CxF/X-4 and Its Use in Grand Format Printing

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Leading color consulting company with 20+ years of experience

Frequently sought for guidance and evaluation of products on the market today

Clients are small shops to recognized brands all needing help in controlling color reproduction

SGIA Color Management Bootcamp Instructor

G7 Certified Expert - Helping clients achieve the benefits in grand format printing since 2006
Markets I will NOT be addressing
Focusing on one segment - Grand Format Printers
Grand Format RIPs

ColorGATE
LFP - Production Software

EFI

CALDERA

PrintFactory™

ONYX®
Questions at the outset

(1) What the heck is CxF/X-4?
(2) Why should I care?
(3) What problems does CxF/X-4 resolve?
(4) What about Adobe products?
Questions at the outset

(1) Which software can create CxF/X-4 files?
(2) Which applications can embed CxF/X-4 data into a PDF/x file
(3) What software recognizes and use CxF/X-4 data
(4) What about verifying CxF/X-4 data to printed color?
First off, let's recognize these are ISO standards

- **CxF/X-3** - (ISO 17972-3:2017)
  - Part 3: Output target data
  - CMYK or nColor

- **CxF/X-4** - (ISO 17972-4:2018)
  - Part 4: Spot color characterisation data
  - Previous version was 2015
CxF3 is an XML based data format that includes spectral measurement data:
- ink solids, tints, and overprint tint values
- Measurement conditions, tolerances, ink formulation

Developed by GretagMacbeth, acquired by Xrite:
- Relinquished intellectual property rights of CxF which became CxF3, ISO 17972-1
ISO 17972 - Color data exchange format (CxF/X)

- Part 1 - Relationship to CxF3 (CxF/X)
- Part 2 - Scanner target data (CxF/X-2)
- Part 3 - Printer target data (CxF/X-3)
- Part 4 - Spot color characterization data (CxF/X-4)
Improved structure and definition

- CxF3 schema replaces CGATS data exchange format for spectral color information
Open and non-propietary structure to exchange spectral data among software programs

CMYK (Process), non-CMYK Color, and nColor

Typical ICC profiling charts have overprints of process colors.
  - We know how different process inks interact with each other with spectral measurements
CxF/X-4 - Spectral spot color characterization data

- Open and non-propietary structure to exchange spectral data among software programs
- Provides a structure to communicate what a tint of spot color is spectrally
- Spot color opacity
- Substrate definition
- Additional optional meta data
How we communicate Spot Colors today

- (Process) CMYK or LAB
  - LAB is preferred, but limiting
- Typically a single 100% tint IS the definition of the color
  - No defintion of what a tint other than 100% should look like
So What?

![Color Libraries](image1)

Options include:

- Pantone 141 C
- Pantone 142 C
- Pantone 143 C
- Pantone 144 C
- Pantone 145 C
- Pantone 146 C
- Pantone 147 C

The selected color is Pantone 143 C, with the values L: 76, a: 18, b: 69.

![Color Selection](image2)

The selected color is Pantone 143 C, with a transparency of 35%.
So What?
No way of really knowing

- Adobe has their own way of displaying tints but it's not based on any standard, instead an accepted predictive model.
- Each RIP has their own way of interpreting what a tint of a solid should look like.
- No clear definition of what tint should look like accept for 100% coverage.
No way of really knowing

- As you move away from 100% coverage the substrate color affects the colorimetry
  - A 35% tint will be affected by the substrate color more so than 70% tint
CxF/X-4

- CxF/X-4 provides a structure to show how the color looks when overprinted
  - 10% tints over substrate
  - 10% tints over black
- Characterization is recorded as spectral data
CxF/X-4 – Conformance Levels

- **CxF/X-4 Complete Characterisation**
  - Spectral definition of color and ink opacity + substrate
  - Color printed over black

- **CxF/X-4a Single Background Characterisation**
  - Spectral definition of color + substrate
  - Color is NOT printed over black

- **CxF/X-4b Single Patch Characterisation**
  - Spectral definition of color
  - Ink will always be printed at 100%
  - Color can be printed over black or not
  - Substrate can be included or not
Products that generate CxF/X-4 files (excluding ink formulation)
CxF/X-4 – Complete Characterization

ColorLogic ColorAnt v6

ORIS CxF Toolbox

4CLR-77-Chart

Epson P7000 - Green

Epson P7000 - Green
CxF/X-4a – Single Background Characterization

Epson P7000 - Green
Great! Now what?

- What to do with this CxF/X-4 file?
- Does any software recognize and use this type of file?
- What about Adobe products?
Now that you have created a CxF/X-4 file you have to embed the CxF/X-4 file into a PDF.

Limited products available to embed CxF/X-4 into PDFs.
Embed CXF/X-4 data in PDFs
Embed CxF/X-4 in PDFs

- PDF 2.0 - ISO 32000-2:2017
  - Published July 2017 after nine years in development
- First “non-Adobe” version of PDF specification
- Adobe PDF 1.7, donated to ISO TC171 in 2008
- PDF/X-4 is based on Adobe PDF 1.6, published in 2004.
PDF 2.0

- Allows CxF/X-4 files to be attached or embedded much like fonts or ICC profiles
- Does not state what to do with CxF/X-4 files
- Oh, object level BPC and page level Output Intent
PDF 2.0 and PreFlighting

- No published preflight profiles for PDF 2.0 from Enfocus
- Callas does have a PDF 2.0 preflight profile
  - Not included in current version of pdfToolbox
- Now what, ????
PDF/X-6 – ISO 15930-9

- Based on PDF 2.0 (Adobe PDF 1.7)
- Under development, not published
- Adobe will update their products to support PDF/X-6 after ISO publishes document.
  - There is no support for CxF/X-4 in Adobe products today.
Adobe APPE v5 does support PDF 2.0, thus CxF/X-4
- APPE does not have a spectral CMM
  - Adobe Color Engine (ACE)
- Does allow for a different CMM to be used in lieu of ACE
APPE – Adobe PDF Print Engine 5

- Grand Format RIP Companies using APPE v5
  - Caldera GrandRIP/VisualRIP
  - Onyx Thrive
  - EFI Fiery XF
  - Aurelon PrintFactory
Grand Format RIP Companies Support for CxF/X-4

- All use colormetric CMMs
- Limited support
  - Some are broken and not working
  - Others have poor implementation with little documentation on using CxF/X-4
- None take advantage of what is possible with CxF/X-4 structure
CXF/X-4 use with current software

- No clear declaration on how to use CxF/X-4 data
- With one exception, all current implementations convert spectral data to colorimetric for processing.
- Some ignore full characterization data while others import full characterization but do not use the tint data effectively
- None use the output profile media white point for adaptation from spectral
Use CXF/X-4 data in PDFs for color conversion
Verify CxF/X-4 color match

- There are a couple of products that can take a CxF/X-4 file and verify the printed color is within tolerance.
- There aren't any RIPs that can verify colors in a CxF/X-4 file.
  - Some convert to LAB to process but do not account for media white point nor TRC of CxF/X-4 full characterization.
What about SCTVi?

- SCTVi (ISO - 20654:2017)
  - Calibration Process
  - It's not characterization method
  - Could be used before a CxF/X-4 characterization
Work to be done

- RIP vendors have a way to go to leveraging CxF/X-4 in their products.
  - There is an opportunity to work on a useful implementation of CxF/X-4 prior to PDF/X-6 release
  - Utilize the media white point in adapting the color from spectral data embedded in a PDF/X-6 file
  - Use the complete characterization for determining spot colors on the output media at different tints or shades
Final Thoughts

- CxF/X-4 is still very much in its infancy
- Opportunity for RIP manufacturers to prepare for PDF/X-6
- Brand owners should start investigating how CxF/X-4 could help in print marketing campaigns
Still confused?

- RPimaging helps companies implement and manage color through product sales and consulting.
- Contact us directly for help on which platform is the best fit for your company for managing color.

- (866) RGB-CMYK ~ sales@RPimaging.com
Q&A
Ask now, or hold your peace
Thank you for attending!

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