GMG ColorServer
SmartProfiler Lab User Manual

Imprint

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GMG GmbH & Co. KG

Moempelgarder Weg 10

72072 Tuebingen

Germany

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Last update of this documentation: 2020-06-08

This documentation refers to the GMG software version No. 5.1.

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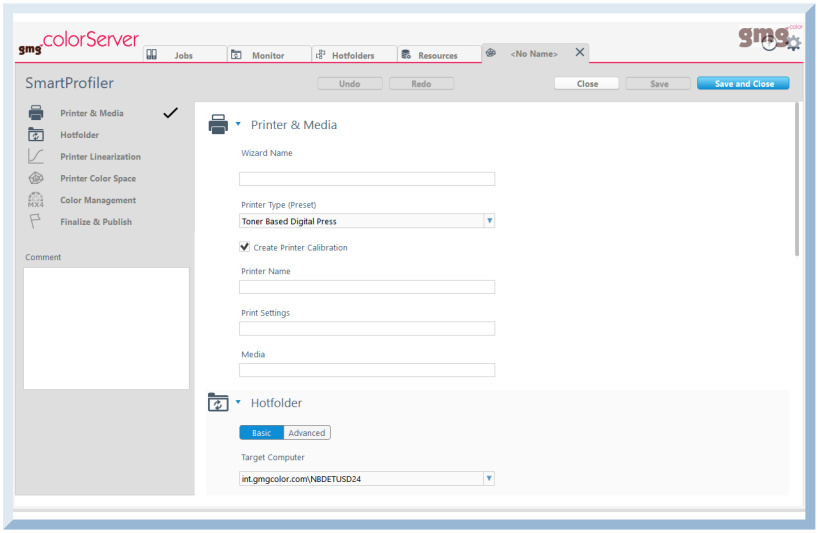
1. About GMG SmartProfiler

GMG SmartProfiler helps you to create printer calibrations and color profiles for digital and large format printers. This optional feature extends GMG ColorServer with profiling functionality. Thanks to the step-by-step structure, any user can calibrate, recalibrate, and profile digital and large format printing systems without expertise in color management.

Generally, you start with creating a new **printer–media combination**, which will be saved as a **SmartProfiler** resource on the server. This resource holds all information required to calculate a profile such as measurement data and the information you provided. From this **SmartProfiler** resource, you publish a **hotfolder** and corresponding color profiles to GMG ColorServer. You can then drop input documents into the hotfolder. GMG ColorServer will automatically optimize them for the profiled printer–media combination.

The GMG SmartProfiler form will guide you through this process. Some steps require **Printing and Measuring** of test charts (see "Printing and Measuring Test Charts" on page 8).

Tip Clean and check your printing system before profiling to obtain most precise color measurements.



GMG SmartProfiler technologies

Depending on the GMG ColorServer version you are using, you will have access to one of the following GMG SmartProfiler types, based on different technologies:

- **SmartProfiler Spectral**: Based on spectral measurements instead of Lab. In the background, GMG OpenColor will serve as a profiling client and will automatically provide the appropriate test charts. Included in the GMG ColorServer Digital and GMG ColorServer Multicolor solutions.
- **SmartProfiler Lab**: Based on Lab. Available as an option for the standard GMG ColorServer version.

The information in this document refers to **SmartProfiler Lab**.

2. Profiling Your Printer and Medium Combination

2.1 Printer & Media

In this part of the form, you define the basic settings for your printer-medium combination such as the **Printer Name** and whether you want to recalibrate the printer later or not.

Note A printer calibration file is valid only for the printer–medium combination it has been created for. You will need a different printer calibration file for each printer–medium combination you want to use.

How to set up Printer and Media

1. Enter a **Name**.
   This name will be used as a name for the hotfolder and all linked resources such as color profiles.
2. Select a **Printer Type** preset in the drop-down list which matches the used printer.
3. Add a check mark to the **Create Printer Calibration** check box if you want to create an initial calibration for your printer-medium combination. You can then easily recalibrate your printer on a regular basis later (see "Printer Calibration").
4. Optionally fill in **Printer Name**, **Print Settings**, and **Media.**
   You can use this information in the **Resources** view to filter your printer-medium combinations.

A check mark will be added to each part of the form you completed and the next part will be enabled.

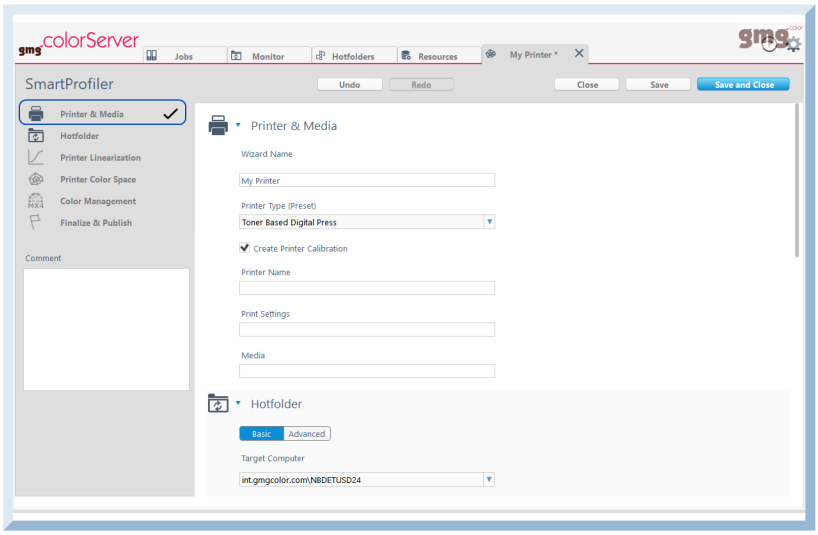


Fig. 1 First part—Printer & Media—completed.

The **Hotfolder** part is now enabled. **Printer Name**, **Print Settings**, and **Media** are no mandatory fields, so they can be left empty.

2.2 Printer Calibration

As varying environment conditions such as temperature and humidity cause undesired printer deviations, for **digital printing**, we recommend calibrating your digital presses on a regular basis.

An MX3 printer calibration fine-tunes the CMY channels, so that deviations are counterbalanced and print results are **stabilized**.

When and why should I use a Printer Calibration?

We recommend using a printer calibration for **digital printing** applications in general for the following reasons.

- You can use a **single** printer calibration file together with multiple MX4 color profiles. This means, you only need to calibrate your printer–medium combination once and then use it in **multiple** hotfolders. This helps to save valuable time and media.
- As test charts for printer calibrations have fewer patches, they are **smaller** than test charts for color profiles. Thus, you need less time and media to calibrate a printer than to iterate a profile.
- The **gray balance** is already optimized in the printer calibration, leading to a very stable gray axis.

In general, you should **not** use a printer calibration in the following cases.

- For **validation prints** on **toner-based** printers: The color space of the printer–medium combination is larger without a printer calibration.
- Do not select this option if you do not intend to recalibrate the printer on a regular basis.

How to recalibrate a printer

1. Select the printer-medium combination you want to recalibrate.
2. Click on the **Recalibrate** button.
   The application will switch from the **form** view to the **Measurement** view.
3. Proceed with printing and measuring (see "Printing and Measuring Test Charts" on page 8) and evaluate your results.
4. If you are not satisfied with the results, click the **Optimize** button to start the next cycle.
5. If you are satisfied with the results, click the **Publish** button to accept the results.
   The profile under **Resources** > **MX profiles** will be replaced. Thus the hotfolder using this profile is also automatically updated.

Note To ensure a high color accuracy and to ensure that the printer will print within the tolerances defined by the print standard, it is strongly recommended to calibrate the printer on a regular basis.

2.3 Hotfolder

In GMG ColorServer, hotfolders are used for automatic processing and for the connection to the frontend RIP. During the **Publishing** step, GMG SmartProfiler will create a ready-to-use hotfolder for your printer-medium combination.

In the **Hotfolder** step, you define the basic hotfolder settings such as the target computer, input and output folders.

Tip You can switch to the **Advanced** view to define advanced hotfolder settings.

How to set up the hotfolder settings

1. Select the **Target Computer** which hosts the ColorServer installation you want to work with.
2. Select the **Hotfolder Location** for your specific printer-medium combination.
3. Define the **Output Type** for your files that will be processed in GMG ColorServer.
   Add a check mark to the **Folder** check box and enter the desired location path for your processed files.
   Add a check mark to the **Printer** check box and select the desired printer in the drop-down list if you want to print your processed files automatically.

A check mark will be added to each part of the form you completed and the next part will be enabled.

See also:

- "Output"

2.4 Printer Linearization

A printer linearization serves to control a printer in a way that the printed colors behave linearly to the input colors (of the original image file). This is an optional step, which requires printing and measuring of test charts (see "Printing and Measuring Test Charts" on page 8).

You can either use the printer linearization used in the printer frontend or you can create a new linearization in GMG SmartProfiler. If you should observe overinking in one of the following steps, you will need to create a linearization. If you are unsure whether you need a linearization or not, it is recommended to create one; it will not be a problem to have a double linearization in your print workflow.

How to create a new Printer Linearization

The **Printer Linearization** test chart contains gradations and overprint patches to determine the single ink limits and the total ink limit, that is, the total amount of ink the media can handle before **overinking** occurs. Process and spot colors are automatically linearized in this step.

Note It is recommended to print the test chart and examine the test chart for overinking before proceeding to the measuring step. In case of overinking effects it is recommended to reduce the ink limit down to the percentage before overinking occurs, and print the test chart again.

Tip If the slope of the linearization curve created by GMG SmartProfiler shows an extreme behavior, a warning message will be displayed, asking you to use the linearization from the frontend RIP. This helps to avoid visible steps when printing.

1. Add a check mark to the **Create Linearization** check box.
2. If you already have an exported measurement file, click the **Import** button to import the file. You can then skip the following steps.
3. Click **Print and Measure** and proceed as described (see "Printing and Measuring Test Charts" on page 8).
   Your **Printer Linearization** data will be saved.
   The application will calculate optimal ink restriction values for your printer, media type, and print mode. After measuring, a linearization curve will be shown. It represents the input-output relation of the printed and the measured inks. You can edit the curve by grabbing and moving coordinates with the mouse.
4. If needed, enter individual **Ink Cuts** for every CMYK channel to compensate deviations from the linear gradation. The slope of the curve will adapt to your changes.
5. You can optionally export the measurement file by clicking the **Export** button.

2.5 Printing and Measuring Test Charts

For creating printer profiles, you will need to provide characterization data, that means, you will need to **print** color patches on the printer using the media type and print mode you want to profile. Then, you need to **measure** these color patches with a spectrophotometer. An array of color patches is called a **test chart**.

The **Print & Measure** button indicates that GMG SmartProfiler requires you to print and measure.



Fig. 2 Print & Measure button.

You can click the **Print & Measure** button to start a new or continue an interrupted earlier measurement session. You can also click the **Import** button if you have previously exported a measurement file. You can click the **Export** button to export a completed measurement for later use. In many cases, you can click the **GamutViewer** button to view a completed measurement in GMG GamutViewer.

When clicking the **Print & Measure** button, the application will switch from the GMG SmartProfiler **form** to the **Measurement** view. Stay in the **Measurement** view until you have finished the measurement and then click the back button to switch back to the form and continue the profiling process. If you leave the **Measurement** view before you are finished, the last measurement session will be automatically saved and you can continue later.

Test charts

GMG SmartProfiler automatically creates test charts specifically for the used measuring device, the selected printer type and according to what the measurement data is needed for, i. e. printer linearization, printer color space characterization, and so on. Therefore, test charts have different layouts and sizes.

How to print a test chart

1. In the **Measurement** view, select the **Measuring Device** (1) you want to use from the drop-down list. The test chart preview (2) shows the layout and color patches.
2. Check and correct the test chart and patch size (3). Make sure the test chart will fit on your media size.
3. Click **Send to Printer** to print out the test chart (4).
   The application will generate the test chart as a PDF and send it to the output folder of your hotfolder.
   —OR—
   Click the **PDF** button to save the PDF manually.
4. Let the printed test chart dry sufficiently as an ongoing drying process might affect the color results.

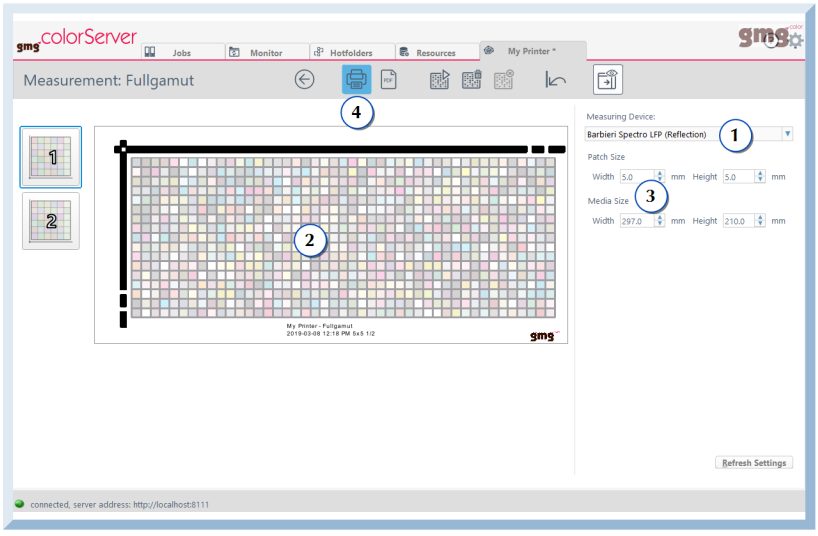


Fig. 3 Print & Measure dialog box, before printing.

How to measure a test chart

Note If the **Refresh Settings** button (4) is shown instead of the measuring device settings, the **connection** to the measuring device has been lost. Click the **Refresh Settings** button to reconnect.

1. Insert the printed and dry test chart into the measuring device and click the **Measure** button (1) to start the measurement.
   The test chart preview will be updated according to the progress of the measurement session.
2. You can move the mouse pointer over the test chart preview to show a **Patch Info** with the printed CMYK values and the measured Lab and LCH values.
3. In case of multiple test chart pages, you will see all pages on the left (2). Select the next page and start the measurement until all pages have been measured.
4. After you have successfully measured **all** test chart pages and copies, click the back button (3) to accept the measurement results and to switch back to the form view.
   —OR—
   You can also click the back button (3) to interrupt the measurement session anytime. Click the **Save** or **Save and Close** button in the form view to save your current progress. You will be able to continue seamlessly at a later point in time.

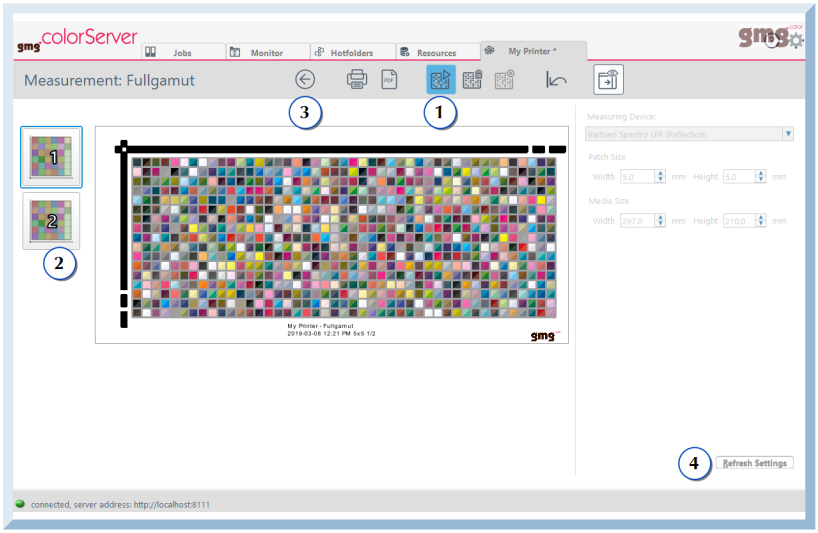


Fig. 4 Print & Measure dialog box, before measuring.

How to measure multiple copies of test charts

This feature is available **only** for **new** measurements. GMG SmartProfiler does **not** support **importing** and averaging multiple measurement files.

1. You can print and measure **multiple** test chart copies to achieve a more reliable fingerprint of your system.
2. If you want to measure the **same** test chart multiple times to obtain averaged measuring values, repeat the measuring procedure by clicking on the **Measure** button (1).
3. On the left side of the **Measurement** view, you can expand the test chart page button (2) to select a specific measurement.
   The test chart view will be updated accordingly.
4. You can delete the currently displayed measurement by clicking the **Remove** button on the toolbar.
5. Click the back button (4) when you are finished.

The application will automatically **average** all measured values.

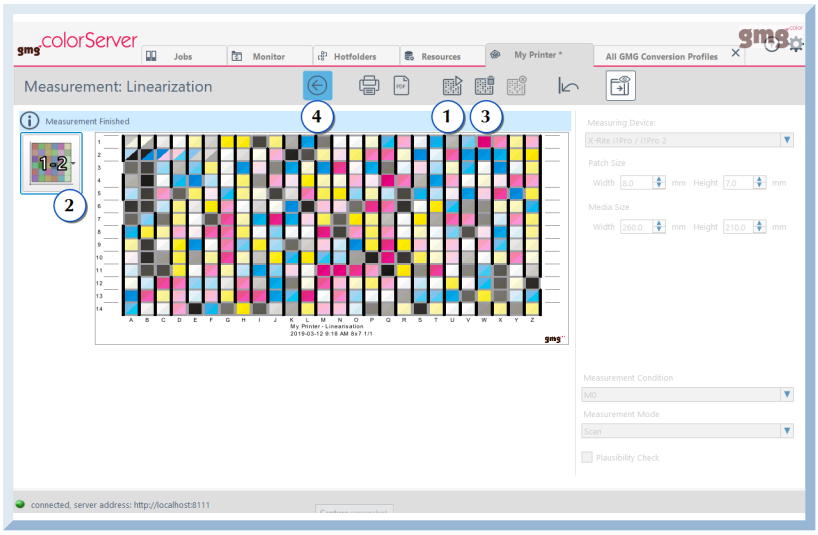


Fig. 5 Print & Measure dialog box, after measuring two test chart copies.

The test chart page button (2) shows the number "2" to indicate that the test chart has been measured twice.

2.6 Printer Color Space

The **Printer Color Space** is the fingerprint of your printer-medium combination and forms the calculation basis for creating printer calibrations and color profiles. To create this fingerprint, you need to print and measure a specific test chart (see "Printing and Measuring Test Charts").

When **recalibrating**, the measured **Printer Color Space** serves to define the output values that need to be sent to the printer to achieve a certain target value.

After printing and measuring, the **Printer Color Space** can be viewed in GMG GamutViewer, for example, you can check which colors are out of gamut.

Gamut Reduction

This option is available only if you have selected the **Create Printer Calibration** option. GMG SmartProfiler can use a slightly smaller color space than the measured printer color space to calculate the printer calibration file. This kind of "buffer" helps to ensure consistency and accurate color reproducibility under varying printing conditions. If the **Gamut Reduction** option is selected, the recalibration process will become easier and faster. On the other hand, less color can be effected in the output. Also, primary colors can be contaminated by other colors.

Note Do not select this option if you do **not** intend to recalibrate the printer on a regular basis. Do not select this option if you want to keep colors pure, for example, if you want to create a profile with Pure M+Y settings. Otherwise, the printer calibration file will introduce contamination even though the color is calculated with **Purify** settings.

2.7 Color Management

In this step, you will define the color management settings, used for normalizing the input color spaces, spot color conversion, and color conversion from the normalizing color space into the printer color space.

Available options	*Description*
CMYK Input Color Space	All document color spaces will be **normalized** into the selected CMYK color space and then converted into the printer color space. Generally, it is advisable to choose a color space that is wide enough to minimize out-of-gamut areas, but is also still within the technical capabilities of the printer-media combination. You have the following options: → Select a **print standard** from the list. → Select **Custom** and load a custom color space file to use a house standard or any other color space. For example, you can use the full gamut file from a printer to define this printer as the print reference. **Note:** When loading a custom MX4 file, only MX4 files with the file name extension "mx4x" will be supported.
Use Embedded ICC Profiles	If this option is deselected, embedded ICC profiles will be ignored and the application will handle documents as if they already were in the selected **CMYK Input Color Space**, i. e. convert them directly to the printer color space, without normalization. RGB, Gray, and Lab elements are still normalized using embedded ICC profiles or rendering intents.
Convert Spot Colors to Printer Color Space	Per default, spot colors will be converted directly into the printer color space, without converting them to CMYK first. This allows you to use the extended printer color space to print bright spot colors. If this option is deselected, spots will be converted to the **CMYK Input Color Space** first. Thus, you will get a less accurate representation of out-of-gamut colors. On the other hand, print results might be more reproducible and comparable, especially if you are using digital printers in parallel with conventional printing methods.

Advanced Profile Settings—Separation Settings

The following table lists all separation settings and delivers a short description.

Option	*Short description*
TAC	(Total Area Coverage) Maximum amount of ink applied to a medium for reproducing the target color (in the darkest shadow area). The four primary colors CMYK (in percent) are summed up to compute this value. The TAC depends on the printing process and medium used. For example, a total ink application of 350% can be achieved on glossy paper. For comparison, the total ink application on newspaper is only 270%. If the TAC is exceeded, the ink spreads, resulting in dot gain and unsharpness. Please refer to the technical specification of the manufacturer of the print medium for further information.
Black Start	Percentage at which the K channel should start to print. For example, if this value had been set to 2% and the original color value in the document was C100, M50, Y50, K1, the 1% K would not be printed.
UCR Light / Midtone / Shadow	Under color removal (UCR) is a technique to reduce the amount of CMY in neutral areas while increasing the amount of Black. Thus the image areas with reduced CMY can dry faster between each printing unit on a printing press. For profiling, you can determine the Black amount in the highlights, the midtones and the shadows.

Advanced Profile Settings—Rendering Intents

The following table lists all rendering intents and delivers a short description.

Rendering Intent	*Short description*
Automatic	This rendering intent is preselected when you select **Default**, **EcoSave** or **Pure Colors** as a profile variant. Keeps colors as far as possible relative and uses perceptual algorithms where necessary. Based on the data fed in to the system so far, this rendering intent is suitable for most requirements and should only be changed if necessary.
Best Visual Impression – Perceptual	This rendering intent aims at preserving the **visual impression** of the original image, including saturation and detail, in the limited output color space. The color space is **scaled** to fit into the output color space, that is, all color values including in-gamut colors will be redistributed. Central colors are remapped more precisely, that is, changed less than colors at the edges of the gamut.

Rendering Intent	*Short description*
Best Color Accuracy – Relative Colorimetric	This rendering intent aims at achieving the highest **color accuracy**. In-gamut colors are reproduced in a color-accurate manner in the output color space. Higher saturated (out-of-gamut) colors are **clipped**. Relative colorimetric aligns the **white point** of the input color space to the output color space, leading to a color compensation when printing on **tinted** paper. As a result, all in-gamut colors are **modified** with respect to the new white point. Apart from that, changes to in-gamut colors are kept to a minimum, so that a maximum color accuracy is achieved.
No Gamut Mapping (Absolute Colorimetric)	In-gamut colors are color-accurately reproduced and out-of-gamut colors are clipped. **Note:** Without gamut mapping, it might not be possible to reproduce the reference color space**.**

Purify color options

It is highly recommended to use the option **Auto Purify for CMY** as it provides a good balance between preserving pure colors and preserving the color impression as intended by the designer or creator of the document.

Option	*Description*
Auto Purify for CMY	Automatically purifies all colors that are only slightly contaminated by other colors.
Pure Black	Keeps the black axis pure. 100% Black is kept at 100% Black and will not be supplemented with or replaced by CMY.

2.8 Finalize & Publish

The final **MX** printer profile, spot color databases, calibration file (optional), normalization resource, and ready-to-use hotfolder will be published to the server. You can view and edit the resources in the same way as other GMG ColorServer **resources**.

After publishing, you can start printing by dropping documents into the input folder of the hotfolder.

See also:

- "Resources"

2.9 Optimize the Profile Quality

You can **print** and **measure** a test chart in an iteration cycle to optimize the profile quality. In most cases, the quality of the calculated profile is already optimal and this step can be skipped without impairing the quality.

The aim is to match the target values defined by the **CMYK Input Color Space** as closely as possible, within the tolerances defined in the **Quality Criteria**. Following each iteration cycle, the program computes new CMYK output values based on the deviation (**Delta E**) 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 cycle.

How to optimize the profile quality

1. On the **Resources** tabbed page, select the **SmartProfiler** resource type.
2. Select a the **printer–media combination** you want to optimize.
3. Click the right mouse button to show the context menu.
4. Click **Iterate Profile**.
5. Click the **Optimize** button to start the iteration cycle.
   The application will switch from the **form** view to the **Measurement** view.

6. Proceed with printing and measuring (see "Printing and Measuring Test Charts" on page 8) and evaluate your results.
7. If you are not satisfied with the results, click the **Optimize** button to start the next cycle.
8. If you are satisfied with the results, click the **Publish** button to accept the results.
   The profile under **Resources** > **MX profiles** will be replaced. Thus the hotfolder using this profile is also automatically updated.

3. Recalibrating a Printer

If you have selected the **Create Printer Calibration** option, you can recalibrate the printer-medium combination on a regular basis. Recalibrating a printer means printing and measuring test charts, and then evaluating the results and adjusting the printer calibration file. This cycle is repeated until the results are satisfying. The aim is to match the target values as closely as possible, within the tolerances defined in the **Quality Criteria**.

You can repeat the cycle until the values are either within the defined tolerances or until you decide to end the cycle by accepting the results.

3.1 Quality criteria

The defined **Quality Criteria** need to be reached for a successful printer calibration. Use higher values if you want to speed up the calibration process (less steps) on the cost of color accuracy.

Delta E is the distance between output and target color. The higher Delta E, the stronger is the deviation from the target color.

Delta L refers to the luminescence, that is, to the Black (K) channel. The higher Delta L, the stronger is the deviation of the luminescence from the target color.

3.2 Calibration results

You can find the results of your last optimization cycle in the **Last Results** overview. The results of the ongoing recalibration are listed under **Current Calibration**.

You can import or export the calibration data by clicking the corresponding button. To gain more detailed information about your calibration you can view the calibration data in GMG GamutViewer.

Clicking the **Show details** button next to a cycle brings up a table with all measured and target values for all patches. This can give you a hint on where to look for the problem if the printer cannot be calibrated. For example, if there are prominent color deviations in a specific color channel, you might need to replace the ink or clean the print heads. If the paper tint values (0, 0, 0, 0) are out of tolerances, you might have loaded the wrong media type into the printer.

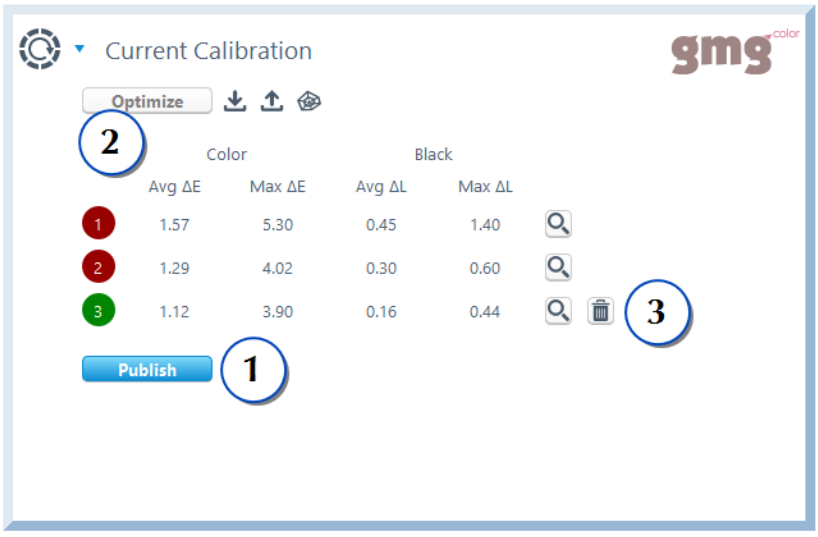


Fig. 6 Results of the current calibration.

Each calibration cycle of printing and measuring is shown as a row in a table. A status lamp shows whether or not the **Quality Criteria** have been fulfilled—in the screen shot, they are fulfilled after running 3 cycles.

3.3 Accepting the results

When you are satisfied with the calibration results, you can click the **Publish** button (1) to accept the results. The status lamp will show green if the **Quality Criteria** have been fulfilled.

The calibration file under **Resources** > **MX profiles** will be replaced. Thus the hotfolder using this calibration file is also automatically updated.

3.4 Optimizing the results

If the quality criteria have not been reached, this will be indicated by a red status lamp. You can click the **Optimize** button (2) to further optimize the print results: The test chart will be printed again with adjusted output values and measured.

You can click the **Remove last optimization cycle** button (3) to delete the last optimization cycle, for example, if you have accidentally inserted the wrong test chart.

4. Customizing Default Settings

To simplify the profiling procedure, GMG SmartProfiler uses default settings to create the hotfolder and all linked resources. You can "overwrite" some of the settings such as the **Use Embedded ICC Profiles** for CMYK of the **Normalization** resource when you fill in the GMG SmartProfiler form. More advanced settings are not shown in GMG SmartProfiler and thus you cannot edit them in the form. However, you can still edit the published resources after publishing. Edit the printer-medium combination and republish it later will keep your manual changes.

If you generally want to use specific default settings such as a specific input folder or advanced settings, you can customize the defaults used by GMG SmartProfiler. To do so, go to **Resources** > **SmartProfiler**, expand the **SmartProfiler Defaults** menu and edit the default resources used by GMG SmartProfiler.

If you then create a **new** printer-medium combination, GMG SmartProfiler will use the customized defaults, both for the visible and for the hidden settings.