



Application Notes

Color Management in ErgoSoft RIPs



Color Management in ErgoSoft RIPs

ErgoSoft AG
Moosgrabenstr. 13
CH-8595 Altnau, Switzerland

© 2010 ErgoSoft AG, All rights reserved.

The information contained in this manual is based on information available at the time of publication and is subject to change without notice. Accuracy and completeness are not warranted or guaranteed.

No part of this manual may be reproduced or transmitted in any form or by any means, including electronic medium or machine-readable form, without the expressed written permission of ErgoSoft AG.

Brand or product names are trademarks of their respective holders.

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.

Rev. 1.1

Contents

Introduction	1
Color Management Workflow	2
The Color Engine.....	2
CMYK Output: RGB Input.....	3
CMYK Output: CMYK Input with Input Profile	4
CMYK Output: CMYK Input without Input Profile	5
RGB Output.....	6
Tools for Color Management.....	7
Output Calibration	8
Requests on Output Calibration	8
Tools for Output Calibration	8
Density Linearization	9
Printer Profile.....	9
Ink Limitation.....	9
Image Color Control.....	11
Input Color Management.....	11
Additional Tools for Image Color Control.....	11

Introduction

These days, one of the crucial demands on large format printing is the color fidelity of the output. The output is not only requested to be brilliant in colors but also to show the same colors on different media or printed with different printers.

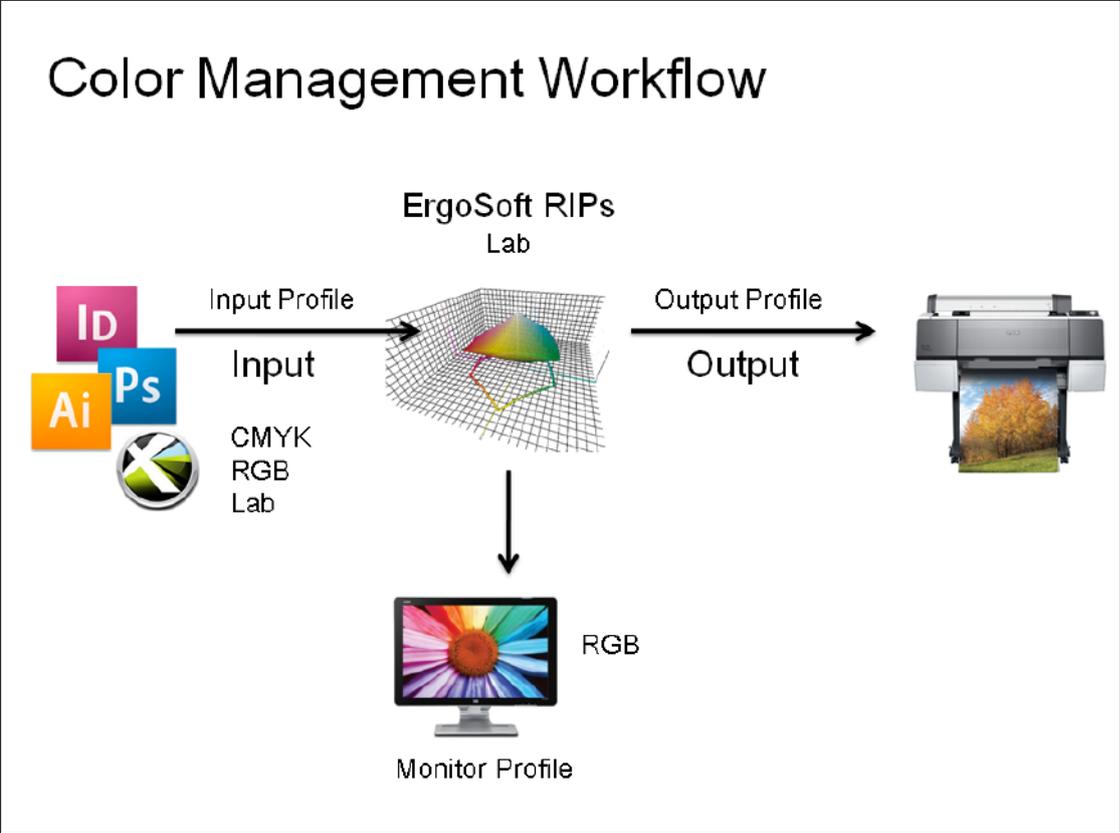
For this task, The **ErgoSoft RIP** offers a well thought out color management workflow with several tools for output calibration, ink amount control, and color fidelity.

Color Management Workflow

The Color Engine

Most printers supported in the **ErgoSoft RIP** software print in CMYK mode (CMYK including light inks) or expanded CMYK mode (CMYK including light inks and additional full tone and light inks). This means that the **ErgoSoft RIP** has to send the images in (expanded) CMYK mode to the printer. For the same (expanded) CMYK values the printed color shade depends on the ink and media used. In addition, some printers can use the RGB output interface provided by Windows.

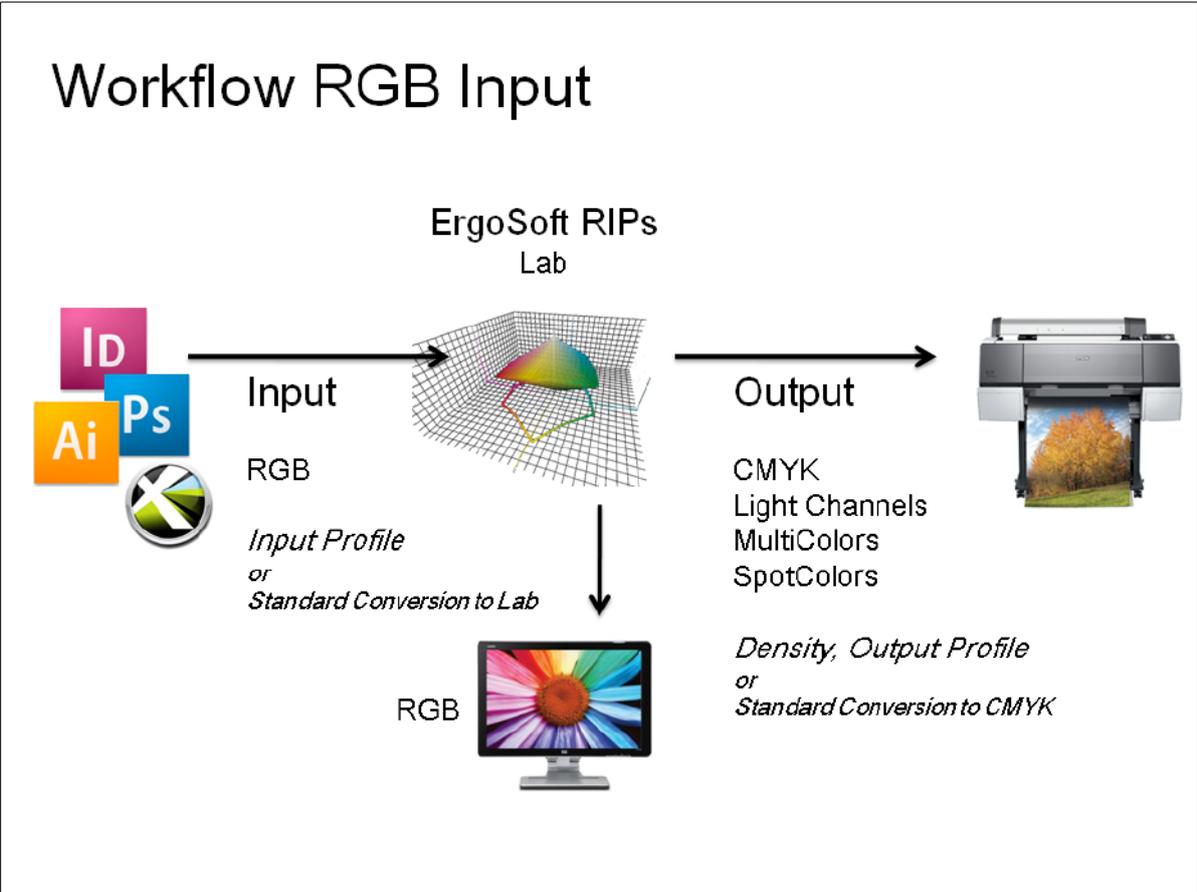
Internally, the **ErgoSoft RIP** uses the device independent Lab mode. RGB image are converted with the help of input profiles (e.g. for scanners) to Lab values. The Lab values are converted into (expanded) CMYK or RGB values with the help of printer profiles, which are especially created for the combination of ink and media used. The result is that an image that is printed on different media look about the same on all media.



CMYK Output: RGB Input

RGB colors must be converted in order to print them on a CMYK printer. Thus, the **ErgoSoft RIP** is delivered with an RGB input profile that is selected by default in the profile settings.

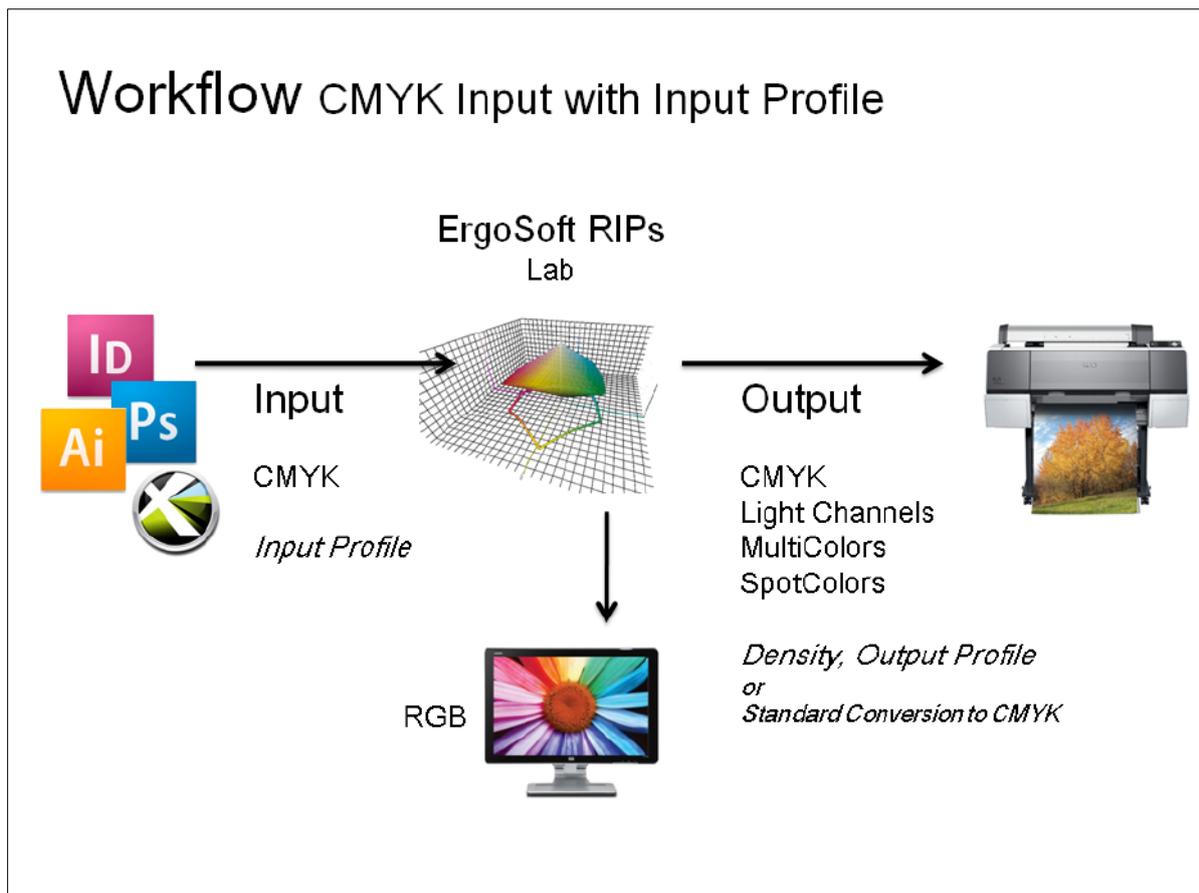
The density linearization is used for ink linearization. The printer profile is used to convert the Lab values resulting from the input conversion (RGB -> Lab) into CMYK and additional colors when the printer profile supports them. When a printer profile has not been selected, a standard conversion from Lab to CMYK without support of additional colors is used.



CMYK Output: CMYK Input with Input Profile

CMYK colors must not be converted in order to print them on a CMYK printer. By default, the **ErgoSoft RIP** does not convert CMYK values into Lab values. Selecting an input profile different from "(none)" forces the color engine to convert the CMYK values of the image into Lab.

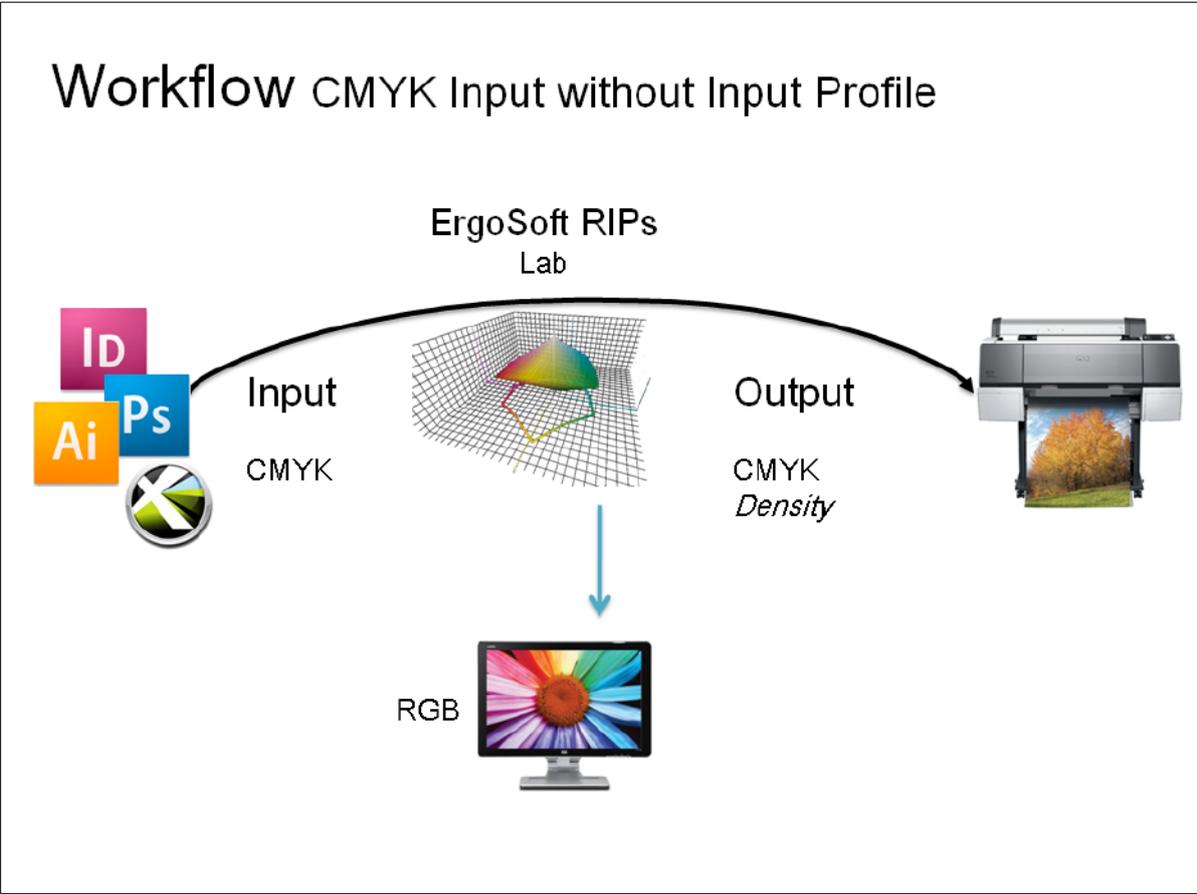
The density linearization is used for ink linearization. The printer profile is used to convert the Lab values resulting from the input conversion (CMYK → Lab) into CMYK and additional colors when the printer profile supports them. When a printer profile has not been selected, a standard conversion from Lab to CMYK without support of additional colors is used.



CMYK Output: CMYK Input without Input Profile

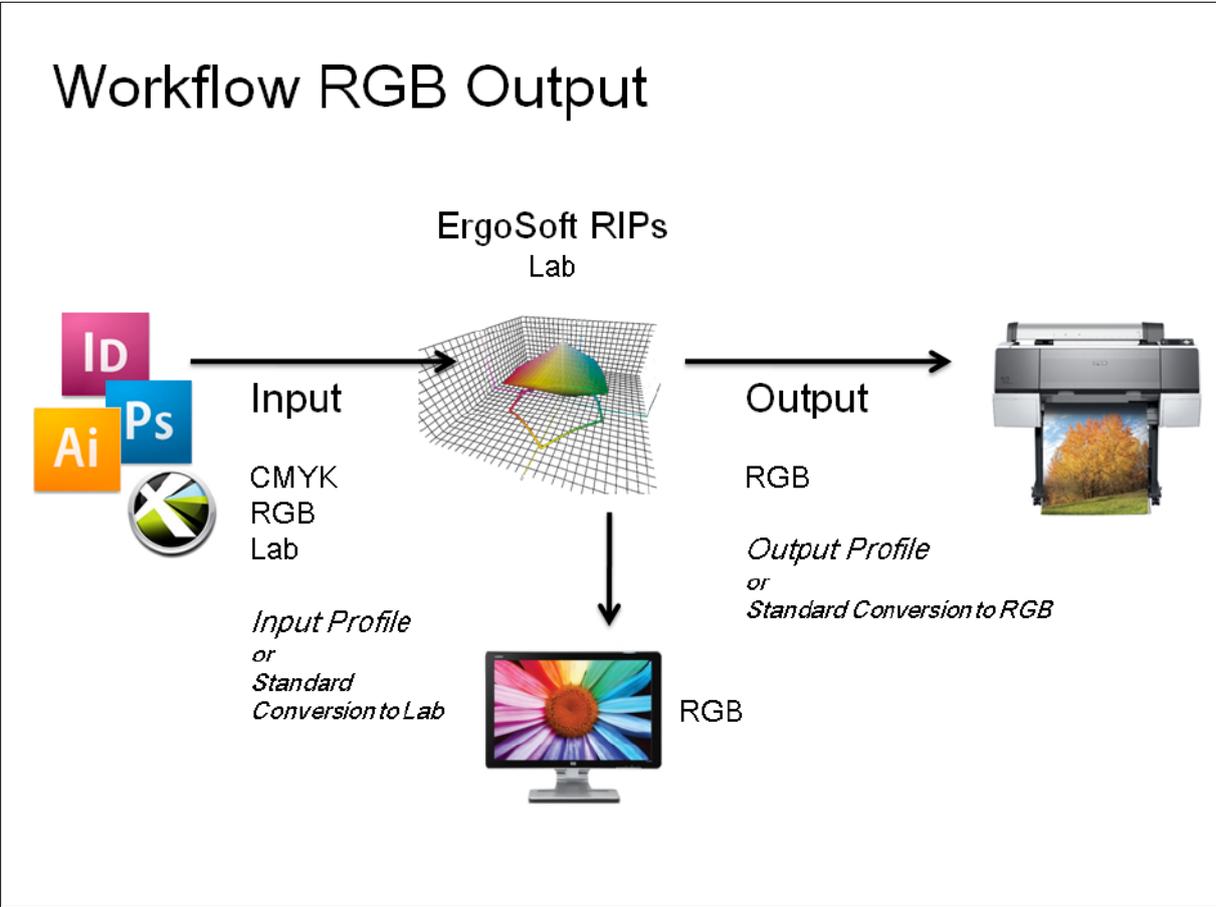
CMYK colors must not be converted in order to print them on a CMYK printer. By default, the **ErgoSoft RIP** does not convert CMYK values into Lab values.

When an input profile has not been selected, only the density linearization is used: the CMYK values cannot be converted into Lab and back into the printer color space.



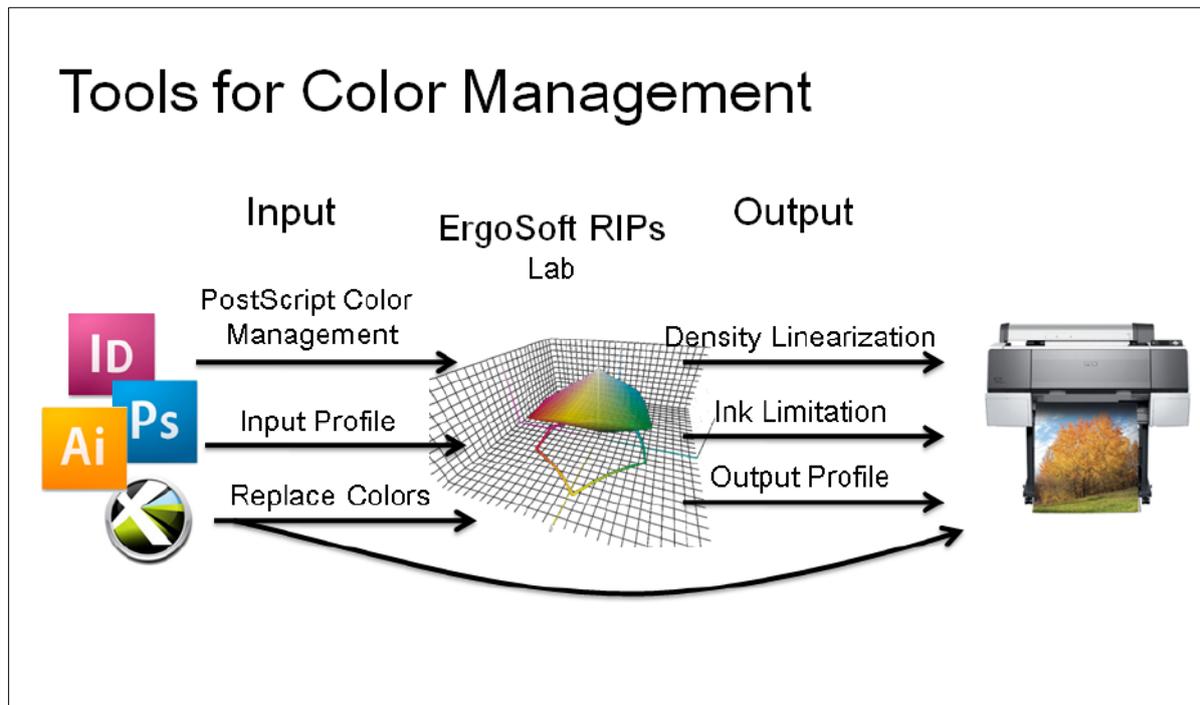
RGB Output

RGB output with help of Windows printer drivers offers very limited output calibration: Just the RGB printer profile can be used; density linearization and ink limitation are not available. Color replacement is available in a very limited way.



Tools for Color Management

The **ErgoSoft RIPs** provide several tools for the color management. The tools can be separated into two parts: tools for output control and tools that control the input directly.



The tools for output control – density linearization, ink limitation, and output profile (printer profile) – are combined to build the output calibration.

The tools for direct input control are separated into two groups. The first group, the input color management, influences the complete image by using a certain profile or rule to convert the image color space into Lab. The second group, the direct color control, is used to modify the image or to control the output color of a certain part of the image to manually make sure that certain colors are printed as expected.

Output Calibration

Requests on Output Calibration

The main requests on output calibration are:

1) Linearity in ink coverage

The ink amount used should rise continuously from 0% (no ink) to 100% (all ink) without gaps, steps, and cracks.

2) Controlled amount of ink used

Bleeding, polling, etc. must not occur – independent from the number of inks used for printing a certain color.

3) Controlled mixed colors

The ink mixing must consider the color of the ink used as well as the color of the media which is gleaming through the inks.

Tools for Output Calibration

There are two parts for output calibration: density linearization and printer profile. The reason for this is that producers of paper/film and ink have their experienced formulas for creating a media or an ink series. Thus, reprinting an image should theoretically give the same result as the sample that was printed some time ago (provided that the same 'ingredients' were used, namely printer, paper, ink version, software settings, etc.). In practice, a colored spot may meet this theory but not an image. Reasons for this may be the wear and tear of the print heads, an invisible change of the surface of the media, a slightly different consistency of the ink, etc. All of these points do not have any visible influence on the mixture of the colors; only more or less ink flows on the media, or the media is able to absorb more or less ink as before.

Thus, calibration of a printer is in the **ErgoSoft RIP** divided into density linearization and printer profiles.

Density Linearization

The density linearization contains specifications about the amount of ink that is to be used for printing. Dependent on mechanical components such as the size of the ink drops, the real covering of the ink does not meet the required. Thus, visually, too much ink will flow to the media, especially for medium and darker colors: the image will be too dark and the darker areas will have no gradation. In the extreme the ink will float on darker parts.

The density linearization contains a correction factor that adjusts the real amount of ink for the given covering (in 2.5%, 5% or 10% steps) to match the desired covering. Intermediate values are determined with help of the measured data.

Thus, the density linearization contains the part of the Color Management that changes frequently. It should be done from time to time, but certainly, with a new cartridge of ink. Only then can it be guaranteed that the 'correct' amount of ink will always flow to the paper.

For a detailed explanation on density linearization please refer to the manual part "Density Calibration".

Printer Profile

The printer profiles contain specifications about the required mixture of the process colors to create colors. These specifications are set by the Color Management, with certain types of print heads and certain versions/series of ink on a certain media.

Thus, the printer profiles only need to be recreated when the print head is changed, when the media is replaced by another media, or when the version number for the ink is changed.

For a detailed explanation about printer profiling please refer to the manual part "ColorGPS".

Ink Limitation

When the media cannot absorb all the ink provided, the ink amount used must be limited. There are several ways for ink limitation depending on the stage in which the ink limitation must come in:

- Ink limitation for individual ink colors when the printout is bleeding or polling just when printing with pure inks.
- Limitation of light inks in order to avoid gaps or steps in the transition range from one dot size to another.
- Overall ink limitation for mixed inks.

For a detailed explanation about ink limitation please refer to the manual part "Ink Amount Check".

Image Color Control

Input Color Management

Images can be created using different sources and color settings. Thus, in order to convert the image color space correctly into Lab, the 'correct' conversion must be used. This is done by using an input profile.

As a special case, PostScript files and PDF files can include objects with different color spaces as well as different object types. The **ErgoSoft RIPs** offer a sophisticated PostScript Color Management to deal with these files.

For a detailed explanation about the input color management please refer to the manual part "Image Color Control".

Additional Tools for Image Color Control

In addition to the input color management, the **ErgoSoft RIPs** offer two other tools for image color control:

- A very basic tool to tune the complete image regarding brightness, contrast, and color channels.
- Several well-founded tools for manually or automatically replacing certain colors in an image (e.g. company logos) by individually defined replacement colors.

For more information please refer to the manual parts "Image Color Control" and "Color Replacement".