



Application Notes

Creating Printer Profiles with ColorGPS



Creating Printer Profiles with ColorGPS

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The **ErgoSoft RIP** is available in different editions. Therefore the description of available features in this document does not necessarily reflect the license details of your edition of the **ErgoSoft RIP**. For information on the features included in your edition of the **ErgoSoft RIPs** refer to the ErgoSoft homepage or contact your dealer.

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Basics on ColorGPS

ColorGPS creates a color profile conform to the ICC standards, which characterizes the maximum gamut of the printer. The technical term for a printer's color space is gamut.

By using an output profile created with **ColorGPS** you can make sure that all input files, regardless of input color space are rendered color-accurately.

More information on color management can be found in the manual part "Color Management" or in current technical literature.

The "International Color Consortium" (ICC) is a group of manufacturers that have joined under the lead of Fogra to define the ICC format.

This format contains cross-platform specifications after which third party developers can create profiling tools and applications to support the ICC standard. Among the founding members of this consortium are companies such as: Adobe Systems Inc., Afga-Gevaert N.V., Apple Computer Inc., Eastman Kodak Company, FOGRA (Honor Member), Microsoft Corporation, Silicon Graphics Inc., Sun Microsystems Inc. and Taligent Inc. These companies have committed themselves to fully support the ICC specifications in their operating systems and applications.

ColorGPS is an "IN-RIP" solution which can only be used as part of an **ErgoSoft RIP**. Such an "IN-RIP" solution has the advantage that the profiler has direct access to data such as e.g. the density linearization. Furthermore, data such as the calibration grid do not need to be exported and imported, but can be processed directly within the program.

To create an output profile for a printer, the print environment must already contain a density linearization. The density linearization is the basis for the output profile. **ColorGPS** even offers the possibility to create output profiles using only the density linearization.

Using ColorGPS

Starting the ColorGPS Wizard



To start the wizard, click the **ColorGPS** icon under the *Linearization & Profile Tools* list in the *Print Environment* toolbar or select menu *Tools > Linearization & Profile Tools > ColorGPS*.

The ColorGPS Wizard

The **ColorGPS** Wizard is made up of two parts.

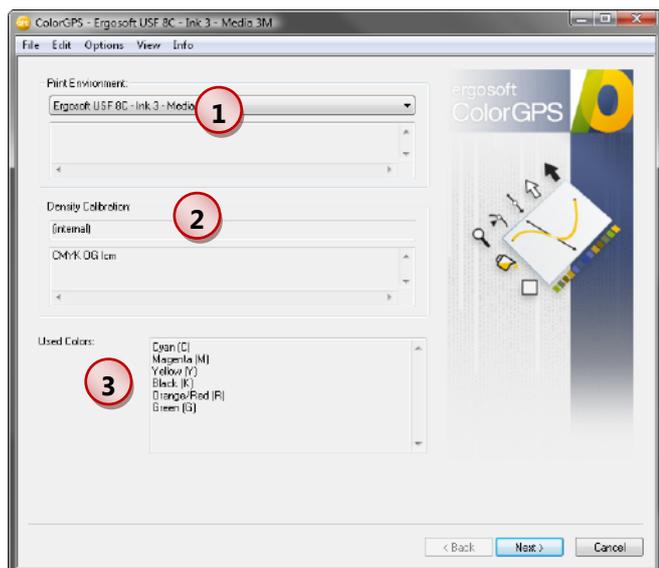
1. Basic settings
 - Choosing the print environment
2. Creating the profile
 - Color application
 - Calibration chart
 - Creating the profile

Basic Settings

Choosing the Print Environment

The first dialog window allows you to choose the print environment that will be edited. The print environment currently active in the **JobComposer** is always selected by default.

- 1 Choose the print environment that should be edited in the **Print Environment** list.
- 2 Depending on the selected print environment, the **Density Linearization** section will display the density linearization used in that print environment.
- 3 The **Used Colors** section displays the colors that are used in the selected print environment. Light inks are not shown as independent colors.



Creating the Profile

Color Settings

1 The **Color settings** section allows you to set a maximum amount of ink that should be used as well as how black inks (K) should be handled.

Total Ink Limit

The total ink limit for the profile is based on the total ink limit for CMYK files without input profile, which is defined in the print environment and adapted from there. But there is also a possibility to use different values.

Using the **Apply Ink Limit on Top of Printer Profile** option available in the print environment, the ink limit for the profile can be overwritten with the one from the print environment.

Using a lower ink limit than the one the profile was created with can cause color inaccuracies. Hence this option should only be used in emergencies.

Black Generation

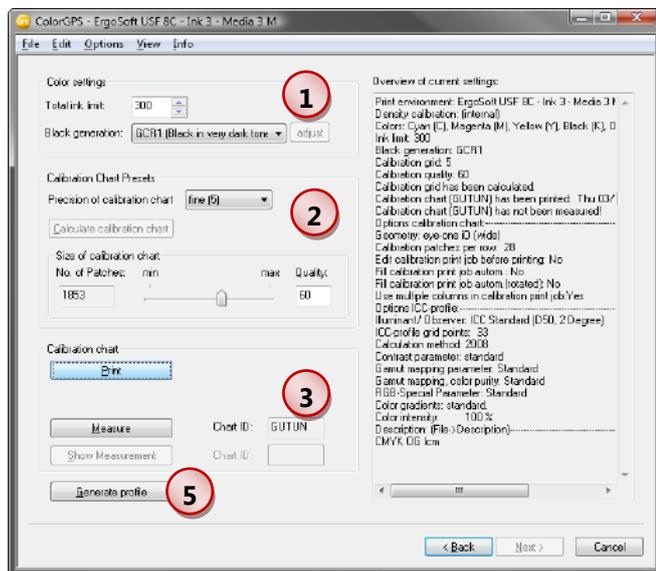
Using the dropdown menu **Black Generation**, the desired black generation can be selected. **ColorGPS** will recommend the most suitable black generation mode based on the set ink colors. You can find a more in-depth description of the different GCRs in the "Choosing the Correct GCR" section of this manual.

Calibration Chart Presets

2 In the dropdown menu **Precision of the calibration chart**, you can define how precisely the printed chart should describe the gamut of the printer. A higher precision leads to a higher amount of patches to be measured, but leads to better results.

Click the **Calculate calibration chart** button to create the calibration chart.

The **Size of calibration chart** section allows you to change the number of patches on the calculated calibration chart. This can be helpful if e.g. you need an exact amount of patches. An identical amount of patches combined with **high precision** of the calibration chart results in **more accuracy on the gray axis** while the combination with **lower precision** of the calibration chart results in **more accuracy at the edges of the gamut**.



Calibration Chart

- 3 Section **Calibration chart** allows printing and measuring the calibration chart as well as checking the measurements.

Printing the Calibration Chart

The generated calibration chart can now be printed using the **Print** button.

Measuring the Calibration Chart

Before starting to measure by using the **Measure** button, make sure that the Chart ID displayed in the dialog matches the one printed on the chart.

Now start the measuring dialog using the **Measure** button.

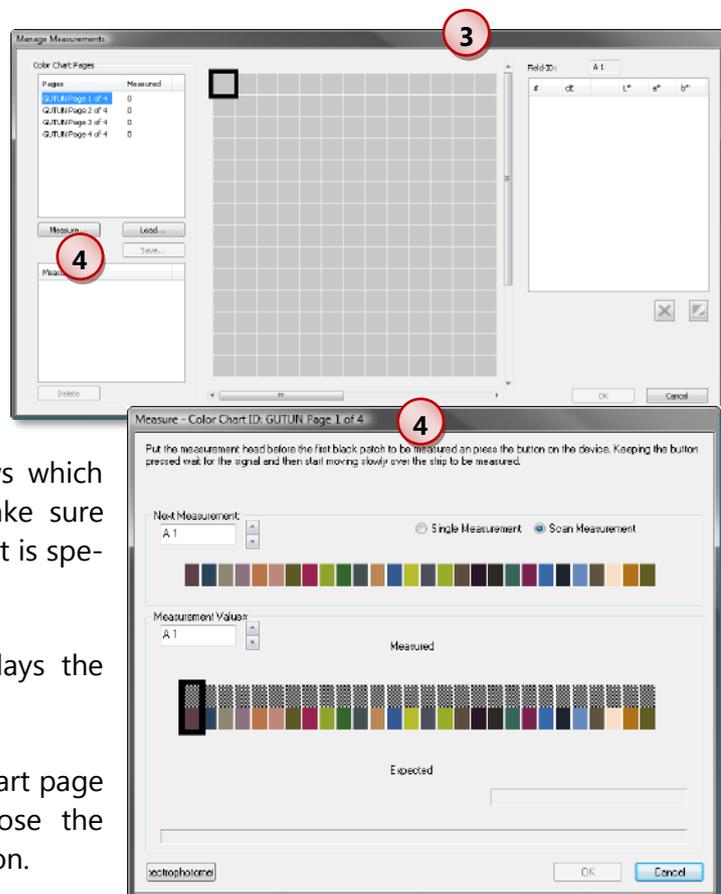
The **Manage Measurements** dialog gives you an overview over the chart pages to be measured for the current calibration. The **Measured** column shows how often a page has already been measured.

- 4 To measure a page, select it and start the measurement with the **Measure** button.

The upper part of the dialog shows which row should be measured next. Make sure that you always measure the line that is specified.

The lower part of the dialog displays the progress of the measurement.

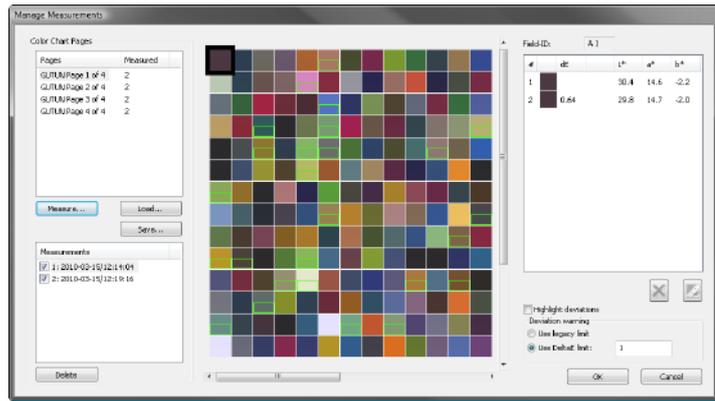
As soon as all lines of the current chart page have been measured, you can close the measuring dialog using the **OK** button.



The **Manage Measurements** dialog lets you select the next page to be measured and repeat the previously described steps.

We strongly recommend measuring each page several times.

The **Manage Measurements** dialog allows you to save measurements and to continue them at a later time. To save a measurement, click the **Save** button. The program will automatically propose the Chart-ID as a filename. We recommend using that one and maybe amend to it if necessary.



Furthermore we recommend to also save the **ColorGPS** File (*.cpd file) should the measuring process or the creation of the profile be interrupted. To complete the measurement at any other time, you can load this measurement by clicking the **Load** button. Please note that measurement that has not been saved is lost after leaving the **Manage Measurements** dialog. This also applies for complete measurements that are further processed after the dialog is closed.

Also, you can select the measured data in the lower left window to automatically display the measurements. It is also possible to select several measurements to compare them.

When having selected one measurement, the expected and the actually measured values are displayed; otherwise, only the measured values are displayed. You can access specific values by clicking on the respective patches. Then, the value may be deleted or re-measured.



Once the measurement is completed, you can leave the **Manage Measurements** dialog by clicking the **OK** button to calculate the average of all measurements and to get back to the **ColorGPS** wizard.

In the **ColorGPS** dialog, you can always access all measurements using the **Show Measurements** button.

Calculating the Profile

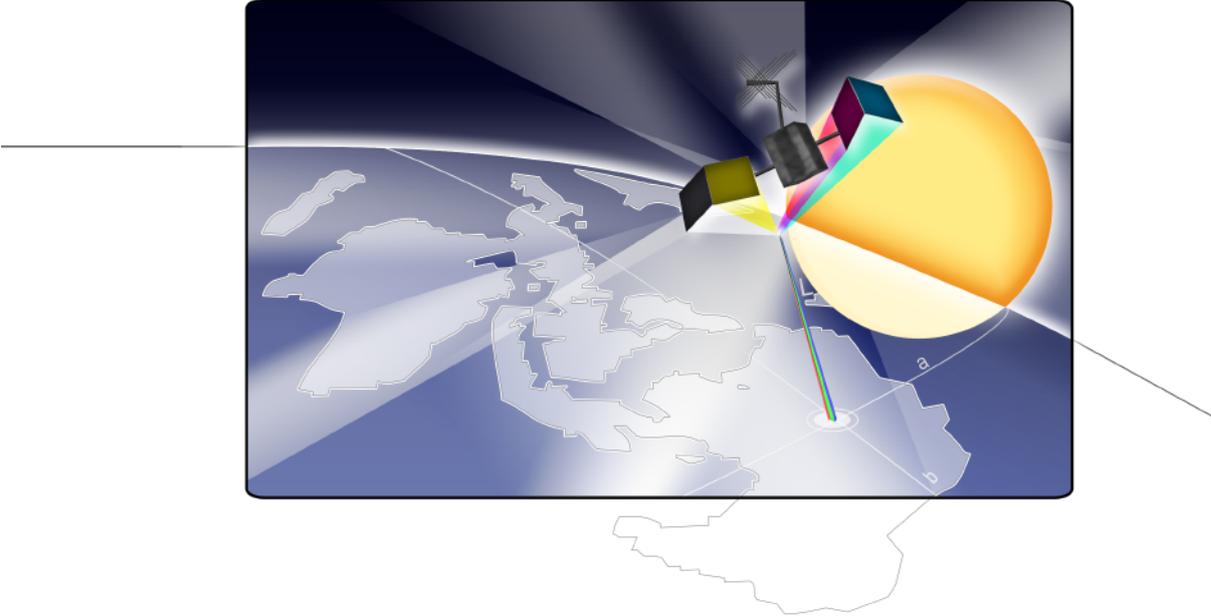
5 After having measured the calibration chart and closed the **Measure Color Chart** dialog , click the **Generate profile** button to create the ICC profile. By default, the ICC profile is automatically embedded into the current print environment. If the print environment is configured to use an external printer profile (or when the ICC profile is re-created using saved **ColorGPS** data *.cpd and the original print environment does no longer exist) you are prompted to specify a name and save the ICC profile.

Please note that this will save the generated profile but not the settings and measurements used to create the profile. To save the settings (presets, calibration chart, measuring values, etc.) select menu *File > Save*. This will save all settings in a *.cpd file.

After having created the profile, close **ColorGPS** by clicking the **Finish** or the **Cancel** button. You will be prompted to save the **ColorGPS** data in a *.cpd file when not having saved them already.

Optional Settings

COLORGPS



Optional Settings

ColorGPS has several options available that allow the professional to make settings for gamut mapping and color mixing. These do however require technical knowledge to be used efficiently and precisely.

Overview of the Options

The **ColorGPS** menu bar allows selecting the following options. Depending on your license, some options might not be available to you.

- Calibration Chart
- ICC Neutral Black
- ICC Profile Accuracy
- ICC Profile Contrast
- ICC Profile Gamut Mapping
- ICC Color Intensity (Color Boost)

Using the Options

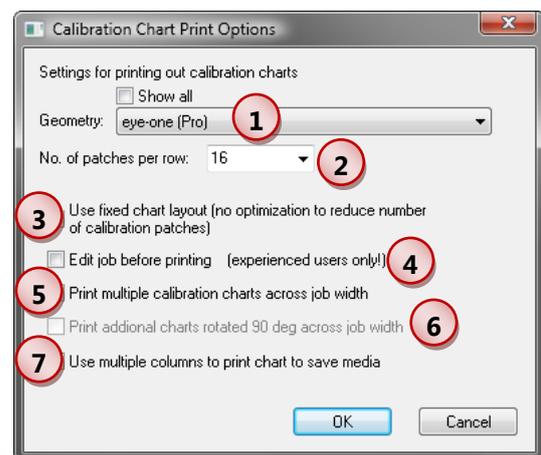
Calibration Chart

The **Calibration Chart Print Options** allows you to make settings that affect the look and output of the calibration chart.

1 The **Geometry** selection menu allows you can change the geometry that should be used (placement, size of the patches). **ColorGPS** will suggest a fitting geometry based on the measuring device selected in the **ErgoSoft RIP**.

2 The number of patches to be printed per row can be set by using the **No. of patches per row** option. Keep an eye out for the maximum amount of patches readable per Row, which varies depending on what measuring device you use.

3 By default, during chart creating very similar or even equal patches are omitted in order to reduce the number of patches to measure. In addition, the number of patches can be reduced by reducing the quality of the calibration chart. When the option **Use fixed chart layout** is checked, very similar and equal patches are not omitted and the quality of the calibration chart is unchangeably set to 100%. This might dramatically increase the number of patches to be printed and measured. On the other hand it avoids that the quality of the cali-



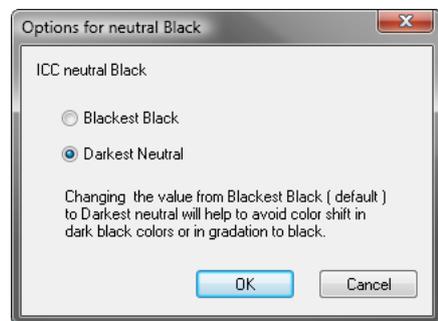
bration chart is set to a too low value, especially when **ColorGPS** automatically creates small charts because of the number of inks used.

- 4 When using the **Edit job before printing** option, a generated chart can be edited in the **ErgoSoft RIP** just like every other. This option should only be used in special cases, since the program will not automatically select the correct print environment; you will have to make sure the right one is selected yourself. Otherwise errors will occur during calibration.
- 5 Option **Print multiple calibration charts across job width** duplicates the calibration chart across the entire printing width, whereas every second chart is rotated by 180°. This comes in handy at times since there are several charts available for ongoing processes (such as sublimation) or if a chart is damaged by e.g. printing errors, so you do not have to repeat the entire step.
- 6 If the option **Print additional charts rotated 90° across job width** is activated, a second row of calibration charts will be printed that is rotated by 90° respectively by 270°.
- 7 Instead of printing a long but small job with the calibration chart, option **Use multiple columns to print chart to save media** divides the long chart into several parts printed next to each other in order to use the whole job width and thus, save media.

ICC Neutral Black

The option **ICC Neutral Black** allows selecting the method how neutral black is mixed:

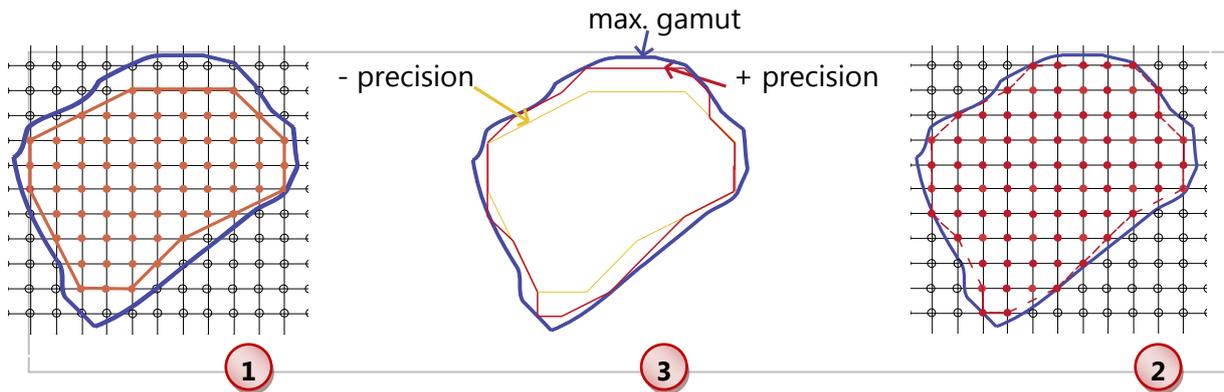
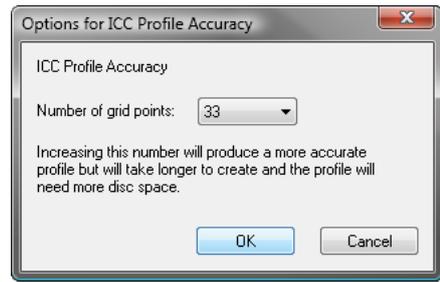
- **Blackest Black** mixes the black using as much colored ink as possible resulting sometimes in a color shift in the darkest black.
- **Darkest Neutral** mixes the black regarding to the neutrality of the black. This may result in a dark black that is not as brilliant as the one mixed with **Blackest Black** but might avoid the color shift in the darkest black.



ICC Profile Accuracy

The option **ICC Profile Accuracy** provides the possibility to set the number of calculated grid points and the accuracy of the profile.

A higher amount of grid points leads to a more precise profile, but will also require more time to calculate. Also it will make the file become larger.



To further describe how the number of printed patches affects the profile, the images 1 + 2 show heavily simplified graphics of the maximum LAB gamut (outer blue line) and the device specific CMYK gamut (inner line). In image 1, less grid points are selected than in image 2. Hence the gamut in image 2 is described more accurately than the one in image 1 and can therefore be used more efficiently (see image 3).

ICC Profile Contrast

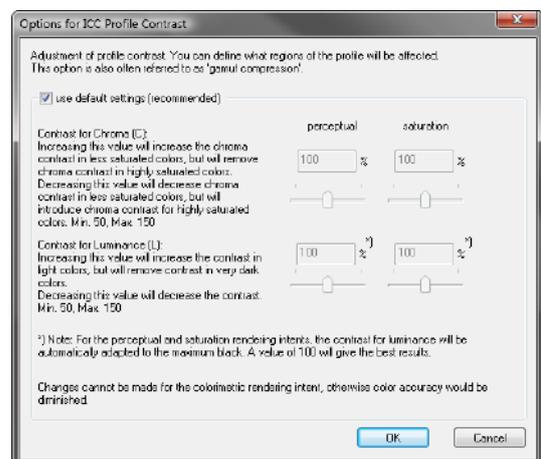
The **ICC-Profile Contrast** option allows you to set in what areas the profile should allow textures, respectively should have high contrast.

You can increase or decrease the contrast in terms of saturation. This results in more or less texture in light and dark tones (respectively in saturated or unsaturated colors).

For **perceptual** rendering intent and **Saturation**, the brightness contrast gets adapted to the maximum black automatically, so the neutral setting of 100% delivers the best results.

Changes to the standard settings can lead to unexpected results.

There are no contrast settings for the colorimetric rendering intents, since they would lose the color correctness.



When decreasing the contrast, the apparent gamut gets bigger, meaning that colors on the outer edges of the Gamut also get textures.

ICC Profile Gamut Mapping

In this dialog you can set the parameters for the gamut mapping, meaning that you can set how the colors that are out of gamut should be calculated. But to “apparently” enlarge the gamut (“apparently” moving the gamut’s edge out further) you should set a lower contrast in the **ICC Profile Contrast** option.

To “apparently” increase the gamut in this case means to give the RIP a recipe that it should apply to imitate colors that are out of gamut.

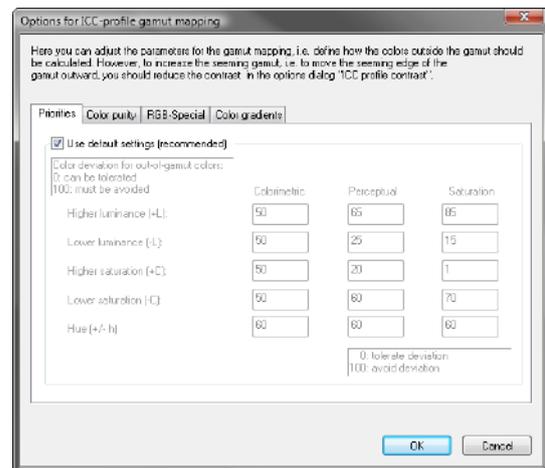
The following four parameters are available:

Priorities

The **Priorities** tab lets you set the derivations that should be tolerated, so you can define in which part of a color recipe the RIP should accommodate to the out of gamut color. You can set in which area of the gamut you want to accept changes or not by using values from 0 - 100.

Entering e.g. 0 into the **Higher luminance (+L)** field means that deviations in this area are tolerated, the out of gamut color will be replaced with a color recipe that does not have the same L value.

On the other hand, when entering the value 100, the program will make sure that the replacing color mixture has the same L value.



Color Purity

The **Color Purity** tab lets you define how the colors that are far off the gamut should be cleaned up. In this case, cleaning colors means that if e.g. you print a saturated cyan that is out of gamut and can only be printed as a combination of cyan and magenta, the cyan value will be corrected far upwards while the magenta values will be corrected downwards.

RGB Special

In the **RGB-Special** tab you can set a special handling for certain colors to prevent them from drifting off too far. Namely this concerns shifts from blue to violet, red to orange and green to yellow, which can be prevented or allowed in this dialog.

Color Gradients

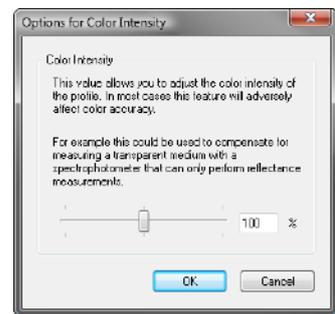
The **Color Gradients** tab is used to prevent so called "Graying" in gradients from dark saturated colors to black. As a bonus, other color gradients are automatically smoothed as well. However, with a low total ink limit (below 300%), setting a high value can also result in the contrary than what you hope to achieve.

ColorBoost Option

The **Color Intensity** (Color Boost) option allows increasing or lowering the intensity of the measured values without having to print a calibration chart with this changed color intensity.

For example, this could be used to compensate for measuring a transparent medium with a spectrophotometer that can only perform reflectance measurement and thus, returns measurement values that are not bright enough.

Drag the slider to the right (higher value) to increase the color saturation. After having changed this value, you do not have to reprint and re-measure the calibration; you just have to recalculate the profile.



Since the color intensity value is only saved in the profile data we strongly recommend to mention the value in the profile description so that you will be able to easily recognize these special profiles some time later.

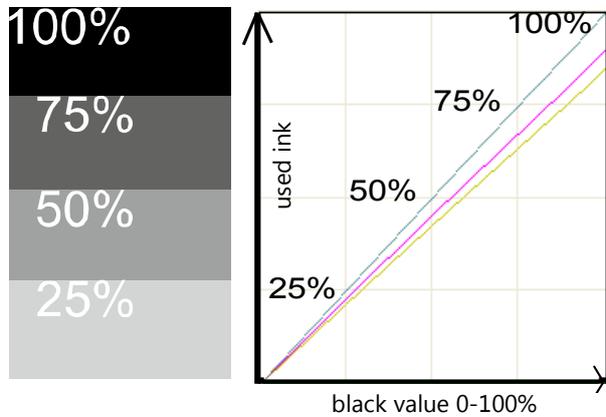
Please note that in most cases this feature will adversely affect the color accuracy.

Choosing the Correct GCR

The following GCRs are available to create an ICC grid.

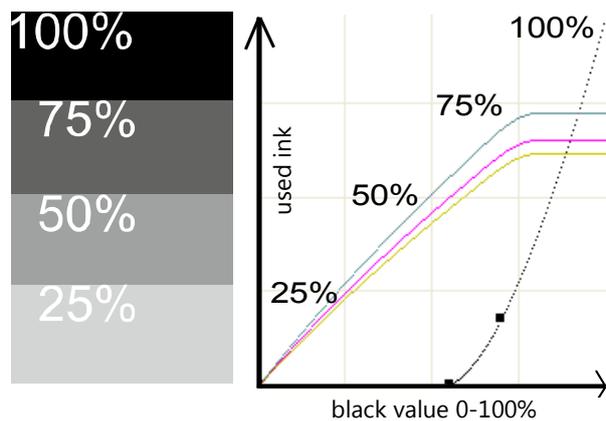
No Black (GRC0)

This GCR uses no black inks, meaning that all gray tones on the axis from black to white are mixed from CMY.



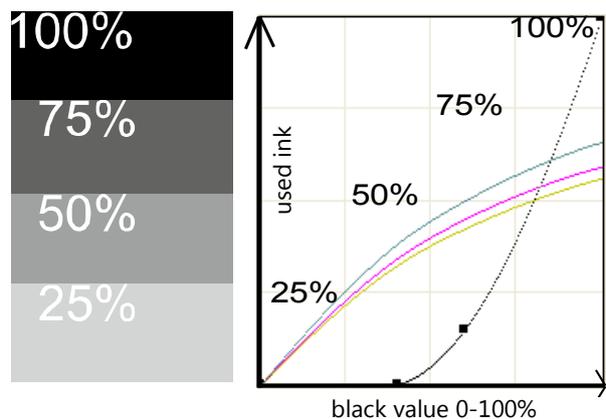
Black only in Shadows (GCR1)

Using GCR1, the black and gray tones in light areas are printed with only CMY. Black ink is only used starting at 50% of the black value.



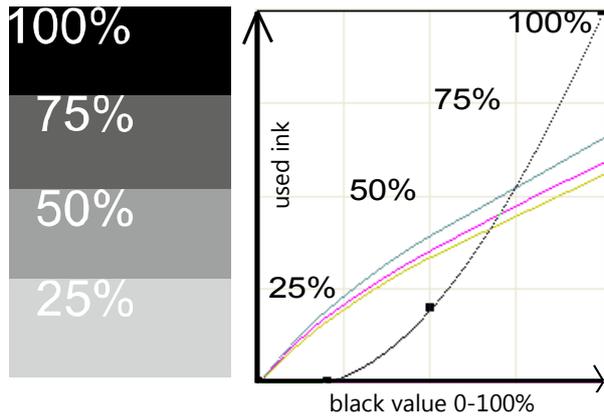
Black in Dark Tones (GCR2)

GCR 2 is similar to GCR1, whereas black (K) can be used sooner, which leads to less CMYK being applied.



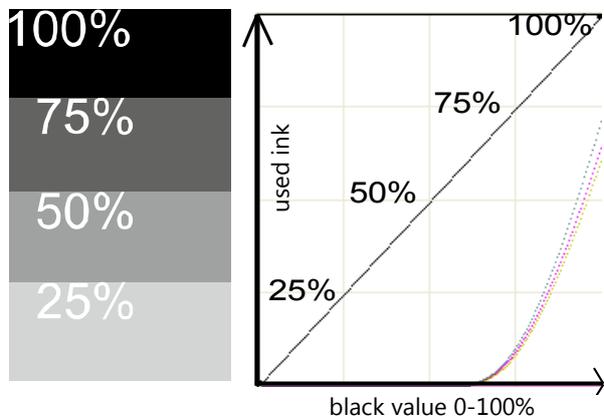
Black from middle Tones (GCR3)

The middle GCR is a more extreme variant of GCR1 + 2. With this GCR, black inks can already be used in middle tones.



Black also in Light Tones (GCR4)

GCR4 allows to print with maximal linear rising black from the beginning. At the end of the curve CMY is used to create a deep black.



User defined Black (GCR+)

GCR+ provides the possibility to define a custom black buildup, respectively setting up on your own how the black ink should be used.

Using the slider that can be moved between the values 0 and 100 the user can set from which brightness value between paper white (0) and maximum black (100) the black ink should be used.

