



(Version 1.0.0 • March 2025)

# PDF/X WORKFLOW

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# USER GUIDE



# Introduction

## Progress

The current Ghent Workgroup specification, GWG 2022, has been in active use for about three years now. It is a relatively modest update from the preceding GWG 2015 specification that has been out for ten years. Both of these specifications are based on the ISO PDF/X-4 standard. These specifications were created out of necessity. The changing technical landscape required new specifications to keep up with reality.

## Transition

Before these specifications, the Ghent Workgroup created the 1v4 specifications. They were the de facto standard for the exchange of PDF documents for many, many years. Unfortunately they are **still** used in many workflows today, while they really no longer should be. This lengthy transition period had been anticipated and couldn't be avoided. Today's technical reality really makes it necessary to complete this transition now, as the benefits of using these modern standards far outweigh the risks.

## Goal

The GWG2022 specification as developed and documented by the Ghent Workgroup is dry and terse material, more suitable for application developers than printers, publishers or creative professionals. This document explains what this specification means for you and your workflow, and why you should no longer use older standards. The document you are reading is the successor to the "GWG2015 PDF/X Workflow" document. If you would compare both documents, you would see many changes. Those reflect the changes in our industry and this version of the document should always get precedence.

If you are in fact an application developer, or if you want to understand the new specification in more technical detail, this paper can be an introduction, but you shouldn't stop here. Download the full specification documentation from the Ghent Workgroup website, or ideally, get in contact with us and participate in the work of the Ghent Workgroup.

## Word of thanks

This paper is an adaptation of a PDFX-ready document; we are grateful to the PDFX-ready organization for their substantial effort to produce the original document and their kind permission to build their work. We also hold to thank the following people for their extensive contribution to the 2015 and 2022 papers:

- David van Driessche, Publignce / callas software
- BArt Van Looy, BVL Consult
- Didier Haazen, VIGC
- Peter Korsmit, CMBO, Roto Smeets Group
- Peter Maes, Roularta Media Group

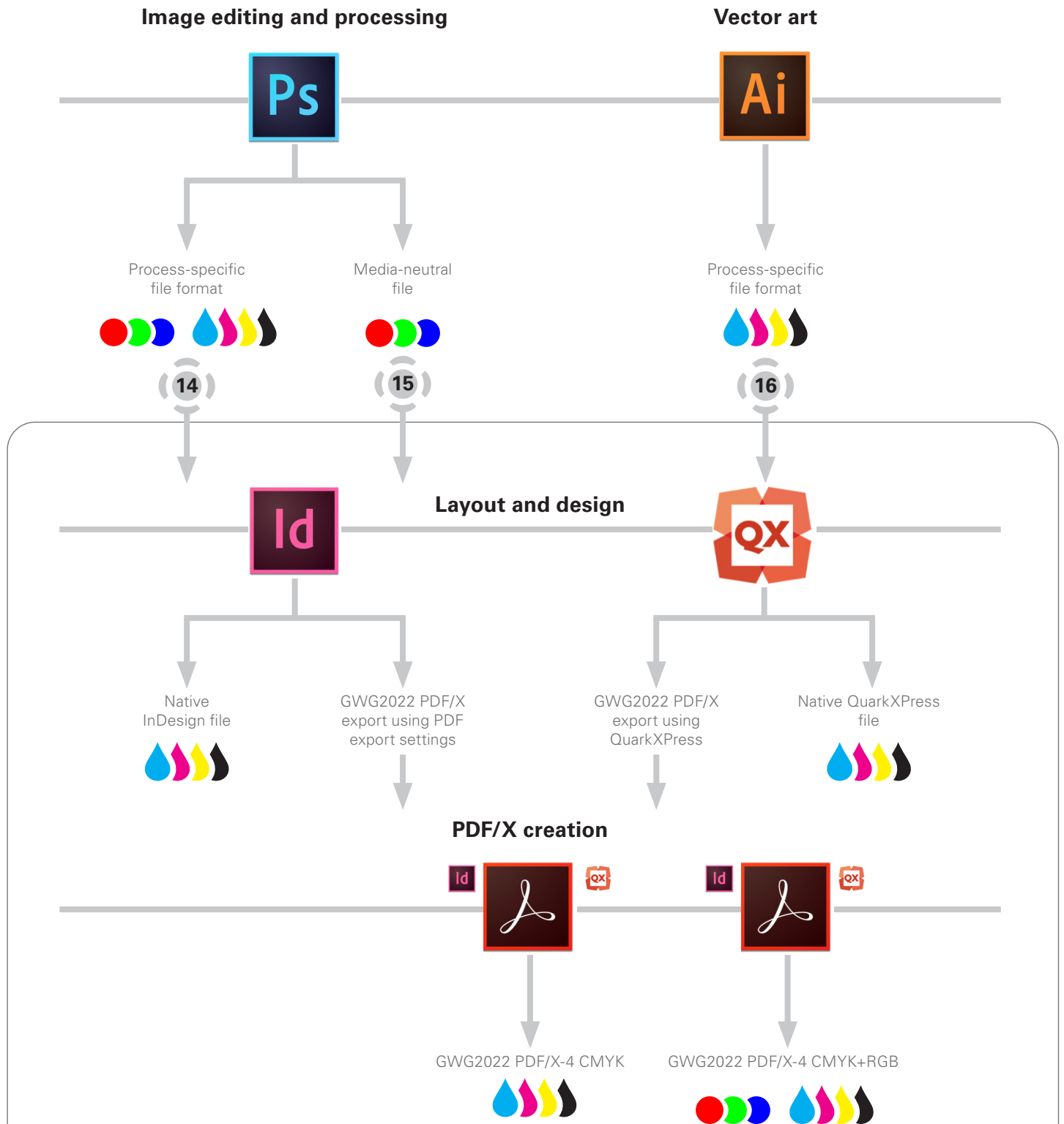
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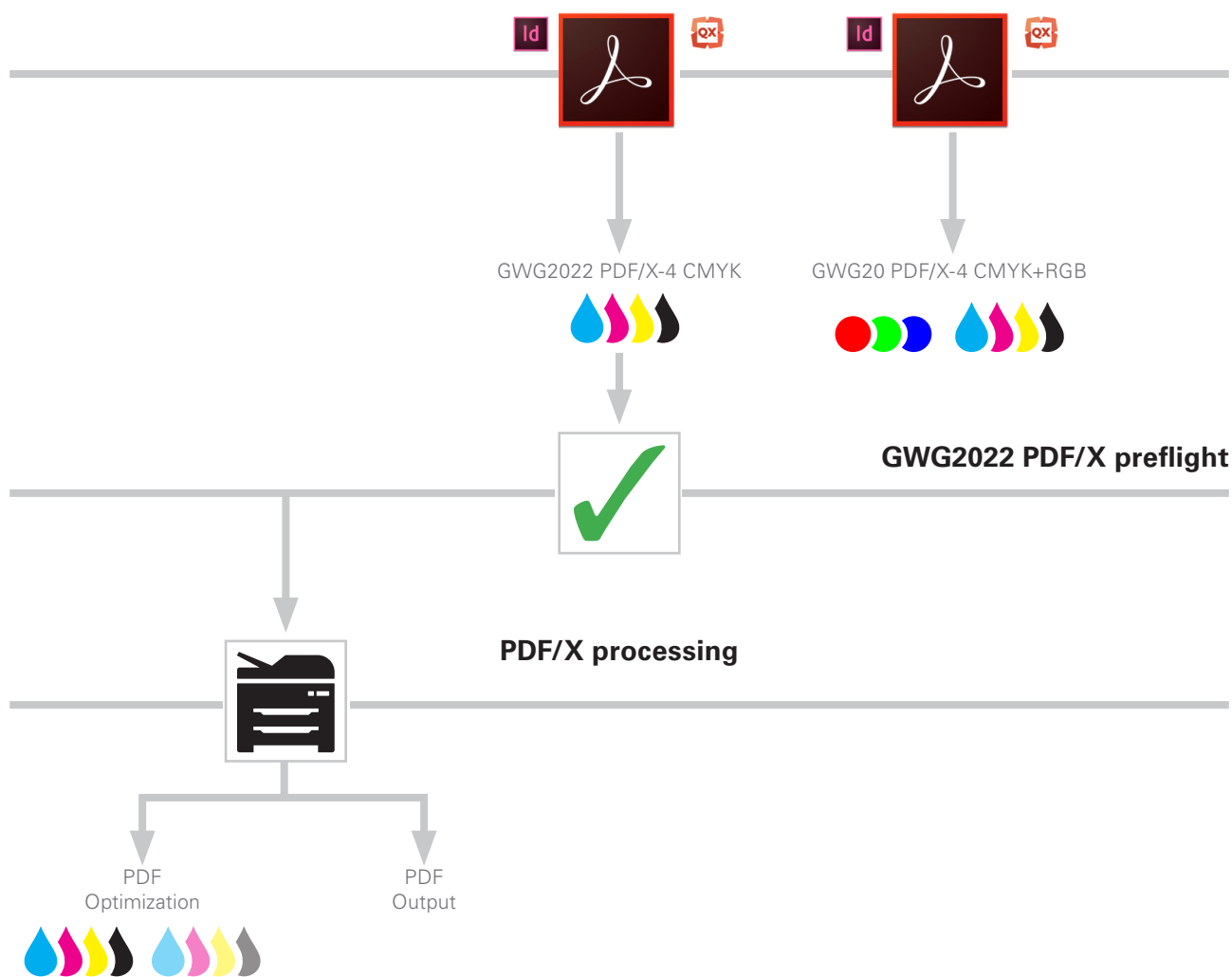


# GWG2022 Workflow

## Overview



## PDF/X creation



### PDF/X-workflows: This diagram shows the different steps and processes that take place in a typical PDF/X workflow:

- Image editing - media-neutral or process-specific.
- Creation of images and illustrations - process-specific.
- Layout and design - media-neutral (use of images) or process-specific.
- PDF/X export - process-specific or media-neutral PDF/X-creation.
- PDF/X creation: PDF/X-4 CMYK or PDF/X-4 CMYK+RGB.
- PDF/X preflight: can be done using a variety of tools.
- PDF optimization and output.

More detailed information about each of these steps is available on the following pages.

# The Ghent Workgroup example page

The Ghent Workgroup example page (of which a preview is displayed on the right) shows the advantages of the Ghent Workgroup workflow; it's the best way to get all of the information out of this manual.

You can use the Ghent Workgroup example page:

- to get an insight into how to use the Ghent Workgroup specifications.
- as a guideline for reliable PDF creation and processing.

The ideal is to judge this page in Adobe Acrobat Pro using separation preview.

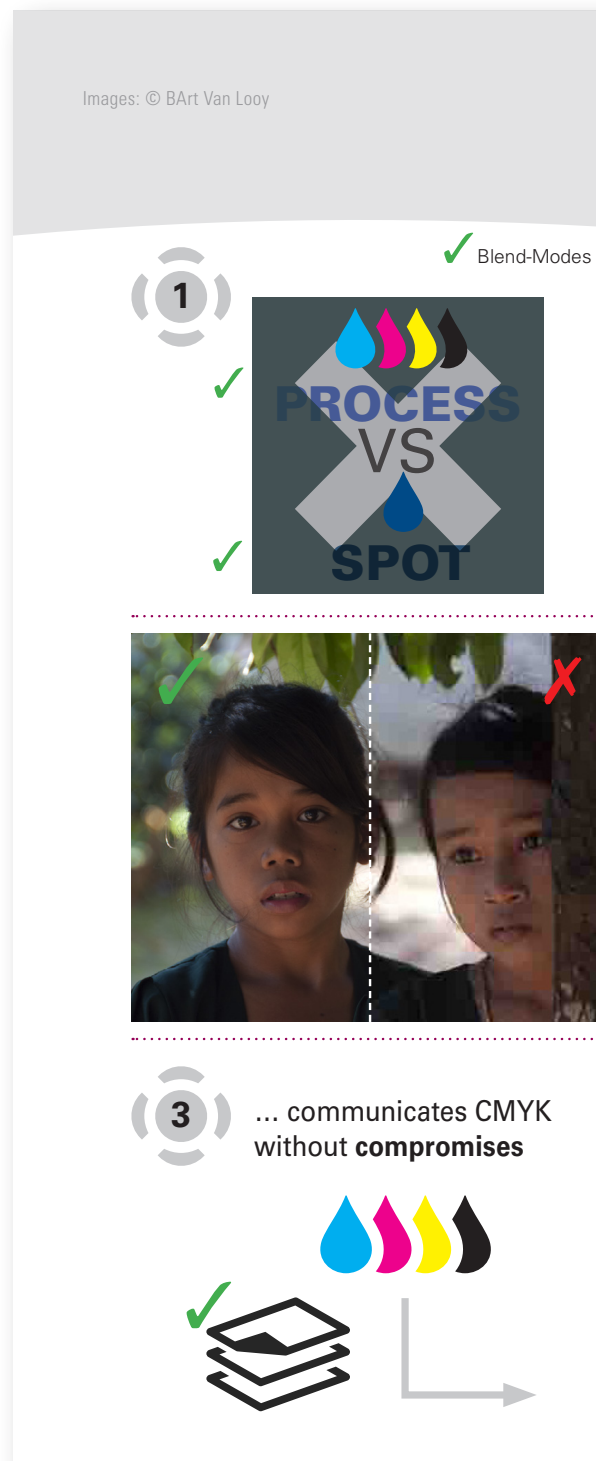
You can download the Ghent Workgroup example page from the GWG website at: **[www.gwg.org](http://www.gwg.org)**.

A detailed description of the different elements in the Ghent Workgroup example page can be found in the corresponding chapters of this manual.

**Note:** this example page in no way replaces other test pages. It is merely an additional instrument you can use for test and demonstration purposes.

The publications of the GWG provide guidelines for content creators and output producers alike; they can help with creation, processing, and publication of PDF/X-data:

- **Content creator:** creates document layout and exports a print-ready PDF/X document.
- **Output producer:** receives and processes PDF/X documents for specific output channels



**This example page uses the following symbols:**

- ✓ A green checkmark indicates an **OK** result.
- ✗ A red cross signifies an **error** or a **problem**.
- ! Warnings are depicted by a yellow exclamation point. Such warnings can lead to **problems**, depending on the situation.
- i **Information-items** are marked with a blue "i". These offer additional information.

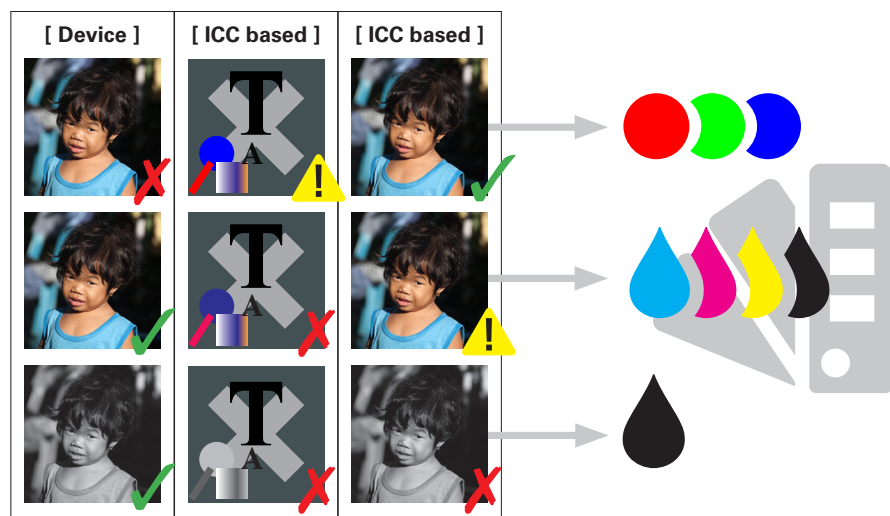
# Ghent Workgroup GWG2015

Example page

[www.gwg.org](http://www.gwg.org)



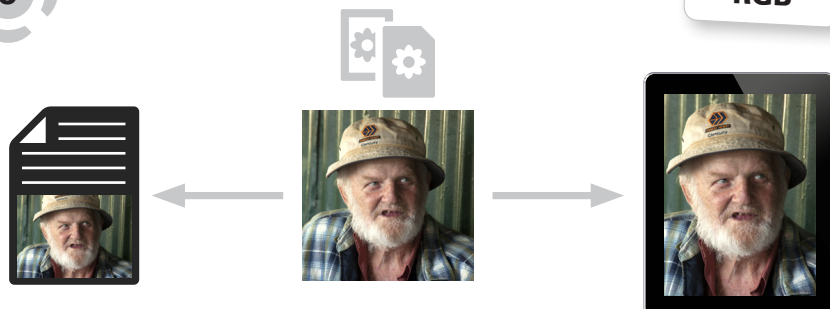
... makes you savvy for handling media neutral data



... conveys the quality of your images into your PDF



... makes you fit future multi channel publishing



# Processing PDF

## Yesterday and today

The print and publishing industry has undergone significant changes, and the way PDF documents are processed has followed suit. **The multi-channel publishing model takes over more and more from the conventional way of working where content is prepared for a specific print condition.** Workflows at publishers increasingly shift to being media-neutral while at creation time a cross-media approach becomes indispensable. At the same time there is significant overlap of different printing technologies that makes it difficult to predict how a particular job is going to be printed.

In the past decade, PDF has become the defacto standard for prepress workflows. Most of the current RIP-solutions implement native PDF rendering support; they no longer internally convert to PostScript. **The Ghent Workgroup GWG2022 workflow guidelines take full advantage of the PDF capabilities built into modern RIPs.** Using native PDF rendering comes with real advantages compared to a workflow reliant on conversion to PostScript. You'll find many of those benefits explained in this document.

**The Ghent Workgroup GWG2022 specification fully enables the use of media-neutral RGB image data.** Vector artwork (illustrations) and text still need to be prepared and placed in CMYK; because of this reliance on CMYK for non-image data, this specification is not yet a complete media-neutral solution for PDF.

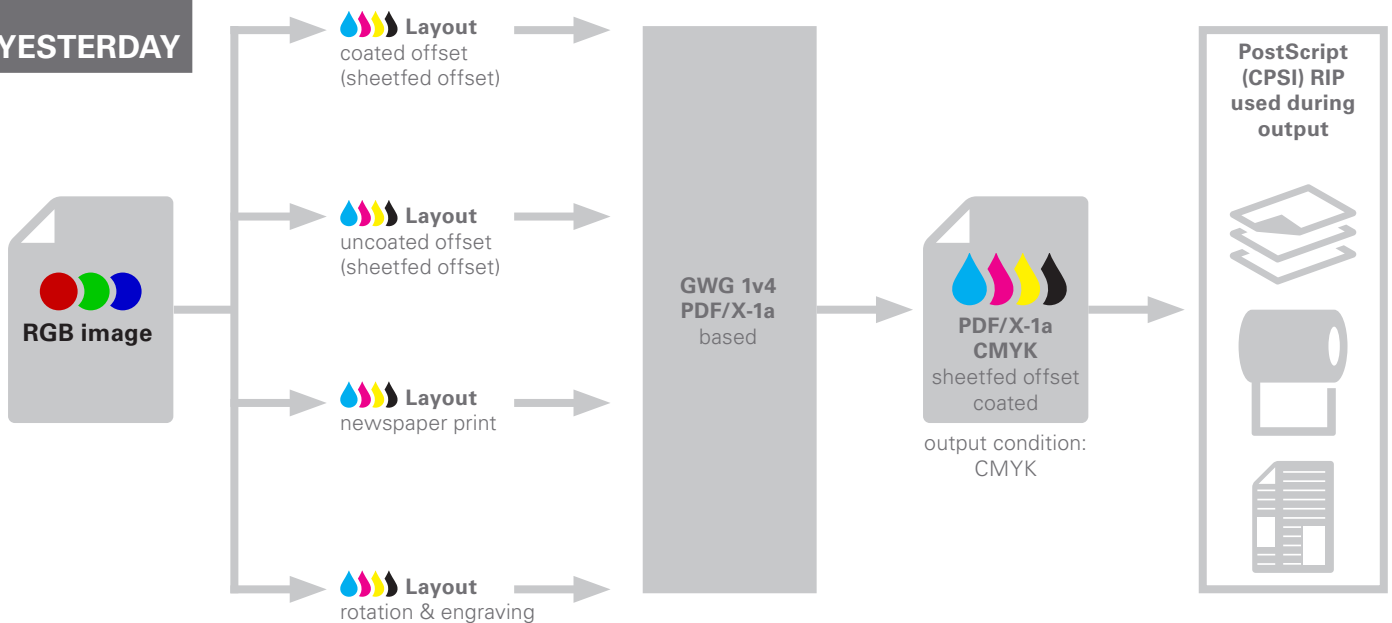
Enabling isn't the same as requiring: the GWG2022 specification contains different variants for CMYK and CMYK+RGB workflows. The former requires image data to also be specified in CMYK, the latter allows image data to be specified as color-managed RGB data. None of these variants is better or worse; they both serve different use cases and workflows.

The possibility in the GWG2022 specifications to keep image data as RGB until late in the workflow, enables more flexibility and allows multiple 'final' PDF files to be created from a given GWG2022 CMYK+RGB PDF file. It enables PDFs created with this standard to be more easily used for ePublishing, more easily changed for alternate printing processes anytime in the workflow, and better take advantage of the enhanced gamut for digital printing techniques.

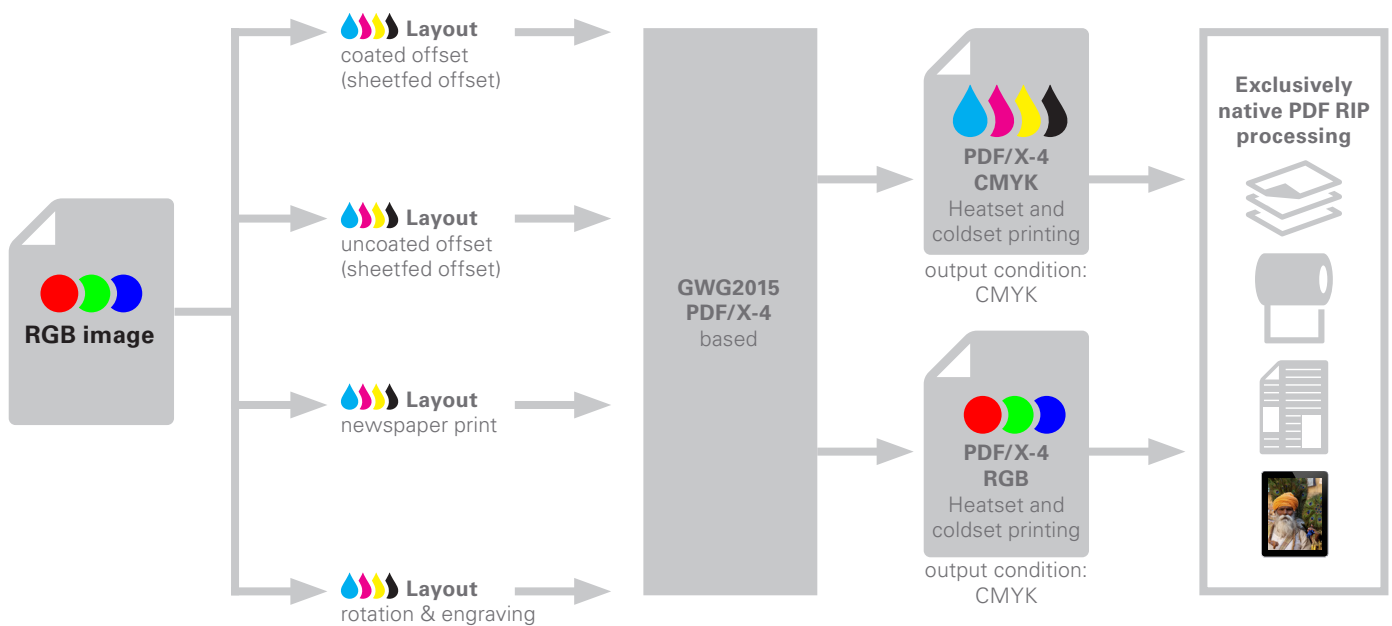
Because of the requirement to keep non-image data as CMYK, the GWG2022 specifications are not usable for a complete RGB-based workflow. The Ghent Workgroup doesn't expect this type of workflow to be realistic for some time to come and at the moment doesn't envision making full RGB specifications.

As always, the Ghent Workgroup wants to support the changing print and publishing landscape and its novel technologies in a way that pushes the envelope, yet can reliably be implemented by typical workflows.

## YESTERDAY



## TOMORROW



# PDF and PDF/X

Through the development of the Acrobat software family and the associated PDF file format, Adobe created a successful and universal, platform-independent, mechanism for viewing and printing documents virtually anywhere.

The increasing capabilities of newer PDF versions, helped by the explosive growth of the Internet, has made PDF the defacto standard for the electronic exchange of documents. The free Adobe Reader software and a growing number of alternative PDF viewing and manipulation software products have spread all across the world; they contribute significantly to how we efficiently create, share and print digital content.

While originally designed with office use in mind, PDF has increasingly been used in graphic arts to replace the exchange of native documents and PostScript. Most graphic arts workflows today either rely exclusively on PDF or strongly advocate its use over other file formats for the exchange of print-ready documents.

## ISO PDF/X standards for graphic arts

PDF by design is a very open file format, allowing for example the inclusion of audio and video content. While this is essential for the use of PDF in digital media applications, it can wreak havoc when used in workflows designed to output high-quality print content. In such workflows, PDF documents should only contain elements that can be printed reliably.

The ISO standards organization developed the ISO 15930 standard (also known as “PDF/X”) to increase the predictability and reliability of PDF in print workflows. The different versions of this ISO PDF/X standard define the requirements and restrictions for specific graphic arts workflows.

Two of these PDF/X versions are commonly used today in graphic arts workflows:

- The older PDF/X-1a version for print workflows that cannot handle PDF files with live transparency.
- The more modern PDF/X-4 version for print workflows that support live transparency, a broader range of (color-managed) color spaces, and other recent PDF features.

## Best of breed?

In the case of PDF/X standards, higher numbers don't mean better standards: there also is a PDF/X-6 flavor, but that has insufficient support from hardware and software solutions for it to be useful (at the present time).

It is important to use a PDF/X version that matches the requirements and capabilities of today's technology. At the moment, the Ghent Workgroup has a clear preference for the use of PDF/X-4.

## A global standard

What is important in PDF/X, is the “X”. This was derived from the full name for the ISO standard “PDF for blind eXchange”. It signifies that PDF/X documents are more reliable than native documents or plain PDF documents in any workflow involving print products where document exchange plays a role.

PDF/X documents are by their nature self-contained; all necessary elements such as fonts, images, ICC profiles... are embedded in the file itself. They also must include or define important information such as page boxes, output conditions and information on whether or not the document has been trapped. PDF/X documents are **complete** documents.

Remark that there are some PDF/X flavors that allow exceptions to this rule, but they are only used in very specific workflows and out of scope for this document.

## PDF/X-Plus

The Ghent Workgroup bases all of its work on the PDF/X standards from ISO; the GWG specifications use PDF/X as a foundation to provide common quality checks. But because the PDF/X standards have been designed for the complete graphic arts industry, they cannot go into detail for different market segments or production methods. And that is exactly what the PDF/X-Plus specifications from the Ghent Workgroup do.

### The Ghent Workgroup specifications add requirements for:

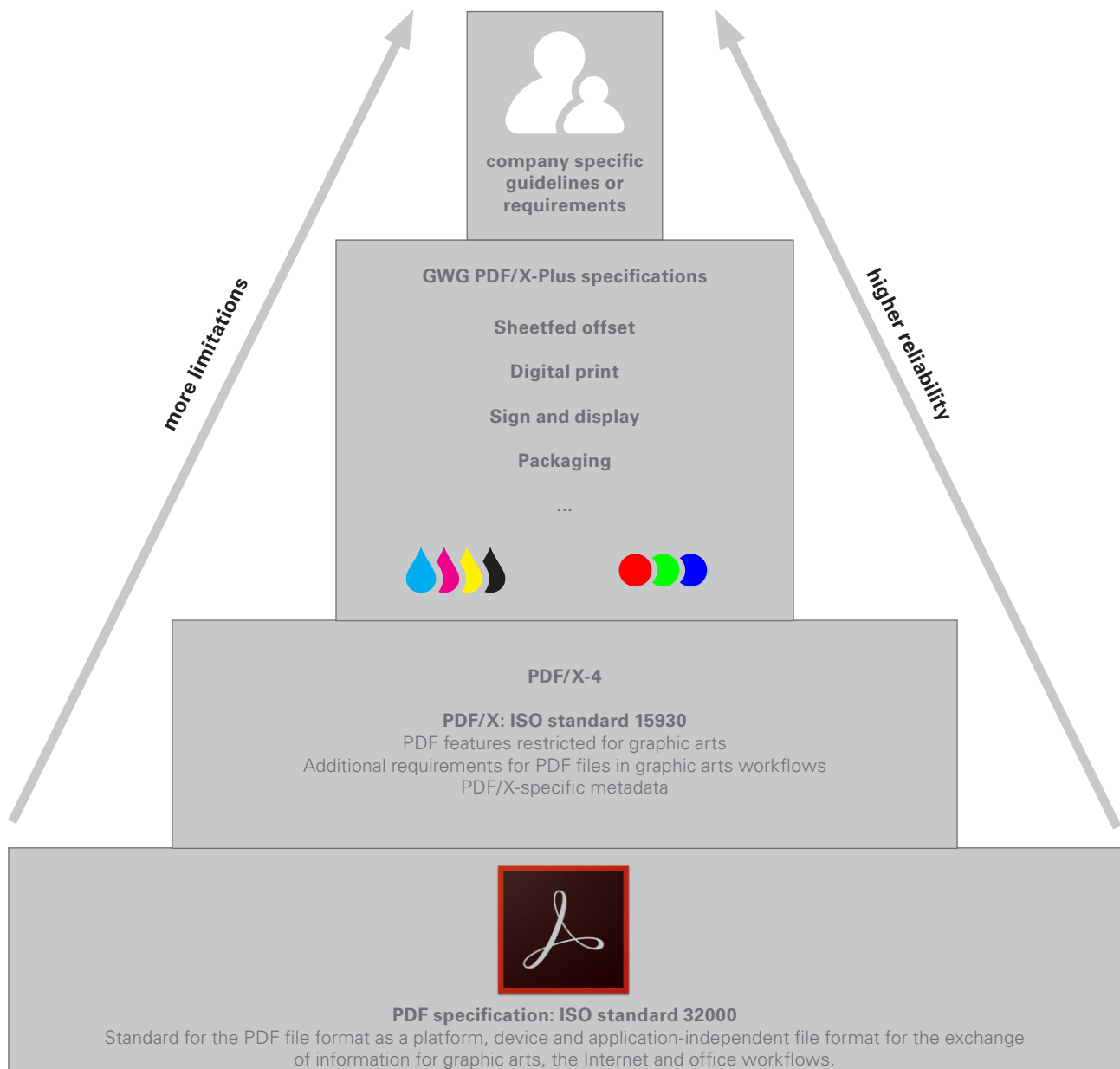
- Minimum and maximum resolution of images
- Maximum ink usage (TAC)
- Minimal line weight and text size
- Use of overprint and knockout for specific elements
- Usage of spot colors
- And more

In summary: PDF/X was developed for the entire graphic arts industry. The Ghent Workgroup specifications are more precise guidelines for individual segments of that industry.

The illustration on the next page shows the concept behind PDF and the various standards and specifications adding limitations and “best-use” requirements on top of PDF. The higher in the pyramid, the more reliable a document will be for a particular usage.

# PDF limitations

necessary for prepress data creation



## PDF/X-4:2008 vs. 2010

When ISO releases part of the PDF/X standard, they get a different number (PDF/X-1a, PDF/X-3, PDF/X-4...). Different parts are typically created as technology evolves and the standard has to be adjusted to take that into account or to support different use cases.

Each part of the standard also receives a publication date number, such as PDF/X-4:2008. That publication date number is the year in which the PDF/X part has been officially published. In case of PDF/X-4 the publication year originally was 2008.

Sometimes parts of a standard need to be clarified or corrected. In that case, it's possible that a "correction" publication takes place. For PDF/X-4 that happened in 2010, when the definition of optional content was improved and a number of ambiguities were removed from the text. That revision was published as PDF/X-4:2010.

There is only one valid PDF/X-4 standard, and it's called PDF/X-4:2010.

# Which Ghent Workgroup specification to use?

## **The problem with standards is always that there are too many... so which Ghent Workgroup specification should you use?**

The Ghent Workgroup actively supported two specifications for a very long time: one based on the older PDF/X-1a standard for workflows that had problems handling live transparency, and one based on the newer PDF/X-4. If you read the previous version of this document, this is explained in quite a bit of detail.

The situation today is much simpler. The Ghent Workgroup today supports only the GWG 2022 specification that is built on the PDF/X-4 standard.

### **Why this change?**

Ten years ago, problems with software that was incapable of handling PDF files with live transparency, were quite common. In that situation, the lesser evil often was to use transparency flattening - a process where page elements using transparency are replaced with different page elements that visually look the same, but no longer require transparency to be used.

If the output device cannot properly handle live transparency, this solution of using transparency flattening was the only proper one. The Ghent Workgroup as a result supported two different specification versions, depending on the capabilities of workflows.

Today, support for live transparency is almost 100%. Now it is transparency flattening that is the biggest risk, and as such the Ghent Workgroup only support GWG2022, which supports live transparency because it is based on PDF/X-4.

### **CMYK or CMYK+RGB**

Note that you still have a choice to make. The GWG2022 specification come in a flavor that only allows CMYK images, and in a flavor that is more liberal and also allows (color-managed) RGB.

Both can be valid choices for your business. You have to make a strategic decision on which of the two you are going to use within your workflows.

### **Will this work in my business?**

This is a very important question to ask before doing any type of standardization; whether it be on a file format or a different business process. Luckily, there are tools that can help you answer this question.

The most important tool the Ghent Workgroup has available to test your workflow is the Ghent PDF Output Suite.

### **Ghent PDF Output Suite**

The Ghent PDF Output Suite consists of a collection of PDF patches (small test files). These patches can be output in a workflow either individually or combined into print sheets.

Each patch is designed to test a specification 'feature' of PDF. The patches allow you to answer questions such as:

- Are all types of fonts supported?
- Does overprint properly work for all types of objects and color spaces?
- Are all type of live transparency rendered correctly?

The patches have been designed for easy interpretation; if they print with large "X" characters on them, something went wrong. If there are no "X" characters, or there are check marks, the patch is completely supported.

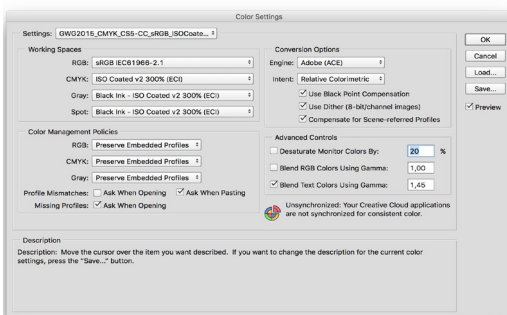
The Ghent PDF Output Suite, as everything developed by the Ghent Workgroup, is available completely free. Visit the Ghent Workgroup web site at: <https://gwg.org/gos5/> to download it.



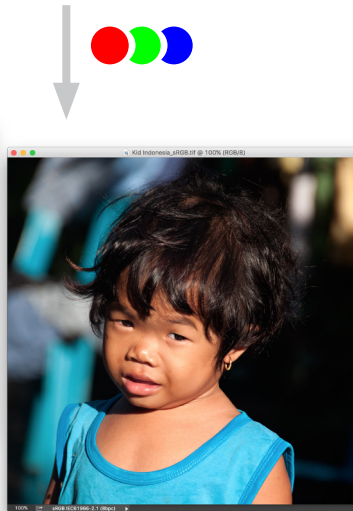
# Process-specific (classic) image editing

## Edit

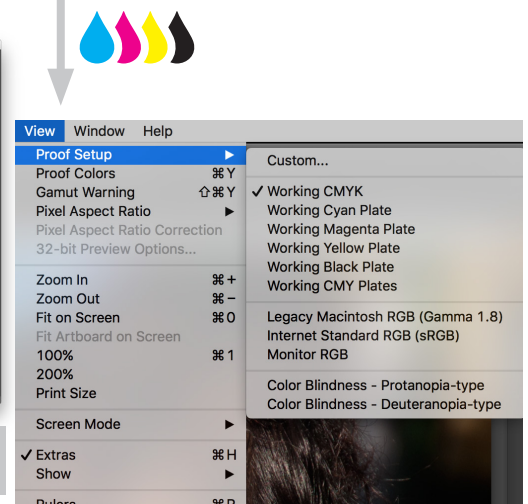
**1** First of all, the color management policies are determined. The GWG developed Photoshop color settings; those .csf settings can be downloaded from [www.gwg.org](http://www.gwg.org). These settings can be used to synchronize the color settings of all Adobe CS / CC applications through Adobe Bridge.



**2** Prepare images for a particular print condition, by editing them in RGB on a calibrated and profiled monitor.



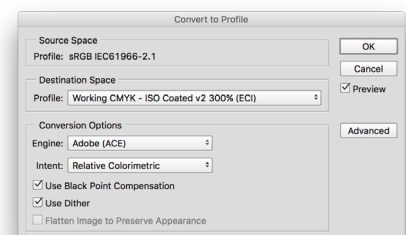
**3** To avoid problems during conversion to CMYK, you can visualize the final result by using the proof preview from Photoshop. Go to **View -> Proof Setup -> Custom**. Configure the CMYK working space for the selected print condition or choose "Custom" for a different proof preview.



You are advised to adapt the working space ICC profiles and rendering intent to your specific needs. Do not modify the other settings.

## Convert

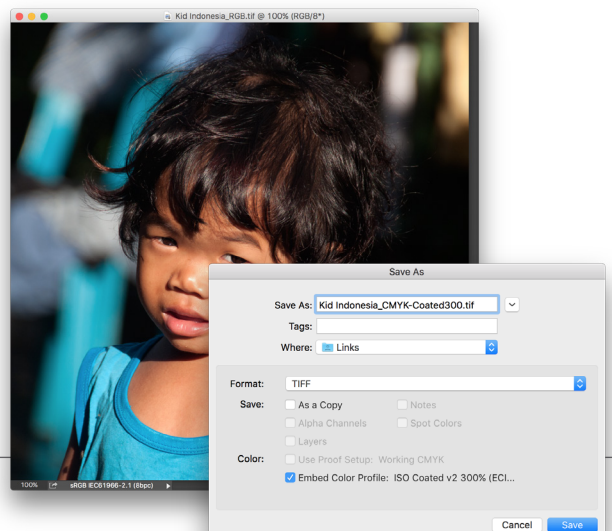
**4** After image retouching, the conversion to CMYK takes place. Preferably use **Edit -> Convert to Profile**, to have access to all relevant options. Though the suggested ICC profiles often give good quality results, you can also choose different ICC profiles (representing the same print condition).



## Save

**5** Save the final CMYK image as one of the predominant image file formats (TIFF, PSD or JPG). Make sure that the ICC profiles used are embedded in the file during save.

While preparing images, a separate CMYK image must be saved for each print condition. It is also recommended to save the original RGB image as a master to create additional separations. If the same image must be prepared for multiple output workflows, this will result in the creation of multiple different image files and will increase the risk of errors. **A more flexible approach is to perform an RGB to CMYK export from the design application.**



# Media-neutral image editing

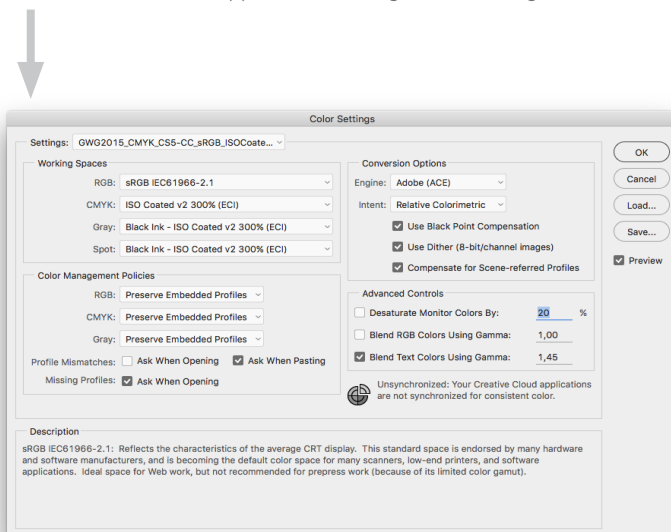
The Ghent Workgroup recommends relative colorimetric color conversion using black point compensation (bpc) for all workflows, except for newspaper-print workflows based on ISO-news-paper26v4. For these workflows, perceptual conversion without blackpoint compensation is advised.



## Color Management

**1** First of all, the color management policies are determined. The GWG developed Photoshop color settings; those .csf settings can be downloaded from [www.gwg.org](http://www.gwg.org).

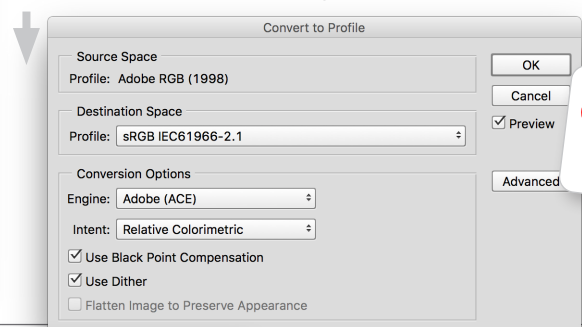
These settings can be used to synchronize the color settings of all Adobe CS / CC applications through Adobe Bridge.



**2** In most cases, it is advised to convert the RGB color space of the image to a specific RGB color space; the GWG recommends:

- If **no profile** is attached to a RGB image, GWG recommends to use sRGB as the default profile
- If a profile is attached to a RGB image, GWG recommends to preserve this source profile
- For retouching in RGB, GWG recommends to use a profile with a wider gamut like Adobe RGB or eciRGB\_v2. In such a case it is advised to convert the RGB image to the specific RGB color space.

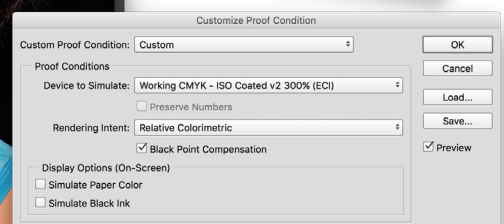
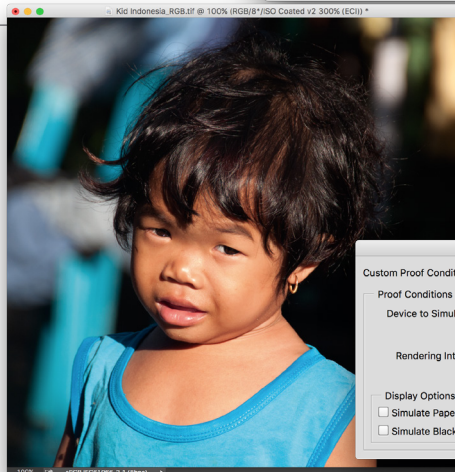
Use **Edit -> Convert to Profile** to perform the conversion.



## Edit

**3** Editing must happen on a profiled and calibrated monitor in the image's RGB color space. To simulate the result of the conversion to a specific print condition, you can use the proof preview functionality in Adobe Photoshop through **View -> Proof Setup -> Custom**.

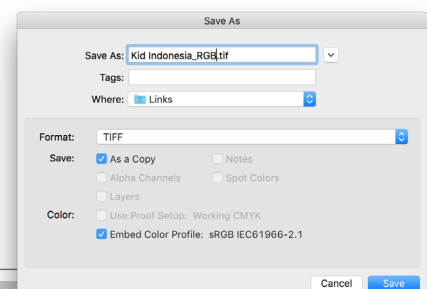
This visualises how an image will look after color conversion. The GWG recommends using the "ISO Coated v2 300% (ECI)" ICC profile for most common printed material. If you are working for newspaper or gravure, you should discuss this with your output partner.



## Save

**4** Save the final RGB image as one of the main image file formats (TIFF, PSD or JPG). Make sure that the ICC profiles used are embedded in the file during save. This master image can now be used for both print and non-print workflows.

This media-neutral form of image preparation is crucial for today's and tomorrow's publishing workflows. It allows performing the conversion to CMYK in the design application when exporting to PDF or through a color management server application further down the workflow, which increases flexibility and final color quality.



### Black point compensation

In combination with the "relative colorimetric" rendering intent, black point compensation (bpc) ensures better details in shadow areas of images. When the "perceptual" rendering intent is used, bpc usually has no effect.

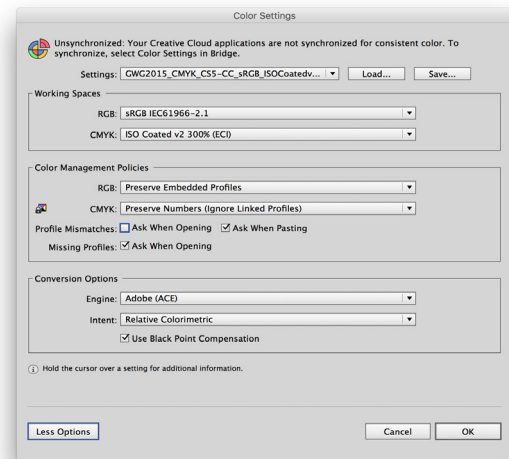
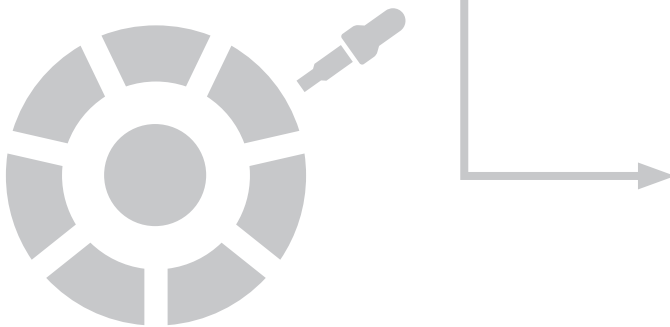
Background: black point compensation was developed by Adobe and was available originally only in the Adobe applications. It's important to realize that this method isn't standardized and small implementation differences may occur as a result.

# Process-specific (classic) preparation of vector-illustrations

1

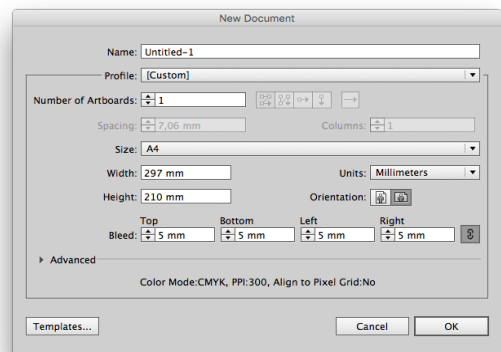
First of all, the color management policies are determined. The GWG developed color settings; those .csf settings can be downloaded from [www.gwg.org](http://www.gwg.org).

These settings can be used to synchronize the color settings of all Adobe CS / CC applications through Adobe Bridge.



2

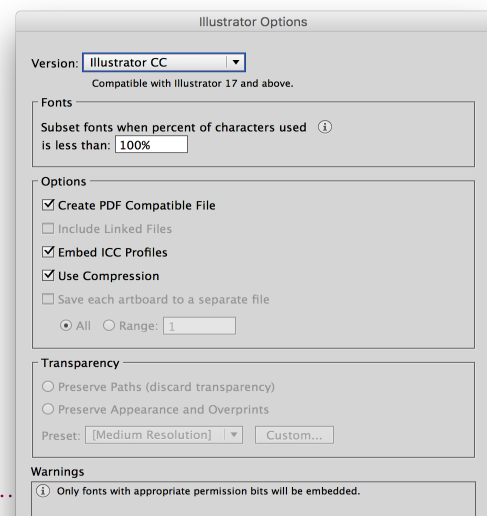
For a new document, select the correct CMYK working space.



3

Save the document as an Adobe Illustrator file (AI format). Don't use the obsolete EPS file format.

Note that in QuarkXPress 9 (or below) placing transparent objects leads to incorrect results; as such it is advised to use EPS in that case.

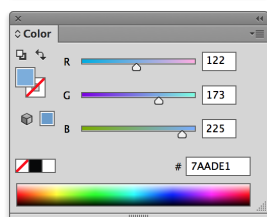
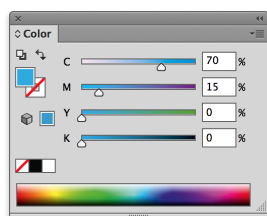


## Checking the document color mode

The actual document color mode of an Illustrator document can be checked through the File menu -> Document color mode. This must be set to "CMYK Color" to be correct.

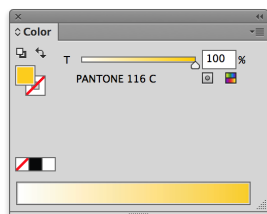


**1** Use the correct CMYK values to define colors. Using RGB values forces Illustrator to convert your colors to CMYK, potentially causing undesired color changes.



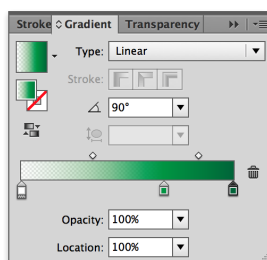
Illustrator converts this to:

|    |   |
|----|---|
| 69 | % |
| 16 | % |
| 1  | % |
| 0  | % |



Name spot colors as spot colors (not as process colors)

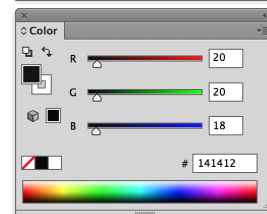
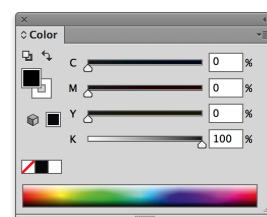
**2** Use the gradient tool in Illustrator for opaque and transparent objects. This gives better print quality.



Transparent objects and drop shadows behave correctly as long as you save your documents as Illustrator format. When using EPS documents, transparency is flattened and may lead to undesired effects.

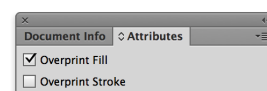
Note that in QuarkXPress 9 (or below) placing transparent objects leads to incorrect results; as such it is advised to use EPS in that case.

**3** Always define black and shades of gray as pure black ("K" only). Black or gray objects defined in RGB often lead to impure color separations.



Illustrator converts this to:

|    |   |
|----|---|
| 71 | % |
| 61 | % |
| 59 | % |
| 85 | % |



Use the proper overprint settings.

#### Overprint preview

Adobe InDesign, Illustrator and Acrobat support overprint preview. If this feature is enabled, it allows you to visualise the final printed result. Enabling overprint preview can be done in the menu through "View", then "Overprint Preview".

# Configuring layout applications

## New documents

The fact that images can be linked with an ICC profile, is not new; what is much less known is that **layout documents can also be linked to a specific ICC profile**. Modern layout applications even require two ICC profiles for each document: one for CMYK and one for RGB. **Both profiles are used for newly created documents**. What does this imply for CMYK-based print workflows?

- The RGB profile is used for all RGB objects placed without associated ICC profile (source RGB). In theory **this should never be the case for files created by professionals**. In those cases where images, coming from non-professional sources, don't have an associated RGB profile, **using the sRGB profile is the best solution**.
- The screenshots on this and the following page define the color settings that should be used in InDesign and QuarkXPress. These settings assume that all placed CMYK elements have been prepared for the selected print condition **before they were placed**. If such placed elements contain a different CMYK ICC profile, that ICC profile will be ignored. As such, it is extremely important to make sure all placed CMYK elements (images as well as vector illustrations) are prepared for the selected print condition before they are placed; if not, **undesired CMYK to CMYK color conversions will take place**.

The GWG offers the necessary color settings for InDesign and the other Adobe applications. You can download these .csf files from the [www.gwg.org](http://www.gwg.org) website. Those files can also be used to synchronize your color settings for all CS / CC applications by using Adobe Bridge. These color settings implement all basic guidelines you should follow when creating new documents.

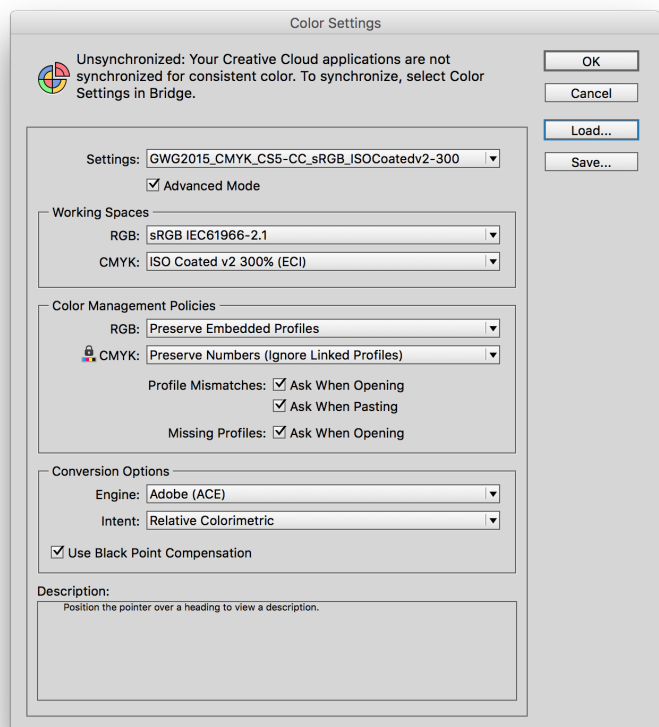
**GWG export settings for InDesign honor the CMYK document profile. This allows creating one generic export setting, as the PDF export will use the CMYK document profile as the output intent profile for the PDF. In other words, it is the CMYK document profile that determines the print condition for the created PDF document. All RGB elements are converted to CMYK using the CMYK document profile during PDF creation.**

The interaction between the color settings of the document and the PDF export settings, highlights the importance of a considered color management strategy.

**Attention:** In QuarkXPress there is no link between the document and the PDF export settings. This makes it crucial to select PDF export settings matching the document and the CMYK elements in the document.



**InDesign  
(CS6 and higher)**

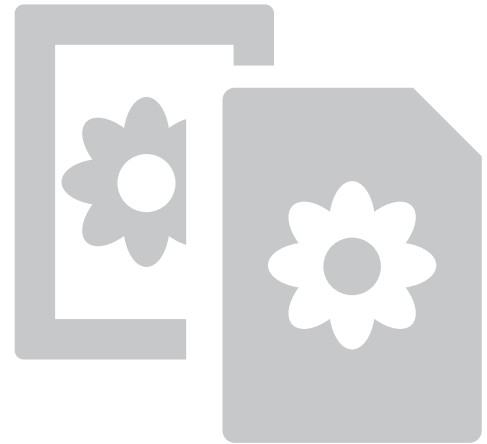


### PDF/X output intent

All PDF/X files contain an "output intent". This output intent defines for which print condition the elements within the document have been prepared. The correct output intent must be selected when creating a PDF document.



**QuarkXPress**  
(version 10 and up)



Edit Source Setup

Name:

RGB CMYK LAB Gray Named Colors Inks

Solid Colors

Profile:

Rendering Intent:

Pictures

Profile:

Rendering Intent:

☐ Color Manage RGB Sources to RGB Destinations

Cancel OK

Edit Source Setup

Name:

RGB CMYK LAB Gray Named Colors Inks

Solid Colors

Profile:

Rendering Intent:

Pictures

Profile:

Rendering Intent:

☐ Color Manage CMYK Sources to CMYK Destinations

Cancel OK

The GWG offers basic color settings for QuarkXPress; these can be downloaded from [www.gwg.org](http://www.gwg.org). The settings must be loaded through a “base document”, after which they can be assigned using the “Source Setup” dialog window. More details about the procedure to follow can be found on the GWG website.

These color settings should be used for all new documents (and will provide correct behavior for both RGB and CMYK elements in those documents).

# Configuring layout applications

## Existing documents

Assuming the GWG color settings have been correctly applied, they will provide correct color setup for all newly-created documents.

For existing documents, not created using these GWG color settings, other base rules can be in effect. Those might cause the ICC profiles associated with placed elements to be used. To avoid this and obtain the same effect as when the GWG color settings would have been used, a manual correction is required.



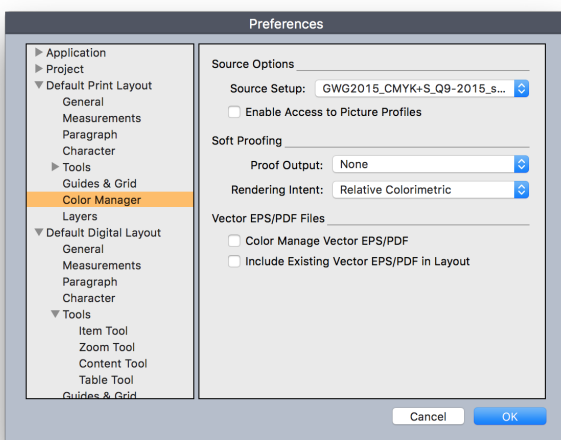
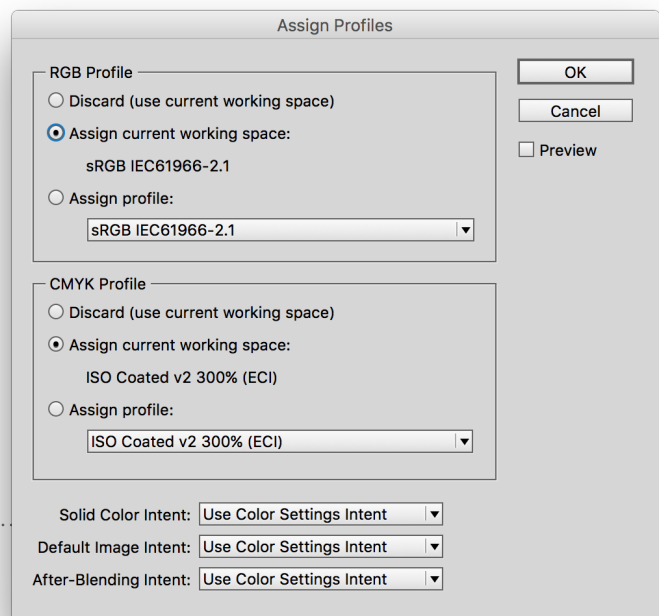
### Preferred color adjustment methods



#### InDesign (CS6 and higher)

Open the existing document, and go to “Edit” -> “Assign Profiles...”. Change the RGB and CMYK color spaces to the suggested GWG color spaces. Doing so, will update the document color settings. Next, check whether the ICC profiles associated with placed elements (both RGB and CMYK) are consistent with the newly set document color spaces.

This step is important when using InDesign **as the PDF export uses the document color spaces and the ICC profiles associated with placed elements**. Because of this, all color space must be consistent with the intended print condition.



#### QuarkXPress version 10 and up

In QuarkXPress, go to “Preferences” -> “Default Print Layout” -> “Color Manager” and adjust the “Source Options” to the correct GWG output style (which must be installed ahead of time).

As in InDesign, it is crucial to also correctly color manage all placed elements (both images and vector elements).

#### Checking the source profiles of an InDesign document

Use the “Edit” -> “Color Settings” menu item to check what the currently assigned document color spaces are. If you don’t want to change anything, make sure to always back out of the dialog window using the “Cancel” button.

#### Recommended color conversion methods

The GWG recommends using **relative colorimetric color conversion using blackpoint compensation** for the complete workflow. An exception is made for workflows based on ISO-newspaper26v4, where **perceptual** conversion **without** blackpoint compensation is advised.

# Live-Preflight in InDesign

The GWG also offers preflight profiles for the Live Preflight functionality in InDesign (based on the work of the VIGC). These preflight profiles enable quality control during the design phase and help make sure you construct documents correctly.

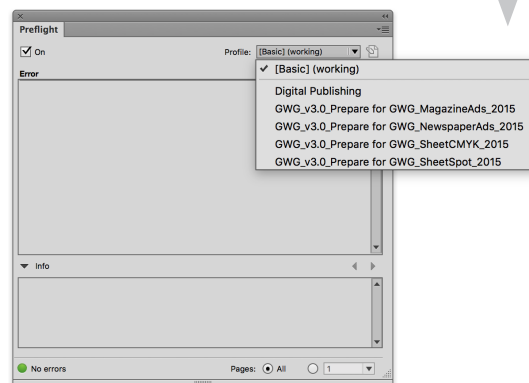
InDesign's live preflight is an interesting tool to detect many common problems while still being in the design phase; in other words, before a PDF has even been generated. The preflight tool in InDesign reports only errors; it's not possible to create preflight rules that indicate warnings. **As a result, not all problems reported by the GWG preflight profile should be interpreted as an error that will cause problems during print.** For each result, you will rather need to evaluate separately, whether this could be an issue in the rest of the workflow.

**InDesign's Live Preflight does NOT replace PDF preflight!** Don't forget also to validate your PDF documents after they have been created from InDesign. This can be done using the GWG preflight profiles in Adobe Acrobat or a similar preflight tool.

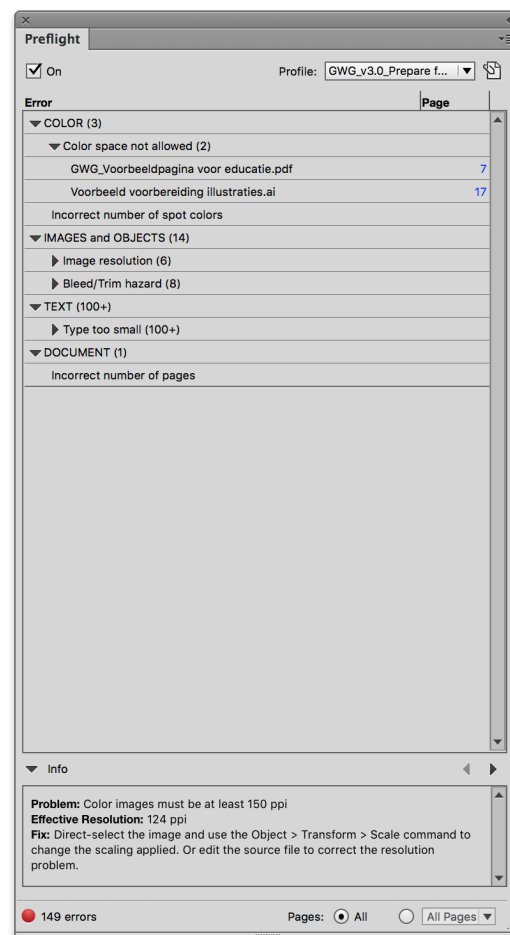
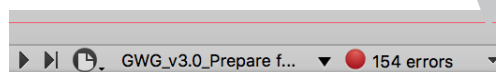
The reason you also need to preflight your PDF documents is that the PDF export process from InDesign can have a significant influence on the quality of your document. Some problems can only be detected after a PDF document has been created. **So always carefully check your PDF documents as well.**

The InDesign Live Preflight profiles can be downloaded together with installation instructions from the GWG website at [www.gwg.org](http://www.gwg.org).

Preflight results are reported in the Preflight Panel, with further explanations in the "Info" section of the panel.



The preflight results are also shown at the bottom of the document window.



You can import and activate the GWG Live Preflight profiles through the Preflight pane ("Window" -> "Output" -> "Preflight"). Double-click a result to select the corresponding element in the document.

# Design & layout

In the **layout** phase, there are two different approaches possible:

- **Process-specific (prepared for or optimised for a specific print condition):** All images must be converted to CMYK, specifically to the selected output intent. The selected print technique is key in determining which CMYK color space is used for the document and the elements placed in the document (see page 16).
- **Media-neutral (not prepared for or optimised for a specific print condition):** Images are not converted to CMYK; they are preserved in their original RGB color space as they are placed in the document. During export of the document to PDF or in a later workflow step, all content is converted to CMYK.

In both cases, all other printed elements are laid out in CMYK (and for some workflows possibly using spot colors). Always use CMYK values that correspond for or are optimised for the intended print technique or output intent. In case of doubt, it's advised to create a soft- or hard-copy proof.

Workflows where all elements (text, vector and images) are media-neutral (RGB), are considered too risky and impractical at the moment. Regardless of the method you select for images, the layout document itself will always be print or medium specific.

The example layout on the next page, illustrates both methods mentioned above.



## What are the optimal values?

Whether or not particular CMYK values are suitable for a specific print technique, mainly depends on the colorimetric and technical properties of that print technique. Typical examples of such properties include registration accuracy, gamut values, minimal printable line widths, smallest reproducible tone values, raster frequency and maximum ink coverage.

If the CMYK values used are suitable for all relevant properties, we can define such CMYK values as optimal for the specific print process. Important recommendations:

- Only use black (K) for black text.
- Avoid tone values under 10%. Lower values lead to less stable print behavior and thus less consistent color.
- Apply UCR or GCR to optimise black generation. Replacing CMY by black results in more neutral colors and more consistency throughout the complete print run. Example: CMYK= 0/0/0/50 instead of CMYK= 45/36/36/0).

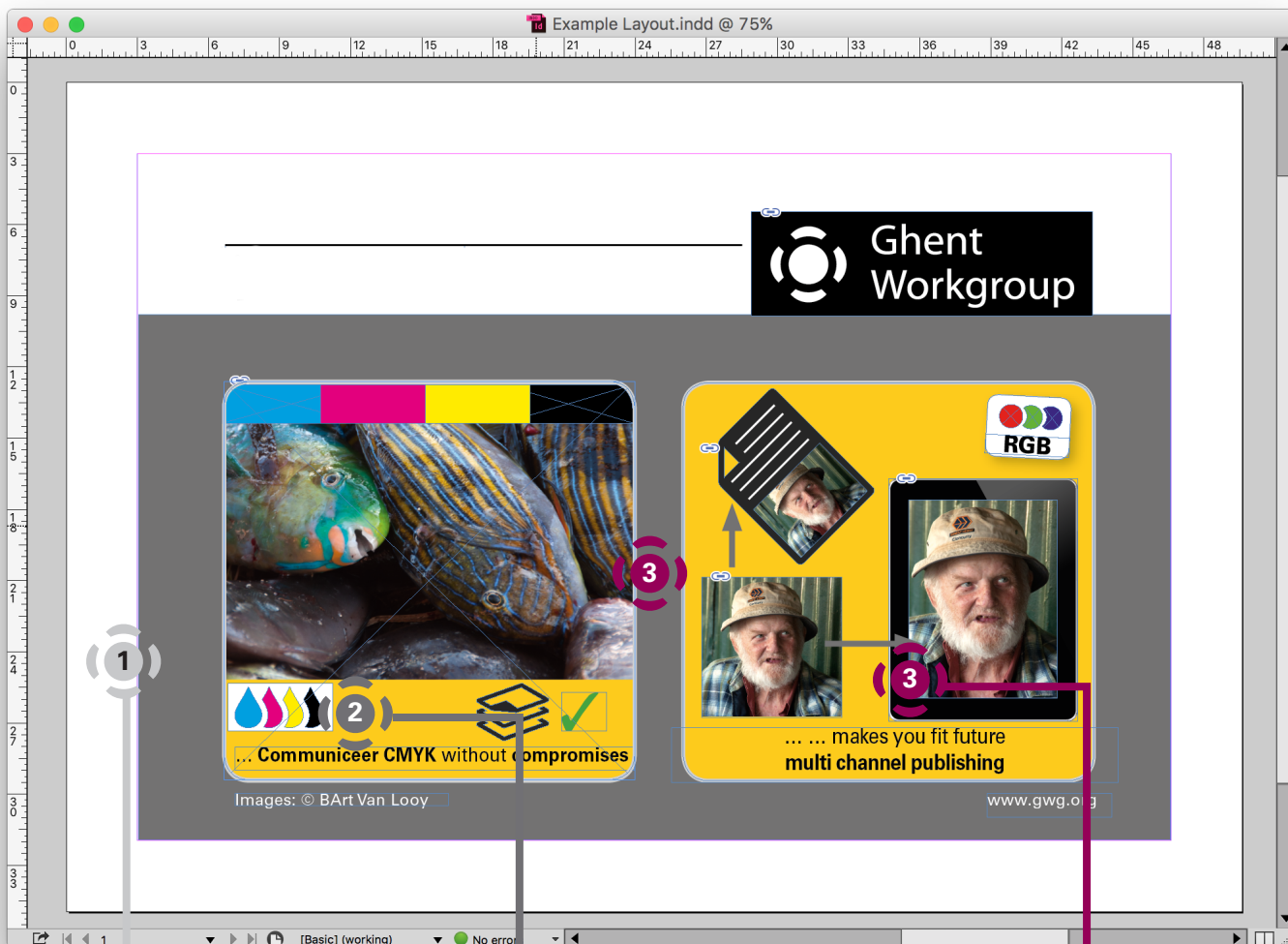
## Problems with Pantone colors in Adobe CS6 and CC

Starting with Creative Suite 6, Adobe includes the PANTONE+ color libraries in their applications. These color libraries define spot colors using LAB rather than CMYK. This improves the color reproduction of these spot colors on screen, but when converted to CMYK these new libraries can lead to significant color changes as compared to the older color libraries.

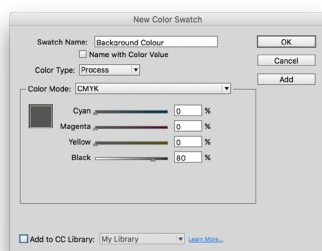
Instructions to (re)install the old PANTONE color libraries in Adobe InDesign and Illustrator CS6 and CC can be found on the PDF/X Ready website:

<http://www.pdf-x-ready.ch/index.php?show=538> (German)

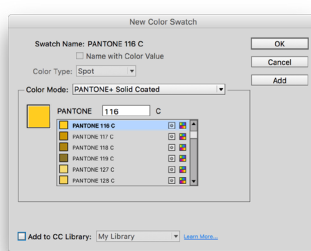




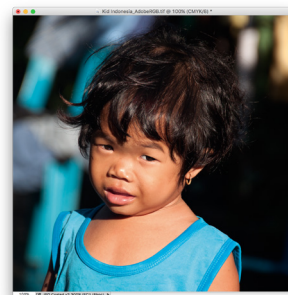
- (1) Use optimal CMYK values** (including for black and gray) for all (vector) illustrations. Don't use RGB values, especially not for elements that have to be printed in pure black. Conversion from RGB to CMYK leads to unpredictable and often unsuitable color values!



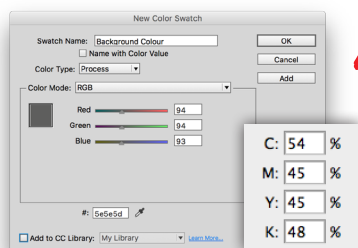
- (2) Define spot colors as a true spot color** in the layout application. Don't define them as process colors.



- (3) Placed images must either be:**
- **Process-specific** as described on page 14. They should then use CMYK suitable for the selected output condition.



- Or **media-neutral** by placing them as **RGB**, as described on page 15. The conversion to the correct CMYK color profile will be done during generation or processing of the PDF file.



Conversion result

Place all vector elements as CMYK (optionally with spot colors) elements as explained on page 14.

Special note for Newspaper:  
Define as CMYK (since if more than 1 spot = Error)



# Layout optimization using transparency

In those cases where it's not possible to retain live transparency, you have to work using the GWG 1v4 specifications. **The GWG recommends optimising your layout to get the best possible transparency flattening results.**

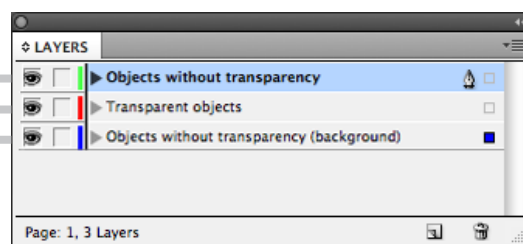
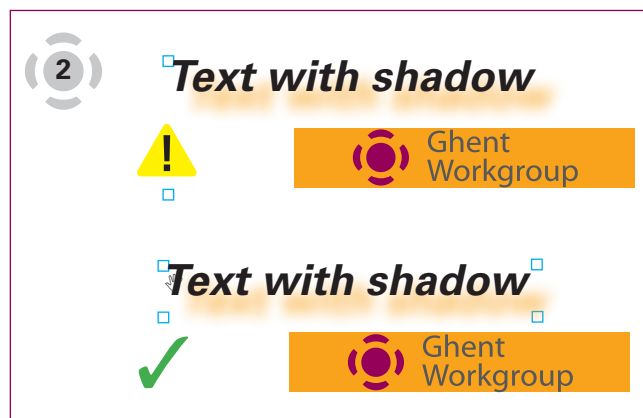
Even if you can use live transparency in your document, layout optimization is still a good idea. Regardless of whether you are using the process-specific GWG 1v4 or media-neutral GWG 2015 specifications, the quality of your PDF files will be improved, and they will become less sensitive to errors further down the workflow.

**1 Adjusting object z-order**  
The rules used to perform transparency flattening are identical for QuarkXPress and Adobe InDesign; transparencies are always resolved from the front to the background. That is why the z-order (their position in the stack of objects) of objects is so important. To avoid unnecessary transformations (eg. text or vector elements that are converted into an image), opaque (non-transparent) objects should always be placed on top of (in front of) transparent objects (see also the checkmark and text in the example below). The use of layers can be useful to separate objects and to make sure the z-order of all objects is correct.

## Dropshadow and text frames

A typical layout challenge is to have an anchored image and text with a dropshadow in a text frame. To optimise this scenario the GWG advises building a "sandwich". At the bottom of the stacking order (in the back of the document) is an empty frame that has a drop shadow applied to it. The next layer in the stacking order contains the text and the top layer in the stacking order contains the image frame with the placed image. The end result of this optimization is identical to the non-optimised scenario, but when transparency flattening is now applied, the text is not converted to outlines or rastered into an image and you end with a higher quality PDF file.

**2 Avoid overlapping frames**  
In many cases, the transparency flattening process isn't triggered by the content itself, but by the frame containing that content (whether it's text, an image or an illustration). As soon as a frame overlaps a transparent object, it's possible that the object is flattened, even if the content itself does not overlap anything else. To avoid this, avoid overlapping frames as much as possible and make frames as small as possible (in other words, the size of its content).



By combining both techniques - adjusting the object stacking order and avoiding overlapping frames - it's possible to avoid lots of problems.

**3 Transparency and color management**  
With the use of live transparency, you introduce an extra complexity level regarding color management: **different objects using different color spaces can also have a range of transparency effects applied. Of course, the goal is to have a predictable result.** A typical example is having an RGB image that overlaps with a CMYK drop shadow. What happens with the parts of those two objects that overlap? Will the result be RGB or CMYK?

That decision is controlled by the "transparency blend space". In InDesign the selected transparency blend space influences the whole page; in QuarkXPress, it only has an effect on those objects that are part of that particular transparency group.

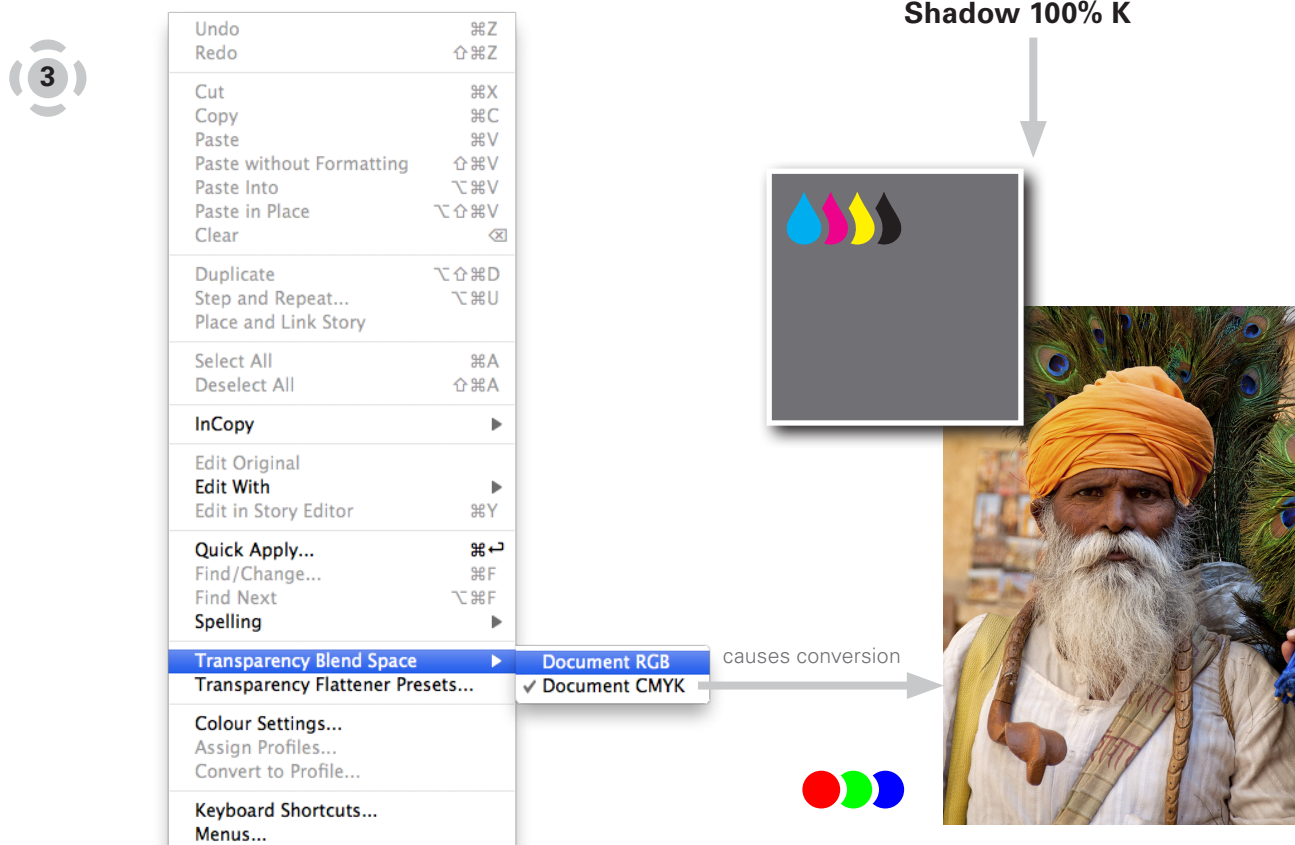
In InDesign, you can set the transparency blend space by using the menu item "Edit" -> "Transparency Blend Space". You can then select either "Document RGB" or "Document CMYK". **The GWG recommends using the latter.**

In QuarkXPress, the transparency blend space is determined by the PDF output style. **The GWG settings for QuarkXPress always use CMYK as transparency blend space.**

Even if you don't use transparency flattening, and you export to a PDF version 1.4 or higher (that supports live transparency), setting the transparency blend space correctly is still important as the document may go through transparency flattening or color conversion later in the workflow.

### Spot colors and transparency

**Spot colors may only be used if they will also effectively be printed as separate inks.** Converting spot color to CMYK once the PDF has been transparency flattened is difficult to impossible; the correct color must already have been selected in the layout phase of the workflow. **When using PDF files with live transparency, converting spot colors in a later stage of the workflow remains possible;** another advantage of keeping transparency live if possible.



# Color management

## Early, Intermediate & Late Binding

The term “Binding” refers to when in the workflow color conversion (from RGB to CMYK for example) towards the wanted print condition takes place.

Although the term “Binding” is a widely used Pre-press-term in this chapter it should be read in the context to image and layout color conversion.

**For a typical graphic arts workflow there are three possible binding stages:**

- Early
- Intermediate
- Late

The discussion that follows is limited to practices for pixel-based elements (images) because those normally are the only elements that can be placed as RGB under the GWG recommendations. As such those are the only elements that would need to be converted from RGB to CMYK.

### Early Binding

Raster images are converted to CMYK immediately after the retouch phase, for example with Adobe Photoshop. As the user, you have full control over the color conversion by selecting the ICC profile, rendering intent and black point compensation settings.

### Intermediate Binding

The images are retouched and remain media-neutral (RGB); they are placed as such in the layout application. The images are converted to CMYK when a PDF is created from the layout application (they are converted from their source RGB ICC profile to the document CMYK ICC profile). As the user, you have control over the color conversion by controlling the application settings, document color settings and PDF export settings and you are able to examine the final PDF.

### Late Binding

The RGB images are placed in the layout application and remain RGB even as the PDF is created. To ensure proper color, all images are tagged (they are associated with individual source ICC profiles). The final conversion for print is done by the workflow system. As the user, you have little control over the actual conversion because it is influenced only by the settings of the output system.

### Process-specific data exchange

The GWG 1v4 and GWG2015 specifications are developed for process-specific exchange of print-ready documents. Documents are always prepared for a specific output condition (with a specific CMYK output intent).

**All vector or text elements in the PDF are specified as CMYK, grayscale or spot color. RGB images are either converted to CMYK when a PDF is created from the layout**

**application (intermediate binding) or are converted only later by the workflow or output system (late binding).**

Converting images at the beginning of the workflow (early binding) is a more conventional and conservative way of working. It offers full control over the separation to CMYK, but it requires separate images for individual print conditions.

**When converting images to CMYK, keep following recommendations into account:**

- Use relative or colorimetric rendering intent
- Use black point compensation
- Include the ICC source profile (the RGB profile)
- Select the correct source profile (and output intent)

**The GWG recommends the use of intermediate binding.** Intermediate binding enables the use of a single RGB image as master file. This helps to reduce errors, specifically errors related to the conversion from RGB to CMYK for specific print conditions.



**Early binding must be used if:**

- Image corrections on the CMYK image are required
- The conversion needs to be done using specific settings
- A source profile is used that creates a specific black or reflects the same underlying print conditions (generic separation). This is typically the case with documents coming from Microsoft applications or for textile reproductions.

When using intermediate binding, it's important to make sure the correct color settings, document profiles (output intent), and export settings or styles are used at all times.

Intermediate binding has the advantage that RGB images are automatically converted to the correct print condition as that is controlled by the layout document settings. It's not necessary to keep multiple versions or copies of images for different output conditions. Using intermediate binding makes it easy to change the output intent of the PDF export whenever that is necessary. Just keep in mind that vector elements and text will be prepared for a specific print condition.



## Attention!

If you select the "late binding" method, you should make proper arrangements with the receiver (printer).

### Early Binding

### Intermediate Binding

### Late Binding

#### Photoshop – Image editing in



Photoshop  
Conversion to CMYK



Photoshop  
Keep RGB



Photoshop  
Keep RGB

#### Layout – Document design



Images – CMYK  
Layout – CMYK  
Vector-illustrations – CMYK  
**PDF-Export – 1:1**



Images – RGB  
Layout – CMYK  
Vector-illustrations – CMYK  
**PDF-Export  
Conversion to CMYK**



Images – RGB  
Layout – CMYK  
Vector-illustrations – CMYK  
**PDF-Export – 1:1**

#### PDF/X-Document



Images – CMYK  
Layout – CMYK

**PDF-Output**



Images – CMYK  
Layout – CMYK

**PDF-Output**



Images – RGB  
Layout – CMYK

**PDF-Output  
Conversion to CMYK**



# PDF/X creation

Many different settings influence how a PDF/X file will be created. The recommended settings constitute a compromise between getting the highest possible quality and obtaining maximum predictability. The following pages define basic terminology and provide guidelines to create high-quality PDF/X from both QuarkXPress and Adobe InDesign. They also contain helpful explanations about the consequences of the recommended settings.



## Marks and Bleed

All printer marks, such as registration and bleed marks, are used only for visualisation purposes. Modern tools use the page boxes defined in the PDF file to obtain correct dimensions for the document. The trim box, for example, defines the desired dimensions of the document after cutting.



## Compression

### a. Downsampling

Downsampling determines the effective resolution to which images are recalculated. That effective resolution is determined both by the intrinsic resolution of the image and how that image is used in the design. For example, a 600 ppi resolution that is scaled down to 50% has an effective resolution of 1200 dpi. Downsampling is triggered by a downsampling limit; all images above that limit are downsampled. **Not using downsampling would result in big PDF files as images would then retain an unnecessarily high resolution.**

The GWG recommends preparing images for the wanted effective resolution and the dimensions in the layout.

This will lead to images of better quality while avoiding overly big files. If that is not or not always possible, downsampling can be used. A good approximation of the intended effective resolution can be calculated as follows: resolution = screening x 2.54 x quality factor.

Depending on the required quality level, two different settings are available from the GWG:

- GWG2015\_...\_250ppi
- GWG2015\_...\_350ppi

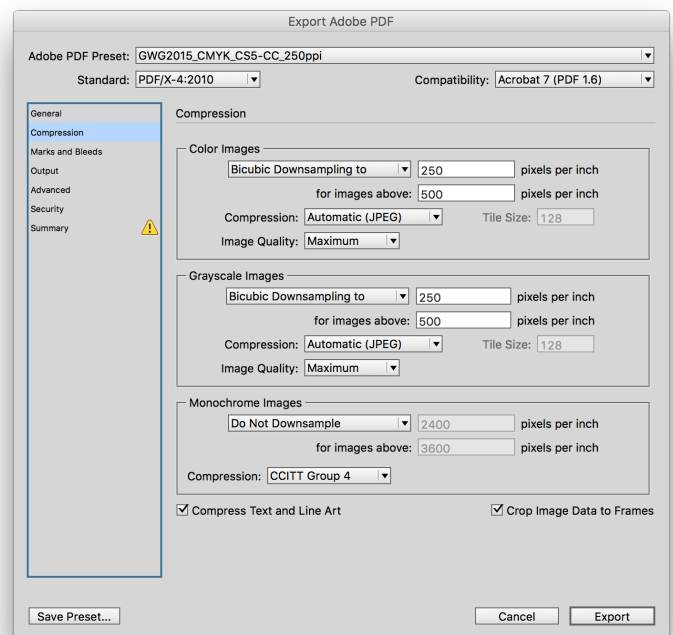
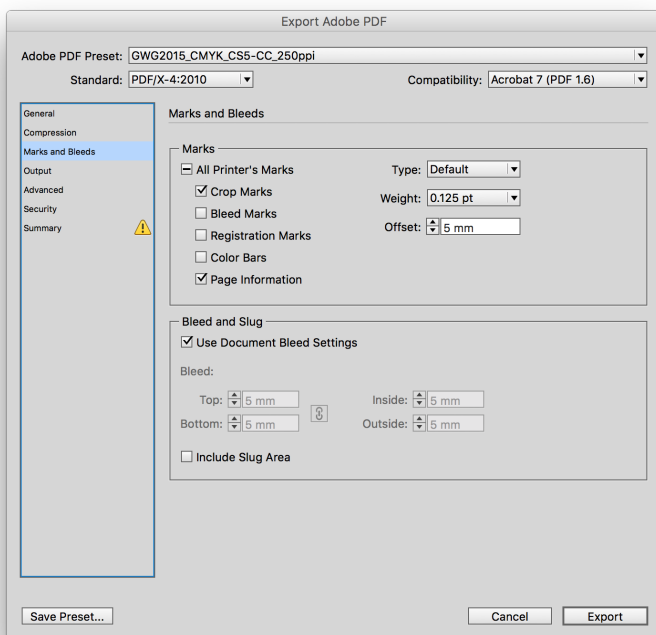
For FM screening, the resolution can be dialed in higher. As a rule of thumb, the resolution for images with high levels of contrast should be higher than the resolution for images with low contrast levels.

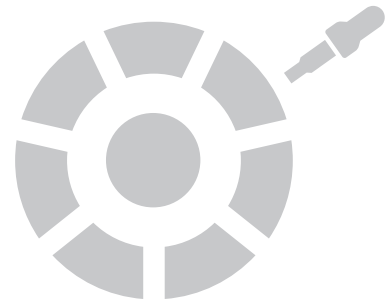
### b. Downsampling method

Different methods to apply downsampling exist. In most cases, bicubic downsampling provides the best image quality.

### c. Downsampling threshold

It makes no sense to downsample an image if it's only just over the downsampling limit (a 304 ppi image if the limit is 300 ppi for example). To stop this from happening, a downsampling threshold can be selected. Downsampling is done only for images above that threshold. When using a downsampling threshold, the GWG advises setting its value to double the downsampling limit.





In other words, if you set the downsampling limit to 300 ppi (you want images to be downsampled to 300 ppi), you should set the downsampling threshold to 600 ppi. The effect is that images under 600 ppi will not be touched. This avoids problems by downsampling images too close to the downsampling limit and makes sure your document never contains images higher than 600 ppi.

#### d. Compression method

Not using compression for images while creating a PDF file results in unnecessary big files. The type of compression to use depends on both personal preferences and technical requirements. The ISO PDF/X-4 standard supports two types of lossless compression: ZIP and JPEG-2000. Additionally, it allows the more conventional JPEG compression which is always lossy to some extent.

The GWG does not recommend the use of JPEG-2000 at this time; instead, it recommends using “Automatic (JPEG)” compression with the quality level set to “maximum”. InDesign then uses a mechanism that analyzes the image contents for each image to determine the optimal compression method. Images with low contrast levels are compressed using JPEG compression while high contrast images are compressed using the lossless ZIP method.

Technical drawings or screen captures will profit from this; as they are compressed using ZIP compression, there will

be no quality loss around sharp edges in the images. If those images were compressed using the lossless JPEG method, the JPEG compression algorithm would introduce so-called “halo” effects around sharp edges, mainly found in illustrations, text and so on.



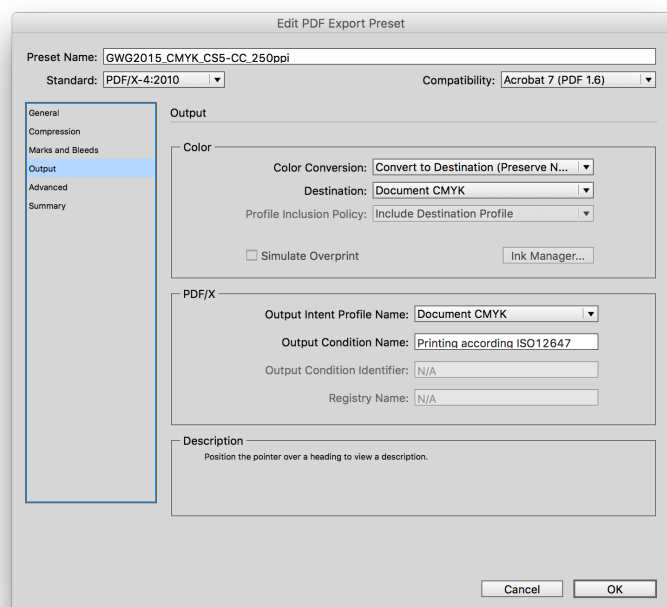
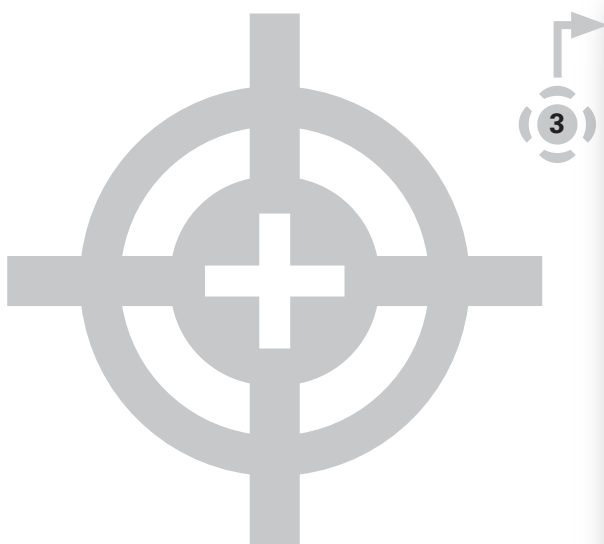
#### Color settings for PDF export

In Adobe InDesign, the GWG recommends using “Convert to Destination (preserve numbers)” with all ICC profile definitions set to

“Document CMYK”. This results in flexible PDF export settings, as InDesign uses the CMYK document profile as destination profile. All RGB images will automatically be converted to that same destination profile during output. QuarkXPress uses the document profile if the output intent is not possible. Be careful to use the document profile while exporting the PDF file.

#### Font embedding threshold

The font embedding threshold percentage defines what percentage of characters of a particular font must be in use in a document before the font will be completely embedded. As you always want fonts to be subsetting (this means that only the used characters will be embedded), this value should be set to “100%” so all fonts are subsetting.



#### JPEG-2000

JPEG-2000 is a newer image compression technique that is supported in PDF files starting with PDF version 1.5 and higher. It usually provides better quality and higher compression rates than traditional JPEG compression. Even though that makes JPEG-2000 a superior compression technique, it also comes with challenges. Uncompressing images compressed with JPEG-2000 takes a lot more time; you can easily experience this in Adobe Acrobat or mobile PDF applications for example. And because there are also some workflow applications and RIPs that don't properly support JPEG-2000 yet, the GWG currently doesn't recommend it.

# InDesign

## Export as PDF/X-4 CMYK



When using the classic PDF/X-4 CMYK export method, all ICC-based color spaces, as well as CIELAB and RGB are not allowed. **The only supported color spaces are CMYK, gray and spot colors.** That is why all RGB elements have to be converted to CMYK, either in the retouch phase (in Photoshop for example) or while making the PDF from the layout application. If CMYK elements in the InDesign document are tagged with CMYK ICC profiles, those profiles are ignored; all CMYK elements must be prepared (separated) using the CMYK document profile before they are placed in the layout application.

This (CMYK) workflow method is very well understood and widely used. It is considered to be a safe and predictable way to prepare PDF files for print.

### PDF/X workflows

The GWG2015 specification builds on the ISO PDF/X-4 standard. At the moment, only Adobe InDesign (starting with version CS 6) and QuarkXPress (starting with version 2015) support reliable PDF/X-4 export directly from the application.

### GWG PDF export settings for Adobe InDesign

Starting with PDF version 1.4, PDF supports a number of features that are no longer compatible with Adobe PostScript (the prime example being live transparency). **Because PDF/X-4 also supports these more advanced features, it is essential that you use the direct PDF export from Adobe InDesign, rather than passing through a PostScript file that is then distilled into PDF using Adobe Acrobat Distiller.** Because of this, the GWG only delivers PDF export settings that use the direct PDF export mechanism in Adobe InDesign; Acrobat Distiller based settings are no longer supported.

The GWG2015 PDF export settings are an evolution of the GWG 1v4 PDF export settings. **They differ from those previous settings, in two important aspects:**

- They are based on the PDF standard **PDF/X-4**
- They generate PDF files compatible with **PDF version 1.6** (Adobe InDesign CS 6 or later)



Edit PDF Export Preset

Preset Name: GWG2015\_CMYK\_CS5-CC\_250ppi

Standard: PDF/X-4:2010 Compatibility: Acrobat 7 (PDF 1.6)

General  
Compression  
Marks and Bleeds  
Output  
Advanced  
Summary

Output

Color

Color Conversion: Convert to Destination (Preserve N...  
Destination: Document CMYK  
Profile Inclusion Policy: Include Destination Profile

☐ Simulate Overprint Ink Manager...

PDF/X

Output Intent Profile Name: Document CMYK  
Output Condition Name: Printing according ISO12647  
Output Condition Identifier: N/A  
Registry Name: N/A

Description

Position the pointer over a heading to view a description.

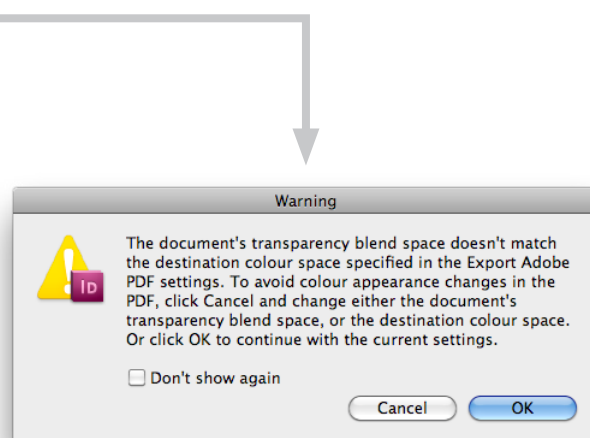
Cancel OK

The GWG CMYK 2015 PDF export settings are such that all printable elements in the document are converted to the document CMYK color space. Elements which already are CMYK, are exported without conversion (“preserve numbers”). And transparency is fully retained during export, which means the exported PDF will contain live transparency. **These PDF export settings are suitable for either early or intermediate binding workflows (see page 24).**

### Transparency blend space

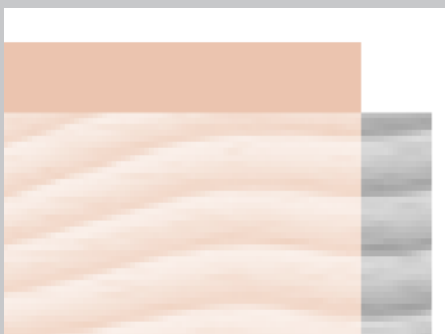
ICC-based transparency blend spaces are not allowed in GWG2015 workflows. CMYK transparency blend spaces that aren’t aligned with the document CMYK color space will be changed to that color space during PDF export. Because that change is not considered to be an explicit color conversion, such a mismatch, and the resulting change, will be announced by InDesign with a warning dialog window. (as illustrated on the right).

Changing the transparency color space, could result in a different visual appearance. As such the GWG recommends adjusting images before the PDF export process. If that is not possible, the generated PDF file (with the changed transparency blend space), can be checked using a soft-proof or hard-copy proof.

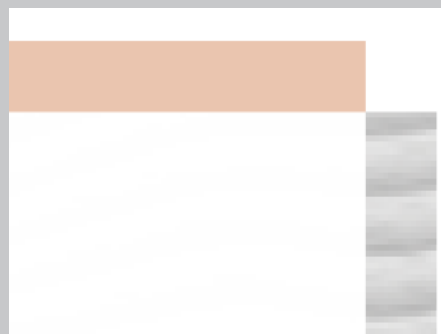


## Warning!

If you place PDF documents using RGB based transparency in InDesign, the application won’t issue a warning; InDesign will simply use the active color space. The first warning you will receive, is when exporting the layout document to PDF (at least if InDesign is set to use the document CMYK profile as transparency blend color space). Because of this, it’s important to check the transparency blend color space of PDF files you are about to place in InDesign. This can be done in Adobe Acrobat 9 or later using the “Output Preview”; by checking the “Blending Colour Space”.



Correct result using an ICC-based RGB transparency blend color space



Incorrect result from changing the transparency blend color space to CMYK

**For more information, also read the “PDF File Aggregation: What You Need to Know” white paper on how to combine multiple files; it can be downloaded on the GWG website at [www.gwg.org](http://www.gwg.org).**

# QuarkXPress

## Export as PDF/X-4 CMYK



When using the classic PDF/X-4 CMYK export method, all ICC-based color spaces, as well as CIELAB and RGB are not allowed. **The only supported color spaces are CMYK, gray and spot colors.** That is why all RGB elements have to be converted to CMYK, either in the retouch phase (in Photoshop for example) or while making the PDF from the layout application. If CMYK elements in the Quark document are tagged with CMYK ICC profiles, those profiles are ignored; all CMYK elements must be prepared (separated) using the CMYK document profile before they are placed in the layout application.

This (CMYK) workflow method is very well understood and widely used. It is considered to be a safe and predictable way to prepare PDF files for print.

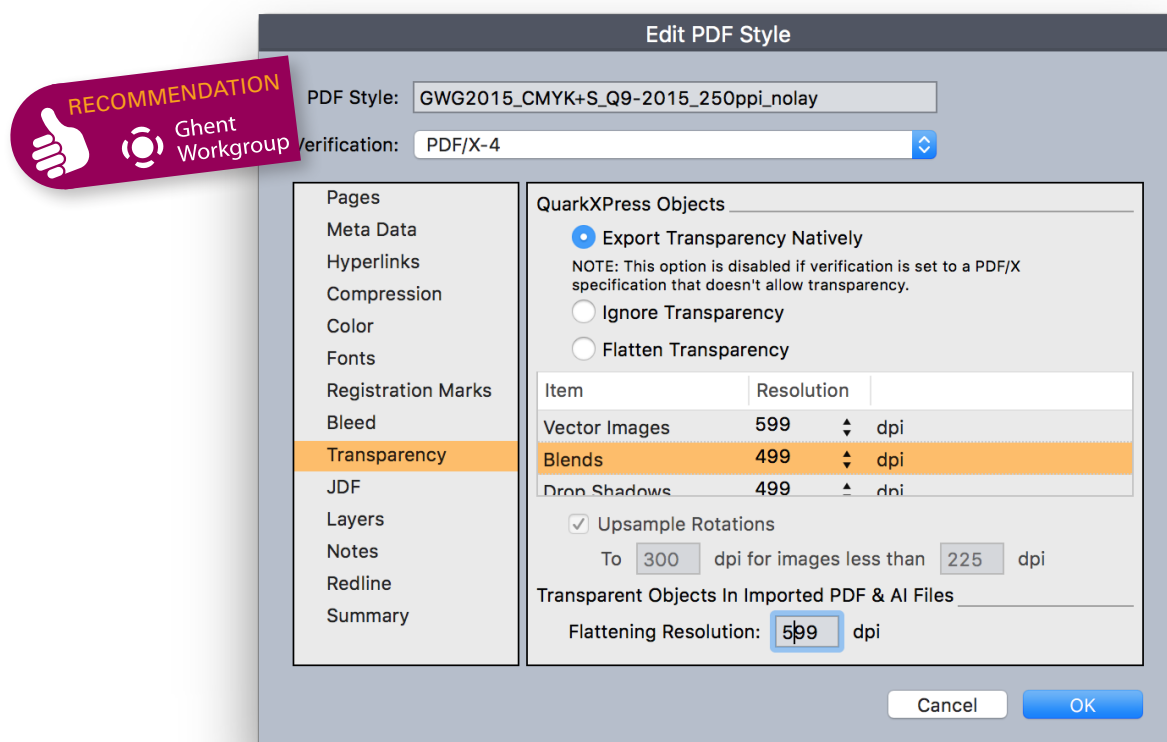
### PDF/X-workflows

The GWG2015 specification is based on the ISO PDF/X-4 standard. Starting with QuarkXPress 2015, there is a reliable export to PDF/X-4 directly from QuarkXPress. With QuarkXPress 10 you can create PDF/X-4 compliant files, however the exported PDF file will have to be further corrected. This can be done by using the fixups in Adobe Acrobat preflight or a similar preflight application.

### GWG PDF export settings for QuarkXPress

Starting with PDF version 1.4, PDF supports a number of features that are no longer compatible with Adobe PostScript (the prime example being live transparency). As QuarkXPress 9 (and below) understands only PostScript constructs and converts imported PDF files to PostScript under the hood, using QuarkXPress 9 or below is not recommended in PDF/X-4 based workflows. The main disadvantage of this export method is related to elements containing transparency that were placed in QuarkXPress. The transparency in such placed elements is flattened by QuarkXPress, which may result in undesirable output.

Using QuarkXPress 2015 and up will result in PDF files that contain live transparency, pass PDF/X-4 tests and are capable of meeting the demands of PDF/X-4 based workflows.



**The GWG has the following recommendations:**

- Use QuarkXPress 2015 or higher.
- Using QuarkXPress 2015 and up will be more straight forward, as no additional correction is needed to get valid PDF/X-4 files.
- Transparency: Select native transparency in the PDF Export settings.
- Choose PDF/X-4 certification when using QuarkXPress 2015 and up.
- **This can be done using the profiles on GWG website:**<http://www.gwg.org/application-settings/>

If you need an output intent not immediately supported by the provided profiles, it's easy to adjust an existing profile to your needs. Keep in mind that you can't change the actual color of elements using these profiles; that is why it is so important that all elements of the layout are properly prepared for the intended output condition.

The GWG2015 PDF export settings are an evolution of the GWG 1v4 PDF export settings. **They differ from those previous settings, in two important aspects:**

- **Preflight:** no standard is selected, as there is no support for PDF/X-4.
- **Transparency:** native export is selected.

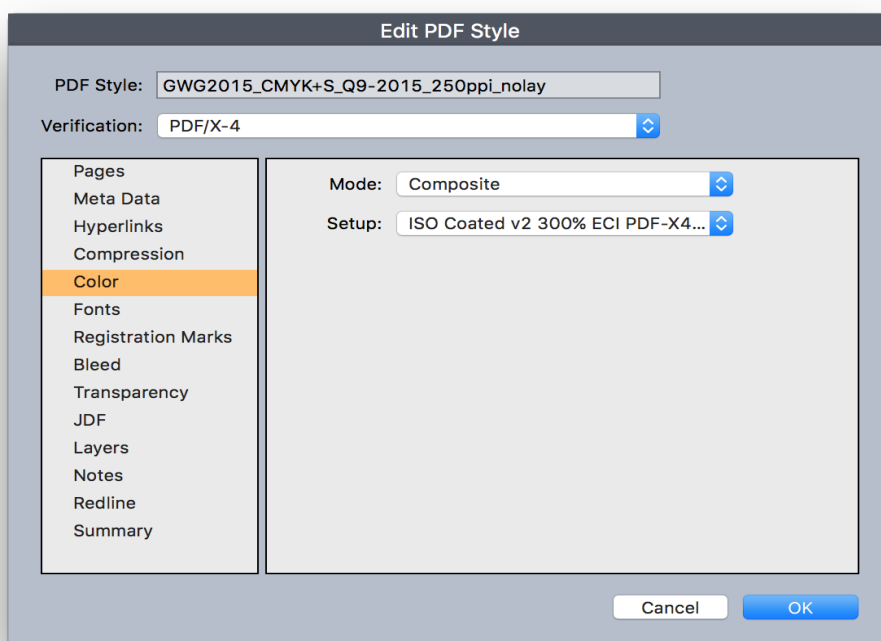
Transparency is fully retained during export, which means the exported PDF will contain live transparency. These PDF export settings are suitable for either early or intermediate binding workflows (see page 24).

**Converting the QuarkXPress 10 PDF to PDF/X-4**

Because the PDF created by QuarkXPress 10 is not a valid PDF/X-4, it has to be further optimized, or "fixed". This can be done using an Acrobat preflight "fixup" profile or by using a profile from a similarly capable preflight application.

**This can be done using the profiles on:**

- **GWG:** <http://www.gwg.org/application-settings/>



**QuarkXPress 10 only**

- If you are importing a vector EPS that contains overprint information, then the overprint information will be lost upon export. Please convert your EPS to AI or PDF before importing it into QuarkXPress 10 to address this issue. This error does not occur when you use QuarkXPress 2015 or higher.

**QuarkXPress 10 and 2015:**

- As there is no downsampling happening in the export of the GWG settings, your resulting PDF might be larger than expected. Please either downsample images before importing them into QuarkXPress or downsample the resulting PDF in the post process.
- If you are importing an 8-bit image with an indexed color space and the color index uses only one color, then please be aware that QuarkXPress will optimize this image and convert it to 1-bit. Depending on the image resolution this might result in a warning or error when checking against GWG settings, as the image resolution then is valued against the threshold of 1-bit images. To overcome this, please convert such images beforehand into 1-bit images (line arts).

# InDesign



## Export as PDF/X-4 CMYK + RGB

The GWG2015 CMYK+RGB variant is not limited to CMYK and spot colors as the classic GWG2015 CMYK variant is. **This enables media-neutral (not process-specific) color use for CIELAB and ICC-based RGB images.**



### Attention!

**To avoid incorrect CMYK separation in the final output, ICC-based gray and ICC-based CMYK images cannot be used.**

**All CMYK elements must be prepared (separated) for the intended output condition before they are placed in the layout application.**

Media-neutral color use is only allowed for images (raster images or bitmaps); it is not allowed for text and line-art. This is also the case for images that may combine raster and vector elements (as possible in Photoshop and Illustrator). The underlying reason is that the text or line-art present in such images may lead to undesired effects during the transparency flattening process.

### PDF/X workflows

The GWG2015 specification is based on the ISO PDF/X-4 standard. At the moment, only Adobe InDesign (starting with version CS 6) and QuarkXPress (starting with version 2015) support reliable PDF/X-4 export directly from the application.

### GWG PDF export settings for Adobe InDesign

Starting with PDF version 1.4, PDF supports a number of features that are no longer compatible with Adobe PostScript (the prime example being live transparency). **Because PDF/X-4 also supports these more advanced features, it is essential that you use the direct PDF export from Adobe InDesign, rather than passing through a PostScript file that is then distilled into PDF using Adobe Acrobat Distiller.** Because of this, the GWG only delivers PDF export settings that use the direct PDF export mechanism in Adobe InDesign; Acrobat Distiller based settings are no longer supported.

To export to PDF files with RGB images, the "GWG2015 CMYK+RGB" PDF export setting has to be used.

This PDF export setting for InDesign avoids unwanted color conversions; the resulting PDF file will contain RGB images tagged with the associated ICC profiles. These export settings are only suitable in late binding workflows (see page 24).

### Transparency blend space

The ISO PDF/X-4 standard allows RGB-based color spaces for all elements, including text and line-art. The GWG 2015 specifications however only allow CMYK and spot colors for text and line-art. Also, make sure that the transparency blend space is always the same as the intended output color space.

### RGB workflow

The prime advantage of an RGB workflow is that the RGB color gamut can be retained much longer before the content is finally converted to CMYK (see also: late binding on page 24). This means that the full color gamut of images can be used to address the properties of different printing techniques.

While this is advantageous for images, the same technique is currently not recommended for text and line-art, as undesired separations may be generated when those elements are converted from their RGB source color space to the output condition color space; hence, the requirement to use CMYK or spot color for these types of elements.

Every PDF/X file contains an output intent with an associated ICC profile. If an element in the PDF/X file is tagged with an ICC profile, the conversion from that profile to the output intent profile is influenced by:

- the source ICC profile the element is tagged with
- the actual pixel values of the tagged element
- the rendering intent
- the destination output ICC profile as determined by the PDF/X output intent

In other words, when discussing the color aspects of the elements in such a file, the final (possibly converted) CMYK values are what is important. These CMYK values can and should be used for any further color transformation, whether it is for proofing or to a final print condition. If an element is part of a transparency group, the calculation of the transparency effects is done using the CMYK values.

There is only one exception to this rule: in isolated transparency groups where an element of the group is labeled with an ICC-based color space, the conversion of all elements of the group will be done to that specific ICC profile.

**Because the final CMYK values for all RGB elements are explicitly defined within such a PDF/X-4 file, one might ask why this is the best way of doing things and what the advantage is.**

The best print result is obtained when color conversions are done once the final output condition (method) is known. In a PDF/X-4 file, that final output condition is defined by the output intent and its associated ICC profile. As soon as the PDF/X-4 file has been created, the output intent (and thus the 'recipe' to convert any RGB elements in the file to CMYK) is fixed. It is then still possible to change the output intent of the PDF/X-4 file later, taking the following into account:

- If a proof of the original PDF/X-4 file has been created, it will no longer be valid once the output intent ICC profile has been changed.
- Transparent elements may be recalculated to different CMYK values as the calculation of transparency effects is done using the output intent ICC profile.
- For images using ICC-based RGB or CIELAB, the output intent ICC profile is used. When changing the output intent, it is possible to get a better conversion result for that particular output condition.
- Text, line-art and any other elements already separated to CMYK in the layout document, won't match the changed output intent. They have to be color converted from the old to the new output intent.

**If there is no valid reason to keep media-neutral images in your PDF documents, the GWG recommends not doing so and creating PDF documents fully separated towards the final output condition ICC profile. But the GWG also suggests taking a look at using images in ICC-based RGB or CIELAB in your PDF documents, as in some workflows there are real advantages to doing so (see also the explanations on page 13).**

An example of a workflow where it can make sense to keep ICC-based RGB images in a PDF document is when output devices with a very large gamut are involved. Typical examples would be large-format print workflows or workflows outputting to enhanced gamut digital devices. Converting images to a standard CMYK output intent is not suitable for such workflows as it will convert the large color gamut of RGB images to a much too small color gamut of such a standard CMYK output intent. In such a workflow, it is better to discuss with your output partner whether you can deliver media-neutral images.

