **See also** column for detailed step-for-step instructions.

Step	*Short description*	*See also*
Set up the printer **hardware** and **software** settings	Printer panel: Select the print medium you want to create a profile for. GMG ColorProof: Select the same print medium for your printer in the **Output** view.	"Changing the Print Medium" on page 8
Create a new empty **MX5** profile	GMG ProfileEditor: Create a new **empty MX5** and link the **gamut** file.	"Starting a New MX5 Profile" on page 9
Transfer the **Compensation Curve** from the RIP	GMG ProfileEditor: Take the corrections applied by the (CTP) RIP into account.	"Transferring the Compensation Curve into the Profile" on page 12
Define the **target** values	GMG ProfileEditor: Import the characterization data from an existing print standard as **Target Values** or **measure** the **Target Values** from a print sample (produced by the printing machine and process that you want to simulate in the proof).	"Importing Target Values" on page 14 "Measuring Target Values" on page 15
Calculate the **output** values	GMG ProfileEditor: Calculate the CMYK **output** values (> **Calculate with Target Values**).	"Calculating the CMYK Output Values" on page 18
Compare target and measured actual values	GMG ProfileEditor: Optimize the profile in an **iterative** process, that is, print the test chart with the profile you are creating and measure the patches. Compare the **Target Values** with the **Current Values** and adjust the output values accordingly (> **Calculate with Target and Current Values**). Repeat this process until the measured values match the target values within reasonable tolerances.	"Determining the Current Values" on page 18 "Iterating the Profile" on page 20

2.1 Changing the Print Medium

Note Some printers with a **bidirectional** connection can send information about the currently loaded print medium to GMG ColorProof. If the media synchronization is activated, the software will be automatically updated after a media change in the printer.

When setting up a new printer, you need to define a print medium which you are going to use with the printer. If you change the print medium in your printer, it is very important to also change the medium in GMG ColorProof to make sure you are using the correct profiles for printing.

How to change the print medium

1. Click the **Output** button on the navigation panel on the left of the main window.
2. Select the printer that you want to change the printer medium for from the **Available Printers** list.
3. Click the **Change Media** button on the right side of the printer.
4. Select the currently loaded **Media Type** and the appropriate **Media Size** from the list. If a sheet type **Media Size** is selected, you need to define the **Orientation** of the sheet in the printer as well.
5. Optional: Customize the **Media Specific Printer Settings** for the selected printer (e.g. the drying time).

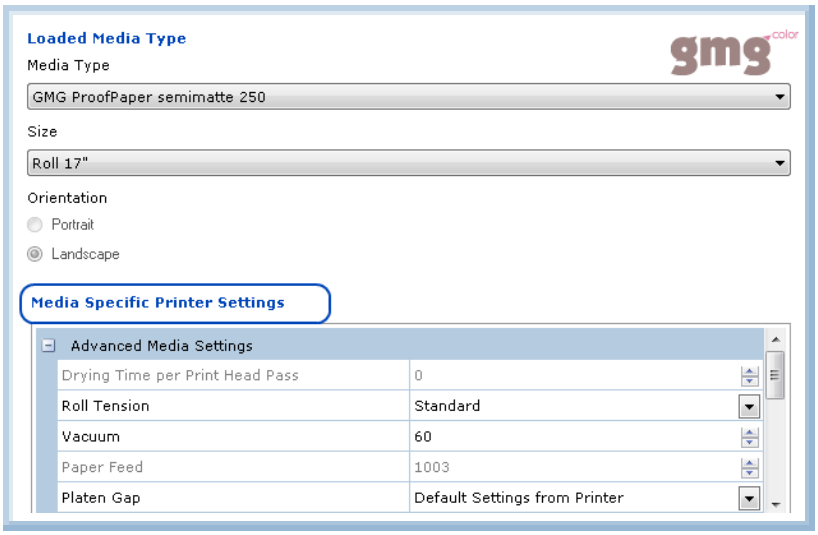


Fig. 1 Changing the print medium in the Output view.

See also:

- "Media Synchronization between Printer and Software"
- "Media"

2.2 Starting a New MX5 Profile

1. Start GMG ProfileEditor.
2. On the **File** menu, click **New MX5**.
   The **New Profile** [MX5] dialog box is displayed.
3. Select the printer type from the **Printer** list.
   Click **Show All Printers** to show all printers supported in GMG ColorProof.
4. Select the **gamut file** (*.csc) for your printer–medium combination from the **Gamut** list.
   If the **Gamut** list is disabled or no gamut file is available for your printer–medium combination, you first need to create this file in the course of creating a printer calibration and then link it to the profile (**Common** tab > **Gamut**).
5. Under **Measuring Device**, select the measuring device you will be using for the test chart measurements.
6. Under **Measurement Chart**, select the test chart you want to use for the profiling.
7. Click **OK** to create the new profile.

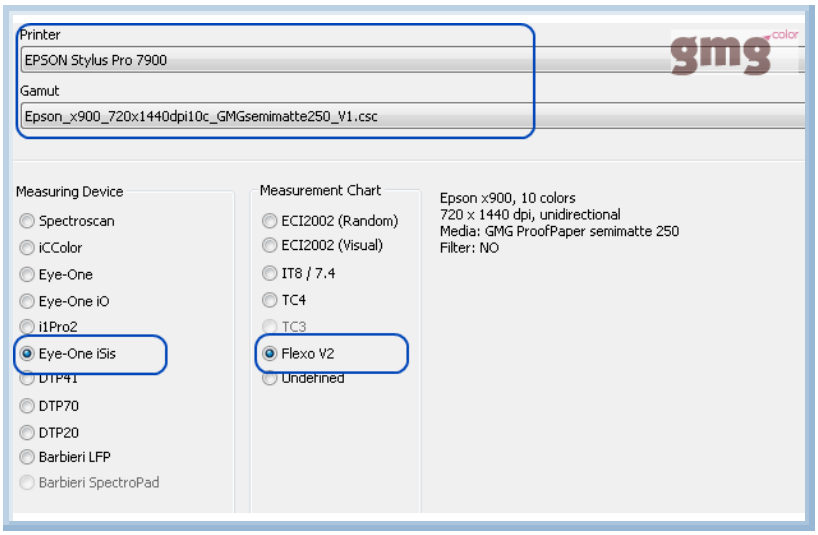


Fig. 2 Starting a new MX5 profile in GMG ProfileEditor.

2.3 Defining Basic Profile Settings

Note Check to ensure all settings are correct and change them if necessary before you proceed. If you change any of these basic settings at a later point of time, you will need to restart the profile creation right from step one.

How to define the basic profile settings

1. Click the **Common** tab.
   All parameters you have entered in the **New Profile** dialog box have been applied to the new profile.
2. Check the **Measurement Settings** and adjust them if required.
3. Use the **Specification** text box and enter profile information such as the used printer, resolution, print medium, measuring device, UV cut filter, backing method, and the single steps you have taken each time you save the profile.
4. Click the **Save** button on the toolbar to save the first step of the profile creation.

2.4 Advanced Simulation Features

Depending on your license, you can make use of advanced features for an even more realistic simulation of the target printing process such as a simulation of the **Paper Pattern** or **Register Shifting**.

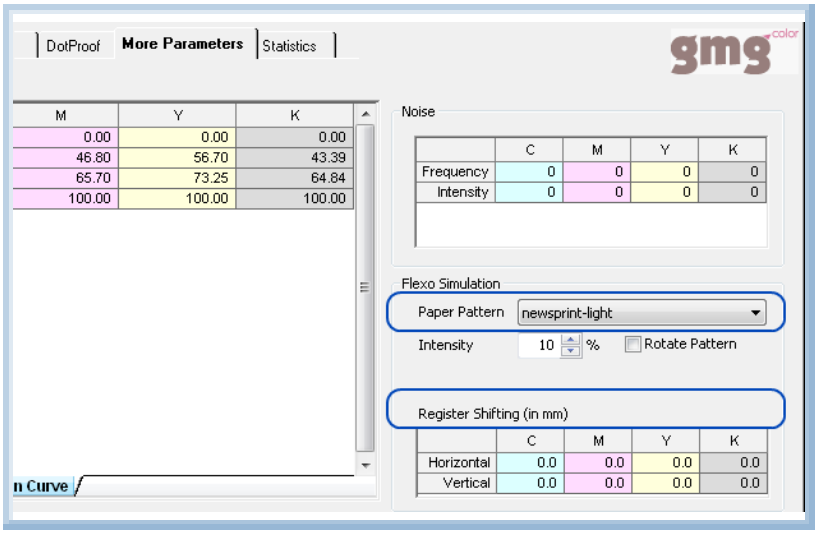


Fig. 3 Creating proof profiles with advanced simulation features.

2.4.1 Simulating a Paper Pattern

If the target printing process uses materials with visible patterns (such as corrugated cardboard or recycled paper), you can use the **Paper Simulation** feature to simulate the structure of the original print material on conventional proof media.

You can, for example, create a very "newspaper-like" proof on standard semi-matte proof paper. The simulation shows the fiber network structure of the paper as well as the paper grain direction. Please note that the paper tint is determined in the contone part of the profile (see "Removing the Paper Tint" on page 24 in GMG-ColorProof-5_Tutorial_MX4_en.pdf).

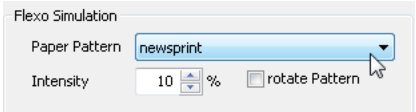


Fig. 4 Simulation of a newsprint paper.

The paper patterns are stored as *.pap files and can be found in the **papers** subfolder of the main program folder. You can add any number of new pap files. Paper patterns are usually contone TIFF images, which can be modified with an image editor program like, for example, Adobe Photoshop. They contain 5 channels—the CMYK channels for the color of the paper structure and an additional alpha channel controlling the brightness of the paper structure (based on the paper color value of the MX5 profile). In order to preserve the brightness, the alpha channel requires a value of 50%. All values below 50% produce a brighter paper color at (0/0/0/0). Any values above 50% will turn the paper color darker.

Apart from just adding a certain paper pattern to your profile, you can also determine the **Intensity** of the simulation. The intensity is only applied to the CMYK channels of the *.pap file, the alpha-channel remains unaffected.

If you wish to rotate the pattern to create a **random** structure, enable the option **Rotate Pattern** check box. This way, the patterns will not be arranged in line, but each will be rotated 90° from the next pattern. This function only makes sense with random structures like newsprint, and is not particularly useful for structures with a preferential direction like corrugated cardboard.

Note The *.pap files have to be square in size and should have the same resolution as the printer.

2.4.2 Simulating Register Shifts

This simulation feature enables you to simulate register offsets in the print by shifting the individual separations in the proof.

These shifts can be accomplished by entering positive and negative values into the respective table row. A negative value in the **Horizontal** row results in a shift of the respective color to the left; a positive value results in a shift to the right. Similarly, a positive value in the **Vertical** row produces a shift upwards, and a negative value results in a shift downwards.

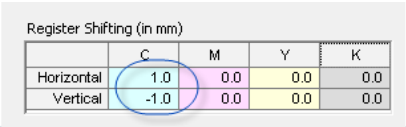


Fig. 5 Register shifting.

Note The use of **Register Shifting** may increase the time required to print.

Note Please note that this function is only available when printing 1-bit TIFFs.

2.5 Taking the Compensation Curve from the RIP into Account

The compensation curve applied by an imagesetter or CTP RIP ensures that a requested 40% color value equals a 40% halftone dot delivered by the plate.

For proofing, these corrections are in so far relevant, as the 1-bit files you want to proof have already been **modified** by the imagesetter or CTP RIP. Thus you need to provide the software with the differences between the **original** color values (before going through your RIP) and the **modified** color values (after going through your RIP). GMG ProfileEditor then uses this information to know where each color value from the original document is "really" located in the 1-Bit TIFF sent to the proofer. The **Compensation Curve from the RIP**, so to speak, provides the reference points for the software.

2.5.1 Transferring the Compensation Curve into the Profile

The following instructions will help you to transfer the compensation curve from your RIP into the profile. You will need to export and screen a PDF which contains color patches in CMYK and is automatically opened and saved to your desktop when you click the **Export** button. After screening the PDF in the imagesetter RIP, you import the screened 1-bit TIFF or LEN files. GMG ProfileEditor then analyzes the differences between the original color values of the patches and the current values. The resulting curves are displayed for a visual check. Alternatively, you can import an already determined compensation curve from a text file.

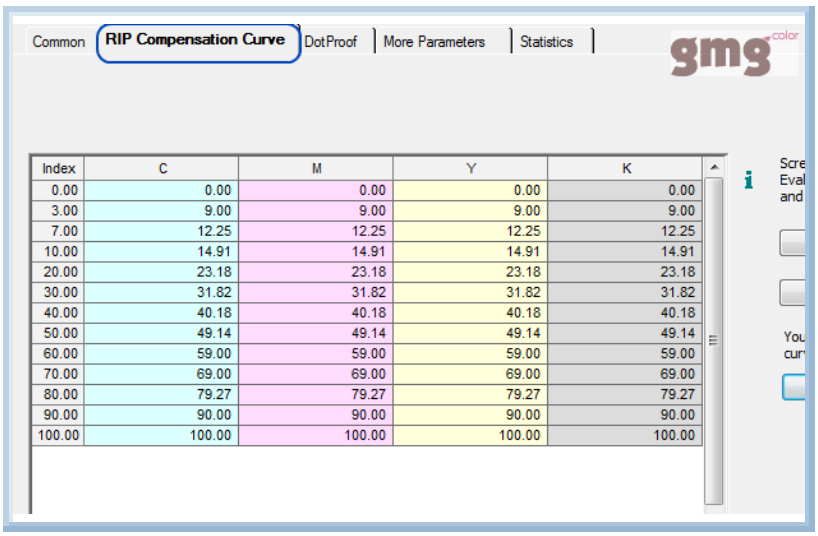


Fig. 6 Example compensation curve.

How to transfer the Compensation Curve into the MX5 profile

1. Click the **RIP Compensation Curve** tab.
2. Click the **Export** button to export a PDF to your desktop.
3. Screen this PDF in the imagesetter RIP.
4. Click the **Import** button and import the screened 1-bit files of the PDF.
   The differences of the original color values and the current color values are visualized as curves.
5. Click **Apply to Profile** to transfer the curves into the profile.
6. **Save** the profile.

2.5.2 Optional: Modifying the Compensation Curve in the Graphic View

Basically, the compensation curve should be steadily increasing with differentiation between each color value. In rare cases, you may notice sharp increases / decreases or a wave pattern. If this is the case, we recommend to manually smooth the curve by selecting and dragging individual fulcrums with the mouse (**Tools** menu > **Show Graphic View**).

The following screen shots show a **Compensation Curve** with two large bumps which we smoothed by dragging two fulcrums into place.

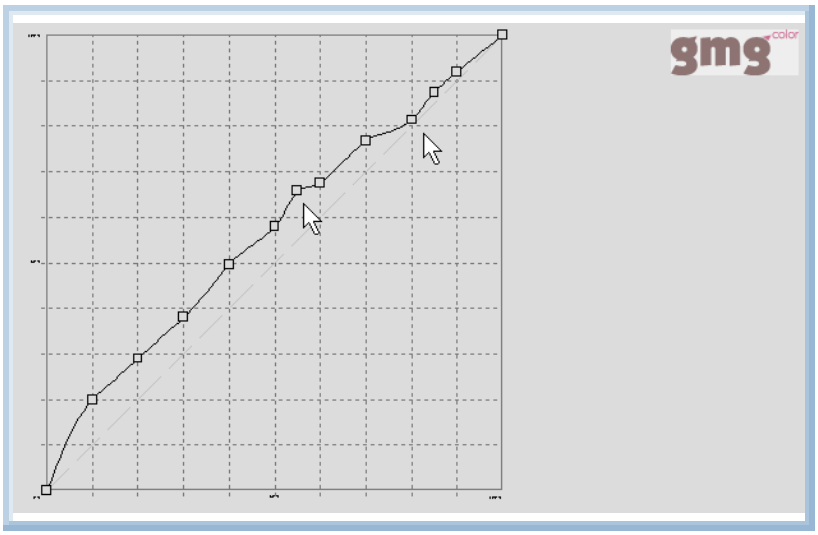


Fig. 7 Compensation Curve with implausible curve shape.

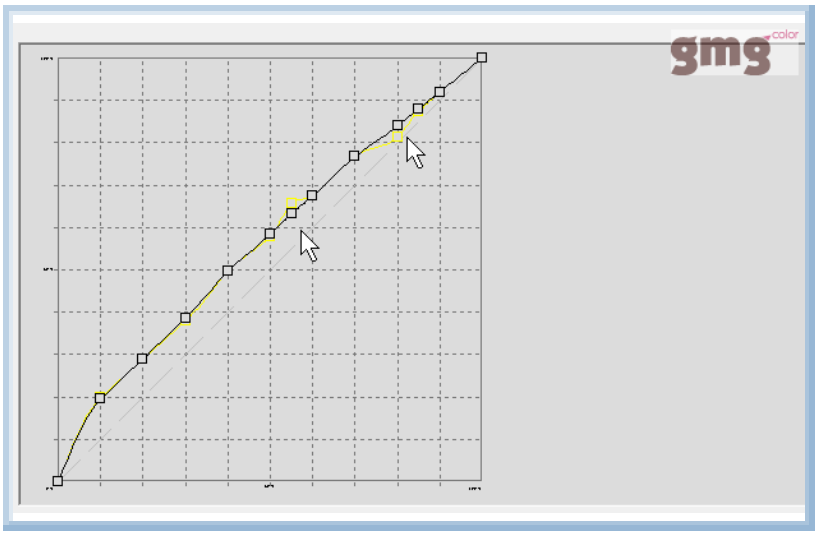


Fig. 8 Smoothed Compensation Curve.

2.6 Measurements and Calculations

2.6.1 Defining the Target Values

Basically, target values are the color values, generally specified in Lab, that should be met when printing a certain CMYK value under a certain printing condition. Target values can be either imported or measured.

- Industrial or commercial printing standards, for example, ISO standards or SWOP, provide target values as **characterization data**. If you want to profile according to an international industry standard, you can simply **import** the target values from a **text file** or **ICC** profile (which can be downloaded from the Internet).
- If the target values for the target printing condition are not available or in case you want to create a profile for a **custom** (in-house) standard, you can **measure** the target values from a **test chart** printed on the target machine. To get more reliable results, you should measure several prints and then average the target values.

See also:

- "Importing Target Values" on page 14
- "Measuring Target Values" on page 15
- "Averaging Target Values" on page 15

Importing Target Values

Characterization data sets contain nominal values for **standardized** printing processes, usually available as text file. If you open such a file, you can see the averaged data from several measurements of a particular test chart.

```
ISO12642-2
ORIGINATOR "Fogra, www.fogra.org"
DESCRIPTOR "FOGRA39L"
CREATED    "December 2006"
INSTRUMENTATION "D50, 2 degree, geometry 45/0, no polarisation filter, white
PRINT_CONDITIONS "offset printing, according to ISO 12647-2:2004/Amd 1, OFCOM
NUMBER_OF_FIELDS 11
BEGIN_DATA_FORMAT
SAMPLE_ID CMYK_C CMYK_M CMYK_Y CMYK_K XYZ_X XYZ_Y XYZ_Z LAB_L LAB_A LAB_B
END_DATA_FORMAT
NUMBER_OF_SETS 1617
BEGIN_DATA
1         0     0     0     0   84.48   87.62   74.57   95.00    0.00   -2.00
2         0    10     0     0   77.89   77.75   68.26   90.67    5.90   -3.86
3         0    20     0     0   71.44   68.34   61.53   86.18   12.01   -5.21
4         0    30     0     0   65.03   59.18   54.42   81.39   18.70   -6.19
5         0    40     0     0   58.85   50.57   47.38   76.42   25.78   -6.91
6         0    55     0     0   50.29   38.82   37.12   68.62   37.72   -7.37
7         0    70     0     0   42.93   29.06   27.82   60.84   50.59   -6.74
8         0    85     0     0   37.03   21.51   20.24   53.50   63.84   -5.37
9         0   100     0     0   33.03   16.79   15.01   48.00   74.00   -3.00
10       10     0     0     0   75.23   79.55   73.29   91.48   -2.97   -6.96
11       10    10     0     0   69.05   70.36   66.38   87.17    2.62   -8.14
12       10    20     0     0   63.29   61.86   59.96   82.84    8.51   -9.42
13       10    30     0     0   57.78   53.70   53.20   78.29   15.13  -10.24
14       10    40     0     0   52.10   45.71   46.38   73.36   22.10  -11.01
15       10    55     0     0   44.54   35.05   36.38   65.79   33.97  -11.22
16       10    70     0     0   37.92   26.16   27.53   58.19   46.54  -10.82
17       10    85     0     0   32.67   19.34   20.21   51.08   59.43   -9.48
```

Fig. 9 Fogra 39L characterization data.

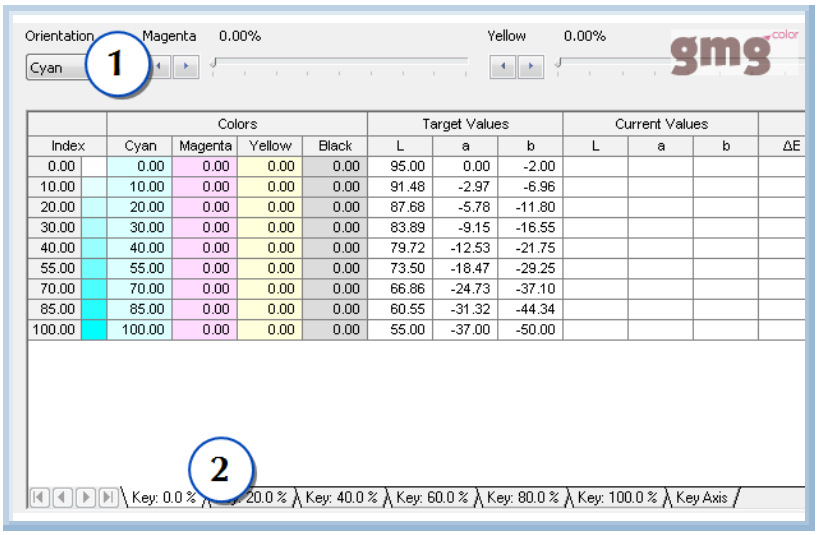


Fig. 10 Profile with imported target values.

How to import target values into the profile

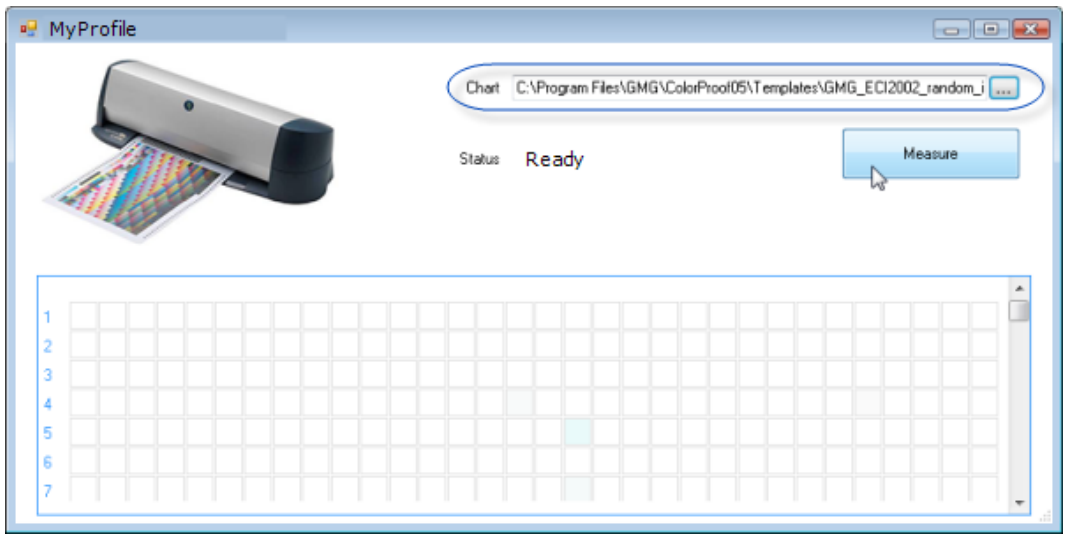
1. On the **Import/Export** menu, click **Import Target Values** and browse for the characterization data.
   The target values are imported as Lab values into the profile.
2. Click **Yes** if the following message is displayed: "In file XX some indices exist twice. Would you like to calculate the average?"
3. Click **OK** if the following message is displayed: "Not all values could be imported into the current color profile because there are no fulcrums for these values."
4. Click the **DotProof** tab.
   Use the **Orientation** drop-down list (1) and the **Key** tabs (2) at the bottom of the dialog to view the target values from various perspectives.

Measuring Target Values

Have the same test chart that you are using for the profile creation, for example, GMG_FlexoChart_V2_iSis, printed on the target printing machine and measure the printed color values as target values in GMG ProfileEditor.

How to measure target values from a test chart

1. On the **Measure** menu in GMG ProfileEditor, click **All Target Values**.
   The measurement dialog box opens. The selected test chart template is pre-selected.
2. If you need to change the test chart template, click the browse button and select the template of the desired test chart (same name) from the **Templates** folder, for example, GMG_FlexoChart_V2_iSis.



3. Insert the test chart that has been printed on the target machine into the measuring device.
4. Click the **Measure** button.
   The test chart is measured.
5. After a successful measurement, the following message is displayed: "Should the measured values be transferred?". Confirm the message by clicking **Yes**. The measured values are transferred as target values into the profile.
6. **Save** the profile.

Averaging Target Values

It is recommended to use several test chart prints from the target machine (at least two) and measure and average the results to get more precise target values.

How to measure and average several measurements

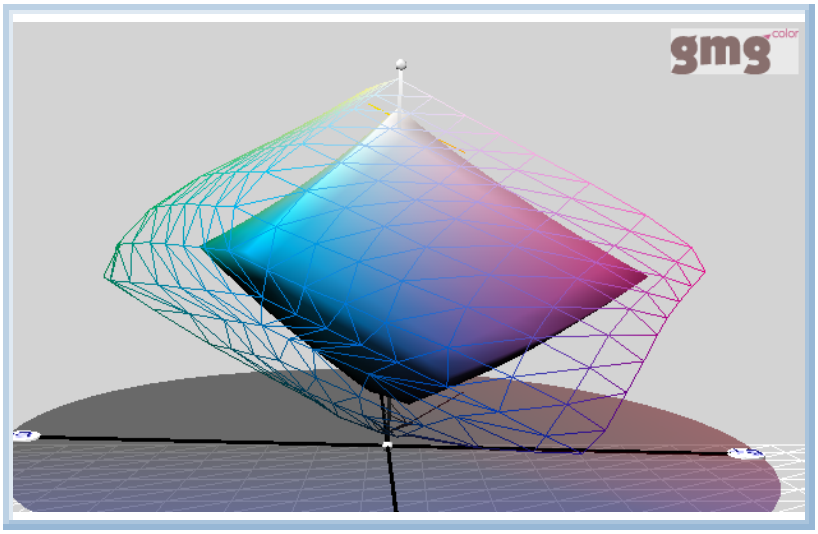
1. On the **Import/Export** menu, point to **Export Target Values** and select **Text File**.
2. Save the measured target values as *xx_targetvalues_1.txt* file.
3. On the **Tools** menu, select **Reset Target Values** to start another measurement.
4. Insert the second print of the test chart into the measuring device and **measure** the target values as described in the preceding chapter.
5. Again, **export** the measured target values (*xx_targetvalues_2.txt)*.
6. Repeat steps 3-5 for each measurement you want to do.
7. After you have completed all measurements and exported them as text files, click the **Import/Export** menu and select **Import Target Values**.
8. Mark **all** text files with target values you want to average by holding down the Shift key and click **OK**.
   The measured data from all selected files is automatically averaged and loaded into the profile as **Target Values**.

Comparing Gamut and Target Values

As printers can vary drastically in their color spaces, it is recommended to check the characterization data against the gamut of your printer–medium combination in GMG GamutViewer. In doing so, you will be able to assess if the proof printer gamut is physically able to match the color space defined by the target values and to localize so-called **Out-of-Gamut** colors.

How to compare gamut and target values

1. On the **Tools** menu, click **Compare Gamut/Target Values**.
   GMG GamutViewer opens showing both gamuts in 3D or 2D view.
2. Click the **color** buttons to change the depiction of the respective gamut according to your choice.
3. Click the drop-down list below each color button to select a **display format**.
   In our example, the **Reference Gamut** (target values) is shown as a multi-color solid. The **Sample Gamut** (printer gamut) is shown in multi-color lines. Ideally, the target color space is equal to or smaller than the color space that can be reproduced by printer-medium combination, as shown in the screen shot.



4. Left-click the gamut and hold down the mouse button. Move the mouse to **rotate** the gamut in all desired directions in 3D view. You can also **zoom** in and out of the image using the scroll wheel of the mouse.

What can I do if gamut and target color space do not fit?

In case the sample gamut does **not** encompass the reference gamut, the respective colors cannot be represented in the proof. Should this only pertain to minor color areas at the outer margin of the gamut, the proof may still be acceptable. If the gamut differences are more striking and apply to larger areas, it will not be possible to reproduce these colors with the chosen printer–medium combination.

Analysis of Target Values: If you have measured the target values from test chart prints of the target machine and you notice large bumps as shown in the following screen shot, it is recommended to use the **Smooth** function in GMG ProfileEditor (see "Smoothing Target Values" on page 17).

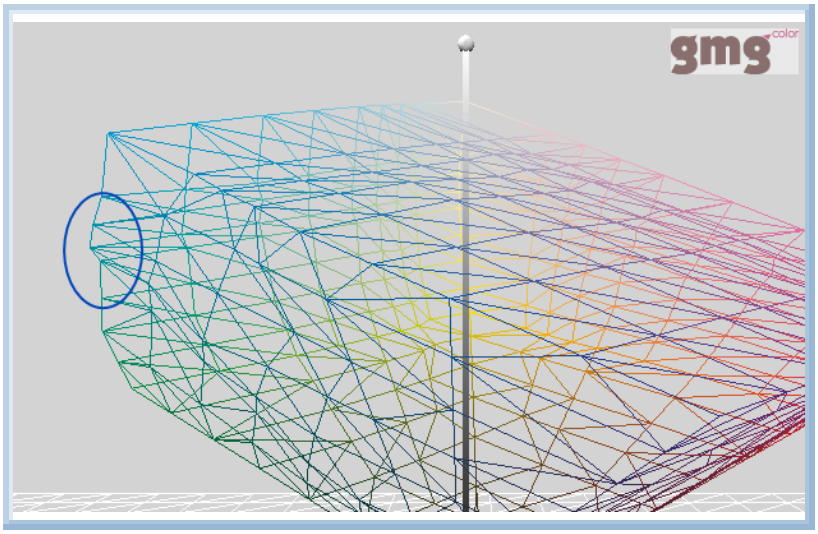


Fig. 11 Analysis of target values in GMG GamutViewer.

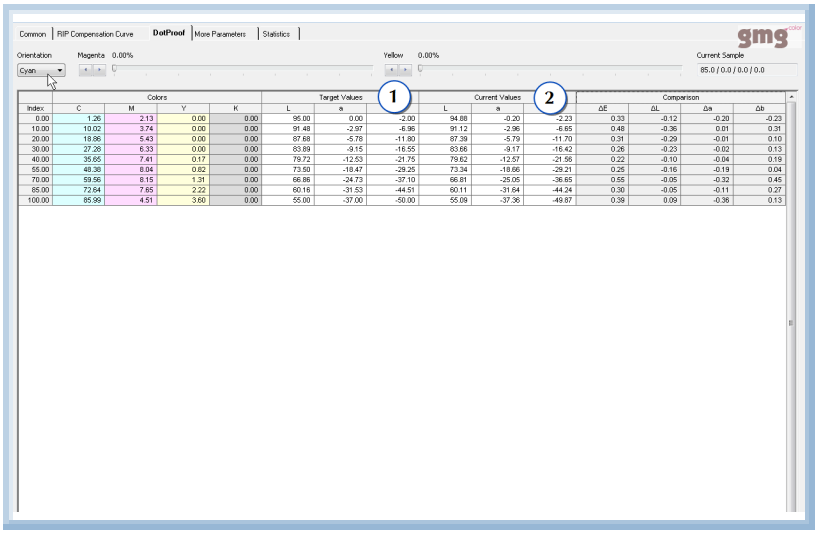
Smoothing Target Values

The automatic smooth function in GMG ProfileEditor interpolates the target values to compensate for larger deviations on the gamut hull.

How to smooth the target values

1. On the **Tools** menu, click **Smooth Target Values** .
   The **Smooth Target Values** dialog box with a slider is displayed, allowing you to determine the intensity of the smoothing.

2. It is recommended to use the **default** settings and click **OK**.
   The target Lab values are adjusted in the **Target Values** column (1). You can optionally load the former target values into the **Current Values** column (2) to see the effect on your data or visualize the differences in GMG GamutViewer.



3. Optional: On the **Tools** menu, select **Compare Target/Current Values** to view the changes.
4. On the **Tools** menu, select **Reset Current Values**.
   The current values (unsmoothed target values) are no longer needed and are thus removed.
5. **Save** the MX5 profile.

2.6.2 Calculating the CMYK Output Values

The CMYK output values are the color values the printer receives and turns into print. The output values are generated by computing the **target values** with the selected **gamut file**.

How to calculate CMYK output values from the target values

1. On the **Measure** menu, click **Calculate with Target Values**.
   The target values are computed with the gamut file to produce the output values of the profile, including an automated smoothing algorithm. The CMYK output values are displayed in the **Colors** column.
2. **Save** the profile.

2.6.3 Determining the Current Values

Printing the 1-Bit Test Chart Files

Note The 1-bit TIFF files of the test chart (e.g. ECI2002) should be produced under exactly the same target printing conditions you want to simulate.

How to create the job for printing the 1-Bit test chart files

1. Start GMG FlexoProof/DotProof.
2. Create a new job in GMG FlexoProof/DotProof and load the 1-bit TIFF files of the test chart, marking all four separations.
3. Under **Merge files**, select a recognition pattern.
4. Ignore the other options in this dialog box and click **Open** to edit the job in the **Manual Job Manager**.
5. **Job** > **Printer Settings** > **Printer**: From the **Printer** list, select your printer.
6. **Job** > **Printer Settings** > **Printer**: From the **Medium** list, select the loaded medium.

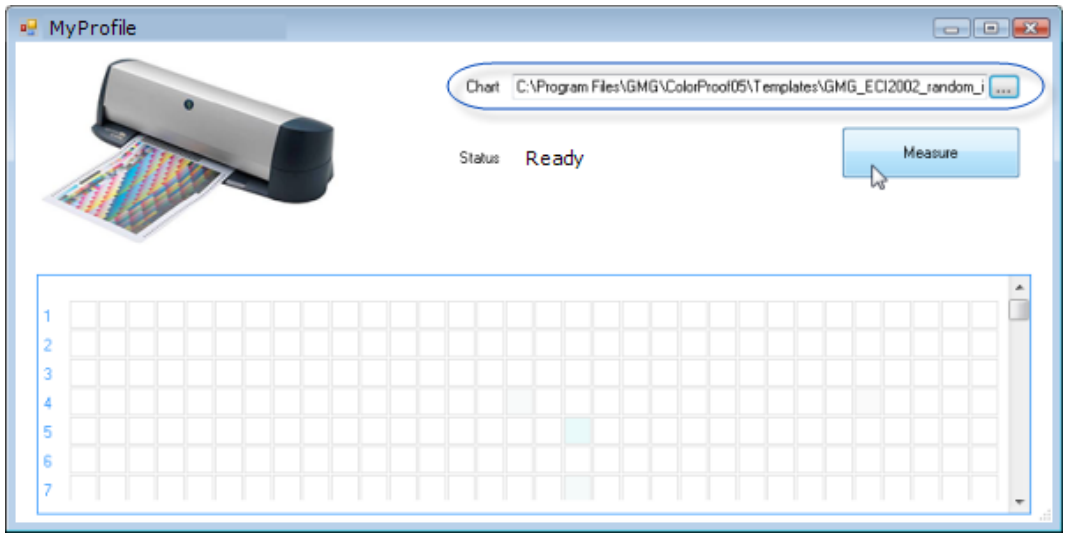
7. **Job** > **Printer Settings** > **Printer**: Under **Calibration Set**, select the calibration set with the print mode you will use for printing the proofs later.
8. **Image** > **Color Management** > **Proof Output**: From the **Proof Standard** list, select **Custom**. Under **Profile (MX DeviceLink / ICC Input)** select the MX5 profile you are creating. Under **Proof Mode**, select **DotProof**.
9. Click the **Print** button on the toolbar to print the job.

Measuring the Current Values

Depending on the printer you use, the **drying time** can have a very strong impact on the quality of the measurements required for profiling. It is thus recommended to investigate the minimum drying time for the printer you are profiling.

How to measure the current values

1. Open the profile you are creating in GMG ProfileEditor and click the **Common** tab.
2. Under **Measurement Settings** > **Chart**, select the appropriate test chart from the drop-down list.
3. Click the **DotProof** tab.
4. On the **Measure** menu, click **All Current Values**.
   The test chart measurement dialog is opened. As you can see, the appropriate template is already pre-selected. Click the browse button to change the test chart template type, if necessary.



5. Insert the test chart you printed in GMG ColorProof into the measuring device.
6. Click the **Measure** button.
   The test chart is measured. Measured data is read as **Current Values** into the open profile.
7. After a successful measurement, the following message is displayed: "Should the measured values be transferred?" Confirm the message clicking **Yes**. The measured values are transferred into the **Current Values** column.
8. Repeat these steps for the second page of the test chart (if any).
9. **Save** the MX profile.

Evaluating the Measured Values

To evaluate the measured values, switch to the **Statistics** tab. You can sort the values according to various criteria. On the screen shot, the data is sorted by Delta E in a descending order (click the **Up** and **Down** buttons to determine an ascending or descending order). By sorting the measured values this way, you can easily see which color patches yield the largest differences between the target values and the current values.

Under **Average all Values**, you can see the average Delta E value for all measured patches in the test chart. The higher the Delta E, the more inaccurate the color.

The **first measurement** will result in **high** Delta E values exceeding 10 or even 20. This Delta E gap is not to be considered a quality criterion and will be drastically reduced if you repeat the above steps, i.e. re-calculate the current and target values, print the test chart and repeat the measurement. The profile can thus be optimized, until the difference between actual color (Current Values) and target color (Target Values) is satisfactory. Experience has shown that an acceptable Delta E is generally reached within **3-4** iterations. If you still get high Delta E results after 5 iterations, the target printing condition might not be reproducible (out-of-gamut) with the printer-medium combination you are using. Generally, we recommend an average Delta E below 1.00 and a maximum Delta E of 5.00.

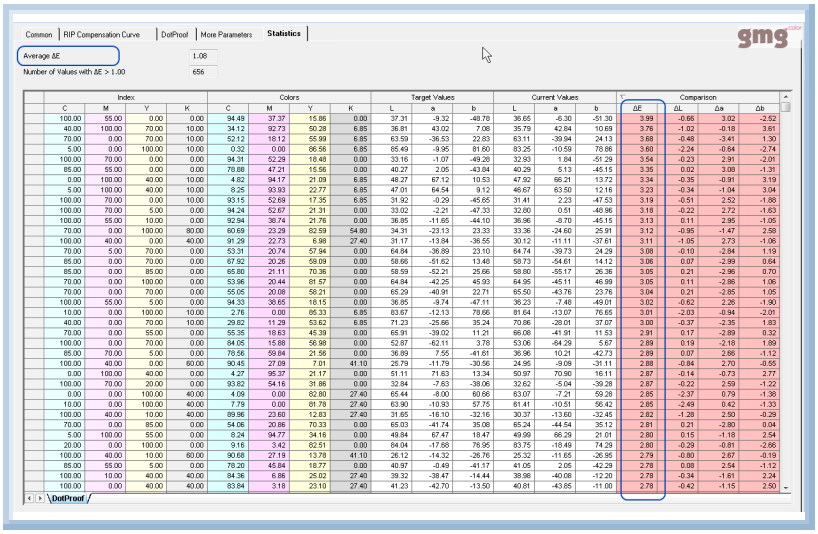


Fig. 12 Statistics with Delta E in descending order.

2.6.4 Iterating the Profile

The aim of an iteration is to match the **Target** values as closely as possible. Following each iteration, the program computes new CMYK output values based on the deviation between the target values and the measured current values. The new output values are used in the next **Printing** step. Thus, the **Current Values** will become closer to the tolerances with **each** iteration, that is, **Printing**, **Measuring**, and **Evaluating**.

How to recalculate the CMYK Output Values

1. On the **Measure** menu, click **Calculate with Target and Current Values**.
   New CMYK values are calculated from the target values and the measured current values. The current values are then removed as they are no longer valid for the current MX profile.
2. **Save** the profile with the calculated color adjustments.

After the recalculation, print the test chart again (for convenience from the **History** in GMG FlexoProof/DotProof), using the just recalculated MX color profile. Measure the test chart and evaluate if the recalculation was sufficient.

As soon as the measured values meet the target values within the desired tolerance, the color profile is **complete** as far as measurement is concerned. At this point, you should print a **test image** and check to see if it visually matches the reference prints.

2.7 Visual Optimization

After completing the measurements, it is recommended to evaluate the calculated colors visually by printing a visual test chart or test image with the generated profile. If the result does not comply with your needs and satisfaction, you can perform manual corrections to attain a visually optimized match between target and proof. The table below provides an overview of the various correction possibilities which are explained in detail in the respective chapters.

Note Visual corrections may change the Delta E values.

Correction Possibilities	*Where to Find*	*See also*
Global correction of color shifts	**More Parameters** tab > **Dot Gain Correction Curve**	"Correcting Global Color Shifts" on page 21
Definition of the first printable dot	**More Parameters** tab > **Dot Gain Correction Curve**	"Defining the First Printable Dot" on page 22
Change primary and secondary color values (CMYK) at the 16 key points	**Tools** menu> **Color Value Correction**	"Correcting Colors at 100% Value" on page 22
Selective color correction (CMYK) of particular fulcrums	**Tools** menu> **Selective Color Correction**	"Changing Color Values Selectively" on page 25
Correction of paper tint	**Tools** menu > **Color Value Correction**	"Removing the Paper Tint" on page 24

2.7.1 Correcting Global Color Shifts

If your visual test prints show global color shifts, for example in the midtones toward the Cyan direction, you can adjust your curves on index value level. The corrections apply to all colors of the modified index values and can be entered into the **Dot Gain** table or made in the **graphic view** by directly manipulating the curves.

Note Corrections entered in the **Dot Gain Correction Curve** table are **not** computed with the color values on the **DotProof** tab and remain separate. This way, the corrections can be modified any time.

How to correct global color shifts

1. Click the **More Parameters** tab.
2. On the **Dot Gain Correction Curve** tab, click the table and select **Add Fulcrum** from the **Edit** menu. This function allows you to insert additional **Index** values into the **Dot Gain** curve.
3. Correct the primary colors directly by clicking into the cell of the table or select and drag individual fulcrums in the graphic view (**Tools** menu > **Show Graphic View**).

2.7.2 Defining the First Printable Dot

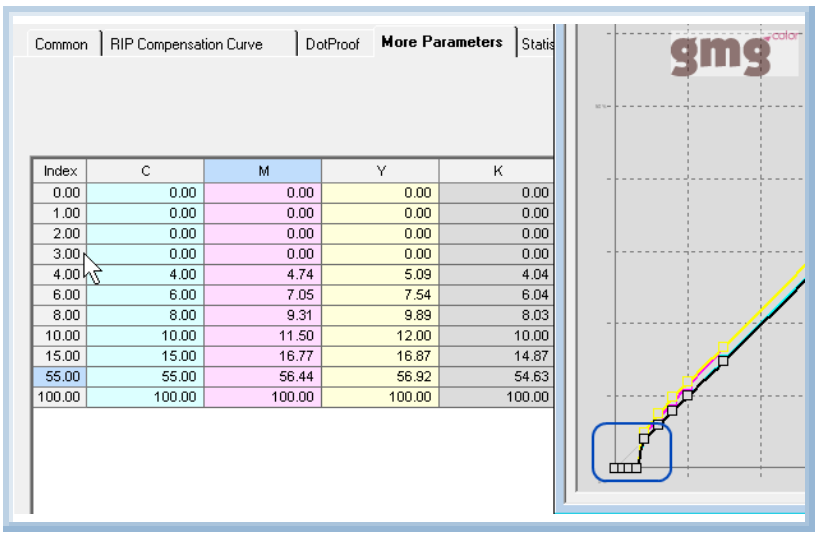


Fig. 13 Example with first printing tone at 4%.

Note In MX5 profiles, the first printable dot is usually reflected in the **imagesetter linearization**. A manual correction of the first printable dot should thus **only** be applied if you are **not** using imagesetter data or if you are using a **linear** curve.

With this simulation functionality, you can simulate the first printable dot of the target printing machine. Since usually no fulcrum exists in the exposure range under 10%, color values are interpolated without any information on the first printable dot in the profile.

In the following example, further fulcrums have been added and all CMYK values below 4% have been set to 0.00. This way, the first printable dot is printed at 4%. It is recommended to add **at least** one fulcrum before and after the first printable dot to 'hold' the curves and prevent them from oscillating.

How to define the first printable dot

1. Click the **More Parameters** tab.
2. Click on the **DotGain Correction Curve** tabbed page.
3. On the **Edit** menu, click **Add Fulcrum** and enter a fulcrum value.
   The new fulcrum is added to the table. Add as many fulcrums as required.
4. Set all values below the first printable dot to **zero**.
5. **Save** the profile and make a test print.

2.7.3 Correcting Colors at 100% Value

Note The **Color Value Correction** function immediately translates the changed values into the CMYK output values. Any change affects the whole gradation of the selected color starting with the solids and continuing proportionally from 100% to 0% into the highlights of this color.

If your visual test images or charts show color shifts in a certain full tone, for example in Cyan (and only Cyan, the other gradations print okay), you can use the **Color Value Correction** (**Tools** menu > **Color Value Correction**) to modify color values with regard to all 16 primary and secondary colors (also with black overprint) of the 4D color space.

In the following example, we used a blank profile to clearly show you the impact of the correction and changed the Cyan gradation by adding 10% Magenta in the highlights (Key 0%).

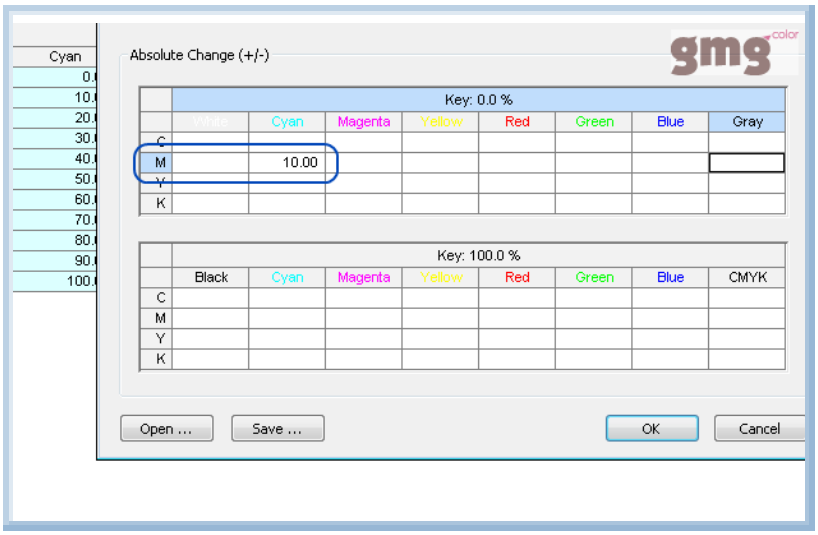


Fig. 14 Adding 10 % Magenta at 100% Cyan using the Color Value Correction.

The next screen shot shows the changed CMYK values and the way the color reproduction of a 100% Cyan in the proof is changed. Please note that not only 100% Cyan is modified, but also all other neighboring color tones, though proportionally decreasing.

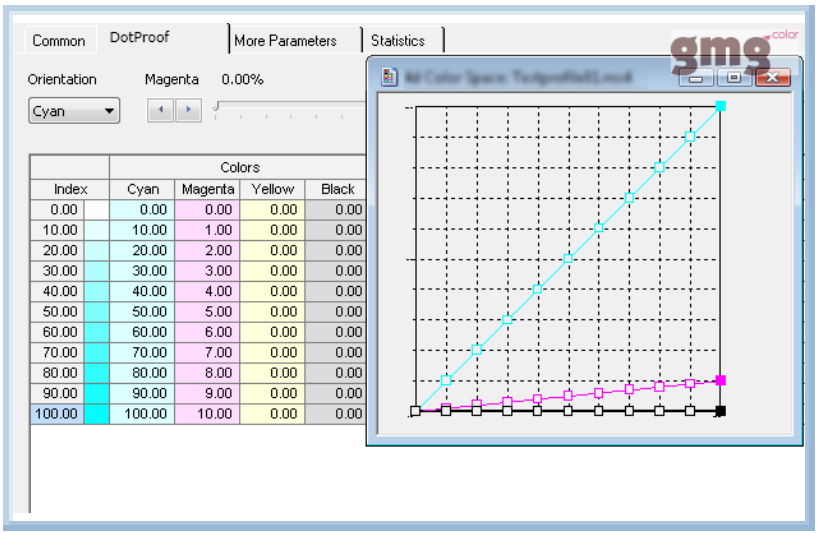


Fig. 15 CMYK values showing the extra 10% Magenta.

When selecting the Magenta **Orientation** at 100% Cyan, you can see changes in the Magenta color values, steadily increasing towards 100%.

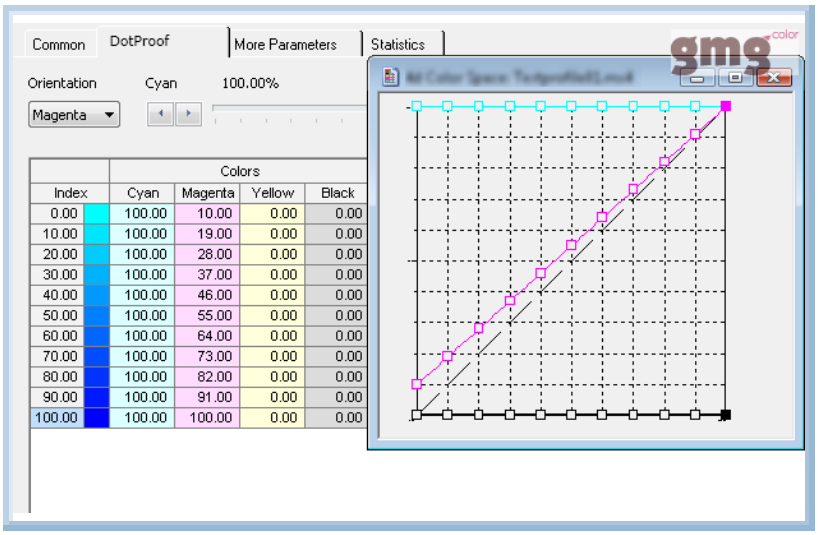


Fig. 16 CMYK values with the Magenta Orientation at 100% Cyan.

The same effect shows when selecting the Yellow **Orientation**.

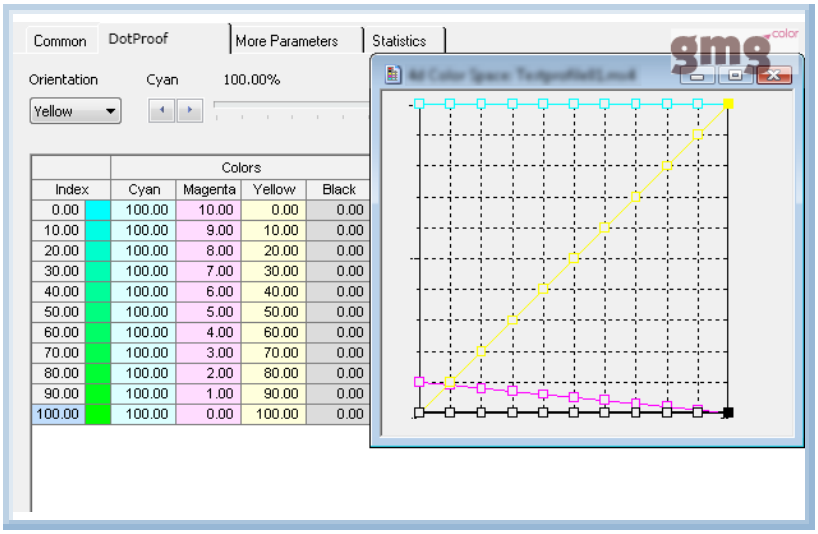


Fig. 17 CMYK Values with the Yellow Orientation at 100% Cyan.

Tip Changes to the **paper tint** should be made in the **White** column at Key 0.0%.
(see "Removing the Paper Tint" on page 24)
Changes to the **3-color gray** should be made in the **Gray** column at Key 0.0%.
Changes to **Black** should be made in the **Black** column at Key 100.0%.

2.7.4 Removing the Paper Tint

If the profile white point is rather close to the proof media white point, you can subtract the paper tint without distorting the overall impression of the proof. The bigger the difference between these white points, the more changes are calculated into the proof output, possibly resulting in a failed proof verification, because the measured values of the control strips are not within the defined tolerances.

→ To remove the paper tint from your proof, deactivate the **Use Paper Tint Simulation** function in GMG ColorProof (**Printer Settings** > **Use Paper Tint Simulation**) when printing the proof.

Alternatively, you can **manually** remove the paper tint directly from the profile, using the **Color Value Correction** function in GMG ProfileEditor (**Tools** menu > **Color Value Correction**) and correcting the white point on a global level (changing all color values).

→ To correct the white point in the **profile**, transfer the CMYK values of the 0/0/0/0 Index into the **White** column (K 0%) and **invert** the values (by putting a minus sign in front).

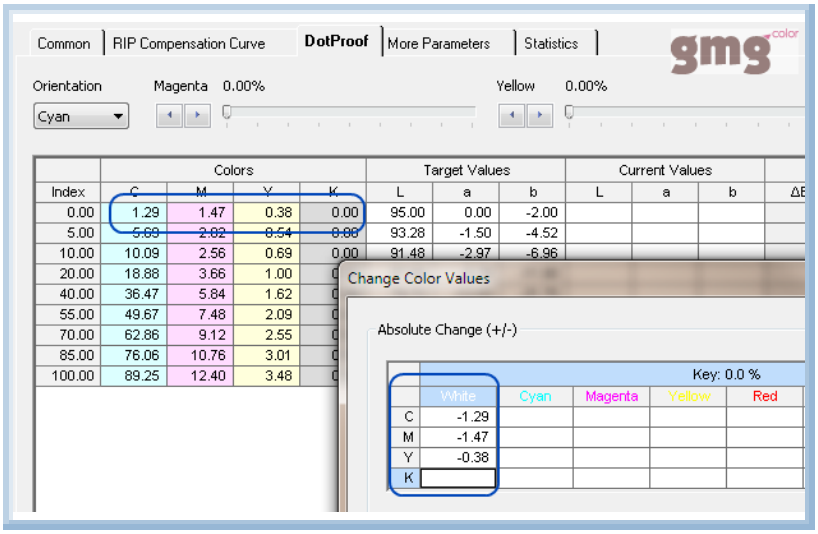


Fig. 18 Removing the paper tint by inverting the CMYK values at 0/0/0/0.

Note If you remove the paper tint from the proof profile, you also need to adjust the paper tint in the associated calibration file (see "Paper Tint Adjustments in the Calibration File" on page 25).

Paper Tint Adjustments in the Calibration File

If you remove the paper tint from a proof profile, this should be reflected in the calibration file by setting **all** color values at Index 0.00 / 0.00 / 0.00 to zero.

How to adjust the paper tint in the calibration file

1. Open the calibration file in GMG ProfileEditor.
2. Set the **CMY** values at Index 0.00 / 0.00 / 0.00 to zero to remove the paper tint.
3. Set the corresponding Lab **Target Values** at Index 0.00 / 0.00 / 0.00 to zero.
   Otherwise, the paper tint will be recalculated again with the next calibration.
4. **Save** the calibration file under a different name.

Note The removal of the paper tint and the corresponding adjustments in the calibration file should be regarded as a special case option which should be used with care. Because of the color value corrections, it will not be possible to print proofs with a GMG Logo.

2.7.5 Changing Color Values Selectively

Note The **Selective Color Correction** should be used with great care as, depending on the defined range, too many or too few color values can be affected, which in the latter case may lead to breaks in the proofs. Therefore, in case of doubts, it is recommended to define a wider color range rather than a too restricted range.

The **Selective Color Correction** (**Tools** menu > **Selective Color Correction**) allows you to perform changes **from any point** in the color space of the profile. Selective color corrections can, for example, be used to correct the skin tones. To determine the **Index** value, you can open the file in the GMG FlexoProof/DotProof preview or in an image editing software and use the color picker tool.

By entering the determined color value into the **Index** column, you define the starting point of the correction. In the **Colors** column, you can see the current CMYK output values.
In the **Correction** column, you can enter the desired CMYK change. The entered values are absolute correction values, that is, when you enter +1.5% Magenta, the Magenta color value is increased by 1.5%. In the following screen shot, you can see an index value of 55.0.0.0 and an increase of the Magenta value by 1.5%.

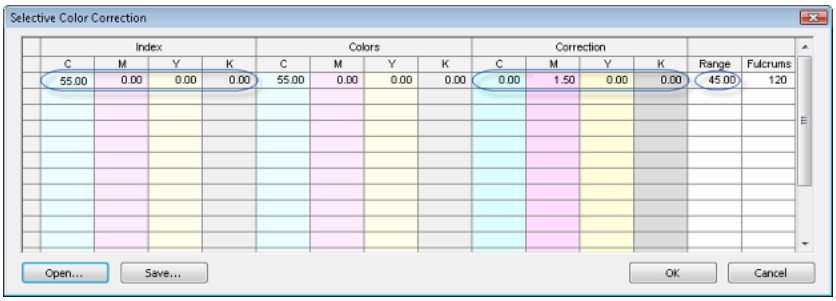


Fig. 19 Selective color correction at Index 55.0.0.0, adding 1.5% Magenta.

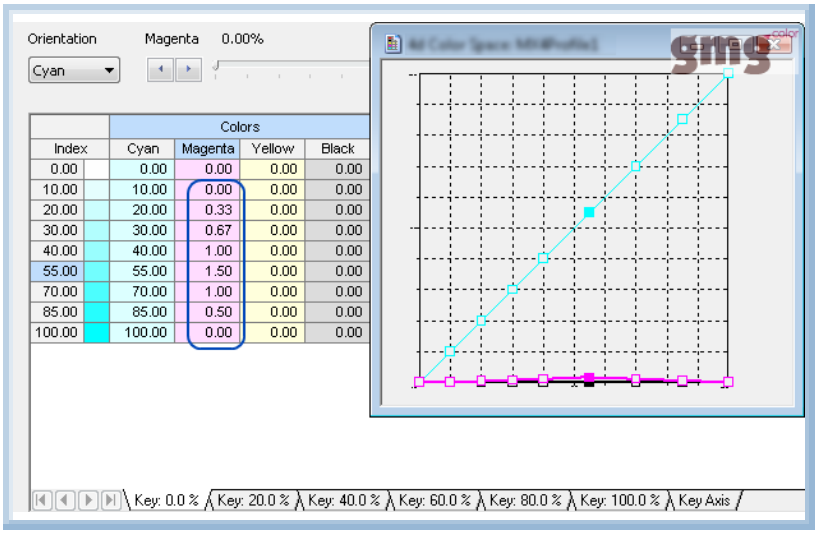


Fig. 20 Impact of the selective color correction on the CMYK output values.

Range: The range of the changes can be defined in the **Range** column in percent. The range value equally affects all directions within the color space. The higher the range value, the more colors are changed. We recommend a range value between 30-80%.

Fulcrums: The number of **Fulcrums** depends on the defined color range and is an indicator for the impact of your correction. The impact naturally depends on the distribution of the fulcrums in the profile. Typically, the number of CMYK fulcrums decrease with increasing Black levels (as you can see in the ECI2002 test chart). When using the same range as in the above example, but at Index 0.0.0.55, the number of fulcrums is considerably reduced.

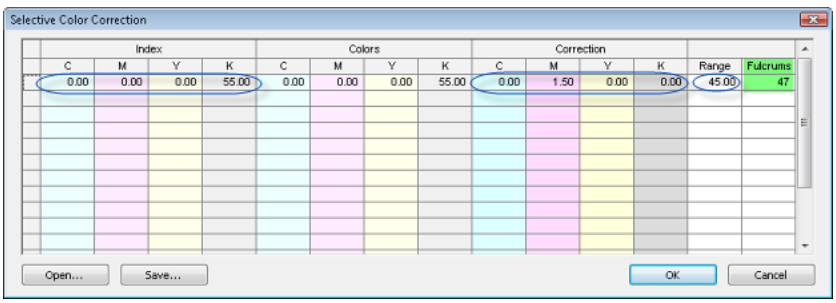


Fig. 21 Selective color correction at Index 0.0.0.55, adding 1.5% Magenta.

Tip We recommend to check the **paper tint** (Index 0/0/0/0) and the **Gray axis** after the correction and reduce the color range in case of undesired changes.