

Siemens Print Media Production Recommendations

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SIEMENS

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Introduction

Given the number of different entities involved in the production of printed products – photographers, graphic designers, prepress professionals, printers, and post-production providers – the best way to achieve predictable and consistent color in print and to ensure that all of the individuals involved at the various stages of the process work together smoothly and efficiently is to apply a set of clearly defined rules.

This prompted us to work with print production partners to map out a consistent production workflow, from end to end – a workflow that we have tested under real working conditions. The recommendations published here on the production of Siemens print media offer clear descriptions of the individual stages in the print production process, from photography to final output, and include specifications designed to enable objective and reproducible quality control.

Key rules

- These recommendations are based on the international standards ISO 12647 (the printing process) and ISO 15930 (PDF prepress data).
- When implementing the ISO standards, we recommend following the specifications in Media Standard Print, published by the German Printing and Media Industries Federation (bvdM).
- As far as possible, we work with support tools (e.g., ICC color profiles, color characterization data, and control wedges for proofing and printing) available from independent organizations like Fogra, ifra, the bvdM, and the ECI.
- Specially created custom support tools (an ICC profile and a control wedge) are also available to optimize the implementation of standards in the production of Siemens print media.

Rules

Rules – Introduction

Norms and standards

ISO standards

Our print media production recommendations build on international ISO standards. Because a large proportion of Siemens printed matter is produced using an offset process, these recommendations center on ISO 12647-2 (Process control for the production of half-tone color separations, proof and production prints – Part 2: Offset lithographic processes). This standard describes all key parameters, reference values and tolerances for standard sheet-fed and web offset printing. Prepress data requirements are specified in the international ISO 15930 standard (prepress digital data exchange with PDF/X).

For historical reasons, the ISO standard on offset printing contains a range of different reference values for a number of specific parameters (e. g., for dot gain). This is because it is an international standard that needs to address technical differences around the world.

Process Standard Offset

Before implementing the requirements laid out in the ISO standard, it is important to decide on one of the permitted offset variants: with positive or negative plates. To promote working to exact guidelines, Process Standard Offset (commonly abbreviated as PSO), a document published by Germany's bvdM, specifies a set of requirements that reference the ISO standard variant with dot gain for positive plates.

To help users to put the ISO standard into practice, organizations like Fogra, Ugra, the bvdM, the European Color Initiative (ECI), and ifra publish a wide range of vendor-independent support tools and information resources, for the most part free of charge.

Media Standard Print

Available in English as well as the original German, the bvdM's Media Standard Print sets out the most important specifications contained in the ISO standard, plus extensive information on how to put these specifications into practice. Media Standard Print is available for free download from www.bvdm.org. Our print media production recommendations make frequent reference to this document.

Siemens corporate design guidelines – in particular, the color definitions and support tools (templates, logo files, etc.) – are likewise based on the ISO standard and the bvdM's process standard for offset printing. Our print media production recommendations therefore represent a valuable complement to our corporate design guidelines and, we hope, will prove to be a useful resource in your communications design work for Siemens.

Rules – Introduction

Technical requirements

To implement our print media production recommendations, you need the following resources:

Calibrated and ICC-profiled equipment

Equipment like cameras, monitors and proofing systems needs to be calibrated and ICC-profiled at regular intervals. D50 standard light should be available for viewing proofs and prints. In addition, color measurement equipment is required to enable objective quality control.

ICC color profiles

A number of specific ICC profiles needed for processing image and prepress data and proofing should be installed. The profile ISOcoated_v2_310_GCR.icc can be found at www.siemens.com/pso; the profile ECI-RGB.V2.0.icc is available in the download area at www.eci.org. The remaining profiles are available at the addresses shown in the table on page 16.

Photography requirements

- The proofing system meets the requirements specified here and described in the section headed “Proofing and color conversion”.
- The monitor is capable of displaying the entire ISO Coated v2 color space.
- The monitor and proofing system’s gamuts have been characterized in custom ICC profiles.
- The monitor and proofing system are calibrated and profiled using a hardware measurement device.
- A Munsell ColorChecker target (24 squares) for checking the camera is available (www.x-rite.com)

- Cameras are profiled with the camera manufacturer’s standard color profiles or with custom profiles (the photographer’s responsibility).
- An ICC-aware raw converter for converting camera raw files.
- Software for saving the raw files in Adobe’s DNG (digital negative) format, e. g., Adobe DNG Converter.

Prepress requirements

- The proofing system meets the requirements specified here and described in the section headed “Proofing and color conversion”.
- The monitor is capable of displaying the entire ISO Coated v2 color space.
- The monitor and proofing system’s gamuts have been characterized in custom ICC profiles.
- The monitor and proofing system are calibrated and profiled using a hardware measurement device.

Print requirements

- The proofing system meets the requirements specified here and described in the section headed “Proofing and color conversion”.
- A spectral photometer and software for checking proofs with a CMYK media wedge.
- A densitometer for checking dot gain curves (characteristic printing curves).
- A spectral photometer (see “Proofing and color conversion”) for standards-compliant verification of full tone color as specified in ISO 12647-2.
- The Siemens print wedge is printed on final output.
- Software for checking production prints with the Siemens print wedge to verify compliance with ISO 12647-2.
- The printing ink conforms to the requirements in ISO 2846-1.

Proofing requirements

- The proofing system (the printer, paper and inks) is capable of rendering the FOGRA39 (ISO Coated v2) color space in full.
- The proofing software is capable of displaying CMYK image data using the ISO Coated v2 color space (photographers).
- The proofing software is capable of correctly processing PDF/X prepress data (prepress and print providers).
- A Ugra/Fogra CMYK 2a media wedge (with the layout for scanned measurements) for checking proofs with color measuring instruments.
- A control strip with the names of the color profiles used (for the simulated printing conditions – e. g., FOGRA39 – and proofing system).
- A control strip with the name of the proof file, and the date and time the proof was created.
- Proof medium (paper or substrate) for FOGRA39 proofs. Technical specifications for the proof medium are described in “Proofing and color conversion”.

Rules – Photographer guidelines

Photographers' tasks

When producing photographs for publication in print media, there are a number of technical steps you can take at different points in the process between image capture and final delivery of the image files that have been shown to achieve good results. Note also that Siemens has a number of requirements regarding photographic style. Guidelines are available in /brandville, Siemens' corporate design platform on the Web (<http://brandville.siemens.com>).

Recommended steps for photographers

- Install the following ICC profiles: ECI-RGB.V2.0.icc (available free of charge at www.eci.org) and ISOcoated_v2_310_GCR.icc (available under Downloads at www.siemens.com/ps0).
- When shooting on location in available light, take a picture of a Munsell ColorChecker target (24 squares) like the one shown on page 9.
- Import the raw files from the camera and make basic corrections in the raw converter.
- Convert the imported images in Photoshop to the profile ECI-RGB.V2.0.icc and make additional corrections as necessary.
- Assign names to the converted images, appending "_ECI.tif" to the file name and embedding the ECI-RGB.V2.0.icc profile.
- Include the image of the Munsell ColorChecker target (24 squares) as a reference in the folder with the ECI RGB images.
- The next step is to convert the images in Photoshop to CMYK using the profile ISOcoated_v2_310_GCR.icc and with the rendering intent options "Relative Colorimetric" and "Use Black Point Compensation" enabled. Save the CMYK images in a separate folder, appending "_ISO2.tif" to the file name.

- In Photoshop, create a contact sheet of the CMYK images using the function "Contact Sheet II" (set the individual image size to 9 × 13 cm).
- Print the contact sheet file on a proofing printer calibrated for ISO Coated v2 (FOGRA39) on suitable proofing paper (see page 15). Your proofs should include a CMYK media wedge and the results from a media wedge measurement carried out on a proof.
- Send the client the files on an electronic medium along with the hard proofs of the contact sheets. The storage medium should contain the files in three separate formats: RGB TIF, CMYK TIF, and sRGB JPEG previews saved at the maximum quality setting.

Importing image data with ICC support

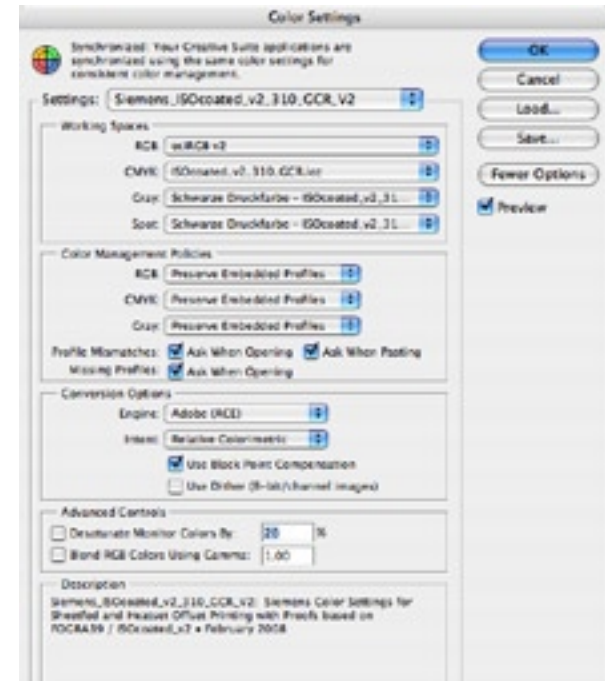
Basic corrections, like the white balance or contrast, are carried out on the raw files. When the camera images are imported, the image data should ideally be converted from the camera's color space to eciRGB v2 or, alternatively, to Adobe RGB using an ICC-based conversion process. The standard color space for file delivery is eciRGB v2; the standard file format is 8-bit TIF.

The eciRGB v2 color space

For optimum prepress hand-off in RGB workflows, the ICC profile ECI-RGB.V2.0.icc (eciRGB v2 for short) should be used as the standard RGB color space in Photoshop. You can find this profile at www.eci.org.

Adobe color settings

In Adobe Creative Suite, including Photoshop and Acrobat, we recommend using the Siemens_ISOcoated_v2_310_GCR_V2 color setting.



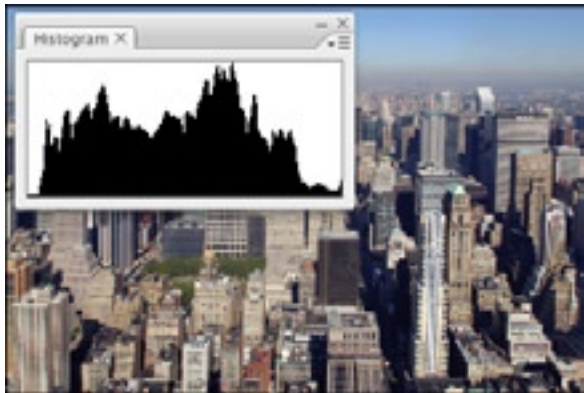
The Siemens_ISOcoated_v2_310_GCR_V2 color setting

Everyone involved in the workflow – photographers, agencies and prepress professionals – should use this color setting, because it sets up the correct RGB and CMYK color spaces and defines the method used to convert RGB to CMYK (see the figure above).

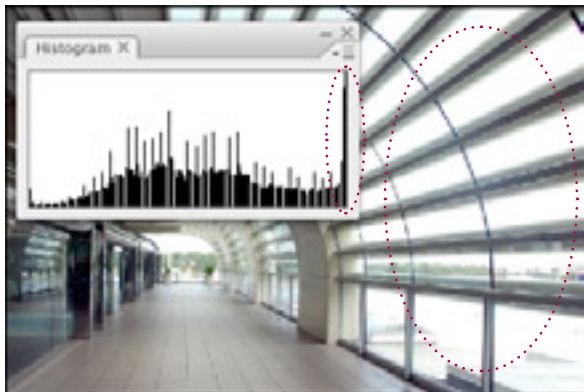
Rules – Photographer guidelines

Histograms, highlights and shadows

The images you supply must have a smooth, gapless histogram for each color channel and, in general, balanced highlights and shadows.



Right: Histogram without gaps



Wrong: Histogram with gaps and large, blown highlight areas in RGB white (255/255/255), marked in red on the photo and at the right-hand end of the histogram.

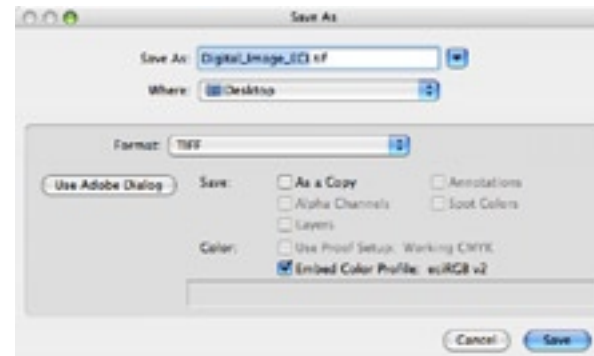
Highlights and shadows should have the following RGB values: 248/248/248 for highlights, 7/7/7 for shadows, with a tolerance of ± 5 . The histogram should not have extreme peaks at the top and bottom ends. Only specular highlights may have the maximum value (255/255/255). These values apply to “normal” images as opposed to, say, atmospheric images with a strong color cast in the highlights (e. g., sunsets), or images that don’t have a full tonal range of light and dark areas.

Corporate design colors

In Siemens’ corporate design guidelines in /brandville, you can find detailed tables showing the correct values for our corporate design colors.

Embedding eciRGB v2

Photographers should use eciRGB v2 as their RGB color space and embed the profile ECI-RGB.V2.0.icc in their files when they save them.



Photoshop dialog box: Saving an image file with an embedded color profile

Image resolution and size

Client requirements are the main factors determining image resolution and size. If specific details have not been agreed, the minimum requirement for a single lens reflex camera is 12 million pixels (equivalent to 36 MB for color images and 12 MB for grayscale images, in each case uncompressed). In addition, images must be sufficiently sharp and detailed.

Meta data

Image files’ Exif and IPTC meta data must be not be deleted during processing. Photographers must make sure that files contain the following IPTC meta data: creation date, name of the photo studio, working title/project name, client and location (if possible), archive number (job identifier), Siemens copyright.

Delivering RGB and CMYK image files

For delivery to clients, images must be saved as follows: in RGB color with the ICC profile ECI-RGB.V2.0.icc embedded and with file names ending in “_ECI.tif”, and in CMYK mode with the profile “ISOcoated_v2_310_GCR.icc” embedded and the ending “_ISO2.tif”. The reference image of the ColorChecker target taken during the shoot must be supplied along with the image files.

The files on the storage medium for delivery to the client should also include sRGB JPEG preview images (e. g., with the long side measuring 1280 pixels) saved at the highest quality setting with file names ending in “_sRGB.jpg”. A color-managed contract proof must also be supplied, along with a media wedge and the proof test results (in the form of a contact sheet). Siemens’ Sectors may have their own specific requirements regarding file delivery.

Rules – Photographer guidelines

Creating proofs

We recommend proceeding as follows when creating proofs: Convert the RGB images to CMYK, save them as TIF files with the file name ending in “_ISO2.tif”, and then proof the CMYK files. With the Siemens_ISOcoated_v2_310_GCR color settings installed, Adobe software is already configured for correct color conversion, with “relative colorimetric with black point compensation” as the rendering intent and ISOcoated_v2_310_GCR.icc as the target profile.

You can automatically convert entire folders of RGB images, including the file names, to CMYK using an action in Photoshop. Hard proofs should show the original images as a collection of samples (plus the Munsell ColorChecker target reference file), with individual images sized at 9 × 13 cm, minimum. Each image should have a caption with its name. The Photoshop command “Contact Sheet II” under the “File/Automate” menu automatically creates contact sheets from the CMYK image files in a folder.

Finished contact sheets are printed on a proofing system. Note that the same requirements apply as to proofs (see “Proofing and color conversion”). When checking the quality of proofs, test their color accuracy using a measuring device and the Ugra/Fogra CMYK media wedge, and include the test results with the proof in the form of a label or separate printout.

Archiving raw files

To avoid possible problems with camera-specific data formats, photographers should archive their camera raw files in Adobe’s DNG (digital negative) format and supply images in this format to clients on request. A significant number of camera makers and software companies now support the Adobe DNG file format, and Adobe’s DNG Converter software is available free of charge for Mac and Windows operating systems.



Munsell ColorChecker target (24 squares)

Rules – Agency guidelines

Agencies' tasks

The overall print production process is currently undergoing fundamental change: Many photographers are beginning to supply print-ready CMYK image data; prepress providers are setting up their own photo studios; and many agencies are doing page composition and reproduction work on in-house DTP systems that they used to send out to external providers.

Increasingly, agencies are handling the conversion of photographers' RGB files to CMYK and are therefore taking on a sizeable responsibility for reproduction quality. Many agencies manage the purchase of photographs and prepress services and print production. This, too, means they bear a substantial responsibility for reproduction and the final printed product.

CMYK image data and proofs

When an agency converts RGB data to CMYK, it also creates color-managed contract proofs or commissions the creation of proofs – say, by a prepress provider. If the agency itself provides prepress services, it should follow the recommendations under "Purchasing prepress services" and in the "Prepress guidelines" section.

Converting RGB files and correcting color in-house

Agencies converting RGB data to CMYK or carrying out color correction work on CMYK files require the following:

- A calibrated, ICC-profiled monitor
- The Siemens_ISOcoated_v2_310_GCR_V2 color settings installed in all their Adobe software
- A color-accurate proofing system
- The CMYK media wedge on proofs

- A spectral photometer and software for color-testing the CMYK media wedge
- A D50 lightbox or viewer for color-matching proofs

Purchasing outside services

If your agency handles the commissioning of photographers, prepress professionals or print providers, you need to explain Siemens' print production recommendations to these partners, and you must check the electronic files, hard proofs and final prints they supply to ensure that these comply with our recommendations.

To achieve predictable and consistent color across all production stages, from photography through color conversion to the proofs and the final printed product, it is important that all of the services are commissioned and quality controlled on the basis of our print production recommendations.

Commissioning photographers

When hiring a photographer, check the following:

- Does the photographer use a calibrated, ICC-profiled workflow?
- Can the photographer supply files with an ECI RGB color space and the ISOcoated_v2_310_GCR.icc profile embedded, plus color-calibrated proofs as per our recommendations?

Checking the image files and proofs

- Does the electronic medium supplied contain RGB and CMYK files?
- Do the RGB files have the ECI-RGB.V2.0.icc profile embedded, and do the CMYK files have the ISOcoated_v2_310_GCR.icc profile embedded?
- Has the photographer included a contact sheet proof for the CMYK image files?

- Does the proof have a control strip showing that it simulates the ISO Coated v2 (FOGRA39) color space?
- Does the proof supplied have a CMYK media wedge?
- If the delivery contains multiple proofs, does it include media wedge test results for one of the proofs in the series?

Rules – Agency guidelines

Commissioning prepress services

Check the following when purchasing prepress services:

- Does the prepress provider use ECI and ifra ICC color profiles for color conversion and proofing?
- Does the prepress provider verify proofs by color-measuring a CMYK media wedge?
- Is the prepress provider able to supply test results as a label or printout?
- Is the prepress provider able to assure compliance with Siemens' defined tolerances with every single proof?
- When purchasing reproduction services and proofs for offset printing on coated paper, suppliers must be instructed to use the ISOcoated_v2_310_GCR.icc profile.
- If final prints are made on a different paper type or using a different printing process, the agency must define the specifications for color conversion, proofing and printing in collaboration with the prepress and print providers. If industry standards are available for the print condition in question, ensure that the prepress and print providers are using the relevant ICC profile and characterization data sets (see "Proofing and color conversion"). It is important that proofs are prepared to industry standards and not to the prepress or print provider's own in-house standards.

Checking proofs

- Does the proof have a control strip showing that it simulates the agreed color space (generally, ISO Coated v2/FOGRA39)?
- Does the proof carry a CMYK media wedge?
- Does the proof include a label or printout with color measurement test results to enable quality control?
- Are all of the values measured within the Siemens tolerances (see "Proofing and color conversion")?
- When working with new prepress providers, check the media wedge using a color measuring instrument.
- If your agency marks color corrections on proofs, ensure that the proofing is carried out in standard D50 light.

Rules – Prepress guidelines

Prepress providers' tasks

Working with Media Standard Print instead of in-house standards

Siemens expects prepress providers to apply the standards set out in the bvdM's Media Standard Print when converting color and creating proofs. The bvdM guidelines prescribe the use of the characterization data sets and ICC profiles listed on page 16 under "Prepress and printing reference values" for offset, news and gravure printing. If specific motifs require different black generation than is specified in ECI, PSR or ifra profiles, the prepress provider should be capable of creating a suitable black-generation profile from the characterization data set.

In offset printing on coated paper, we recommend using the ISOcoated_v2_310_GCR.icc ICC profile for color conversion. This profile was created with the same characterization data set as the ECI profile (FOGRA39) but with a maximum tone value sum of 310 percent and high GCR. It affects areas of neutral color to a greater degree than it does skin tones or strong colors.

Regular evaluation of the CMYK media wedge

Prepress providers should calibrate their proofing systems regularly and be able to document the color accuracy of a series of proofs by presenting test results that show that the media wedge on one in series of proofs has been passed.



CMYK media wedge

The CMYK media wedge and a color measuring device are used to check the print quality, and the results are compared with the reference values shown on page 16 (e. g., FOGRA39 for proofs of offset prints on coated paper).

The narrow Siemens tolerances listed in "Proofing and color conversion" apply:

- Paper white: dE 2
- Median deviation: dE 2
- Maximum deviation: dE 6
- Primary colors: dE 5
- Primary colors: dH 2.5
- CMY gray: dH 1.5

All color measurements should be carried out on a white background as per ISO 12647-2.

Rules – Print provider guidelines

Print providers' tasks

The rules presented here apply to offset and digital printing methods, because the data these methods use are, by and large, the same. Unless otherwise noted in a print order, the offset data supplied is for ISO Coated v2.

Uniform requirements for suppliers and print providers

To ensure predictable and consistent results, Siemens and its production partners should supply standardized print data and proofs as per the specifications in Media Standard Print. Print providers need to optimize their in-house prepress and printing processes in line with the data they receive so as to ensure that final printing produces color that accurately matches that of the proofs supplied. Under these circumstances, print providers' in-house proofs should achieve the best possible match with the color-calibrated proofs they receive and with the final print. This means that print providers must do the following:

- Set up print simulation for final printing on their own proofing system (see "Proofing and color conversion")
- Evaluate the CMYK media wedge on their own proofs and the proofs they receive
- Check the characteristic printing curves to ensure compliance with ISO 12647-2 (see Media Standard Print for reference values for a range of print setups)
- Check the full-tone colors in accordance with ISO 12647-2/bvdm Media Standard Print specifications

Proof and print quality assurance

On request, print providers should supply a proof with test results for the CMYK media wedge in the FOGRA39 color space or for the intended print condition (see "Proofing and color conversion"). They should also doc-

ument the OK sheet's compliance with ISO 12647-2. The requirements are the same as the requirements in Media Standard Print (www.bvdm.org) for CIELAB color points and dot gain curves.

Dot gain as per ISO 12647-2

The data and proofs supplied are aligned with the dot gain specified in ISO 12647-2. For offset printing on coated paper, curve A applies to the colors C, M and Y (a dot gain of 13 percent measured on the paper compared to 40 percent in the file), and curve B applies to black (a dot gain of 16 percent compared to 40 percent in the file).

File	Gain	Gain
	CMY	K
20 %	7.6	10.2
25 %	9.3	12.1
40 %	13	16
50 %	14.3	17
60 %	14.5	16.6
70 %	13.4	14.9
75 %	12.3	13.4
80 %	10.7	11.5

Media Standard Print 2007 (English) and MedienStandard Druck 2007 (German), both available for free download from www.bvdm.org, contain a table of reference values in 5-percent steps from 5 to 95 percent for the various paper types.

Screen ruling, angle and dot shape

Unless agreed otherwise, we recommend a screen ruling of 70 l/cm with elliptical dots. Our Healthcare Sector requires a minimum screen ruling of 80 l/cm. The first dot joint should not be below 40 percent and the second not above 60 percent. Black should be at 45° or 135°. Cyan, magenta and black must be angled at 60° to one another. Yellow must be angled at 15° from one of the main colors (see Media Standard Print, section B2).

Including the Siemens print wedge in the trim area

Provided there is sufficient space on the printed sheet, print providers should place the Siemens print wedge in the trim area, vertically to the cylinder axis. The 8 mm-wide version should be used for scanned measurements. The wedge allows the OK sheet to be checked in accordance with the requirements specified in Media Standard Print. Print providers should supply test results for the Siemens print wedge on the OK sheet with every print job and should archive the OK sheet.

You can find the latest version of the Siemens print wedge in the download area at www.siemens.com/ps.

Rules – Print provider guidelines

Working within tolerances

For Siemens, it is paramount that the final print is a good visual match with the supplied proof. In this context, measuring the Siemens print wedge enables precise identification and correction of color aberrations. Achieving the specified reference values and keeping within tolerances is crucial to quality and not just an end in itself.



Color measurement in a print shop

Siemens Printwedge

When measuring the Siemens print wedge, the results partly depend on the wedge's color zone mappings and neighboring color zones. Occasionally, minor deviations from the ISO 12467-2 requirements are acceptable, provided the print achieves a close visual match with the proof.



Siemens Printwedge

However, if significant aberrations are apparent across a succession of print jobs or if a print job fails to visually match the proof and exhibits substantial aberrations in its measured colors, corrective measures will need to be taken. The exact steps necessary will be decided on a per case basis.

Spot color

When using spot color, Siemens reserves the right to specify the required ink manufacturer as well as the relevant lab values, including tolerances, for the dry sheet, as measured on black backing. The exact requirements will depend on the individual project and print order.

Catalog printing

With catalog printing on sheet-feed and web offset machines, the same general specifications apply as above. Due to the paper types used in catalog printing (e.g., paper weights of 60 to 80 g/cm² and grades of paper with a low wood content), these specifications may be altered with the client's approval.

Rules – Proofing and color conversion

Color calibrated proofs

Proofs are the most important means of evaluating digital images and prepress data. We recommend consistently using proofs as a means of visually checking image and prepress data at each of the various stages in the production chain.

Proofing for photographers, agencies, prepress and printers

To ensure an efficient and color-managed workflow, it is important that printouts of digital images or prepress data look as identical as possible at all the different points along the production process chain. For this reason, we recommend that color-calibrated proofs are always made from CMYK data. This is consistent with the media-specific workflow recommendations contained in the bvdM's Media Standard Print. By including a proof with the RGB and CMYK image files delivered to an agency or a prepress provider, a photographer provides a visual specification of how her or she wants the pictures to look. If the image data is to be used for printing, the agency or prepress provider has both the RGB and CMYK files to work with. If the data is later offset printed on coated paper, the CMYK data supplied by the photographer generally serves as a starting point. And if printing is carried out on other materials or using other printing methods, the RGB data can be converted into CMYK data for the printing method in question.

Color standards for proofing and printing

Color standards defined with CIELAB color numbers allow proofs and prints to be checked objectively using measuring instruments. The decisive factor governing color reproduction in print is the so-called printing condition – the combination of printing method and

paper type. Printing conditions are commonly referred to by a unique name adopted from the characterization data set on which they are based. FOGRA39, for example, refers to offset printing on coated paper as defined in the ISO 12467-2 standard. You can find a list of specifications for different printing methods and paper types on page 16, under "Prepress and printing reference values".

Proofs for offset printing on coated paper (FOGRA39)

Offset printing on coated paper is Siemens' reference method for the production of print media. To assess RGB files supplied by photographers, the images must first be converted to CMYK using the ISOcoated_v2_310_GCR.icc profile (see the information on color conversion on page 17) and then proofed for the FOGRA39 printing condition. Agencies and prepress providers should also prepare proofs for print media to the same specifications when prints are made on coated paper using the offset process. This ensures that print providers will consistently receive proofs of the same type, regardless of the source, when producing Siemens print media on coated paper using the offset process.

Checking proofs with color measuring instruments

- The simulated printing condition and reference values for proof checking are defined by FOGRA39 (Siemens' reference color space) or by an another agreed characterization data set for the relevant print condition (see page 16, "Prepress and printing reference values").
- If multiple proofs are to be supplied, the CMYK media wedge of a proof should be tested with a color measuring instrument and the test results supplied with the proof.

- For proof evaluation, the following tolerances apply. Some of these are narrower than specified in Media Standard Print 2007:
 - Paper white: dE 2
 - Median deviation: dE 2
 - Maximum deviation: dE 6
 - Primary colors: dE 5
 - Primary colors: dH 2.5
 - CMY gray: dH 1.5

A number of proofing solution vendors supply complete systems that include the CMYK media wedge, pre-defined settings for the FOGRA39 color space (ISO Coated v2) and the means to measure the color and evaluate the CMYK media wedge.

Proofs for other printing conditions

When creating proofs for other printing conditions, change the ICC color profile and the characterization data set to match the printing condition you wish to simulate (see page 16, "Prepress and printing reference values"). For example, for web offset on LWC paper, you would use the ISOwebcoated.icc profile and the FOGRA28 characterization data set.

Proof medium recommendations

A number of specifications need to be defined to ensure that proofs that produce correct results in color testing are also visually consistent. Visible differences between measured, technically accurate proofs do occur, and tend to result from differences in the amount of optical brightener in the proof medium. The amount of brightener can be estimated by taking a colorimetric measurement of the b^* value on the unprinted paper (without a UV filter, according to ISO 12467-2). Papers for inkjet printers range from around $b^* = 1$ (yellowish white without optical brighteners) to

Rules – Proofing and color conversion

$b^* = -8$ (bluish white with a high proportion of optical brighteners).

Proof media that meet Siemens' specifications exhibit a low amount of optical brightener that corresponds to the amount of optical brightener in coated papers commonly used in offset printing. The b^* value should be between -4 and -1 . The white point of the proof medium may deviate by $dE 3$ from the FOGRA39 white point, without paper color simulation. Measured on white backing, the brightness should be at least $L^* = 94.5$. Proof media without any optical brightener are often unsuitable for proofing according to these specifications because they are too yellow.

Prepress and printing reference values

We recommend using the following ICC profiles and characterization data sets to create proofs for the print processes and paper types listed (cf. bvdM Media Standard Print). The characterization data sets shown here serve as a reference when checking proofs:

	ICC profile	Characterization data
Offset printing		
Coated paper	ISOcoated_v2_eci.icc ¹	FOGRA39
LWC paper	ISOwebcoated.icc ¹	FOGRA28
Uncoated paper	ISOuncoated.icc ¹	FOGRA29
Uncoated yellowish paper	ISOuncoatedyellowish.icc ¹	FOGRA30
SC paper	SC_paper_eci.icc ¹	FOGRA40
Newspaper printing		
Newspaper	ISOnewspaper26v4.icc ²	IFRA26
Gravure printing		
HWC paper	PSRgravureHWC.icc ³	PSRgravureHWC_ECI2002
LWC paper	PSRgravureLWC.icc ³	PSRgravureLWC_ECI2002
SC paper	PSRgravureSC.icc ³	PSRgravureSC_ECI2002
MF paper	PSRgravureMF.icc ³	PSRgravureMF_ECI2002

1 www.eci.org – Available for download as “ECI Offset 2007” archive

2 www.ifra.com – Available for download as “ISO Profiles”

3 www.eci.org – Listed by name and available for individual download

(Status: December 2007)

Rules – Proofing and color conversion

Converting colors from RGB to CMYK

Creating color-calibrated proofs and converting RGB colors to CMYK are two key steps in the production of print media and are covered in greater detail here.

The black channel and maximum tone value sum

When RGB colors are converted to CMYK, the CMYK profile employed controls black generation. The black channel and tone value sum play an especially important role here. To ensure on-press color stability, neutral colors need to be generated using black to the greatest extent possible. At the same time, a maximum tone value sum should be selected that allows the CMYK data to be processed both in sheet-fed offset and web offset printing.

The ISO Coated v2 color space

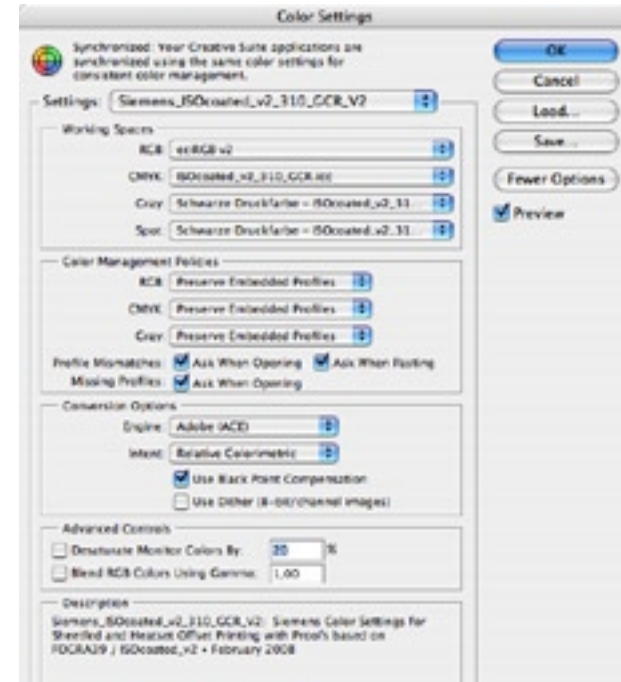
The ISO Coated v2 color space plays an important part in our print media production recommendations. Because a large proportion of our printed matter is offset printed on coated paper, ISO Coated v2 is the standard color space used to archive print-ready CMYK data. In addition, ISO Coated v2 serves as the intermediate color space when RGB files are reviewed and approved. If a photographer creates and edits RGB images, the images need to be converted to ISO Coated v2 and proofed and approved in that color space. The photographer then sends the RGB files and CMYK files, plus a proof with a CMYK media wedge, to the client. Numerous color profiles for the ISO Coated v2 color space are available, but these can produce a spread of different results. To avoid problems with color aberrations as far as possible, you should consistently use the FOGRA39 characterization data set for proofing and an ICC profile based on the same data set for color conversion.

The profile variant ISOcoated_v2_310_GCR.icc

When converting colors to the ISO Coated v2 color space, you should only use the ISOcoated_v2_310_GCR.icc profile. This profile, created using the FOGRA39 characterization data set, has a maximum total ink coverage of 310 percent to enable CMYK data to be used without problem in web offset printing for catalog production. In addition, the gray axis of the ISOcoated_v2_310_GCR.icc profile relies more heavily on black. This stabilizes color on press, particular in product images with neutral or broken colors. The profile also limits the width of GCR to avoid possible graying of skin tones.

“Relative colorimetric with black point compensation” rendering intent

Our recommendations in this section are still provisional in that trials with photographers and reproduction companies are still underway. However, our findings to date have shown that the procedure described below works. From Siemens’ perspective, it is important that the conversion of RGB data to CMYK always produces consistent results at different points in the workflow. We therefore recommend choosing “relative colorimetric with black point compensation” as the rendering intent when converting colors.



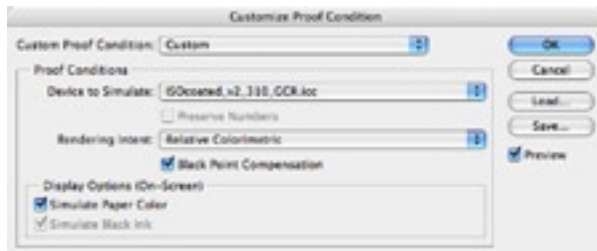
Siemens_ISOcoated_v2_310_GCR_V2 color settings



Photoshop settings for converting images from RGB to CMYK

Rules – Proofing and color conversion

Experience gathered by photographers and prepress providers indicates that this is the best choice of rendering intent, delivering optimum CMYK conversion results with typical Siemens RGB images more than 95 percent of the time. However, a loss of definition may be observed in a small number of images with highly saturated colors when they are converted to CMYK fully automatically using this method. To avoid this, photographers should adjust such images manually before converting them. While working on RGB images, they can preview how the colors will look in print using a soft proof based on the ISOcoated_v2_310_GCR.icc profile, with the rendering intent set to “relative colorimetric with black point compensation”.



Proof condition settings in Photoshop

If areas of highly saturated color show a loss of definition, these areas can be adjusted manually until sufficient definition is visible in the soft proof. This is the only way to ensure that all of the RGB data will be converted to CMYK fully automatically for the approval proof. At the same time, choosing the rendering intent “relative colorimetric with black point compensation” produces balanced results when RGB data is separated using CMYK profiles produced using a number of different profile creation programs. This is important when the RGB data is to be used additionally on other output devices.

Converting images for multimedia, the Web, and presentations (MS Office)

If you need to process RGB or CMYK images for use in multimedia and web applications, you should convert them from their current profile (ECI-RGB.V2.0.icc, ISOcoated_v2_310_GCR.icc) to the sRGB color space (IEC 61966).

Background

Background

Why publish recommendations on print media production?

Background

Professional quality management is a central pillar of Siemens' corporate strategy, and choosing dependable suppliers plays a major part in this. Our print media production recommendations form an integral part of our quality management. Because graphic design and printing have developed from a group of trades into a visual communications industry, we would like to familiarize you with a number of industrial quality management concepts.

Defining processes and measuring results

The print production chain involves a number of different entities – photographers, graphic designers, prepress professional and print providers. At different points in the production process, precursor products such as photographs or proofs need to be assessed for quality and approved for onward processing. Unlike other industry sectors, print production used not to have formally defined process stages or measurable quality standards. Until recently, there were no fixed criteria for assessing and approving digital images. If different proof providers produced proofs from one and the same set of prepress data, the results were often very different, and it was impossible to tell which proofs were accurate. When the hard proof and the print were not the same, it was difficult to determine whether color aberrations were due to the prepress data, the proof or the printing.

The goal of our print production recommendations is to clearly describe the individual process stages, complete with reference values and tolerances, to enable quality control based on measurable parameters.

Building on ISO standards

When two or more companies collaborate on an industrial product, international norms and standards help them to work together smoothly and efficiently. Our recommendations for print media production are based on ISO 12647-2 (Process control for the production of half-tone color separations, proof and production prints – Part 2: Offset lithographic processes) and ISO 15930 (prepress digital data exchange with PDF/X). The German Printing and Media Industries Federation (bvdm) publishes recommendations on implementing these standards in its Media Standard Print and Process Standard Offset documents.

Working with suppliers to continuously improve processes

To achieve consistently high quality, everyone involved in the production process has to commit to and maintain quality standards. For many in the visual communications industry, working with color measuring instruments as a tool for quality control is new and unfamiliar. However, once embraced, this approach adds a new degree of consistency to one's own production processes. At Siemens, we will regularly assess how well our suppliers succeed in working to our specifications and keeping within our tolerances in the production of print media.

In a number of regards, this approach is taking us into uncharted territory. For example, there is no ISO standard that defines the process of assessing and approving digital photographs. The way forward we describe in our recommendations, based on techniques applied successfully by a number of major photo studios, marks an effort to define this process more exactly. However, we assume that the process will be modified and refined substantially over time.

Likewise new is that Siemens requires the inclusion of a control wedge in the trim area on printed sheets, and we expect all print providers to measure the wedge according to unified criteria and include the test results on the OK sheet. As this is not yet common practice within the industry, we want to trial this procedure with your help and support. What is important for us is that we can work with you to identify which measurement results can provide a reliable gauge of an accurate visual match between the proof and the print and are therefore best suited for quality control.

Supplier management

Siemens evaluates suppliers at regular intervals according to a number of criteria. The measured quality of the products supplied, the technology and the price are just some of the factors assessed. Supplier evaluations are recorded centrally by Global Procurement Logistics (GPL) and are available to all our company units. If your business delivers products and services that meet the quality standards outlined in these print production recommendations, that information will be published in a database to which all Siemens units have access. In short, good quality, alongside other, will assure you a GPL listing.

Background

Defining processes and responsibilities

Producing printed matter today is an almost entirely digital process. It spans a number of different tasks and stages, from photography to page design, prepress, and plate exposure. Our print production recommendations aim to clearly define the interfaces between all the entities in the process.

There used to be sharp distinctions between the work tasks involved in the production of print media, and each was performed by a specific trade or profession. Today, though, these traditional distinctions are becoming increasingly blurred, particularly in digital photography and image processing, which is why individual responsibilities are no longer as clearly defined.

When a photographer supplies RGB images to an agency and the agency converts the images to CMYK, both are performing tasks that used to belong to the prepress domain. This means that much of the responsibility for image quality in the final printed product now rests with the photographer.

To ensure that the photographer can communicate his or her desired intent to the agency, prepress professionals, and the printers who will print the images, Siemens' print production recommendations contain clear recommendations on how image data should be prepared and exchanged.

Color-managed workflow

Throughout the process – from image capture and processing, to layout and graphic design, to print data generation and digital proofing – ICC color profiles should be used to characterize the color gamuts of the equipment used (camera, monitor, color printer/proofing system). ICC profiles also serve to specify the color properties of the image and prepress data.

Corporate design color values

Our print production recommendations specify the use of certain color profiles and rendering intents when converting RGB and CMYK data. Important Siemens corporate design and product colors are defined as specific numeric values within the RGB and CMYK color models. These reference values serve as a guide for everyone involved in print production – photographers, agencies, prepress and production managers – when it comes to proofing our corporate design and product colors in image files.

Background

Resources and literature

Proofing systems with an integrated CMYK media wedge

A growing number of vendors now offer complete proofing systems that include the CMYK media wedge and a color testing solution. These offer the fastest way for photographers, agencies, prepress services and printers to produce proofs to the standards defined in the bvdms Media Standard Print. You can find vendor-independent information on the Web at www.digitalproof.de.

ECI and ifra ICC color profiles

The European Color Initiative (www.eci.org) provides its ECI RGB working color space profile as well as a number of ICC profiles for ISO 12647 standard offset printing and gravure printing. ifra offers ICC color profiles for standard newspaper printing (www.ifra.com). These profiles are a de facto industry standard and are used for color conversion, soft proofs, and digital proofs.

Altona Test Suite – Online Version

With the Altona Test Suite, you can check whether your PDF prepress data will be output correctly during proofing or CTP plate exposure. The Suite consists of three PDF files along with detailed documentation in English and German. It can be downloaded free of charge from www.eci.org.

DIN/ISO 12647-2

A German and international standard defining reference values and tolerances for standard offset printing. Media Standard Print 2007 summarizes the key points contained in the standard. The DIN/ISO 12647 set of

standards also includes parts covering other printing methods: “3” and “4”, for example, cover newspaper printing and gravure printing, respectively. Sources: www.beuth.de, www.iso.org

DIN-Taschenbuch 367

This is a German-language CD-ROM with summaries of all the key printing industry norms and standards. Source: www.beuth.de

bvdm Process Standard Offset

This is a manual for prepress professionals and print providers on implementing ISO 12647-2. It offers comprehensive practical tips and detailed explanations on how to color-measure proofs and prints in the event of complaints from clients. An updated edition is due to be published in English and German in 2008. Source: www.bvdm.org

bvdm Media Standard Print 2007

Media Standard Print covers the main ISO 12647 specifications for standardized printing, and includes a table with the dot gain curves for the offset process in 5-percent steps. The document also includes valuable information on implementing the ISO standard, in particular on data and proof preparation, plus pointers to useful tools and resources. It is available in English and German and can be downloaded free of charge from www.bvdm.org.

Farbmanagement in DTP-Anwendungen

This German-language brochure published by the German Printing and Media Industries Federation (bvdm) contains useful tips on color management in DTP. It begins with how-to guides on installing ICC color profiles and setting up applications, and offers step-by-

step explanations with screen shots on how to accomplish a number of tasks, including creating image files and preparing print-ready PDFs. Source: www.bvdm.org

4 Farben 1 Bild (book)

Aimed at a beginner audience, this German-language book covers color conversion, soft proofing, PDF creation, and digital proofing with ICC profiles and media wedges. Source: book retailers, www.springer.de

Digitales Colormangement, Grundlagen und Strategien zur Druckproduktion mit ICC-Profilen, der ISO 12647-2 und PDF/X-1a (book)

This German-language publication is intended for anyone involved in print production who is interested in a thorough grounding in ISO 12647-2 and color management. Source: book retailers, www.springer.de

Siemens corporate design guidelines in /brandville

You can find extensive information on Siemens' corporate design colors and photographic style on the internet at <http://brandville.siemens.com>.

Background

Glossary

Technical terms used in the guidelines are explained here in alphabetical order:

16-bit color depth

Color depth describes the number of possible shades of color per color channel (e. g., red, green and blue in RGB images) as 2^n bits. As a rule, a depth of 8 bits is generally sufficient, with 2^8 offering 256 shades per channel. The advantage of 16 bits is finer gradation and less likelihood of banding when images are corrected. A color depth of 16 bits is recommended when archiving original, unprocessed images.

Adobe Camera Raw

The camera raw functionality in Adobe® Photoshop® provides fast and easy access to the “raw” image formats produced by professional digital cameras and enables efficient processing of “digital negatives” while preserving the original raw files.

Adobe DNG Converter

Camera raw data is the recommended format for archiving digital photos. To avoid possible problems associated with processing manufacturer-specific raw files, conversion to DNG format (digital negative) using software like Adobe’s DNG Converter software is recommended.

Altona Test Suite

The Altona Test Suite, available online for free or as an application kit by mail for a fee, is a joint project of the German Printing and Media Industries Federation (bvdm) in Wiesbaden, the European Color Initiative (ECI), EMPA/Ugra in St. Gallen, and Fogra (Graphic

Technology Research Association) in Munich. The Altona Test Suite is a set of PDF files designed to test output devices, in particular proofing solutions and conventional and digital printing systems. It can be downloaded for free from www.eci.org. The application kit additionally includes reference prints, color specimens, and a CD-ROM containing the test suite data, characterization data, and ICC profiles for ISO 12647 standard printing conditions. The detailed documentation explains what is in the Altona Test Suite and how to work with it, and provides the information you need to standardize process control.

www.eci.org/eci/de/060_downloads.php
www.altonatestsuite.com

Highlights

The lightest areas of an image. For a natural look, highlight areas should have a value of not more than, say, RGB 248/248/248, leaving the maximum value (RGB 255/255/255) for specular highlights.

Shadows

The darkest areas of an image. For a natural look, shadow areas should have a value not lower than, say, RGB 7/7/7, leaving the lowest value (RGB 0/0/0) for fine, dark image detail.

Characterization data

Characterization data describes the color gamut of a device. It provides a basic foundation for the creation of ICC color profiles (such as FOGRA39 for ISO Coated v2 [ECI]). Characterization data for print applications contains a table with CMYK values and measured CIELAB values for the print process in question.

CIELAB

The CIELAB color system was created by the CIE (the Commission Internationale d’Éclairage or International Commission on Illumination). The CIE develops color systems that set out to describe mathematically the colors visible to the human eye. The three color values in the CIELAB system are luminance (L^*), red/green (a^*) and yellow/blue (b^*).

CMYK

CMYK is an abbreviation for cyan, magenta, yellow and key (key = black). A full range of color tones can be created from these four primary colors using a subtractive mix of colors.

CtP curve

A CtP curve corrects the tonal transfer in the digital exposure of printing plates so as to produce the desired dot gain in print. CtP: computer to plate, digital plate exposure

D50 standard light

Proofs and prints respond differently to changes in the light in which they are viewed. In one light, colors in a proof and in a print may look the same when compared, yet significant differences in color may become evident in other light. This is because metameric matches may cause colors to look the same in a certain light. In standards-based print media production, from photographic work to printing, D50 light is a fundamental requirement to ensure proofing under uniform lighting conditions. (“D” stands for daylight, and “50” for the color temperature 5000 K.)

Background

Densitometer

A reflection densitometer is a device used to determine the ink saturation (thickness) and dot gain in production prints. It does this by measuring the difference between the light it emits and the light reflected back by the paper. The greater the density, the less light is reflected. With transparent materials like film negatives, a transmission densitometer is used to measure the opacity.

dE

Delta E (abbreviated as dE or ΔE) describes the visually perceptible difference between two colors. The lower the delta E value, the closer two colors are together and the more closely they match. In quality control as per ISO 12467, the difference between a color value measured in print and its corresponding reference value in the CIELAB color space is computed.

Printing condition

A printing condition describes the essential characteristics that influence the color results produced by a printing method, e.g., different paper types in standard offset printing.

DTP (desktop publishing)

The process of using personal computers for prepress tasks such as page composition and image editing.

ECI

The European Color Initiative (www.eci.org) offers free resources and guides on standards-based color management and print process standardization for use in production printing. The resources include ICC color profiles for standard offset and gravure printing, the

Altona Test Suite, and the ECI/bvdm Gray Control Strip for print quality control. The ECI operates mailing lists in English and German.

ECI RGB

ECI RGB is an RGB color space defined by the ECI (European Color Initiative). The color space encompasses all of the possible color spaces within the CMYK color model. Equal values of red, green and blue produce neutral grays. ECI RGB is the recommended color space for editing and archiving RGB images. The ICC profile for this space is available for download from www.eci.org.

Eye-One

Eye-One is the name of a spectral photometer made by X-Rite, used to measure colors on monitors, proofs and prints.

Fogra

Fogra (Graphic Technology Research Association) seeks to advance research, development and applications in the field of printing technology and to make the results available to the printing industry (www.fogra.org).

GCR

GCR stands for gray component replacement. The gray component is the part of a mixed color consisting of the chromatic colors cyan, magenta and yellow that produces a neutral gray. In GCR, the gray component is replaced with an amount of black (K) ink that produces the same gray tone. A simple example: The mixed color 70C, 50M, 30Y contains the gray component 40C, 30M, 30Y. This can be replaced with 30K to produce these new color values: $(70C-40C) = 30C$, $(50M-30M) = 20M$, $(30Y-30M) = 0Y$ and 30K.

Ghent PDF Work Group

The Ghent PDF Workgroup (GWG) is an international body comprising industry associations and software vendors. The goal of the GWG is to develop and disseminate specifications for best practices in print media production based on the PDF format. To this end, the GWG offers information, program settings and test data for free download at www.gwg.org.

ICC profile

ICC profiles are used to control the conversion of color (e.g., from RGB to CMYK) and to simulate and preview the appearance of press-printed material on monitors and on digital printers. In the mid-1990s, the International Color Consortium defined a specification for color profiles which has since been standardized by the ISO. An ICC profile describes the color gamut and reproduction characteristics of a device (a monitor, printer, scanner, etc.) and numerically maps an image capture or output device's device-dependent RGB and CMYK values to the device-independent CIELAB color space. The ICC format is recognized as a standard in color management.

iNP paper

iNP is improved newsprint paper designed for heat-set web offset printing.

ISO

Abbreviation for the International Organization for Standardization, a body that coordinates international standardization.

Background

ISO Coated v2

ISO Coated v2 is a widely used designation for the color space achieved in offset printing on coated paper as described in ISO 12647-2. The designation is derived from ISO Coated v2 (ECI), the name of an ECI ICC profile. In the context of proofs, the term applies to the FOGRA39 characterization data set on which the profile is based.

ISOcoated_v2_310_GCR.icc

The name of an ICC color profile used in offset printing on glossy or matt-finish coated paper based on the ISO 12647-2 standard. This is Siemens' required profile for color separations in print media production. The profile is based on the FOGRA39 characterization data set.

LWC paper

LWC stands for light weight coated. LWC paper is a paper containing wood, coated on both sides, and available in weights ranging from 39 to 80 g/cm². It is used for web offset and gravure printing (magazines, mail order catalogs, etc.).

MFC paper

Paper with a machine finished coating as opposed to a coating applied in a separate operation.

PDF/X

PDF/X is an ISO standard specification for print-ready PDFs. The "X" stands for data eXchange. An ISO 15390 standard-compliant PDF/X file contains all the information needed to print the document professionally (including high-resolution images and fonts) and exact color definitions. To ensure reliable printing, all these properties are tested and verified when a prepress PDF file is converted to PDF/X.

Phase one®

Phase One® produces digital backs for medium-format cameras that allow high-resolution digital captures without the need for a direct connection to a computer. The captures are saved in a special raw format that enables lossless compression.

Photoshop®

Professional image editing software from Adobe.

Photoshop® CS

More recent versions of Adobe's professional image editing software (CS, CS2, CS3).

PSR-Profile

ECI color profiles for process standard rotogravure.

Rendering Intent

In color conversion, the rendering intent determines how the source colors are converted into the target colors. In proofing, the colors of the printing method being simulated need to be reproduced as faithfully as possible. During conversion from a larger source color space to a smaller target color space (e. g., in newspaper printing) this is not possible, so the source colors have to be downscaled to the smaller target color space in a way that preserves the overall impression. The choice of rendering intent therefore depends on whether or not the target color space can reproduce all of the colors in the source color space.

RGB

The abbreviation RGB stands for the primary colors red, green and blue. RGB is an additive color model in which the primary colors, when mixed together, produce white. Individual colors are described using three numeric values, one each for red, green and blue.

RIP

A raster image processor is a hardware device or a combination of hardware and software that converts print data (PostScript or PDF) into pixels for output on a device such as a monitor, printer or photosetter.

SC paper

SC stands for supercalendered. It describes an uncoated type of paper whose surface is smoothed by a calender. SC paper is used in web offset and gravure printing (e. g., magazine printing).

Soft proof

A soft proof simulates colors on a monitor as they will appear in final printed output. For example, using the appropriate ICC color profile, you can preview on-screen how an image's colors will look in a printed magazine.

Spectral photometer

A spectral photometer is an instrument that measures color values (typically, CIELAB colors). Not to be confused with a densitometer, which is used to determine the density of ink and dot gain on press-printed material.

Background

sRGB

This is an internationally standardized RGB color space ("s" is for standard), originally developed with the goal of mapping all of the colors supported by monitors (including office monitors) and color printers. It has a considerably narrower gamut than the ECI RGB color space, in other words it encompassed fewer colors. sRGB is the preferred color space for image files used on the Internet or in Microsoft PowerPoint presentations.

Ugra

Ugra is the Swiss Center of Competence for Media and Printing Technology (www.ugra.ch). It is the Swiss equivalent of Germany's Fogra.

Background

Useful web addresses

International Organization for Standardization

www.iso.org

Bundesverband Druck und Medien

www.bvdm.org

European Color Initiative

www.eci.org

Fogra Forschungsgesellschaft Druck e. V.

www.fogra.org

ifra

www.ifra.com

Ugra

www.ugra.ch

Siemens resources

SiemensPrintWedge_F39

www.siemens.com/ps0

ISOcoated_v2_310_GCR.icc

www.siemens.com/ps0

Siemens_ISOcoated_v2_310_GCR_V2.csf

www.siemens.com/ps0

Other resources

Munsell ColorChecker target (24 squares)

www.xrite.com

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