

A Guide to Spot-on Color in Industrial Printing

A COLORGATE WHITEPAPER

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INTRODUCTION:

Producing Market-Leading Quality in Digital Industrial Printing

In industrial inkjet printing, color management is a critical factor in achieving competitive color and quality results. An effective and accurate color management workflow needs two parts: the right software and the right hardware.

Without accurate measurement data, you can neither profile your printer nor check whether brand colors are printed correctly.

The software must work well with the printer and provide all the functions needed to get amazing results. There is a clear split in “responsibilities” between the printing systems with its ability to print dynamic colors in an even, calibrated and consistent fashion, and the software for characterizing the hardware and driving it with the correct data for achieving high-quality, consistent results within narrow tolerances. When it comes to hardware, though, you do not only need to consider the printing system but also your color measuring equipment. Without accurate measurement data, you can neither profile your printer nor check whether brand colors are printed correctly. The lack of efficient measuring processes is why color measurement and color profiling are often considered a bottleneck in print production.

Traditional measurement methods have their drawbacks. Common handheld spectrophotometers have one particular limitation: they are made with flat, paper-like surfaces in mind. There seems to be no reasonable solution for 3D surfaces, or objects that are particularly small, large, unusually shaped, structured, elastic or reflecting. However, with ColorGATE, users do have a partner who facilitates creating profiles from such kind of demanding surfaces.

In this document, we explain typical challenges due to color management issues in industrial printing environments and an innovative solution from ColorGATE to tackle these issues. Central to this new digital print workflow solution are Productionserver (software) and the Rapid Spectro Cube LED (hardware). Combined with your printing device, you get an excellent print and color management workflow.

CHAPTER 1:

What is Color Management and why is it so Challenging?

Basically, color management means making sure that the color you want comes out at the end of the printing process. To do this, a RIP or color management solution “translates” color from one device to another one, using data defined in ICC profiles. ICC profiles are the “dictionaries”, mapping a device’s color to another device’s color or to a device-independent color space like $L^*a^*b^*$.

To manage color correctly, the first step is to characterize, or to profile, your printing device. This must include the following three factors, which are influencing color during printing:

- Characteristics of the media, e.g., color, ink absorption, dot gain, etc.
- Printing technology, that is, number of primary colors, resolution, and other print settings
- The ink that’s used

If one of these parameters changes, the color result of the print changes as well. That’s why ideally a color profile is generated for each combination of these conditions. Only then the profile is most accurate.

To create a profile, you print a ‘profiling target’ which contains color patches, made from combinations of color values, often different CMYK values. Then, you measure the printed target with a measuring device and record the absolute color that’s produced when printing those CMYK combinations. Absolute color is measured by spectral reflectance values and converted into $L^*a^*b^*$ values. While CMYK looks different when printed on different output devices, one combination of $L^*a^*b^*$ values always describes the same color, regardless of which device it has been produced on. Measuring $L^*a^*b^*$ values requires a measuring device capable of measuring absolute color.

However, like in all computing processes, the quality of the result depends on the quality of the input data. Gaining this data can be very complicated, especially in the industrial printing industry, due to the lack of a suitable measuring device. Most users still use a handheld device. This is usually a very time-consuming and inaccurate process, because:

- These devices are only able to measure one patch at a time.
- The measuring patches have a certain minimum size. This might lead to significant material consumption (e.g. printing three t-shirts to measure all patches required) and might not even be possible for very small objects (like bottle caps).
- Some special applications (3D structures such as shoes, coffee mugs, casings) cannot be measured at all.
- Also, not all people have in-depth knowledge of color management to measure color and then create the respective ICC profiles.

Color management means making sure that the color you want comes out at the end of the printing process.

This results in inkjet users compromising on the quality of their ICC profiles, taking shortcuts like using generic profiles. Or, in other words, **they are not using the full potential of their digital printing equipment.**

That's why ColorGATE has designed the Rapid Spectro Cube LED (RSC LED). It is an integrated profiling solution based on a contactless measurement process which captures profiling targets and creates high-quality ICC profiles even from challenging print products.

Using the RSC LED in conjunction with the latest version of Productionserver, it's particularly easy to achieve the desired print conditions / print output. You receive an integrated color management solution for profiling, color correction and print data generation which brings out the best from any industrial printing system.

*Using the RSC LED
in conjunction with
the latest version
of Productionserver,
it's easy to achieve
the desired print
conditions/output.*



CHAPTER 2:

The Solution for Color Management and Print Data Creation

ColorGATE is your partner for digital printing. With more than 20 years of experience not only in color management, but also in the various printing industries, we developed a total solution which will help you to fully exploit your potential and even save costs in the process.

Productionserver

With various modules you can customize your software to your needs.

Productionserver from ColorGATE is a software package for color and print data management.

Productionserver controls color in three ways:

- Color accuracy (i.e. printing according to a certain standard, reference or color definition)
- Color consistency (i.e. achieving identical results over time, between different printers, on different substrates, between different production facilities)
- Color composition (i.e. print identical color with less ink, thus generating ink savings and functional benefits)

It also contains features for linearization and profiling target generation, a powerful ICC profiling engine and is equipped with highly efficient and reliable print data generation technology.

Productionserver is modular. Each configuration includes modules according to your requirements e.g., to make handling print jobs more efficient, time and cost saving and more productive.

Discover the Modules for Productionserver

ColorGATE offers various modules, so your Productionserver fits exactly into your production workflow. Here are some examples:

INK SAVER — LESS INK, SAME QUALITY

Optimize your color composition with ColorGATE's Inksaver technology and save up to 30 % of ink costs – with no visible losses in quality.

COST CALCULATION MODULE — STAY ON TOP OF YOUR PRODUCTION COSTS

With the Cost Calculation Module, you can calculate your costs per print based on your actual ink and substrate costs and generate cost reports in HTML / CSV format.

MEDIA DEVICE SYNCHRONIZATION — GET SIMILAR RESULTS ON DIFFERENT PRINTERS

Media Device Synchronization enables you to set a printer back to a reference state. MDS is based on ICC profiles for consistent results.

QUALITY ASSURANCE MODULE — MAKE SURE YOUR OUTPUT COLORS SHINE

Control your output colors with ColorGATE's Quality Assurance Module. Print a control wedge to check whether your color still matches your reference.

You can find more information and all modules from ColorGATE here:

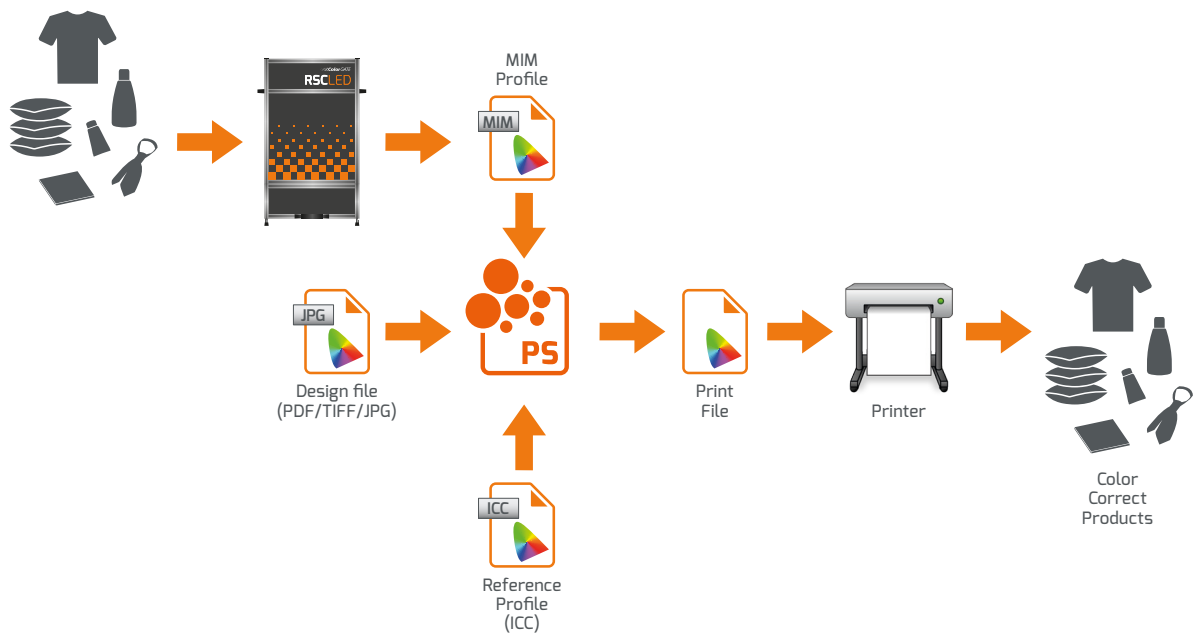
<https://www.colorgate.com/products/software/modules/>

ICC PROFILES AND MIMS

As previously mentioned, an ICC profile for a printing system only applies to the specific combination of media, ink and print mode under which has been used for its creation. ColorGATE's MIM¹ (Media-Ink-Metamode) technology maps the ICC profile to those three parameters and helps operators to select the right profile for the current print settings.

TARGET GENERATOR

ColorGATE's Target Generator creates linearization and profiling targets in a flexible manner. This function plays well together with the Rapid Spectro Cube: the minimum patch size in targets can be as small as 1 x 1 mm. With the Target Generator, users can create targets that fit on very small printed objects. In garment printing, for example, this can make a difference between 3 garments (classic handheld spectro) and 1 garment (Rapid Spectro Cube) that need to be sacrificed for the purpose of profiling.



¹ A MIM package contains:
– Advanced color and process management settings.
– An ICC profile, specific to a specific media.
– A linearization file that precisely controls ink application.

The RSC LED is a new and unique solution on the industrial printing market.

Rapid Spectro Cube LED — High-Quality Color Profiles for Industrial Print Products

The RSC LED is a new and unique solution on the industrial printing market. Seamlessly integrated with ColorGATE Productionserver¹, it enables fast and efficient linearization, profiling, and re-calibration (via MDS)².

With the RSC LED, you can create individual color profiles from industrial print objects where other measuring devices quickly reach their limits, like:

- Particularly small objects (e.g. bottle caps)
- Unusually shaped objects (industrially printed objects such as tiles or wood decorations, promotional items, folding rules, etc.)
- Structured objects (textiles) or laminated surfaces

This takes color profiling from 2D to 3D.

But also in 2D profiling applications, the RSC LED is much more efficient than typical handhelds. It captures up to 10,000 patches automatically in less than a minute and delivers high quality ICC profiles immediately after that. Based on typical wages and time savings your investment already pays off after nine months.

The RSC LED also has a compact, weight-reduced design for flexible and, if necessary, mobile use. Its internal illumination delivers stable and consistent results.

Technical Details of the RSC LED

Weight	12 kg
Dimensions	410 x 510 x 610 mm
Power supply	Available for 110V and 220V networks
Illumination	Internal LED for highly consistent measurements
Maximum target/substrate size	Up to 18 x 18 cm (7 x 7 in)
Minimum patch size	1 x 1 mm (0.04 x 0.04 in)
Measurement objects up to	30 x 35 x 10 cm (11.8 x 13.7 x 4 in) (D x L x H)
Detection speed	Up to 10,000 patches per minute
Detection type	CCD-based detection
Handling	Can be placed on flat objects without drawer

Includes software package for fast and efficient linearization, profiling and recalibration (MDS).

¹ The Rapid Spectro Cub LED can only be used in conjunction with ColorGATE Productionserver and the additional RSCCapture software module in their latest versions.

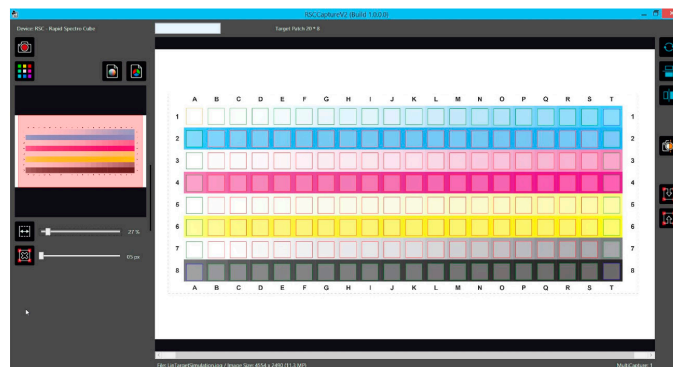
² Media Device Synchronization: With MDS, you can harmonize printers of the same type at different locations (synchronize the print output); calibrate printers back to the original print output following extended usage (wear) and modified print image; create a profile for synchronizing multiple printers of the same type for identical print outputs at the same location (using the same MIM).

Typical Color Management Challenges

When measuring colors on structured or 3D surfaces with typical handheld measuring devices, the following challenges can be encountered:

- Slow, single-patch reading process is slow
- Fixed illumination and sensor geometry
- Low-resolution sensors
- Struggle with structured, translucent or reflective surfaces

Compare this to the RSC LED: it can measure color on structured, translucent or reflective surfaces automatically in less than a minute. This is possible because of its high-resolution sensor technology that corresponds to the actual color impression of the human eye.



With the RSC LED you capture a complete target within seconds!

CHAPTER 3:

Outstanding Support from a Host of Industry Experts

ColorGATE offers various support options for users to ensure that you can always work productively.

VALUE PACKS



Our software and maintenance contract provides free access to updates, upgrades and our web support

TRAINING



We help you to develop the best workflows for your new color management solution

CONSULTING



We provide you with vendor-agnostic know-how to help you develop your new system

Professional Color Management Services (PCMS)

A print service provider's color management approach determines the company's competitive position in the market. Also, color management touches all aspects of a print business. That is why business leaders cannot delegate this topic to their technical teams

Our experts have deep industry know-how and understand your process chain.

During our Professional Color Management Service process, we start with a Color GAP Analysis – we "x-ray" your color management workflow and provide you a report with all findings. We recommend potential improvements and help you with our expertise. We will pick from a selection of powerful bundles that include know-how, software and hardware. And our expertise covers technology from all leading brands!

ColorGATE helps you to evaluate, analyze and plan your color management expertise, sets up your hardware and software with you and enables you to achieve the best possible color quality – a real competitive advantage for you!

These services help to understand a company's intended color and quality positioning on the market.

A Color GAP analysis* is the first thing ColorGATE starts with in this analysis, providing a report with all findings and relate them to the company's standing in the market. This results in recommended potential improvements.

This report helps to determine where you actually are, where you want to be, and what can be done in order to fully exploit your color quality potential.

* Color GAP analysis: A complete "x-ray" of a company's color management workflow. This includes rigorous tests, checks and measurements of hardware and software, operator interviews, resulting in a detailed report of all findings.

CONCLUSION

Print service providers often unnecessarily compromise on print and color quality. With a properly aligned workflow combining the right software and hardware solutions, there is no need for such compromises.

By providing a quick and efficient way to produce high-quality color profiles, ColorGATE eliminates a weak point in the color management chain. Print service providers maximize the potential of their digital printing device. Using a color management workflow and the right know-how, ColorGATE provides a powerful solution for every digital printing challenge.

Further information on ColorGATE can be requested through this email address: contact@colorgate.com, or through the website colorgate.com/printquality



ColorGATE Digital Output Solutions GmbH, Grosse Duewelstrasse 1, 30171 Hannover, Germany
+49 511 94293-0 • contact@colorgate.com • www.colorgate.com



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