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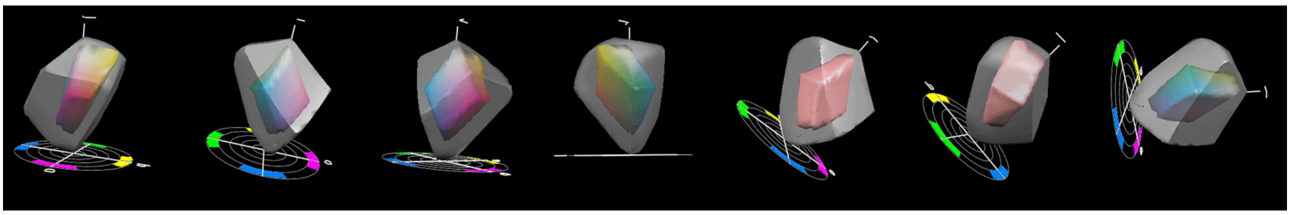
THE 2021 POINT ABOUT ISO 12647-x STANDARDS FOR CMYK PRINT AND PROOF WORKS Rev. 4

French version: https: //www.color-source.net/Documentations/Infos_clients/LE_POINT_2021_SUR_LES_NORMES_CMYK_ISO_12647.pdf

This document is summarizing the necessary information:

- For setting your printing presses matching ISO 12647-2-3-4-6 or G7/IDEAlliance standards, and for controlling the prints,
- For producing your color proofs complying with ISO12647-7 on a simple A3+ EPSON inkjet costing less than 330 US$,
- For controlling all CMYK color proofs using freeware, according to ISO 12642, ISO 12647-7 or IDEAlliance standards, or by using more relevant techniques,
- For making optimized ISO 12647-2-3-4-6 or G7/IDEAlliance (GRACoL & SWOP) color separations,
- For downloading affordable applications allowing you fast and easy ISO 12647-2-3-4-6 or G7/IDEAlliance press settings, with using affordable and flexible measurement instruments such as Eye-One Pro 1, 2, 3, or Techkon or MYIRO or else 45/0° scanning spectrophotometers,
- For knowing ISO12647-2: 2013 version and understanding their limits,
- For updating and enhancing your CMYK ISO or G7/IDEAlliance I.C.C. profiles,
- For creating, communication and using your own print standards when no public ISO standards can be used for your printing configuration.



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June 2021 summary

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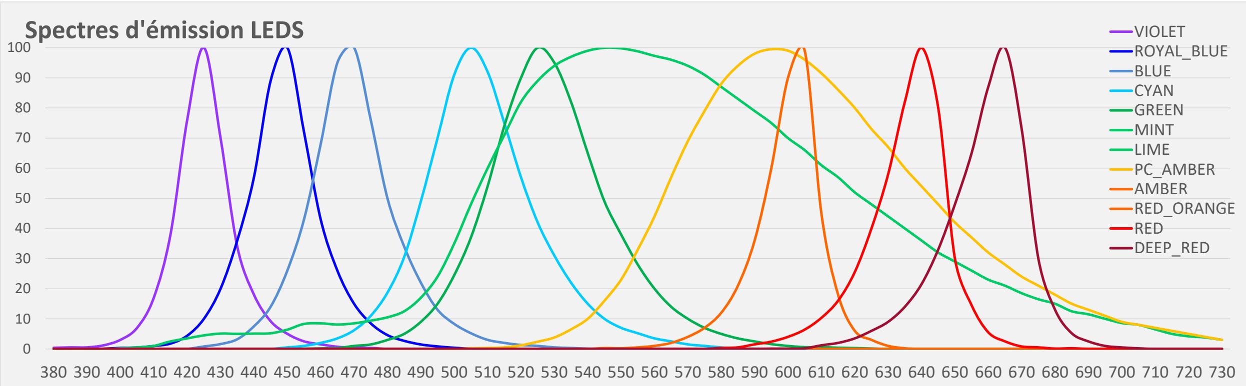
Editorial: What's new since 2015?

It's already been seven years since last update of our whitepaper about ISO12647-x standards!

Seven years we spent on engineering and development, which went way too fast, but allowed us:

- To significantly enhance and expand our software applications for Print Houses dedicated to calibrate presses matching ISO12647-x, and to create, communicate and match specific print standards when needed,
- To develop new applications in many different industrial areas, for example in the field of digital photography,
- To develop innovative algorithms for building high-definition 45/0° real-time spectral scanners based on using power LEDs for lighting of each scanned line, allowing continuous true color and density control.

For more information on Colorsource advanced spectral algorithms, please contact us.



The present 2021 update of our paper about ISO12647-x that we publish since 2007, will be the last one, because we think it is a useful update for you, but we believe we have now done a full tour of this important topic for Graphic Industries.

In the future, we shall devote our time supplying ever more efficient software tools and algorithms to our Customers in Graphic and other Industries,

And licensing our technologies and know-how to manufacturers integrating them into their own products.

Enjoy reading,

Wilfrid Meffre

1) The interest of ISO 12647 standards for CMYK print and proof works:

ISO 12647 standards concern to date the following CMYK print processes:

- **ISO 12647-2**: Process control for the production of half-tone color separations, proof and production prints: Offset lithographic processes.
- **ISO 12647-3**: Process control for the production of half-tone color separations, proofs and production prints: Coldset offset lithography on newsprint.
- **ISO 12647-4**: Process control for the production of half-tone color separations, proofs and production prints: Publication gravure printing.
- **ISO 12647-5**: Process control for the manufacture of half-tone color separations, proof, and production prints: Screen-printing.
- **ISO 12647-6**: Production Process control for the production of half-tone color separations proofs and production prints: Flexographic printing.
- **ISO 12647-7**: Process control for the production of half-tone color separations, proof, and production prints: Proofing processes working directly from digital data.

Before the specification of standard chromatic responses for CMYK offset and gravure print processes (C.I.E. Lab printed color for each Customer's file CMYK value), there were nearly as many CMYK chromatic responses as Print Houses and printing presses.

In older times, Print Houses tried to simulate the various proprietary analogue proofs such as Cromalin (DuPont), MatchPrint (3M), AGFAProof and ColorArt (FUJI), which diverse dot gains curves were mainly of optical origin. Their solid CMYK primary Lab colors were not standard, and differed from the presses CMYK solid inks colors, which themselves depended on each Ink Supplier.

First digital proofs used to simulate the colors of some arbitrary analogue proofing system, including its frequent flaws. Because no reference chromatic response of the various allegedly "standard" analogue proofing systems was published by their respective Vendors! In France each Repro House often simulated its own DuPont analogue Cromalin, when nearly 80% of the Cromalins produced in the field used to show wrong dot gain curves that did not match the official "DuPont-Brunner" dot gains curves.

Under these conditions, standardization was necessary for making the workflow more reliable at each step of the graphic production process, in order to allow Print Houses better simulate the Customer's proofs, by using standard, objective, and inexpensive tools such as modern color management tools and PC connected fast spectrophotometers.

ISO 12647 standards specify today the arbitrary generic CMYK chromatic responses of main traditional CMYK print works:

- This allows all prepress actors carrying out good color separations and good color proofs that anticipate well the final print run, as long as the Print Houses can set their printing press matching the relevant ISO CMYK profile,
- This discharges the Print House from any responsibility with respect to prepress, if a print run matching the relevant ISO CMYK standard does not produce the expected colors.

For each type of traditional CMYK printing configuration on each type of main classic paper, ISO12647 sets:

- The Lab 2° color of each C, M, Y, K solid ink in D50 lighting conditions,
- The Lab 2° colors of the overlays R (M + J 200%), V (C + J 200%), B (C + M 200%),
- The generic Lab 2° color of the paper type,
- The aim TVI curve for each C, M, Y, and K ink,
- The accepted tolerances of visual deviations.

Complying with ISO 12647-x standards by the simplest methods involves using standardized papers, standardized CMYK primary inks, and of course matching the specified CMYK colors, which requires printing each solid ink with appropriate density, and also the using a properly calculated correction curve for producing each printing form.

More generally, ISO12647 standards indicate a good methodology for obtaining reproducible prints regardless of the printing technologies and inks. And very often the Print House will need using this methodology for creating, publishing documenting, and matching their own CMYK or N-colors printing standards, for example in the field of packaging and/or for producing high-end polychrome prints. **No print run of any kind should be made if no print standard has been chosen or created first!**

See the overall methodology: https://www.color-source.net/en/Docs_Formation/Normalizing_print_processes.pdf

Complying with **ISO 12647** standards - or any other public or private standard specifying a certain color rendering on a press - is knowing how to print the same colors from the same file every day, and this on each one of your presses.

Thanks to **ISO 12647**, it is now very easy and inexpensive to produce digital color proofs simulating the various ISO CMYK printing configurations, and checking a color proof is valid is very easy for any proof's user or producer.

For example, this document will show you how to produce excellent CMYK proofs that are perfectly compliant with ISO12647-7 with using a simple and unexpensive A3+ EPSON XP-15000 printer costing about three hundred euros.

You will find at the end of this document useful Internet links for downloading additional technical information, readymade generic CMYK ISO I.C.C. profiles, and the official characterization data allowing you computing your own ISO CMYK I.C.C. profiles if needed with enhanced gamut mapping rendering intents and inks settings.

- The relevant technical information is currently dispersed (generally in English and German languages) between the BVDM, Fogra, IFRA, ECI, G7/IDEAlliance and International Color Consortium websites,
- Full ISO 12647-x standards official texts are only available from the official ISO website with your credit card. A link at the end of this document gives access to the official ISO 12647-x standards web page.

2) The tools you need for calibrating your presses matching ISO12647-x standards:

Most of Print House already own the hardware needed for calibrating their presses matching ISO12647-x standards: At most, some small investments in affordable measurement instruments, dedicated software, D50 lighting and training will be enough for them to match easily ISO 12647 standards. What you need:

1. A connected 45/0° spectrophotometer capable of operating in scan mode for fast spectral measurement of printed control bars (e.g., X-Rite i1Pro 1, 2, 3 family or Techkon or the Konica Minolta Sensing MYIRO model…),
2. Appropriate software for calculating the optimal CMYK print densities on the press, and the printing form's' correction curves to be programmed on the prepress flow. On this issue, Colorsource proposes its **MagicPress** and **MagicPrepress** software applications. Because there are no standard print densities: For each ISO12647 offset, gravure or flexographic printing configuration, the "good densities" of solid CMYK inks are those allowing each ink matching the aim D50 Lab 2° color specified by the chosen ISO12647 aim standard.

For offset and gravure prints, all presses density calibrated for matching a same CMYK ISO aim standard will produce roughly the same colors, and will therefore share the same standard I.C.C. CMYK profile, which can be easily used upstream for making all suitable color separations and color proofs.

However, calibrating a CMYK flexo press according to ISO 12647-6 is not enough for determining completely its color response. Because the diversity of inks, clichés and screenings used for flexographic prints can lead to significantly different chromatic responses for a same press density calibration, so that no standard I.C.C. CMYK profile can be published for flexography.

This means that flexo Printer must equip himself not only with the tools for calibrating his press to ISO12647-6 standards, but also with software tools for making the I.C.C profile that characterizes his press once it matches the ISO standards. This allows optimized color separations and reliable color proofs upstream, and it allows as well the Print House to properly convert and use generic Customer's color separations such as ISOCoatedv2 (Fogra39).

3) ISO12647 standard papers and target Tone Value Increase curves:

3-1) ISO12647-x standard papers naming:

Standard paper types according to ISO12647 for offset printing:

- Standard paper types 1 & 2: HWC (High Weight Coated) Coated gloss, semi-matte and matte papers ranging 80 to 250 g/m²,
- Paper type 3: LWC (Light Weight Coated) Coated gloss, semi-matte and matte papers 48 to 80 g/m²,
- Paper type 4: Wood-free uncoated white papers 80 to 250 g/m²,
- Paper type 5: Yellowish (Recycled papers), typically 115 g/m²,
- SC papers: Super Calendered SC-A or SC-B 38 to 60 g/m²,
- MFC papers: Machine Finished Coating 51 to 65 g/m²,
- SNP papers: Standard News Print (Standard newspaper for heatset web offset 40 to 52 g/m²),
- INP papers: Improved News Print (Improved newspaper for heatset web offset 40 to 56 g/m²).

Standard paper types according to ISO12647 for gravure Publishing:

- LWC Papers: Light Weight Coated,
- HWC paper High Weight Coated or "Improved LWC",
- SC: Super Calendered Papers SC-A or SC-B,
- MF papers: Machine Finished papers.

According to ECI, surfacing optimization of SC-A papers and cylinders engraving optimization allowed a 20% color gamut enhancement.

Standard media types according to ISO12647 for flexographic printing:

- Coated: White coated papers and cardboards,
- Uncoated: White uncoated papers and cardboards,
- Corrugated: Corrugated boards,
- Film/Foil: Plastic or aluminum thin films.

3-2) ISO 12647-2 and -3 standard aim TVI curves for sheet-fed and web offset printing:

Fortunately, ISO12647 do not claim that their arbitrary choice of target dot gain curves is ideal, but at least, the selected aim **Tone Value Increase curves** (**TVI curves**) perfectly do the job.

A set of standard offset aim TVI curves named **A**, **B**, **C**, **D**, **E**, **F** was originally specified by ISO12647-2: 2004. Their respective **40%** dot gains are **13, 16, 19, 22, 25 and 28 %**:

ISO12647-2: 2004 aim TVI curves naming A à F	A	B	C	D	E	F
ISO12647-2: 2004 aim TVI curves naming A à E		A	B	C	D	E
0 %	0	0	0	0	0	0
10.0	14.0	15.6	17.3	18.9	20.6	22.3
20.0	27.7	30.2	32.8	35.5	38.1	40.8
30.0	40.7	43.7	46.7	49.8	52.8	55.9
40.0 %	**53.0**	**56.0**	**59.0**	**62.0**	**65.0**	**68.0**
50.0	64.3	67.0	69.6	72.3	74.9	77.5
60.0	74.5	76.6	78.7	80.8	82.8	84.8
70.0	83.4	84.8	86.3	87.6	89.0	90.3
80.0	90.7	91.6	92.4	93.0	93.7	94.4
90.0	96.0	96.6	96.8	97.0	97.3	97.5
100.0 %	100.0	100.0	100.0	100.0	100.0	100.0

In 2013, ISO12647-2 changed their naming of standard aim TVI curves for offset printing: The "**A**" target curve was abandoned, and the legacy target curves named **B** to **F** were renamed ISO curves **A** to **E**.

No interest in this new naming: Because the original 2004 "**A**" tone curve is still widely used in 2021 for **ISOCoated_v2** (**Fogra39**), and we therefore retain the 2004 name list (Aim TVI curves named **A** to **F**) in this article, and in our **MagicPress** and **MagicPrepress** software applications for calibrating printing presses.

We shall see, on page 19 in paragraph 5-4), that there are very good reasons why **Fogra39** targets (Offset on High Weight Coated Paper - types 1 or 2), and also **Fogra47** (Offset on uncoated white paper - type 4) remain widely used in 2021, rather than their proposed "replacements" **Fogra52** and **Fogra51**.

3-4) Aim TVI curves for sheet-fed and web offset printing in United States:

An excellent point: **G7/IDEAlliance** have dropped their strange indeterminate target curves called "NPDC" for "Neutral Print Density Curves", and are now using well documented aim TVI curves chosen from the classic curves above.

The aim TVI curves for each **G7/IDEAlliance** 2013 ICC profile are documented on https://color.org/registry/index.xalter web page, and they are quite coherent with the published I.C.C. profiles and press characterization files, as for Fogra based European I.C.C. profiles.

We therefore consider that the 2013 calibration standards and I.C.C. profile promoted by **G7/IDEAlliance** since 2015 are quite valid and easy to use for press setting, unlike their previous 2006 versions, which required sophisticated calculation for computing the CMYK aim TVI curves … that were not published nor documented.

Funnily, some experts still pretend today that matching **G7/IDEAlliance** would require very specific and mysterious techniques, when matching aim colors and TVI curves is sufficient for matching any well specified reference CMYK – or else – print standard!

More and more fake news today about so many subjects: If in doubt, you can easily test our software applications for matching any US standard, which should close this subject.

3-5) Aim TVI curves promoted by WAN-IFRA for coldset web offset printing

Wan-IFRA have standardized their own target tone curve with 26% dot gain at 40% for ISO12647-3.

3-6) ISO 12647-4 aim TVI curves for gravure publishing:

Dot gain at 40% is 17% according to ISO12647-4: 2005 for drum gravures between 150 and 200 dpi. See the published ISO standard 12647-4: 2005. For knowing full TVI specifications, you can freely download Colorsource application **MagicPrepress** trial version that is designed for computing the CMYK printing forms engraving curves. This application can display all **ISO12647-2-3-4-6** target TVI curves values.

Note that in the field, gravure drums Producers are using many (too many!) different curves, probably because historically they received many different kinds of empirical CMYK color separations, and in all cases, they had to supply drums that could print them properly. So that sometimes the only "not too expensive" solution is to apply the gravure correction curves not to the printing forms (the drums) but to the CMYK file upstream the drums.

3-7) ISO 12647-6 aim TVI curves for flexographic printing:

For knowing their full specifications, you can freely download Colorsource application **MagicPrepress** trial version that is designed for computing the CMYK printing forms engraving curves.
This application can display all **ISO12647-2-3-4-6** aim TVI curves values.

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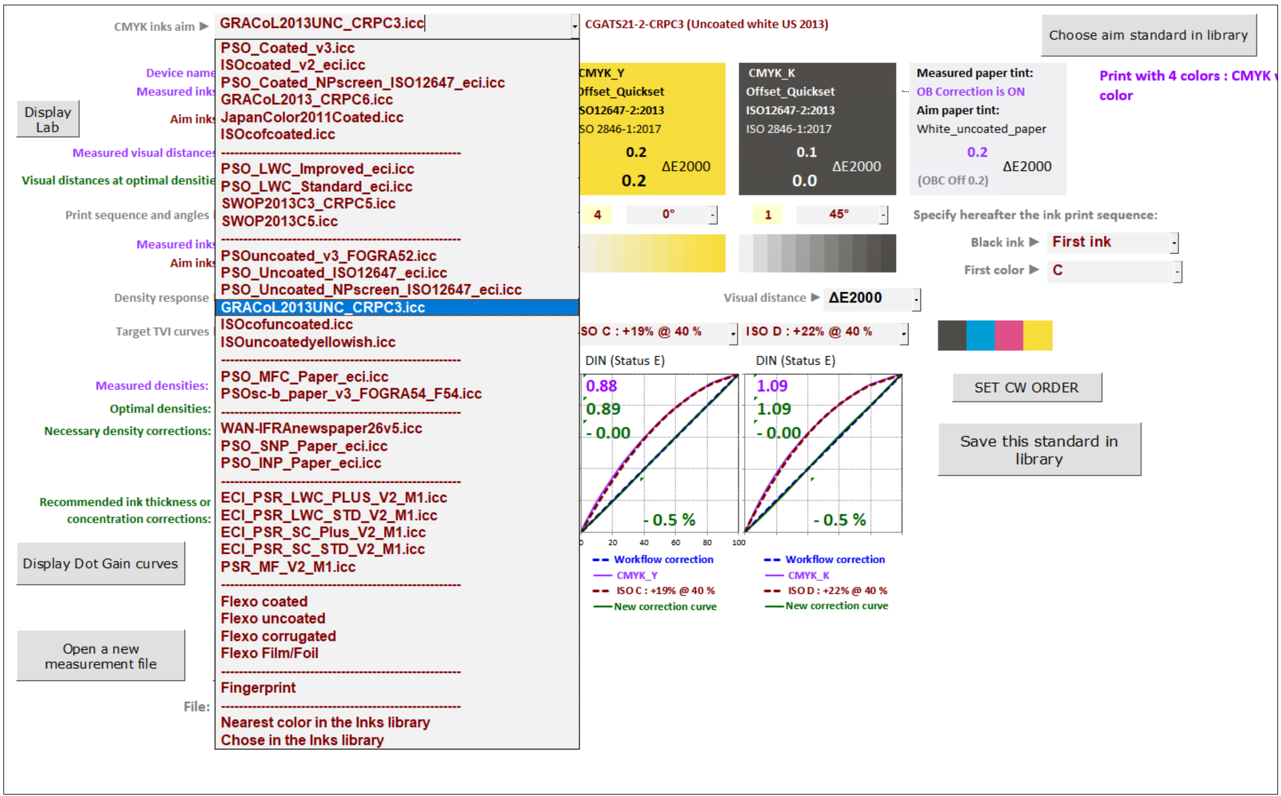

Workflow correction: No correction curve on workflow.

	Group 1: ISO 2846-1:2017 DIN (Status E) 45°			Group 2: ISO 2846-1:2017 DIN (Status E) 15°			Group 3: ISO 2846-1:2017 DIN (Status E) 75°			Group 4: ISO 2846-1:2017 DIN (Status E) 0°		
Aim inks:	Group 1: ISO 2846-1:2017 DIN (Status E) 45°			Group 2: ISO 2846-1:2017 DIN (Status E) 15°			Group 3: ISO 2846-1:2017 DIN (Status E) 75°			Group 4: ISO 2846-1:2017 DIN (Status E) 0°		
Measured inks:	CMYK_K			CMYK_C			CMYK_M			CMYK_Y		
Shown: Print order	Printed file %	MEASURED CURVE	DESIRED CURVE (Aim:ISO D : +22% @ 40%)	Printed file %	MEASURED CURVE	DESIRED CURVE (Aim:ISO C : +19% @ 40%)	Printed file %	MEASURED CURVE	DESIRED CURVE (Aim:ISO C : +19% @ 40%)	Printed file %	MEASURED CURVE	DESIRED CURVE (Aim:ISO C : +19% @ 40%)
	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	10.9	9.8	5.0	9.8	8.9	5.0	9.9	8.9	5.0	9.8	8.9
	10.0	20.7	18.9	10.0	18.8	17.3	10.0	19.1	17.3	10.0	18.9	17.3
	20.0	37.1	35.5	20.0	34.5	32.8	20.0	34.5	32.8	20.0	34.2	32.8
	30.0	50.9	49.8	30.0	48.1	46.7	30.0	48.1	46.7	30.0	47.8	46.7
	40.0	62.3	62.0	40.0	59.7	59.0	40.0	59.7	59.0	40.0	59.4	59.0
	50.0	71.9	72.3	50.0	69.8	69.6	50.0	69.8	69.6	50.0	69.7	69.6
	60.0	80.2	80.8	60.0	78.6	78.7	60.0	78.7	78.7	60.0	78.7	78.7
	70.0	87.3	87.6	70.0	86.2	86.3	70.0	86.2	86.3	70.0	86.2	86.3
	80.0	93.2	93.0	80.0	92.4	92.4	80.0	92.4	92.4	80.0	92.5	92.4
	90.0	97.2	97.0	90.0	97.1	96.8	90.0	96.8	96.7	90.0	97.1	96.8
	95.0	98.7	98.5	95.0	98.7	98.5	95.0	98.5	98.4	95.0	98.7	98.5
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

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4) May 2021 summary of CMYK ISO 2-3-4-6 standards:

4-1) Up to date ISO 12647-2 and -3 sheet-fed and web offset press characterization data and generic CMYK I.C.C. Profiles: (Curve's name A to F using 2004 and not 2013 naming)

ISO12647-2 standard offset printing configuration	Internal name of the generic CMYK I.C.C. ISO profile (Name shown by applications)	File name(s) of the free generic CMYK I.C.C. ISO profile(s) offered on Internet	characterization data and aim TVI curves (Self-Backing measurements)
Paper types 1 & 2: High Weight Coated matte, semi-matte or glossy papers. HWC ranging 80 to 250 g/m². 150, 175 ~ 240 dpi AM screenings	ISO Coated v2 (ECI) ISO Coated v2 300% (ECI) Coated_Fogra39L_VIGC_300.icc Coated_Fogra39L_VIGC_260.icc	**ISOcoated_v2_eci.icc** **ISOcoated_v2_300_eci.icc** **Coated_Fogra39L_VIGC_300.icc** **Coated_Fogra39L_VIGC_260.icc**	**M0*** measurements: **FOGRA39L.txt** K: Curve B CMY: Curve A
Paper types 1 & 2: High Weight Coated matte, semi-matte or glossy papers. HWC ranging 80 to 250 g/m². Typical 20 µm stochastic screenings.	PSO Coated NPscreen ISO12647 (ECI) PSO Coated 300% NPscreen ISO12647 (ECI)	**PSO_Coated_NPscreen_ISO 12647_eci.icc** **PSO_Coated_300_NPscreen_ISO 12647_eci.icc**	**M0*** measurements: **FOGRA43L.txt** CMYK: Curve F
Paper types 1 & 2: High Weight Coated matte, semi-matte or glossy papers. HWC ranging 80 to 250 g/m². 150, 175 ~ 240 dpi AM screenings	PSO Coated v3	**PSOcoated_v3.icc****	**M1*** measurements: **FOGRA51.txt** et** FOGRA51_Spectral.txt CMYK: Curve B
Paper types 1 & 2: High Weight Coated matte, semi-matte or glossy papers. HWC ranging 80 to 250 g/m². 150, 175 ~ 240 dpi AM screenings	GRACoL2013_CRPC6.icc	**GRACoL2013_CRPC6.icc**	**M1*** measurements: **CGATS21-2-CRPC6.txt** K: Curve C CMY: Curve B
Paper types 1 & 2: High Weight Coated matte, semi-matte or glossy papers. HWC ranging 80 to 250 g/m². 150, 175 ~ 240 dpi AM screenings	Japan Color 2011 Coated	**JapanColor2011Coated.icc**	**M0*** measurements: **JapanColor2011Coated.txt** CMYK: Curve A
Continuous offset on type 2 papers. AM screening typ. 150.	ISO Continuous Forms Coated	**ISOcofcoated.icc**	**M0*** measurements: **FOGRA31L.txt** K: Curve D CMY: Curve C
Paper type 3: Improved LWC papers ranging 51 to 80 g/m². Typ. 150 dpi AM screening.	PSO LWC Improved (ECI)	**PSO_LWC_Improved_eci.icc**	**M0*** measurements: **FOGRA45L.txt** K: Curve C CMY: Curve B
Paper type 3: Standard LWC papers ranging 48 to 70 g/m². Typ. 150 dpi AM screening.	PSO LWC Standard (ECI)	**PSO_LWC_Standard_eci.icc**	**M0*** measurements: **FOGRA46L.txt** K: Curve C CMY: Curve B
Paper type 3: Standard LWC papers ranging 48 to 70 g/m². Typ. 150 dpi AM screening.	SWOP2013C3_CRPC5.icc	**SWOP2013C3_CRPC5.icc**	**M1*** measurements: **CGATS21-2-CRPC5.txt** K: Curve C CMY: Curve B

(*) **M0** or **M1** measurement conditions: See explanations in paragraph 5-2) in pages 15, 16, 17 and 18.

(**) Measurement file and profile containing a wrong paper tint. Do not use except to correctly recalculate characterization file and profile with appropriate correction of optical brighteners. see paragraph 5-4) page 19.

ISO12647-2 standard offset printing configuration	Internal name of the generic CMYK I.C.C. ISO profile (Name shown by applications)	File name(s) of the free generic CMYK I.C.C. ISO profile(s) offered on Internet	characterization data and aim TVI curves (Self-Backing measurements)
Paper type 4: Wood-free uncoated white papers. Typical 150 dpi AM screening.	PSO Uncoated ISO12647 (ECI)	**PSO_Uncoated_ISO12647_eci.icc**	**M0*** measurements: **FOGRA47L.txt** K: Curve D CMY: Curve C
Paper type 4: Wood-free uncoated white papers. FM screening. Better for typical 30 µm stochastic screenings than above I.C.C. profile.	PSO Uncoated NPscreen ISO12647 (ECI)	**PSO_Uncoated_NPscreen_ISO12647_eci.icc**	**M0*** measurements: **FOGRA44L.txt** K: Curve F CMY: Curve F
Paper type 4: Wood-free uncoated white papers. Typical 150 dpi AM screening.	PSO Uncoated v3 (FOGRA52)	**PSOuncoated_v3_FOGRA52.icc****	**M1*** measurements: **FOGRA52.txt**** CMYK: Curve D
Paper type 4: Wood-free uncoated white papers. Typical 150 dpi AM screening.	GRACoL2013UNC_CRPC3 .icc	**GRACoL2013UNC_CRPC3.icc**	**M1*** measurements: **CGATS21-2-CRPC3.txt** K: Curve D CMY: Curve C
Continuous offset on type 2 papers. AM screening typ. 150.	ISO Continuous Forms Uncoated	**ISOcofcoated.icc**	**M0*** measurements: **FOGRA32L.txt** K: Curve E CMY: Curve D
Paper type 5: Thin coated recycled papers. Typ. 150 dpi AM screenings.	SWOP2013C5.icc	**SWOP2013C5.icc**	**M1*** measurements: **SWOP2013C5.txt** K: Curve C CMY: Curve B
Paper type 5: Yellowish uncoated recycled papers. Typ. 150 dpi AM screenings.	ISO Uncoated Yellowish	**ISOuncoatedyellowish.icc**	**M0*** measurements: **FOGRA30L.txt** K: Curve D CMY: Curve C
MFC papers: Machine finished coated papers. Typ. 150 dpi periodic screenings.	PSO MFC Paper (ECI)	**PSO_MFC_Paper_eci.icc**	**M0*** measurements: **FOGRA41L.txt** K: Curve C CMY: Curve B
SC papers (SC-B): Super Calendered Papers B quality. Typ. 150 dpi AM screenings.	PSO SC-B Paper v3 (FOGRA54)	**PSOsc-b_paper_v3_FOGRA54.icc**	**M1*** measurements: **FOGRA54L.txt** CMYK: Curve C

(*) **M0** or **M1** measurement conditions: See explanations in paragraph 5-2) in pages 15, 16, 17 and 18.

(**) Measurement file and profile containing a wrong paper tint. Do not use except to correctly recalculate characterization file and profile with appropriate correction of optical brighteners. see paragraph 5-4) page 19.

ISO12647-2 and – 3 standard offset printing configurations	Internal name of the generic ISO CMYK I.C.C. profile	File name(s) of the free generic CMYK I.C.C. ISO profile(s)	characterization data and aim TVI curves (Self-Backing measurements)
Heatset web printing on Standard News Paper. Typ. 100 dpi AM screenings.	PSO SNP Paper (ECI)	**PSO_SNP_Paper_eci.icc**	**M0*** measurements: **FOGRA42L.txt** K: Curve D CMY: Curve C
Heatset web printing on Improved News Paper. Typ. 100 dpi periodic (AM) screenings.	PSO INP Paper (ECI)	**PSO_INP_Paper_eci.icc**	**M0*** measurements: **FOGRA48L.txt** K: Curve D CMY: Curve C
Coldest web printing on Standard News Paper. Typ. 100 dpi periodic screenings.	WAN-IFRAnewspaper26v5	**WAN-IFRAnewspaper26v5.icc**	**M1*** measurements: From published I.C.C. profile CMYK: Curve E

(*) **M0** or **M1** measurement conditions: See explanations in paragraph 5-2 in pages 15, 16, 17 and 18.

4-2) Obsolete or little used ISO 12647-2 et ISO 12647-3 I.C.C. profiles:

Obsolete or little used ISO12647-2 and -3 standard offset printing configuration	Internal name of the generic CMYK I.C.C. ISO profile (Name shown by applications)	File name(s) of the free generic CMYK I.C.C. ISO profile(s) offered on Internet	characterization data and aim TVI curves (Self-Backing measurements)
SC papers (SC-B): Super Calendered Papers. B quality Typ. 150 dpi AM screenings.	SC Paper (ECI) Replaced by PSO SC-B Paper v3 (FOGRA54)	**SC_paper_eci.icc** **Replaced by** **PSOsc-b_paper_v3_FOGRA54.icc**	**FOGRA40L.txt (M0)** Replaced by FOGRA54.txt (**M1**)
Paper types 1 & 2: High Weight Coated matte, semi-matte or glossy papers. HWC ranging 80 to 250 g/m². 150, 175 ~ 240 dpi AM screenings	GRACoL2006_Coated1v2 Replaced by GRACoL2013_CRPC6.icc	**GRACoL2006_Coated1v2.icc** Replaced by **GRACoL2013_CRPC6.icc**	**GRACoL2006_Coated1.txt (M0)** NPDC* TVI curves Replaced by CGATS21-2-CRPC6.txt (**M1**)
Paper type 3: Standard LWC papers ranging 48 to 70 g/m². Typ. 150 dpi AM screening.	SWOP2006_Coated3v2 Replaced by SWOP2013C3_CRPC5.icc	**SWOP2006_Coated3v2.icc** Replaced by **SWOP2013C3_CRPC5.icc**	**SWOP2006_Coated3.txt (M0)** NPDC* TVI curves Replaced by CGATS21-2-CRPC5.txt (**M1**)
Paper type 5: Thin coated recycled papers. Typ. 150 dpi AM screenings.	SWOP2006_Coated5v2 Replaced by SWOP2013C5.icc	**SWOP2006_Coated5v2.icc** Replaced by **SWOP2013C5.icc**	**SWOP2006_Coated3.txt (M0)** NPDC* TVI curves Replaced by CGATS21-2-CRPC3.txt (**M1**)
Coldest web printing on Standard News Paper. Typ. 100 dpi periodic screenings	ISO Newspaper 26 Replaced by WAN-IFRAnewspaper26v5	**ISOnewspaper26v4.icc** Replaced by **WAN-IFRAnewspaper26v5.icc**	**IFRA26.txt (M0)** Replaced by IFRA26L.txt (**M1**)
Coldest web printing on Standard News Paper. Typ. 100 dpi periodic screenings	ISO Newspaper 30 Replaced by WAN-IFRAnewspaper26v5	**ISOnewspaper30v4.icc** Replaced by **WAN-IFRAnewspaper26v5.icc**	**IFRA30L.txt (M0)** Replaced by IFRA26L.txt (**M1**)

(*) NPDC for "Neutral Print Density Curves" now dropped and replaced by standard well-documented aim TVI curves. See if needed for more details our (very) critical study in the 2015 release of this paper:

https://www.color-source.net/en/Docs_Formation/Archive/2015_POINT_ABOUT_ISO_12647_STANDARDS.pdf

NB: We still supply the obsolete or little used ISO12647-x and G7/IDEAlliance 2006 targets in the form of an Excel standards' library you can use with **MagicPress** and **MagicPrepress** applications for press calibration.

Sample obsolete standards library download link:

https://www.color-source.net/en/Documentations/Sample_obsolete_or_little_used_ISO12647_stanadards_library.xlsx

Any **MagicPrepress** User can easily specify and record himself any obsolete ISO12647-x standard, as for any other public or private print standard using one to ten inks.

4-3) Up to date characterization files and I.C.C. profiles characterizing offset prints on paper type 1 and 2 with matte or glossy OPP filming:

NB: These I.C.C. profiles are only intended for color separations and color proofing, for taking into account the effect of lamination on the final colors of the laminated offset prints.

Paper types 1 & 2 printed according to **ISOcoated_v2_eci.icc** (Fogra39), and then laminated with glossy OPP film.	PSO Coated v2 300% Glossy laminate (ECI)	**PSO_Coated_v2_300_Glossy_laminate_eci.icc**	**M0** measurements: **FOGRA50L.txt**
Paper types 1 & 2 printed according to **PSOcoated_v3.icc** (Fogra51), and then laminated with glossy OPP film.	PSO Coated v3 Glossy laminate	**PSO_Coated_v3_Glossy_laminate.icc**	**M1** measurements: **FOGRA57.txt.**
Paper types 1 & 2 printed according to **ISOcoated_v2_eci.icc** (Fogra39), and then laminated with matte OPP film.	PSO Coated v2 300% Matte laminate (ECI)	**PSO_Coated_v2_300_Matte_laminate_eci.icc**	**M0** measurements: **FOGRA49L.txt**
Paper types 1 & 2 printed according to **PSOcoated_v3.icc** (Fogra51), and then laminated with matte OPP film.	PSO Coated v3 Matte laminate	**PSO_Coated_v3_Matte_laminate.icc**	**M1** measurements: **FOGRA56.txt**

4-4) Up to date ISO 12647-4 I.C.C. profiles and characterization data for gravure publishing:

ISO12647-4 standard gravure printing configuration	Internal name of the generic CMYK I.C.C. ISO profile published by eci.org in 2019	File name(s) of the free generic CMYK I.C.C. ISO profile(s) offered on Internet published by eci.org in 2019	**M1*** characterization data (Self-Backing measurements)
Gravure prints on bright LWC (Light Weight Coated) papers Typ. 51 g/m²	PSR_LWC_PLUS_V2_M1_v2	**PSR_LWC_PLUS_V2_M1_v2.icc**	**PSR_LWC_PLUS_V2_M1.txt**
Gravure prints on LWC (Light Weight Coated) papers Typ. 51 g/m²	PSR_LWC_STD_V2_M1	**PSR_LWC_STD_V2_M1.icc**	**PSR_LWC_STD_V2_M1.txt**
Gravure prints on SC Plus papers (SC-A)	PSR_SC_PLUS_V2_M1	**PSR_SC_PLUS_V2_M1.icc**	**PSR_SC_PLUS_V2_M1.txt**
Gravure prints on SC papers (SC-B). Typ.52 g/m²	PSR_SC_STD_V2_M1	**PSR_SC_STD_V2_M1.icc**	**PSR_SC_STD_V2_M1.txt**
Gravure prints on MF or INP papers typ. 55 g/m².	PSR_MF_V2_M1	**PSR_MF_V2_M1.icc**	**PSR_MF_V2_M1.txt**

(*) **M0** or **M1** measurement conditions: See explanations in paragraph 5-2) in pages 15, 16, 17 and 18.

4-5) Obsolete or little used ISO 12647-4 I.C.C. profiles and characterization data for gravure publishing:

Obsolete or little used ISO12647-4 standard gravure printing configuration	Internal name of the generic CMYK I.C.C. ISO profile (Name shown by applications) published by eci.org in 2009	File name(s) of the free generic CMYK I.C.C. ISO profile(s) offered on Internet published by eci.org in 2009	**M0*** characterization data (Self-Backing measurements)
Gravure prints on bright LWC (Light Weight Coated) papers Typ. 51 g/m²	PSR LWC Improved (ECI)	**PSR_LWC_PLUS_V2_PT.icc** Replaced by **PSR_LWC_PLUS_V2_M1_v2.icc**	**ECI_PSR_LWC_PLUS_V2.txt** or **ECI_PSR_LWC_PLUS_V2_L.txt**
Gravure prints on LWC (Light Weight Coated) papers Typ. 51 g/m²	PSR LWC Standard (ECI)	**PSR_LWC_STD_V2_PT.icc** Replaced by **PSR_LWC_STD_V2_M1.icc**	**ECI_PSR_LWC_STD_V2.txt** or **ECI_PSR_LWC_STD_V2_L.txt**
Gravure prints on SC Plus papers (SC-A)	PSR_SC_PLUS_V2_PT	**PSR_SC_PLUS_V2_PT.icc** Replaced by **PSR_SC_PLUS_V2_M1.icc**	**ECI_PSR_SC_PLUS.txt** or **ECI_PSR_SC_PLUS_L.txt**
Gravure prints on SC papers (SC-B). Typ.52 g/m²	PSR_SC_STD_V2_PT	**PSR_SC_STD_V2_PT.icc** Replaced by **PSR_SC_STD_V2_M1.icc**	**ECI_PSR_SC_STD_V2.txt** or **ECI_PSR_SC_STD_V2_L.txt**
Gravure prints on MF or INP papers typ. 55 g/m².	PSR MF	**PSRgravureMF.icc** Replaced by **PSR_MF_V2_M1.icc**	**PSRgravureMF_ECI2002.txt** or **PSRgravureMF_ISO12642.txt**

NB: We supply the obsolete or little used ISO12647-x and G7/IDEAlliance targets in the form of an Excel standards library you can use with **MagicPress** and **MagicPrepress** applications for press calibration. Any **MagicPrepress** user can easily specify and record any obsolete ISO12647 or any other print standard using one to ten inks.

Sample obsolete standards library download link:

https://www.color-source.net/en/Documentations/Sample_obsolete_or_little_used_ISO12647_stanadards_library.xlsx

4-6) ISO 12647-6 CMYK I.C.C. profiles for CMYK flexographic printing:

ISO12647-6 standard flexographic printing configuration.	Internal name of the CMYK I.C.C. ISO profile (Name shown by applications)	File name of the CMYK I.C.C. ISO profile	**M0** characterization data and aim TVI curves
Corrugated board.	No standard I.C.C. profile can reasonably be specified.	To be established by print house for each ISO12647-6 calibrated press	Only media, solid and superimposed primary colors, TVI curves, and tolerances are specified. See aim TVI curve in MagicPrepress trial version.
White coated paper and cardboard.	No standard I.C.C. profile can reasonably be specified.	Idem	Idem
White uncoated paper and cardboard.	No standard I.C.C. profile can reasonably be specified.	Idem	Idem
Plastic or metallic film or foil.	No standard I.C.C. profile can reasonably be specified.	Idem	Idem

5) Colors and densities measurement conditions for calibrating presses to ISO12647-x standards:

5-1) Measuring on a white or on a black background for your ISO12647 press calibrations?

ISO12647 originally published the aim CMYK solid inks and overlays D50 Lab 2° colors measured on a black background (BB for Black-Backing). Measuring the print over a black background was for minimizing the influence of the colors eventually printed on the other side of the measured colors, by absorbing the light from the spectrophotometer that has passed through the paper.

But this was not the best choice, since the printed colors measurements on a black background greatly depend on the paper opacity. Moreover, these BB measurements do not match the usual viewing conditions of prints.

So that nobody is using the ISO published black background Lab measurements as a reference: All Fogra and G7/IDEAlliance press characterization files, and therefore the CMYK I.C.C. profiles used for color separation and color proofing, as well as the aim colors to be matched on a calibrated press, are measured on a white background (Or more exactly in "Self-Backing" mode where a few blank sheets of paper are stacked under the measured printed sheet. Using Self-Backing measurements makes the D50 Lab 2° ISO published reference colors much more independent of the paper opacity. And it easier to use, since you don't need using a black background for measuring your control bars in the pressroom. Of course, avoid any print on the back of your control bars.

Our **MagicPress** and **MagicPrepress** software applications therefore contain all the up-to-date ISO12647-2-3-4-6 and G7/IDEAlliance target colors measured in Self-Backing mode. These colors are those contained in the published press characterization files and generic I.C.C. profiles that allow making the color separations and color proofs.

Technical note:

Our **CMYK_100%** software, now replaced by more powerful and universal **MagicPress**, allowed you to perform Black-Backing measurements and compute all the results you would get if making Self-Backing measurements. And vice versa to perform your measurements in Self-Backing mode, and compute all the results you would get if making Black-Backing measurements:

- For computing colors and densities in Self-Backing mode from Black-Backing spectral measurements, only one additional spectral measurement is needed: The Self-Backing spectral measurement of the paper,
- For computing colors and densities in Black-Backing mode from Self-Backing spectral measurements, only one additional spectral measurement is needed: The Black-Backing spectral measurement of the paper.

The main interest of this function was of course to put an end to the sterile debates between measuring in SB or BB mode, by demonstrating that we know how to calculate with excellent accuracy all BB measurements from SB measurements, and vice-versa! We could of course bring back this feature to **MagicPress** if you would need it for some … very particular application.

5-2) Measuring printed colors' spectral reflectance's using M0 or M1 conditions?

FOUR different measurement conditions for printed colors have been specified by ISO13655: 2009 standard (Spectral measurement and color computation related to images in the graphic arts):

M0 measurement condition (Legacy conditions): The measured colors are computed as C.I.E. L*a*b* D50 2°, and the spectrophotometer's internal light source for reflection measurements matches 2856K incandescence (approx. C.I.E. **A** illuminant) without UV filter.

M1 measurement condition: The measured colors are computed as C.I.E. L*a*b* D50 2°, and the spectrophotometer's internal light source for reflection measurements matches daylight (approx. C.I.E. D50 Illuminant) without UV filter.

M2 measurement condition: The measured colors are computed as C.I.E. L*a*b* D50 2°, and the spectrophotometer's internal light source for reflection measurements contains no UV.

M3 measurement condition: Only for density measurements: The spectrophotometer's internal light source for reflection measurements is matching incandescence (C.I.E. **A** illuminant) and is filtered by a polarizing filter.

Historically, the reference Lab D50 2° colors published by ISO12647-x: 2004 were all **M0** measurements since all market 45/0° reflection spectrophotometers for Graphic Industries were using an incandescent bulb "C.I.E. A" light source.

The **ISO12647-x: 2013** standards imposed using the recently specified **M1** measurement conditions, claiming it would provide a better accuracy, particularly for color measurements on papers containing strong optical brighteners. **The problem, which we strongly denounced in 2015, is that all the published technical arguments to promote using the M1 rather than M0 historical measurement condition … were wrong**.

At worst, filtering an incandescent light source in the spectrophotometer for producing a D50 daylight greatly reduced the light intensity of that source, and gave reflectance measurements in **M1** less accurate than in **M0** because of a poorer Signal/Noise ratio, unless a longer measurement time was used.

Indeed, when a tint contains no optical brighteners, the UV content or the "Visible Light/UV Light" ratio of the light source has no influence on the measured spectral reflectance, and therefore no influence on measured color.

Using **M0** or **M1** or **M2** measurement conditions will generally only alter the measured spectral reflectance when measuring prints on papers containing optical brighteners, and more significantly on low-density zones.

On a slightly fluorescent paper:

- Using a UV-cut filter (**M2** measurement condition) does not solve problems because we measure the paper tint less bluish than we actually perceive it under D50 light,
- In traditional **M0** measurement conditions, the spectrophotometer measures a paper tint significantly bluer than we perceive it under D50 light,
- In **M1** measurement conditions, the spectrophotometer measures an even more exaggeratedly blue paper tint, because the paper optical brighteners are excited by more UV.

We showed in 2015 how damaging spurious commercial arguments were to a good understanding of ISO12647, by examining:

- **PSO_Coated-Premium.icc** (FOGRA51) I.C.C. profile candidate to I**SOcoated_v2_eci.icc** (FOGRA39) replacement,
- and **PSO_wood-free_uncoated.icc** (FOGRA52) I.C.C. profile candidate to **PSO_Uncoated_ISO12647_eci.icc** (FOGRA47) replacement.

These beta I.C.C. profiles, based on the **M1 FOGRA51** and **FOGRA52** press characterization files, have since been finalized and renamed **PSO_Coated_v3.icc** and **PSOuncoated_v3_FOGRA52.icc**, but the erroneous paper tints present in **FOGRA51** and **FOGRA52** characterization files - and in the published generic I.C.C profiles - have not been corrected:

- With **PSO_Coated_v3.icc** profile **(FOGRA51**) candidate to replace **FOGRA39**:
  Thick coated paper D50 2° Lab paper tint measured in **M1** conditions, L, a, b - 94.9, 1.5, **-6.0** is clearly too blue,
- With **PSOuncoated_v3_FOGRA52.icc** profile **(FOGRA52**) candidate to replace **FOGRA47**:
  White uncoated paper D50 2° Lab paper tint measured in **M1** conditions, L, a, b - 93.5, 2.5, **-10.0** is far too blue.

The Lab D50 2° Lab paper tints in the published FOGRA51 and FOGRA52 characterization files are **WRONG**.

Indeed, let us remind below what many seem to ignore - or have forgotten - about the C.I.E. Lab color measurement system**:**

1. The C.I.E. Lab color measurement system **should not be considered today as a color appearance model**, but only as a great way to encode any color human vision can perceive, with three unique components L, a and b,

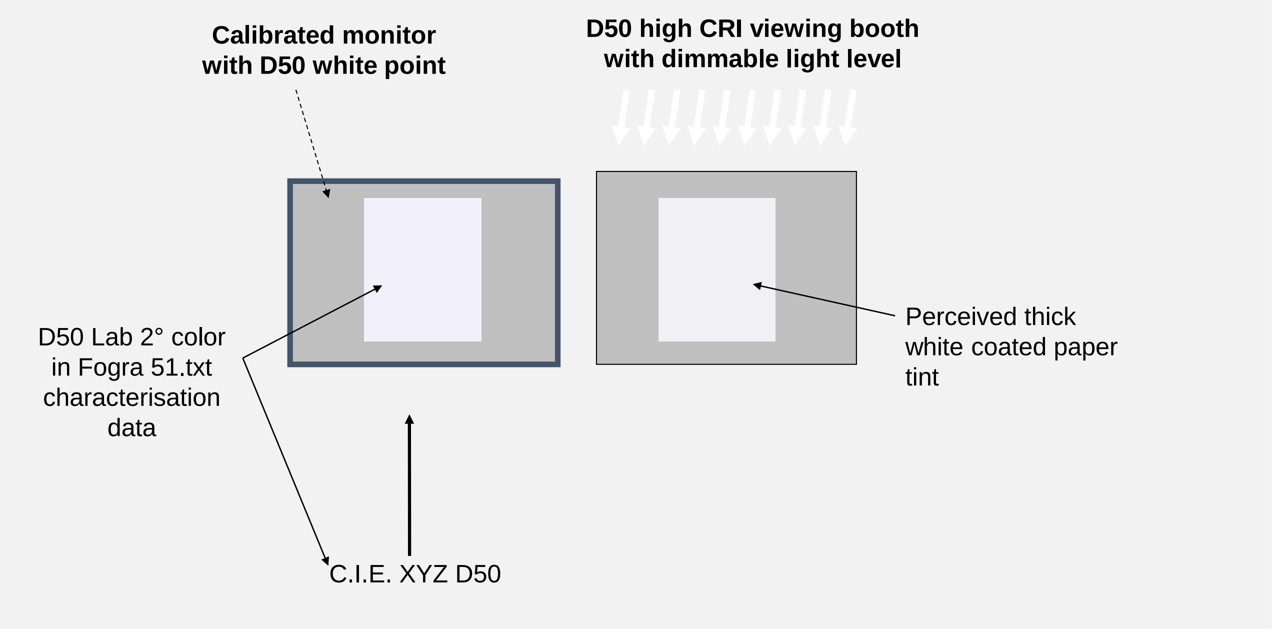
2. An excellent way to check that the Lab D50 2° measurement of a paper tint (or any other tint) is valid is:
   a. Place the measured sheet of paper in a D50 light booth ensuring a high color rendering index,
   b. Display its Lab D50 2° measured color (for example using Photoshop) on an RGB monitor properly calibrated (D50 white point) and characterized by its I.C.C. profile,
   c. Match together the level of illumination level on the paper sheet and the luminance of the calibrated monitor (e.g., 500 lx on the paper sheet if 160 cd/m² (≈ 500/π) on the screen),
   d. Compare visually the paper sheet in the D50 viewing booth with its Lab D50 2° measured color displayed on the calibrated monitor.

COLORSOURCE

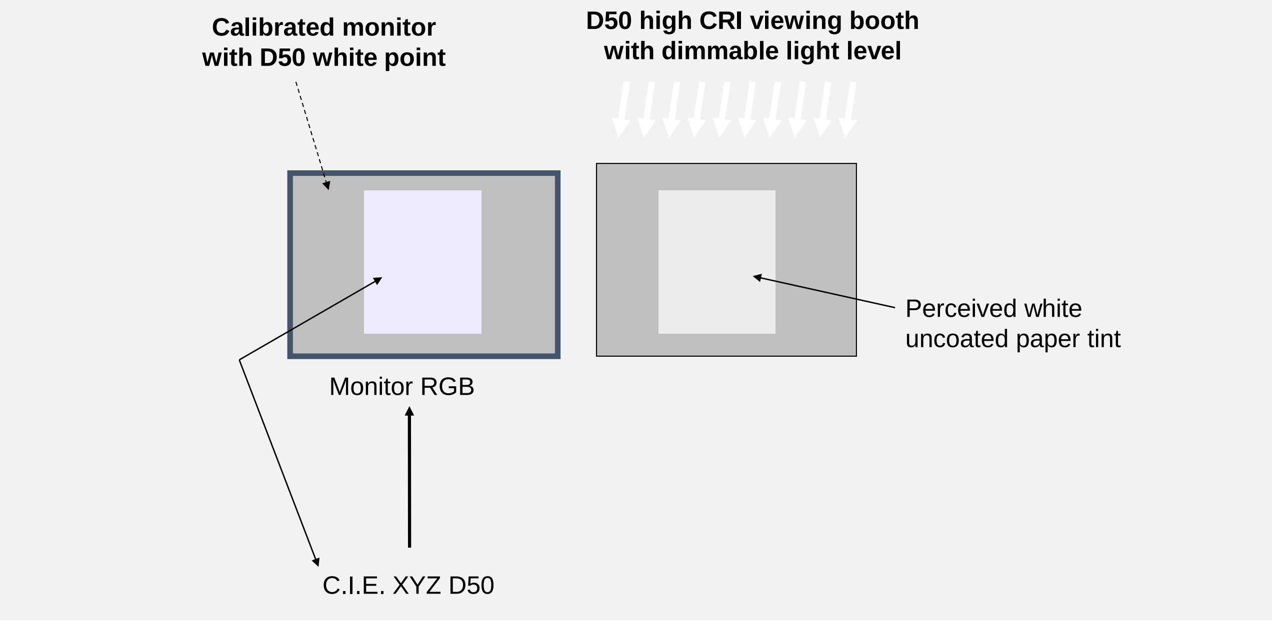
And now, of two things, one:

- Either we perceive, under these valid visual comparison conditions, the same color on the paper sheet and on the monitor, and this means that the Lab D50 2° paper tint measurement is valid,
- **Either we perceive significantly different colors on the paper and the monitor, which means the Lab D50 2° paper tint measurement … is WRONG!**

Below is the visual comparison between thick coated paper sheet and Fogra51 paper tint:



Below is the visual comparison between white uncoated paper sheet and Fogra52 paper tint:



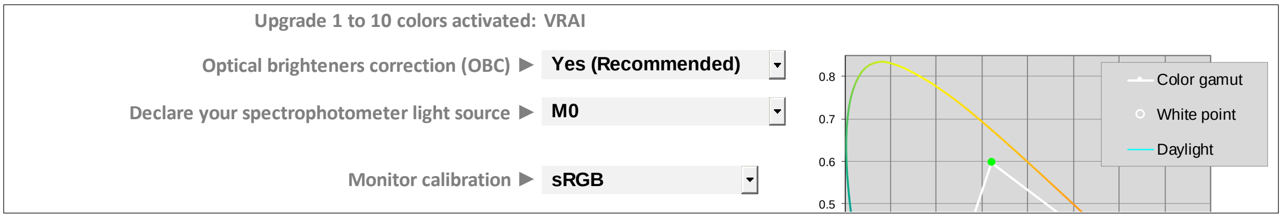
Obviously, using the **M1** measurement condition does not allow better color measurements than the historical **M0** measurement condition, and even gives worse measurements in the context of its erroneous use in some published ISO12647: 2013 press characterization data files.

Actually, the problem is that C.I.E. L*a*b* (1976) system for measuring apparent colors is a primitive color appearance model with limited performance, which does not allow computing the actual paper tint we perceive if the paper contains optical brighteners.

We perceive a paper tint less bluish than the Lab color measured by the spectrophotometer in **M0** or **M1** conditions, because the chromatic adaptation of our vision (white balance) is neither completely made on paper (We would then perceive it neutral white), nor completely on the D50 light (We would then see the paper as blue as the spectrophotometer does).

An excellent solution is therefore implemented in Colorsource **MagicPress** and **MagicPrepress** applications dedicated to calibrating presses matching ISO12647 2-3-4-6 2004 and 2013 standards:

- All the Lab D50 2° aim colors are calculated taking into account the **M0** or **M1** measurement condition attached to each characterization file published by ISO12647 since 2004,
- When measuring your prints in Self-Backing mode, and whatever your ISO12647 2-3-4-6 target, you keep free to use your spectrophotometer in **M0** or **M1** measurement condition, and simply declare the measurement condition you are using in the software's preferences.



5-3) Densities' measurement conditions for ISO12647 press settings:

All density measurements must be performed in Self-Backing mode, and in relative density mode, for minimizing the influence of the paper opacity and paper tint on measurements.

No polarizing filter should be used if the same 45/0° instrument is used for color and density measurements. Such a filter could introduce a bias on color measurements, without providing a significant enhancement of density measurements' accuracy on wet offset prints, since ISO12647-2 does not require using very high densities.

5-3-a) Setting CMYK solid inks' densities on the press:

There is no ISO12647 reference density: For each C, M, Y and K solid ink, the "good density" is the one allowing to get the minimal visual distance (Using preferably ΔE2000) between the measured solid ink color and its reference color specified by the chosen ISO12647-x aim standard.

So that for the solid CMYK inks' density adjustment phase, no matter which spectral response is chosen on our **MagicPress** software DIN (Status E), ANSI T, or Status I (SPI). Some offset press' ink-keys readers are using the most universal I status.

5-3-b) Pairing density measurements between MagicPress and third-party instruments:

Using any spectral measurement produced by any 45/0° spectrophotometer such as i1Pro family without UV-Cut filter, **MagicPress** calculates densities (DIN, T or I) identical to those calculated by **ProfileMaker**, or a **SpectroEye** used without a UV-Cut or polarizing filter.

Many ink-keys 'readers and pressroom densitometers are measuring significantly different densities, due to different measurement conditions (e.g., measuring on a matte black rail, using different optical filters such as polarizing filter, and also because of frequent inter-manufacturers differences when measuring densities).

For pairing **MagicPress** densities with a third-party instrument's density measurements, simply compute and set your optimal CMYK densities using **MagicPress**, and then measure a good print with the third-party densitometer, and then type these measurements in **MagicPress**.

5-3-c) Calculating the correction curve for each printing form:

Here it is essential to use the DIN (Status E) spectral response, since all reference aim TVI curves published by ISO 12647-2-3-4-6 were measured and established using this same spectral response. Therefore, apples and pears should not be mixed here, and using relative densities measured with ANSI T or I spectral responses would lead to slight errors on the CMY correction curves computed for the workflow. Errors that are quite easy to evaluate by selecting different density spectral responses in **MagicPrepress** application.

5-4) Conclusions about the aim colors specified by ISO12647-2-3-4-6: 2004 (M0 measurement condition) and 2013 (M1 measurement condition):

The C.I.E. Lab D50 2° apparent colors - measured in Self-Backing mode - to be matched at press density calibration stage are contained in the published press characterization files, and also in the published generic CMYK I.C.C. profiles.

Each ISO CMYK I.C.C. profile allows you computing (by converting CMYK to D50 Lab 2° in absolute mode), the apparent colors of any CMYK screened tone, including solid CMYK, overlays and paper:

ISO 12647-2: 2004 (M0) configurations	C 100%	M 100%	Y 100%	K 100%	M + Y 200%	C + Y 200%	C + M 200%	Paper
ISOcoated_V2 (ECI).icc FOGRA39.txt (Thick white coated papers)	L = 55 a = -37 b = -50	L = 48 a = 74 b = -3	L = 89 a = -5 b = 93	L = 16 a = 0 b = 0	L = 47 a = 68 b = 48	L = 50 a = -65 b = 27	L = 24 a = 22 b = -46	L = 95 a = 0 **b = -2**
PSO Uncoated ISO12647 (ECI).icc FOGRA47.txt (White uncoated papers)	L = 60 a = -26 b = -44	L = 56 a = 61 b = -1	L = 89 a = -4 b = 78	L = 31 a = 1 b = 1	L = 54 a = 55 b = 26	L = 54 a = -44 b = 14	L = 38 a = 8 b = -31	L = 95 a = 0 **b = -2**

Clearly, the generic paper tints specified above by the **Fogra39** and **Fogra47** characterization files measured in **M0** conditions are quite realistic, as they have been modified for Optical Brighteners Correction (**OBC**). Retained Lab values suppress the overly bluish color cast caused by the UV components of the spectrophotometer built-in incandescent light source.

ISO 12647-2: 2013 (M1) configurations	C 100%	M 100%	Y 100%	K 100%	M + Y 200%	C + Y 200%	C + M 200%	Paper
PSO Coated v3.icc FOGRA51.txt (Thick white coated papers)	L = 56.1 a = -34.9 b = -52.5	L = 48.1 a = 75.3 b = -5.2	L = 88.9 a = -4 b = 92.4	L = 16 a = 0.1 b = 0.3	L = 47 a = 68 b = 48	L = 49.5 a = -65.9 b = 24.3	L = 24.7 a = 21.1 b = -47.5	L = 95 a = 1.5 **b = -6**
PSO Uncoated v3.icc FOGRA52.txt (White uncoated papers)	L = 58.7 a = -22.3 b = -48.1	L = 54.5 a = 60.1 b = -4.3	L = 87.7 a = -2.6 b = 72.4	L = 32.7 a = 1.2 b = 0.1	L = 52.6 a = 56 b = 25.5	L = 52 a = -41.4 b = 11.2	L = 38.5 a = 9.8 b = -32	L = 93.5 a = 2.5 **b = -10**

On the other hand, the generic paper tints specified above by the **Fogra51** and **Fogra52** characterization files measured in **M1** conditions are wrong, as they were not amended with the necessary Optical Brighteners Correction to mitigate the even bluer color cast caused by the stronger UV components of the spectrophotometer built-in D50 light source.

A useful reminder: Above Lab paper tints are wrong simply because they do not match the colors that we perceive in D50 lighting under valid visual comparison conditions!

These wrong paper tints do not cause any problem to our software applications for calibrating offset presses matching **Fogra51** or **Fogra52** standards, **but the big problem remains that the published CMYK profiles PSO Coated v3.icc and PSO Uncoated v3.icc cannot be employed for producing good color proofs simulating these standards**.

On this issue we have even seen some proprietary color proofing proof system vendors promoting yellowish paper for producing **Fogra52** color proofs that are not too blue!

That's why we recommend everyone to continue using profiles based on **Fogra39** and **Fogra47** rather than their **Fogra51** and **Fogra52** proposed replacements

Another valid solution would be computing from the **Fogra51** and **Fogra52** characterization files, new replacement measurement files with the appropriate Optical Brighteners Correction, and then computing valid CMYK I.C.C. profiles giving good color separations **AND good color proofs**. For this purpose, we will soon add to our **MagicPrepress** application a button for exporting the characterization files with the appropriate OB corrections.

5-5) Main ISO12647-x I.C.C. profiles changes since 2015:

The **eci.org** website explains the reasons that have motivated the replacement of a few characterization files and associated I.C.C. profiles since 2015.

- The **SC_paper_eci.icc** profile **(Fogra40)** was replaced by **PSOsc-b_paper_v3_FOGRA54.icc** profile **(Fogra54)** significantly different (lower color gamut) following changes in paper manufacturing.
- **G7/IDEAlliance** profiles have adopted well-documented aim TVI curves and their modern versions are easy to use.

All new ISO12647 press characterization files, or replacement of older files, were made using **M1** measurement conditions and no longer **M0**, with sometimes the very confusing measurement errors that we have explained, when the involved paper contains optical brighteners.

When the involved paper contains no or very little optical brighteners, the discrepancies are sometimes negligible between the old **M0** profile and its newer **M1** version, and **MagicPrepress** software makes it easy estimating the differences between the old and new profiles:

- Negligible differences between **ISOnewspaper26v4.icc** and **WAN-IFRAnewspaper26v5.icc**,
- Small differences between the gravure print 2008 (**M0**) and 2018 (**M1**) characterization files for LWC+ paper,
- Negligible differences for gravure print on papers containing little or no optical brighteners (LWC, SC-A, SC-B) 2008 and 2018 versions,
- Significant differences between the gravure **PSRgravureMF.icc** 2008 (**M0**) and **PSR_MF_V2_M1.icc** 2018 (**M1**) I.C.C. profiles, possibly as a result of significant changes in the characteristics of MF papers.

5-6) What is left in today in 2021 from our 2015 critics?

Of course, the integration into 45/0° spectrophotometers of LED-based light source instead of an incandescent light bulb - can be a step forward:

- With offering a longer maintenance-free life span,
- With better measurement speed (almost no built-in light source warming time),
- With better measurement accuracy of spectral reflectance (thanks to more uniform signal/noise ratio over all visible wavelengths).

So that **M1** measurement condition is an improvement over the **M0** measurement, provided that the D50 source built into the spectrophotometer for **M1** measurements is not produced by optical filtering of an incandescent bulb, ... which has not always been the case.

The problem is that in 2015 the major vendors and their standardization committees defended the interest of switching from **M0** to **M1** ... **by entirely wrong technical arguments that had only increased the technical confusion among Users**.

And in addition, some standardization committees have not been able to properly use the **M1** conditions spectral measurements for publishing press characterization files with valid Lab paper color measurements, which could reliably be used by all players of the Graphic Industries for color separations AND color proofing.

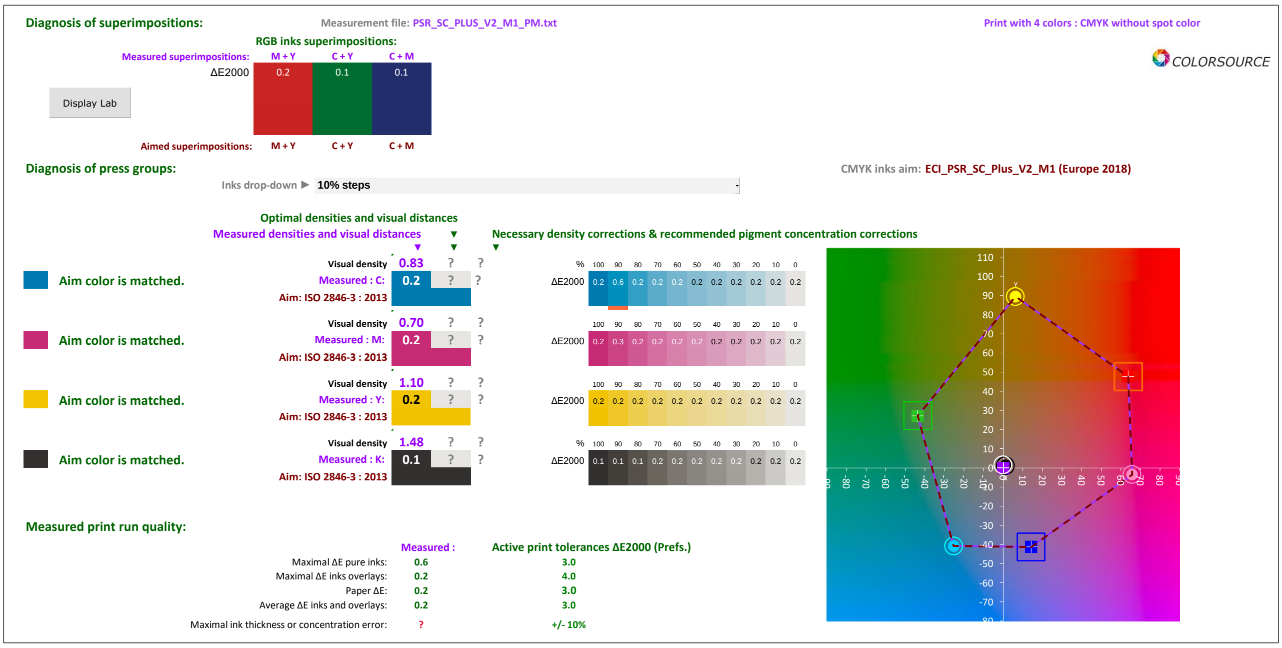
The result of our 2015 very critical review is that - very wisely - most users have decided to continue using **Fogra39** and **Fogra47** rather than their proposed replacement profiles based on **Fogra51**and **Fogra52**.

Actually, the only valid characterization files published under **M1** measurement conditions were those characterizing prints on papers containing little or no optical brighteners: And these characterization files are almost identical in **M0** and **M1** conditions.

For example, see below, the comparison between:

- **ECI_PSR_SC_PLUS.txt (M0)**,
- and **ECI_PSR_SC_Plus_V2_M1.txt (M1)**,

made using **MagicPrepress** software:



Measured print run quality:

	Measured :	Active print tolerances ΔE2000 (Prefs.)
Maximal ΔE pure inks:	0.6	3.0
Maximal ΔE inks overlays:	0.2	4.0
Paper ΔE:	0.2	3.0
Average ΔE inks and overlays:	0.2	3.0

To avoid any problems in the future, our experts will have to finally understand that any Lab measurement that does not match the color we perceive under valid observation conditions ... is simply a wrong Lab value that should not be validated or used.

Moreover, ISO12647 should decide if press characterization files should be published with or without Optical Brighteners Correction, and with which level of OBC, because in 2021 we find quite different decisions for the different up to date (I mean still frequently used) published characterization files and I.C.C. profile, and this for M0 and M1 measurement conditions.

6) How to use ISO 12647 standards at repro stage:

6-1) ISO CMYK I.C.C. profile to be used for color separations:

Obviously, if a specific ISO 12647 printing configuration is envisaged for a print run, the best color separation profile to be used for optimizing the esthetic reproduction choices at repro stage is an I.C.C. profile computed from the text measurement file characterizing the considered printing configuration.

If possible, for optimizing the color separations quality, you should edit the ISO CMYK I.C.C. profile in order to take into account the real stock paper tint, rather than the generic ISO paper tint:

- Introducing the real stock paper tint into any CMYK ISO I.C.C. profile is quite fast and easy with using for example ProfileMaker **ProfileEditor** module. If needed use **MagicPress** application for correcting the optical brighteners of the measured stock paper tint.
- For taking into account very strong changes of the paper tint, you can use Colorsource **CMYK_Backgrounds** application, but there you need using a **spectral** press characterization file. This application allows you computing the new press characterization file even if you change from a white paper to a pink or yellow paper. If you change from a white paper to a vivid red or black paper, **CMYK_Backgrounds** application proposes you using if needed one of more white ink layers prior to your CMYK inks, and allows you viewing the color gamut you will get depending on the number of white ink layers you choose, and then computing the according CMYK press characterization file without having to reprint and measure a CMYK characterization chart.

If you cannot compute yourself your own ISO CMYK I.C.C. profile from the press characterization data, you can use one of the relevant generic I.C.C. profiles available free of charge on the **ECI** or **I.C.C.** website, but these profiles are not flaw-free (See paragraph 6-3) on pages 24-25). This however allows all small design studios calibrating their RGB monitors with a few hundred dollars probe to enhance significantly their CMYK repro work quality.

If you do not know at prepress stage which of ISO12647 printing configuration will be used, ECI give recommendations about the default I.C.C. profile you should use at Repro stage for easing the Print House job:

- For offset printing if paper type and screening are not known: ISO Coated v2 300% (ECI) (Fogra39)
- If thin coated paper (LWC) is envisaged but its tint is not known: PSO LWC Improved (ECI) (Fogra46)
- For gravure printing if paper is not known: PSR LWC Standard (ECI) and its modern version now.

In above three cases, the Print House will have to simulate your color proof on its printing press, by properly using I.C.C. or DeviceLink profiles on their prepress workflow upstream their printing forms engraving system. For example, the Print House can change a Fogra39 color separation paper into a gravure color separation for LWC paper, while ensuring close apparent colors, and vice-versa.

For flexographic printing, no CMYK profile is available for optimizing the color separation and proofing steps, unless the Print House have duly characterized his flexographic printing press, after it has been matched to the relevant ISO12647-6 standard or to their own documented private flexographic press setting standard.

More generally using I.C.C. or DeviceLink profiles on their prepress workflow allows Print Houses changing non suited color separations into new color separations tailored to the final print run configuration, if necessary, by compressing the density and color gamut while preserving as well as possible the *color appearance*:

- If the proof and press color gamut are not too far away, you can get visually excellent results without needing to remake all repro work,
- But making **ISOcoated_v2** (Fogra39) color separations for a final print run on standard news print (Fogra42), does not allow qualified Repro Operators making the best reproduction aesthetic choices for each original: In this case simulating the Fogra39 proof by the press without selective and qualified human intervention leads to poor results i.e., “good color copy quality” vs. “High end repro quality by a qualified color specialist”.

Qualified Color retouching Operators do not care about the press target dot gains: The press I.C.C. profile allows them optimizing their aesthetic choices (light dynamic compression, reproduction of nonprintable colors etc.) by visualizing their documents on a calibrated monitor as they will print. Their work is mainly an artistic work.

From this point of view, we see that with modern production processes where all traditional and digital presses will have to simulate as well as possible the Customer’s visually accepted good or bad proof, standardizing the presses dot gains is not inevitably a good idea:

Digital presses apparent dot gains depend on each PostScript RIP being used, which does not cause any problem for good repro work and print run. Standardizing the presses TVI curves is just one of the many ways for matching some arbitrary generic CMYK chromatic response such as specified by ISO 12647-x or G7/IDEAlliance CMYK ICC profiles.

6-2) ISO CMYK I.C.C. profile to be used as source profile for color proofing:

The generic free of charge CMYK ISO profiles are essentially good in their “CMYK to Lab” direction when used in absolute mode as source profiles for producing color proofs on RGB monitors or on paper, since this “CMYK to Lab” conversion table is the interpolated press characterization measurement file.

However, pay attention to the profile ink coverage (Lab to CMYK profile conversion tables): A good proof on monitor or paper does not ensure your CMYK separations are printable.

According to “ECI'S Whitepaper”, ECI look for color proofing methods based preferably on using standard I.C.C. profiles, which should be “almost exclusively” based on measurement methods and with “practically” no manual correction.

For quality’s sake, I think it would be highly desirable that ECI would only admit color-proofing methods based exclusively on standard I.C.C. or DeviceLink profiles, exclusively on measurement methods and without any manual correction.

Because a digital color proofing system that does not produce good proofs by using standard I.C.C. or DeviceLink profiles, is a color proofing system that does not work. The failure of fast and automated color calibration methods for producing good proofs is always the tree hiding the forest:

Any manual correction of a faulty color calibration introduces a large variety of results depending on the intervening “Expert” and his mood of the day. I no longer count print runs that had to be trashed because of manual corrections by “experts” on failing color proofing systems and/or color calibration software producing bad profiles.

There is only one valid reason for manually modifying a proof color calibration: If the spectrophotometer does not “see” C.I.E. Lab D50 2° colors as we do perceive them, for example when measuring test charts printed on textile or enameled china, which particular surfaces require great measurement precautions, and would often require using dedicated and very expensive instruments. In this case, you can modify the measured test chart patches wrongly seen by the spectrophotometer, by visual comparison between these bad measurements displayed on a calibrated monitor and the measured test chart properly enlightened. You can then compute the I.C.C. profile from the measurement file that has been visually corrected using valid visual comparison conditions.

But for limited and simple color printing and proofing applications such as envisaged by ISO 12647, the test charts are always printed on opaque and hardly textured media, so that any decent spectrophotometer with 45/0° geometry perceives the colors better than we do, so that there is not any valid reason why we would modify its measurements.

When possible, for optimizing the color separations and color proofs quality, it is highly suitable editing the generic ISO I.C.C. profile paper tint, in order to take into account, the real stock paper tint, rather than the ISO I.C.C. profile generic paper tint.

6-3) Important notes about free downloadable generic CMYK ISO profiles:

Because of the non-standardization of CMYK ISO inks reflectance curves, the characterization measurement files published by Fogra, and thus the generic CMYK I.C.C. ISO profiles computed from these measurements, unfortunately only contain the average apparent colors of the measured test charts, in C.I.E. XYZ and in C.I.E. Lab co-ordinates (D50 2° **M0** and Self-Backing), and not the average reflectance curves of the CMYK screened tones and paper.

So that Fogra measurements files do not contain the solid ink densities, neither the final dot gain curves to be matched during print runs, nor the appearance effects induced by the inks and papers.

The measurement files are available in form of FOGRAxxS.txt (for Small) FOGRAxx.txt and FOGRAxxL.txt (for Large):

- The “xxS” version is the measurement file of a CMYK IT-8 7.3 ANSI test chart with 928 patches (American National Standards Institute chart later standardized by ISO),
- The “xx” version is a 1485 patches CMYK ECI2002 ECI test chart (European Color Initiative chart, later standardized by ISO),
- The "xxL" version (e.g., FOGRA39L) is a larger 1617 patches test chart.

For offset printing, measuring too many patches is useless. Better is worth making an average measurement file of many smaller non-standard CMYK charts, so as to take into account the press fluctuations and the inherent imperfections of inks keys adjustments, which always need compromising in real life.

Note that you can always compute your own ISO CMYK profiles from the Fogra or ECI or G7/IDEAlliance published characterization measurement files, for optimizing the ink settings of the “Lab to CMYK” conversion tables, and for using the best gamut mapping algorithms, for getting optimized color reproduction at Repro stage.

The generic published ISO profiles are not very good in “Lab to CMYK” directions when used for color separations at repro stage.

The ISOcoated_v2 profile is provided by the ECI in two generic forms:

- **ISOcoated_v2_eci.icc** with 330% maximal ink coverage,
- And **ISOcoated_v2_300_eci.icc** with 300% maximal ink coverage.

These profiles are identical in their “CMYK to Lab” directions, but, as shown below, very bad when used for color separations using their “Saturation” rendering intent:

Original Image

CMYK ISO Coated_v2 with saturation rendering intent with generic ECI profile.

CMYK ISO Coated_v2 with saturation rendering intent computed with Eye-One Match software.

The ideal process would be making always oneself the ISO calibrated press I.C.C. profile with real inks and paper, by using the average spectral measurements of a printed test charts, because Fogra data are generic colorimetric data.

However, using the Fogra or ECI generic data for standard commercial print work is still a great progress as long as the according I.C.C. profiles are properly computed and used.

Note that the two **Fogra39** based profiles **Coated_Fogra39L_VIGC_260.icc** and **Coated_Fogra39L_VIGC_300.icc** available for download on color.org (I.C.C. website) are much better in their “saturation” rendering intent mode:

COLORSOURCE

7) Choosing CMYK inks for matching ISO 12647 standards:

7-1) Using CMYK inks not complying with ISO 2846-x standards:

Let us stress it is possible matching ISO 12647 standards with non-standard inks, as long as they allow a better (or near enough) color gamut: It is what we do when simulating CMYK ISOcoated_v2 (Fogra39) colors on a digital printer for producing a color proof, or on a digital press for producing a longer print run simulating an offset press.

In this last case, we deliberately shrink the digital press color gamut to the smaller press color gamut, which is a pity, and shows the limits of any standardization process that necessarily downgrades the performances to an average level.

Some large Print Houses use higher than ISO CMYK densities or larger color gamut CMYK inks for simulating ISO or larger than ISO color gamut's, depending on their customer's needs:

- Some Graphic Industries Clients need a standard average quality, in order to standardize their colors worldwide at many Print Houses with locally available inks, papers, and repro and print technologies,
- Other Clients not having these constraints prefer getting optimal performances at a single Print House, and do get a better quality by using the maximal press color gamut.

This trend will grow with digital presses soaring applications and market share: Many digital presses offer a much better than ISO CMYK color gamut, and using these digital presses for simulating ISO 12647 colors is like using an offset or gravure press with seven CMYK + Orange + Green + Violet inks… for simulating the poor greens, blues, violets and oranges of standard CMYK publishing.

7-2) Using ISO 2846-x complying CMYK inks:

When producing CMYK inks complying with **ISO 2846-x**, their vendors cannot guarantee fixed spectral reflectance curves, but only an ISO complying D50 2° C.I.E. Lab solid color for a reasonable ink thickness to be determined by the Print House, because of the large manufactured quantities and the availability and the price fluctuations of the raw ingredients.

A Cyan ink is not a special tint such as a "Pantone Coated", which formulation, if done properly, guarantees a specified spectral reflectance (at appropriate ink thickness) and not a simple D50 2° apparent color. However, "same C.I.E. Lab D50 colors" not meaning "same densities", ISO 12647-x or IDEAlliance solid ink densities can only be indicative values.

With any ISO2846-x complying ink, you have to search for each C, M, Y and K ink, the solid density (100% thickness and/or pigment concentration) allowing you matching the relevant C.I.E. Lab D50 2° target color published by **ISO 12647-x** or **IDEAlliance** according to each standardized print technology, paper and screening. That is what MagicPress applications does instantly

With a press in good condition, if no solid ink density allows you matching the ISO specified C.I.E. Lab color within the ISO ΔE tolerances, it means the ink you are using does not meet ISO **2846-x** standard, or that sometimes your paper is the problem, or that your press needs to be washed or maintained.

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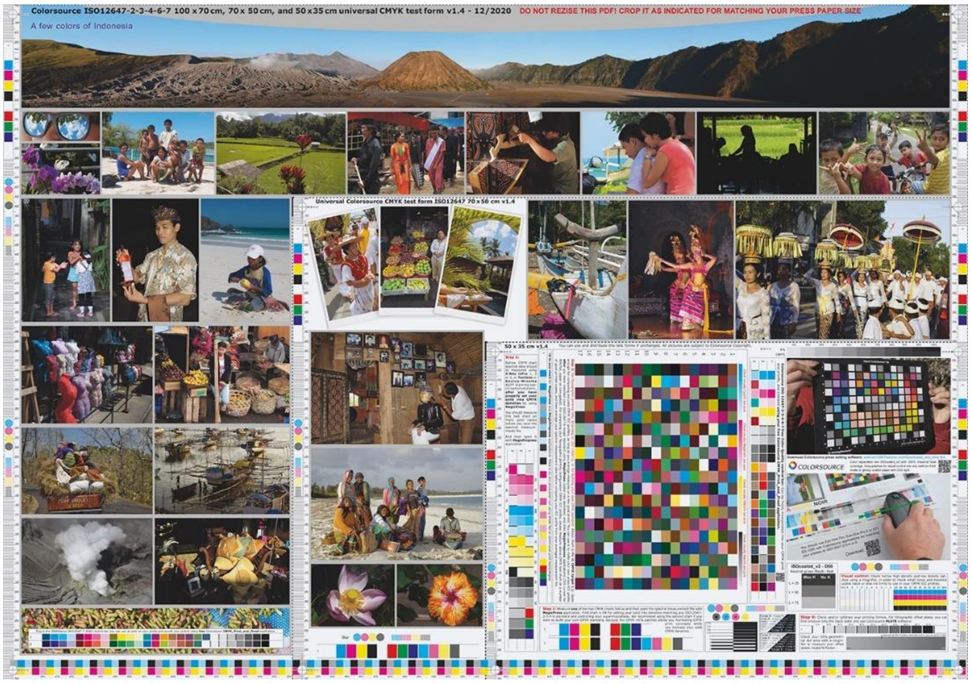
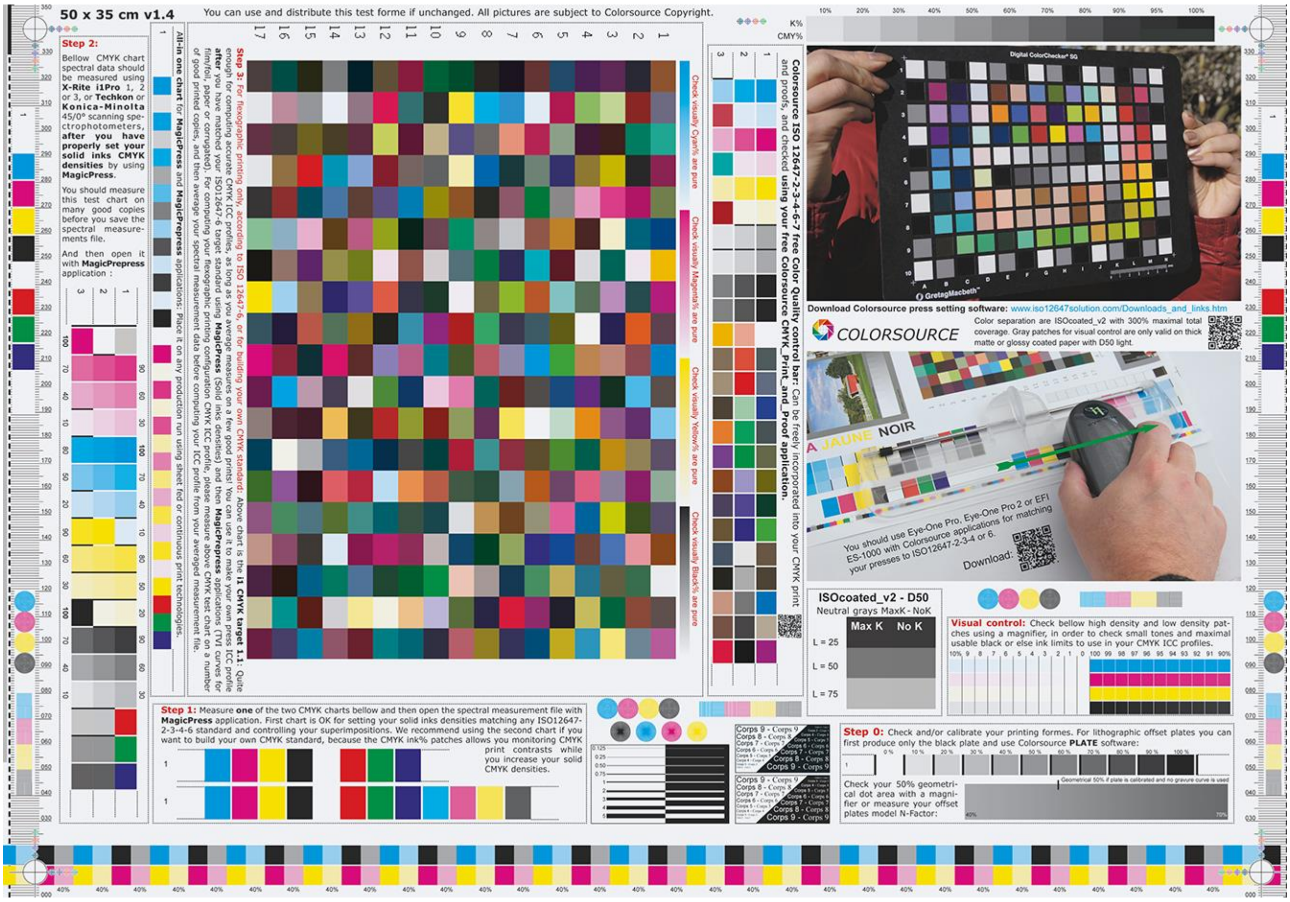
8) Density based method for matching ISO12647-x standards:

8-1) Colorsource free and universal CMYK test print forms:

This 100 x 70 cm CMYK test print can be cropped down to a 70 x 50 cm, or to a 50 x 35 cm test form:



The base 50 x 35 cm test form includes all the CMYK test charts you need for matching easily ISO12647-2-3-4-5-6 CMYK print standards or for setting up your own private CMYK print standards:



For setting properly small format presses, Colorsource offer you as well two free SRA3 format CMYK test forms: One SRA3 Landscape plus one SRA3 Portrait CMYK form. Please see download link hereafter:

https://www.iso12647solution.com/Colorsource_universal_CMYK_print_test_formes.htm

8-2) Using the CMYK test print forms for setting lithographic offset presses:

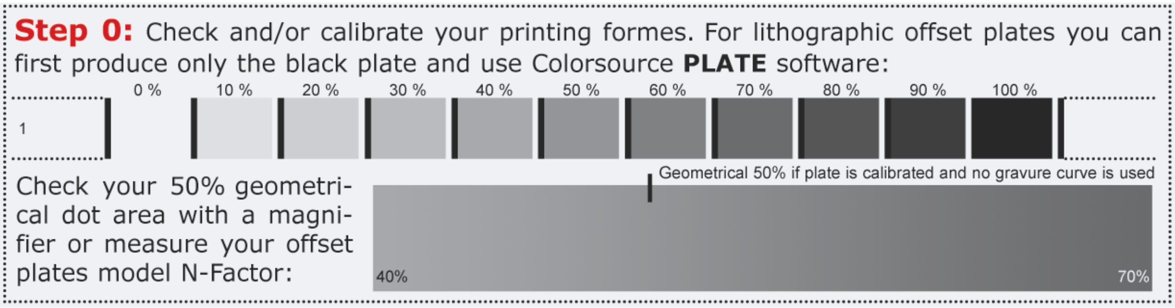
Colorsource have developed the necessary software tools for accurately computing the optimal print density for each CMYK ink, and the appropriate CMYK printing form correction curves for matching any **ISO12647-2-3-4-6** or **G7/IDEAlliance** specified target, by using the measured spectral characteristics of the print run specific inks and paper on appropriate CMYK control bars.

This software is using the raw spectral data of very popular and affordable 45/0° spectrophotometers such as **Eye-One Pro** family. (You do not pay for useless built-in measurement functions and the results display is much better on RGB monitors or on laptops).

Colorsource software works as well for any N-colors printing application with or without a CMYK base, for example for seven colors packaging printing, or for cartographic printing applications. This solution is much better and much cheaper than the most basic CMYK densitometers! This software allows as well calibrating the offset plates, and you can download it for a free trial test on Colorsource web site.

For any kind of ISO12647 press setting, you must first check the printing forms quality and accuracy.

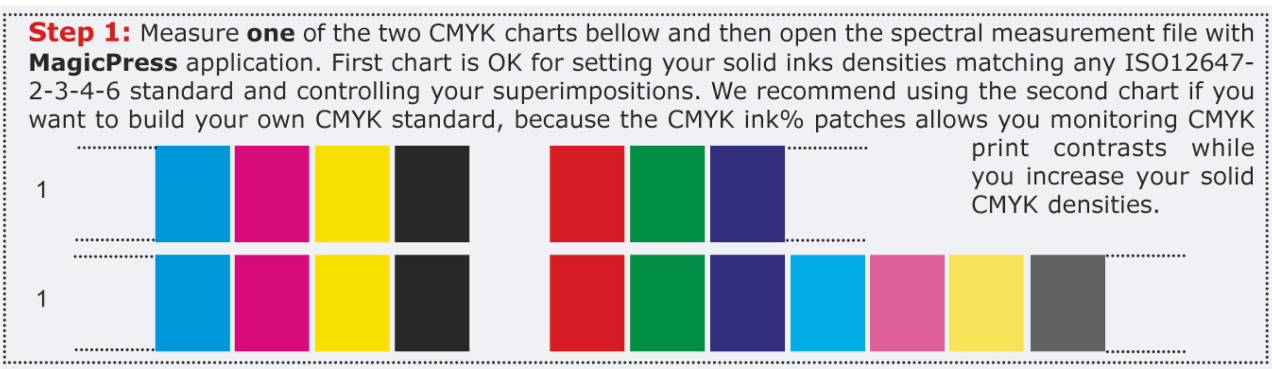
For offset printing, you can first produce only the black plate of one of the Colorsource test forms, where a zone is dedicated to plate control and CtP calibration. **PLATE** application allows easy CtP calibration using a simple 45/0° spectrophotometer:



Setting your printing press matching ISO12647 standards or any other imposed CMYK chromatic response is quite fast, easy, and cheap, as long as you choose the right tools and methods:

8-3) Computing each optimal CMYK solid ink density for matching ISO12647-x:

In a first step you adjust each CMYK solid ink density, by playing on the ink thickness or concentration, in order each ink matches the target Lab color imposed by your public or private CMYK standard:



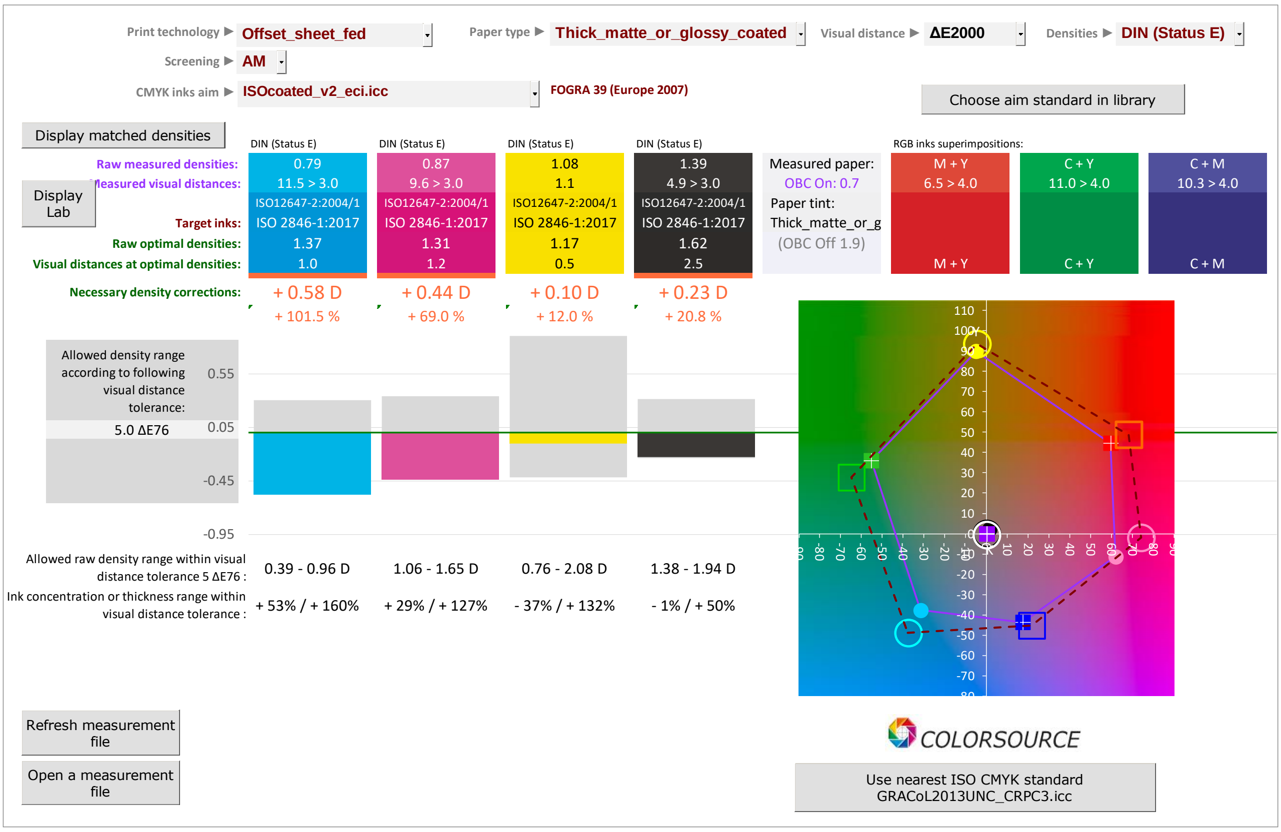
This step is crucial for any traditional or digital print process, because it largely determines the print process dot gains and color gamut, that strongly depend on the solid inks' thicknesses and/or concentrations. A classical mistake in Graphic Industries is neglecting this first step, although producing good prints on a traditional or digital press with poorly set solid inks and trappings is nearly impossible. Another classical mistake consists into modifying the solid inks densities for improving the print gray balance, which is never necessary when your printing forms are properly tailored to your measured print process characteristics.

First look for each C, M, Y, and K color the solid ink density that allows matching the ISO target C.I.E. Lab D50 color according to your print configuration. In practice, the optimal density depends on the ink reference, on its possible formulation changes, and as well depends a lot on your paper reference and batch.

Colorsource **MagicPress** application computes the four optimal CMYK densities after one single scan spectral measurement. The application displays the measured inks densities and colors and their optimal print densities (and/or concentrations) that will ensure minimal visual distance to your selected ISO12647-x target.

The minimal and maximal authorized print densities and/or Ink thicknesses or concentrations within your own ΔE tolerance are displayed as well:

For example, **MagicPress** application computes hereunder that CMYK densities should be respectively increased by 0.58, 0.44, 0.10 and 0.23 D, for reaching respective 1.0, 1.2, 0.5 and 2.5 ΔE2000 minimal possible visual distances:



MagicPress shows above as well that reaching the optimal densities requires increasing your CMYK ink thicknesses or pigment concentrations respectively by + 101.5 %, + 69.0 %, + 12.0 % and + 20.8 %.

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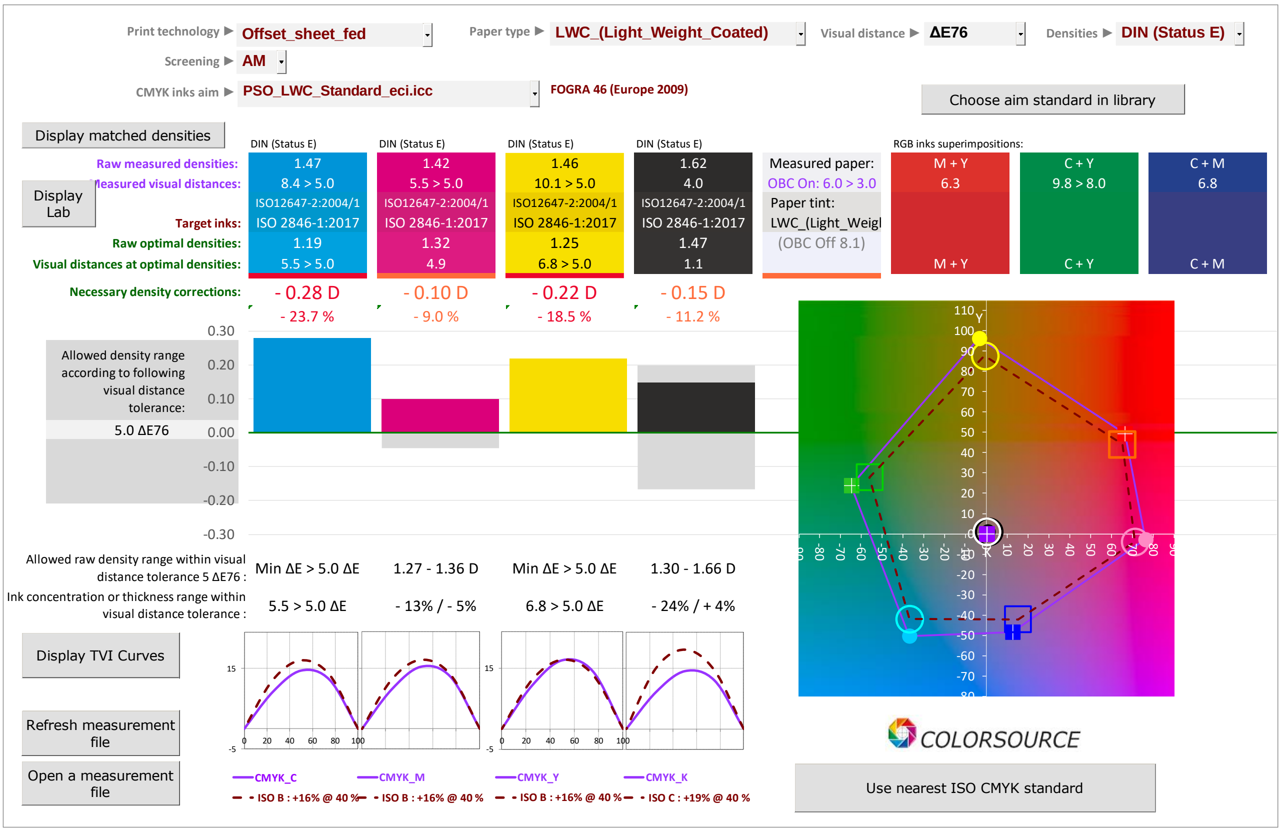
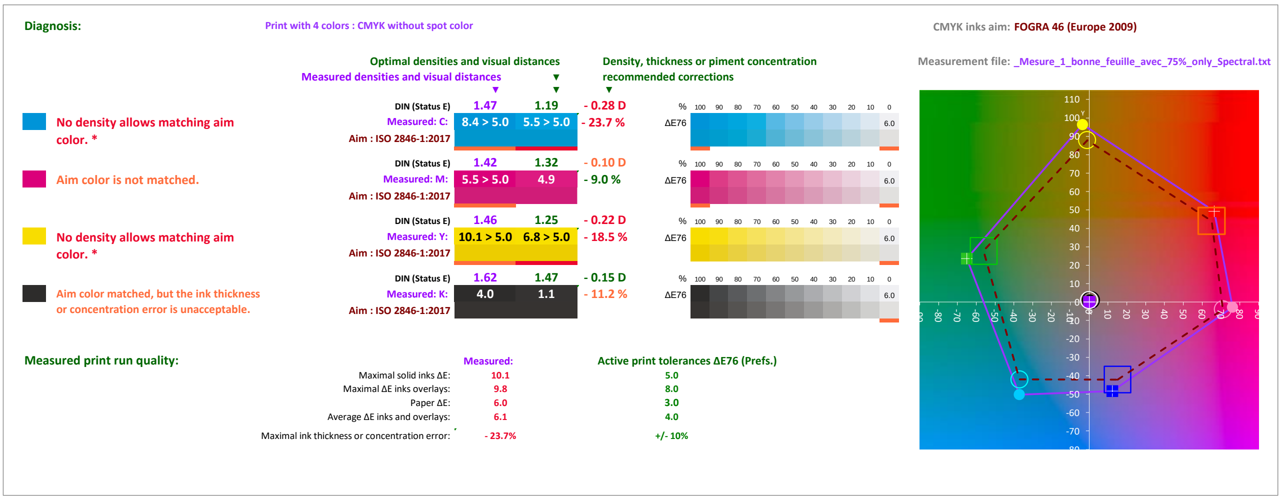
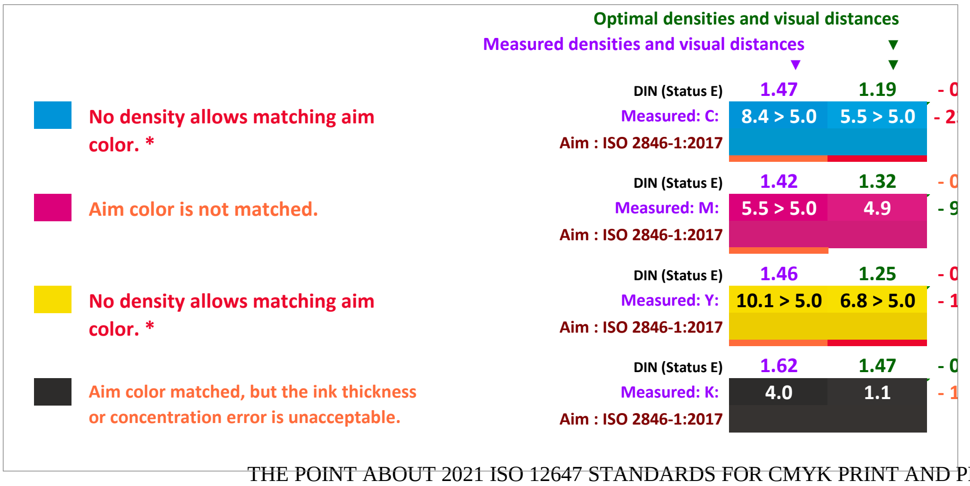
MagicPress application may sometimes predict that one or more of the CMYK inks cannot reach their ISO target color within the ISO tolerances, even if printed at their optimal density values:







For example, above situation may mean that Cyan ink does not comply with ISO 2846-x specifications (bad ink formulation), or that you are printing on some exotic paper different from the selected **LWC_Standard** target (which may be quite legitimate), or that your press Cyan inkpot is polluted and a press wash is needed.

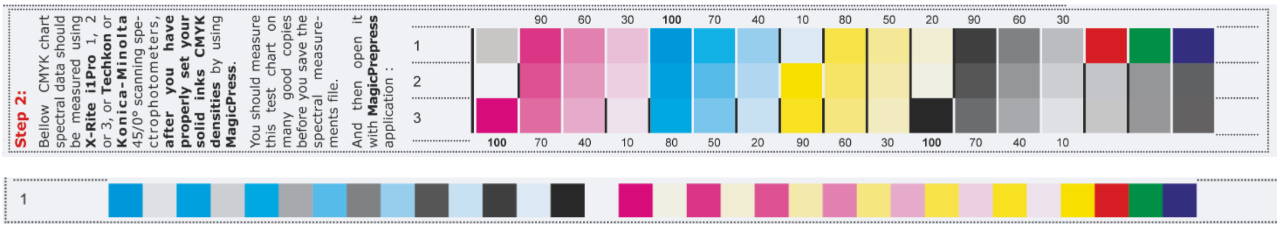
When the four CMYK inks are set to their computed optimal densities, check the red, green and blue superimpositions do match the according ISO colors. Checking trapping colors is quite useful when printing with wet offset technology, where you can be OK on solid inks and be bad on their superimpositions. (E.g., in case of blanket pressure problem).

Download **MagicPress**: https://www.iso12647solution.com/Downloads_and_links.htm

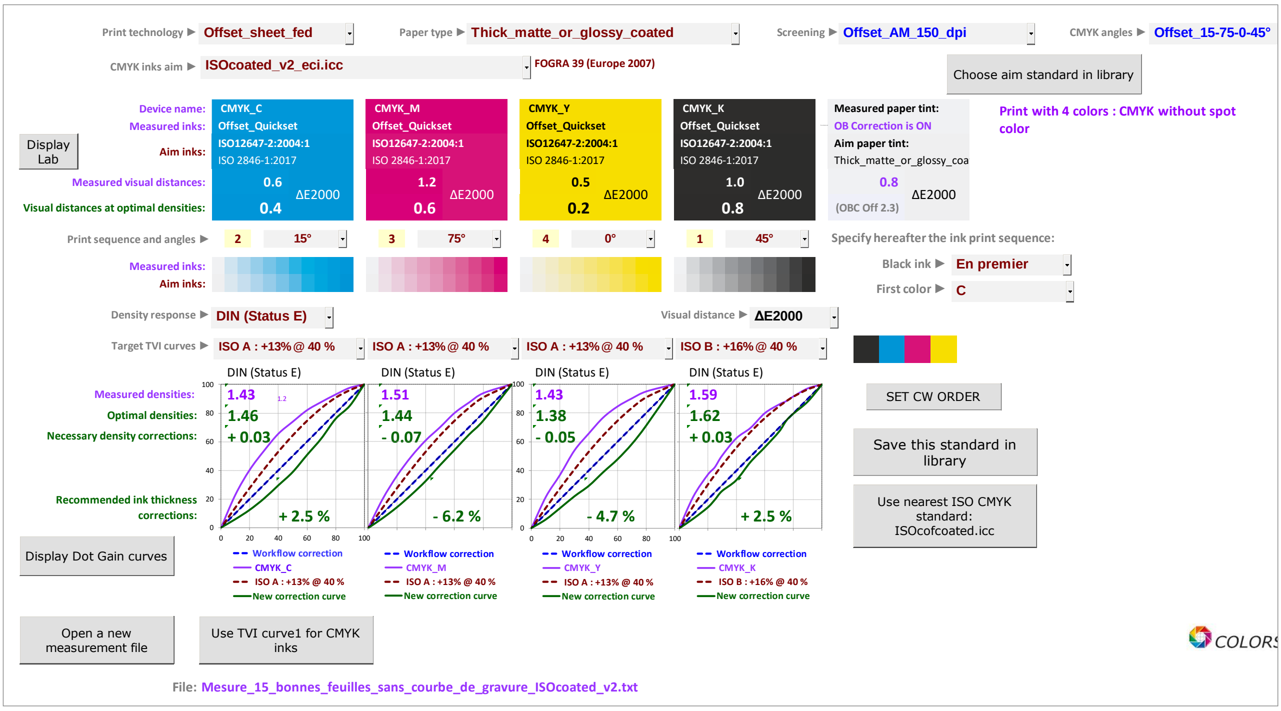
8-4) Computing the CMYK printing forms correction curves for matching ISO12647-x:

Once you have set your CMYK inks to their optimal densities in order to measure the press TVI curves in good inking conditions, you have to measure your average press dot gains in this appropriate condition, and compute a specific correction curve for each printing form, that will allow you matching the CMYK TVI curves imposed by the public or private standard you want to match. This will ensure an excellent color matching on not only your primary inks and their superimpositions, but also on all CMYK screened tones.

You can for example measure one of the following charts on a number of printed copies:



MagicPrepress averages your measurement data and works from their average values:



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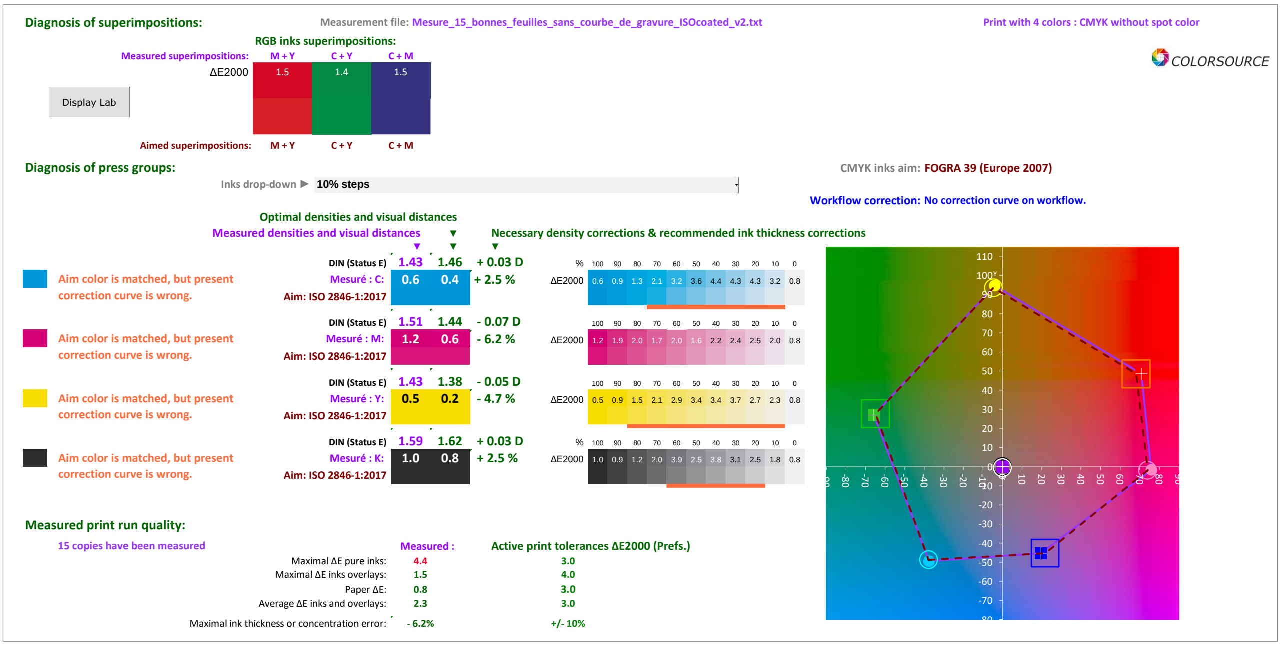
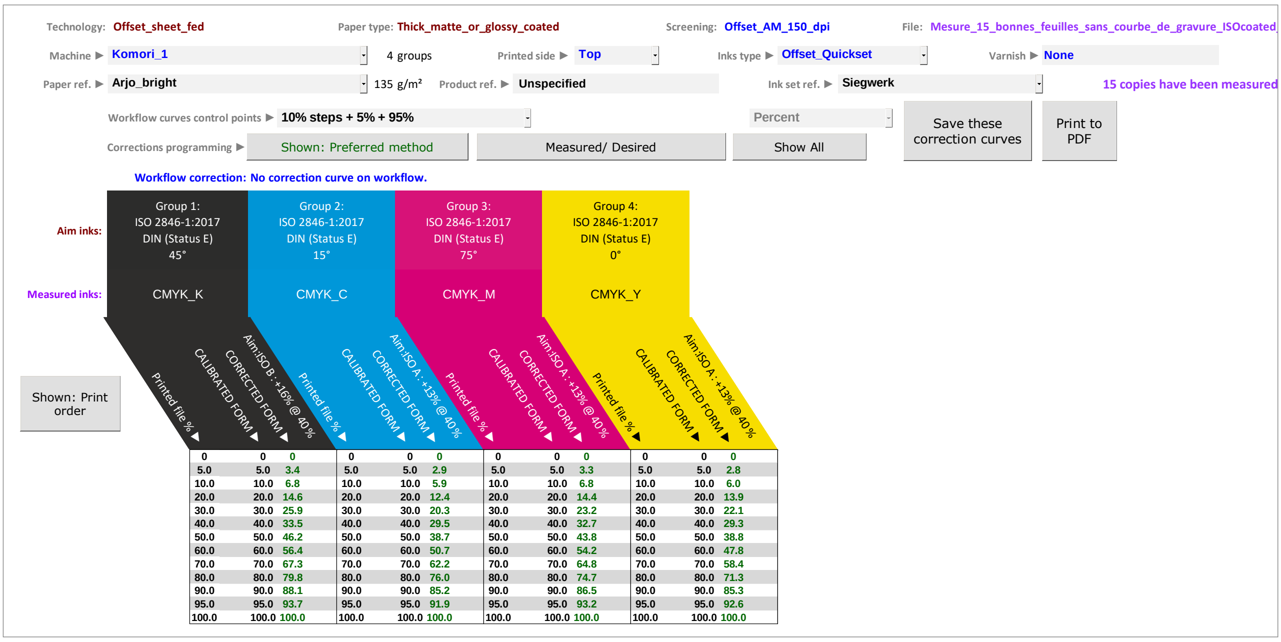
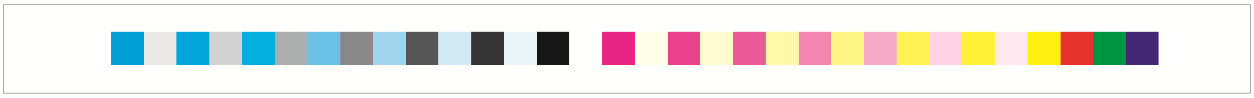




Note that using **MagicPrepress** when making production print runs on web offset presses is quite simple:

A small Colorsource (or else) control bar can easily be added to most commercial print runs, and the existing correction curves on the workflow can easily be taken into account for calculating new correction curves, if the current production print measurements show it is necessary.



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Declare the correction curves of the measured print run ▶ **Manual input of the existing correction curves**

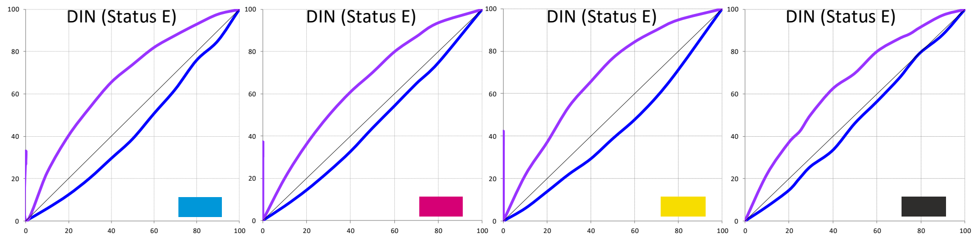
Use the Workflow control points specified in "NewCurves" tab (10% steps + 5% + 95%)

CMYK_C: Use this correction curve for all inks

Show the uncorrected press raw TVI curves

File: Mesure_15_bonnes_feuilles_sans_courbe_de_gravure_ISOcoated_v2.txt

15 copies have been measured

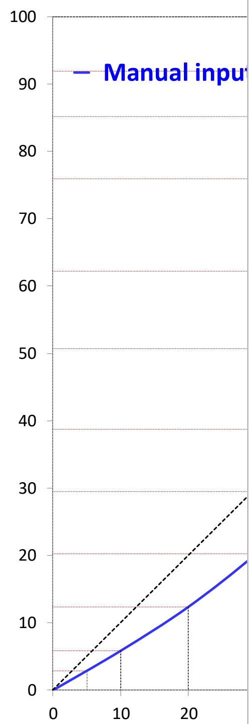


Max Raw DG: 36% @ 30%	Max Raw DG: 28% @ 30%	Max Raw DG: 38% @ 40%	Max Raw DG: 27% @ 30%
— Workflow correction	— Workflow correction	— Workflow correction	— Workflow correction
— CMYK_C measured	— CMYK_M measured	— CMYK_Y measured	— CMYK_K measured

Maximal raw on Y: 40% will print corrected.

Chose a

Device name:	CMYK_C		CMYK_M		CMYK_Y		CMYK_K	
Measured inks names:	Offset_Quickset		Offset_Quickset		Offset_Quickset		Offset_Quickset	
Modify or suppress	0	0	0	0	0	0	0	0
	5.0	2.9	5.0	3.3	5.0	2.8	5.0	3.4
	10.0	5.9	10.0	6.8	10.0	5.9	10.0	6.8
	20.0	12.4	20.0	14.4	20.0	13.9	20.0	14.6
	30.0	20.3	30.0	23.2	30.0	22.1	30.0	26.0
	40.0	29.5	40.0	32.7	40.0	29.3	40.0	33.5
	50.0	38.7	50.0	43.8	50.0	38.8	50.0	46.2
	60.0	50.7	60.0	54.2	60.0	47.8	60.0	56.4
	70.0	62.2	70.0	64.8	70.0	58.4	70.0	67.3
	80.0	76.0	80.0	74.7	80.0	71.3	80.0	79.8
	90.0	85.2	90.0	86.5	90.0	85.3	90.0	88.1
	95.0	91.9	95.0	93.2	95.0	92.6	95.0	93.7
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Insert zone								



It is therefore extremely simple to comply with CMYK ISO 12647-x standards.

When you are experienced, a specific test print run can be done in half an hour or less, and you can use as well any production print run for checking and/or updating your correction curves.

This allows you instant and worry-free press settings, as long as you check the color proofs upstream. (If an accepted color proof is bad, you should rather use the proof control bar's measurement file as a fingerprint with **MagicPress** and **MagicPrepress**!)

This purely densitometric press calibration method for matching ISO12647-x has the merit of being very simple and unexpensive, and harmonizing the colors on all the Print House's machines.

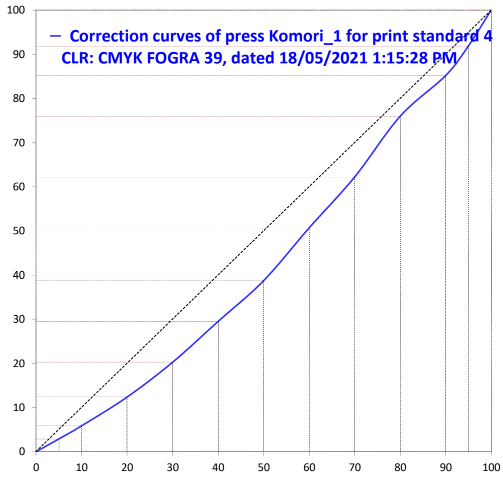
		CMYK_C	CMYK_M	CMYK_Y	CMYK_K
	Workflow correction	—	—	—	—
	CMYK_C measured / CMYK_M measured / CMYK_Y measured / CMYK_K measured	—	—	—	—

Device name: CMYK_C | CMYK_M | CMYK_Y | CMYK_K

Measured inks names: Offset_Quickset | Offset_Quickset | Offset_Quickset | Offset_Quickset

CMYK_C		CMYK_M		CMYK_Y		CMYK_K	
Offset_Quickset		Offset_Quickset		Offset_Quickset		Offset_Quickset	
0	0	0	0	0	0	0	0
5.0	2.9	5.0	3.3	5.0	2.8	5.0	3.4
10.0	5.9	10.0	6.8	10.0	5.9	10.0	6.8
20.0	12.4	20.0	14.4	20.0	13.9	20.0	14.6
30.0	20.3	30.0	23.2	30.0	22.1	30.0	26.0
40.0	29.5	40.0	32.7	40.0	29.3	40.0	33.5
50.0	38.7	50.0	43.8	50.0	38.8	50.0	46.2
60.0	50.7	60.0	54.2	60.0	47.8	60.0	56.4
70.0	62.2	70.0	64.8	70.0	58.4	70.0	67.3
80.0	76.0	80.0	74.7	80.0	71.3	80.0	79.8
90.0	85.2	90.0	86.5	90.0	85.3	90.0	88.1
95.0	91.9	95.0	93.2	95.0	92.6	95.0	93.7
100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Chose a set of correction curves in the library



Workflow correction: Correction curves of press Komori_1 for print standard 4 CLR: CMYK FOGRA 39, dated 18/05/2021 1:15:28 PM

	Group 1:			Group 2:			Group 3:			Group 4:		
Aim inks:	Noir_ISO_Offset DIN (Status E) 45°			Cyan_ISO_Offset DIN (Status E) 15°			Magenta_ISO_Offset DIN (Status E) 75°			Jaune_ISO_Offset DIN (Status E) 0°		
Measured inks:	CMYK_K			CMYK_C			CMYK_M			CMYK_Y		
	Printed file %	MEASURED CURVE	DESIRED CURVE Aim:ISO B : +16% @ 40%	Printed file %	MEASURED CURVE	DESIRED CURVE Aim:ISO A : +13% @ 40%	Printed file %	MEASURED CURVE	DESIRED CURVE Aim:ISO A : +13% @ 40%	Printed file %	MEASURED CURVE	DESIRED CURVE Aim:ISO A : +13% @ 40%
	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	7.8	7.9	5.0	7.0	7.0	5.0	8.3	7.0	5.0	7.3	7.0
	10.0	15.4	15.6	10.0	14.0	14.0	10.0	16.4	14.0	10.0	14.9	14.0
	20.0	29.7	30.2	20.0	27.8	27.6	20.0	31.5	27.6	20.0	30.4	27.6
	30.0	43.3	43.7	30.0	40.7	40.7	30.0	45.2	40.7	30.0	43.0	40.7
	40.0	55.4	56.0	40.0	53.3	53.0	40.0	57.4	53.0	40.0	54.2	53.0
	50.0	66.5	67.0	50.0	64.5	64.3	50.0	67.8	64.3	50.0	66.8	64.3
	60.0	76.6	76.6	60.0	75.3	74.5	60.0	77.5	74.5	60.0	76.5	74.5
	70.0	83.4	84.9	70.0	83.9	83.4	70.0	85.1	83.4	70.0	85.2	83.4
	80.0	90.8	91.5	80.0	90.5	90.7	80.0	91.0	90.7	80.0	92.4	90.7
	90.0	96.3	96.6	90.0	95.9	96.3	90.0	96.3	96.3	90.0	96.8	96.3
	95.0	98.3	98.4	95.0	98.1	98.3	95.0	98.3	98.3	95.0	98.5	98.3
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Shown: Print order

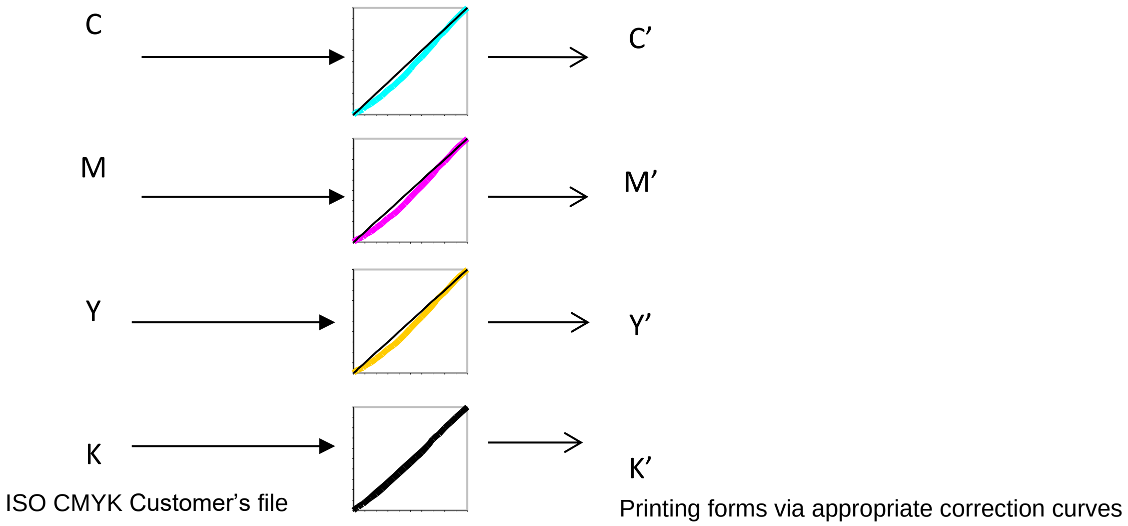
Workflow correction: Correction curves of press Komori_1 for print standard 4 CLR: CMYK FOGRA 39, dated 18/05/2021 1:15:28 PM

Shown: Print order

	Group 1: Noir_ISO_Offset DIN (Status E) 45°			Group 2: Cyan_ISO_Offset DIN (Status E) 15°			Group 3: Magenta_ISO_Offset DIN (Status E) 75°			Group 4: Jaune_ISO_Offset DIN (Status E) 0°		
Aim inks:	Group 1: Noir_ISO_Offset DIN (Status E) 45°			Group 2: Cyan_ISO_Offset DIN (Status E) 15°			Group 3: Magenta_ISO_Offset DIN (Status E) 75°			Group 4: Jaune_ISO_Offset DIN (Status E) 0°		
Measured inks:	CMYK_K			CMYK_C			CMYK_M			CMYK_Y		
	Aim:ISO B : +16% @ 40%			Aim:ISO A : +13% @ 40%			Aim:ISO A : +13% @ 40%			Aim:ISO A : +13% @ 40%		
	Printed file %	CALIBRATED FORM	CORRECTED FORM	Printed file %	CALIBRATED FORM	CORRECTED FORM	Printed file %	CALIBRATED FORM	CORRECTED FORM	Printed file %	CALIBRATED FORM	CORRECTED FORM
	0	0	0	0	0	0	0	0	0	0	0	0
	5.0	5.0	3.4	5.0	5.0	2.9	5.0	5.0	2.8	5.0	5.0	2.8
	10.0	10.0	6.9	10.0	10.0	5.9	10.0	10.0	5.7	10.0	10.0	5.8
	20.0	20.0	14.8	20.0	20.0	12.3	20.0	20.0	12.4	20.0	20.0	12.7
	30.0	30.0	26.4	30.0	30.0	20.2	30.0	30.0	20.1	30.0	30.0	19.9
	40.0	40.0	34.1	40.0	40.0	29.5	40.0	40.0	29.2	40.0	40.0	27.3
	50.0	50.0	46.2	50.0	50.0	38.4	50.0	50.0	39.9	50.0	50.0	37.7
	60.0	60.0	56.3	60.0	60.0	50.4	60.0	60.0	51.0	60.0	60.0	45.9
	70.0	70.0	69.3	70.0	70.0	61.5	70.0	70.0	61.7	70.0	70.0	56.1
	80.0	80.0	80.9	80.0	80.0	75.6	80.0	80.0	73.2	80.0	80.0	69.0
	90.0	90.0	89.0	90.0	90.0	86.0	90.0	90.0	86.5	90.0	90.0	83.1
	95.0	95.0	94.2	95.0	95.0	92.5	95.0	95.0	93.3	95.0	95.0	91.3
	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

Download **MagicPrepress**: https://www.iso12647solution.com/Downloads_and_links.htm

Programming these correction curves into the prepress workflow software allows matching the ISO CMYK target:



The density-based press setting method accounts for main parameters affecting the press CMYK chromatic response: Print technology, paper type, inks colors and density curves. It is quite appropriate for standard commercial offset, gravure and flexographic print works, and more generally for any 1 to 10 colors print process.

Density based method allows good results, although many parameters (for example moisture, temperature, traditional or random screenings, “ISO papers” coating dispersions etc.) cannot perfectly be accounted by density-only adjustments.

However, mastering density-based press-setting methods is compulsory, even if you decide to go for more sophisticated methods that involve using I.C.C. or DeviceLink profiles on your prepress workflow, in order to change your Customer's CMYK PDF into Press C'M'Y'K' PDF. Because stabilizing and repeating any print process always requires in a first step specifying properly the solid inks colors, trapping colors and TVI curves, and then matching them at each production run.

Important note:

For a long time, the references dot gain curves for offset printing were the analogue proofs optical dot gain curves. Moreover, matching these arbitrary analogue proofs dot gain curves, would have required specific plate correction curves, as for matching the ISO TVI curves nowadays.

However, the same screened films were generally used for producing the analogue proofs in the Repro House …and then the printing plates! So that the press Conductors were most of the time given unsuited plates for matching the analogue proof, which explains their frequent skepticism with respect to any new press setting method that does not ask for some "Black Art".

This skepticism quickly fades away thanks to the immediate quality enhancement and increased press setting easiness, provided above good methods are properly taught and implemented.

9) Matching ISO 12647 standards by associating density and color measurement-based methods: Simulating color proofs on the printing press:

9-1) Interest of this method:

Density based methods cannot take into account all variables such as ink formulations, moisture, paper coating and surfacing, paper tints, optical brighteners and screenings. So that simulating color proofs on printing presses is the best solution for most of traditional and digital Publishing print works. To date it only shows technical limits for some Packaging specialties.

This method consists in making the printing press simulate the apparent colors of Customer’s proof: For example, simulating ISOcoated_v2 proofs - or any other color space - by changing the proofed CMYK color separations into new press-optimized C'M'Y'K' color separations.

This is meeting the demand of all Customers since the origin of color printing: Customers ALWAYS asks the Print House to simulate colors of their visually accepted proofs, whether these proofs are valid or not.

When a press is simulating a proof, using ISO inks is not compulsory, as long as the inks authorize a better or near-enough color gamut.

But whichever the ISO or non-ISO press setting standard you choose, you still need matching reliably this standard, using the density-based methods described at paragraph 8) for being able to simulate successfully the proofs on your press.

For offset printing, using CMYK ISO 2846-2 complying inks is not constraining, and allows average size Print Houses buying from several inks Suppliers, with constant CMYK apparent colors, provided they use **MagicPress** application for computing their optimal print densities that varies depending on each formulation and ink and paper batch.

In other words, Print Houses can simulate proofs by using ISO2846 compliant inks or not, but it may be convenient to simulate Customers proofs by using ISO inks with presses matched to an existing ISO standard by density-based methods.

Simulating Customer’s proofs by re-computing their CMYK color separations can bring many advantages, and first allows optimizing the print visual color appearance:

Repro House using a generic CMYK ISO profile for their color separations have centered their neutral gray on the ISO generic D50 paper tint,

The stock paper tint is different from this generic ISO paper tint, and the color proof neutral grays must be transposed to the stock paper gray axis, under penalty of a large visual mismatch in highlights between proof and prints.

If the ISO CMYK color separation is not changed into a new color separation accounting for the stock paper tint, the press Conductor can only work the C, M and Y solid ink densities to adjust the gray axis in light tones, provided he is given grays with enough CMK base at low densities, and provided this trick does not destroy other colors!

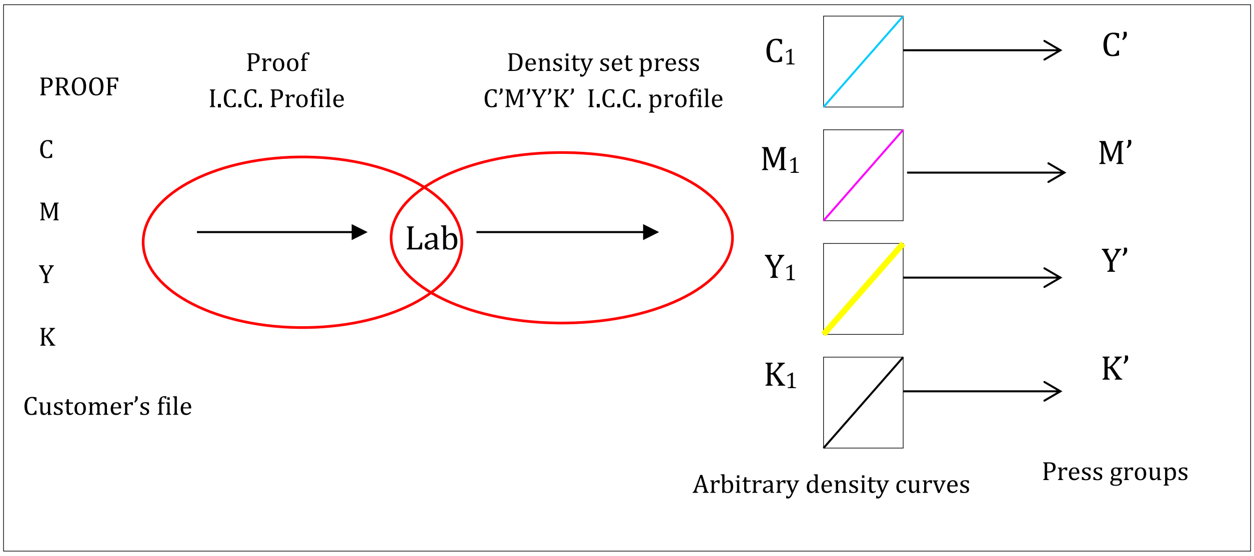
When the press does simulate proofs, the repro color separations are changed into new press color separation accounting for the different paper tints, which makes it much easier.

This example illustrates an important point about color proofing: Whether a proof simulates a printing press, or whether a press simulates a color proof, the proof and print are not two documents with identical C.I.E. Lab colors, would this only be for matching their apparent neutral grays.

9-2) Principle of operation:

The following diagram illustrates a way in which a press can simulate Customer's proofs: In this diagram, the press is simulating Customer's proof since received color separations are changed into new color separations.

- Customer's proof can be a proof matching some CMYK ISO standards or not, but it is necessary to know its color space I.C.C. profile, or at least to be able to establish this I.C.C. profile,
- The press can be set matching a CMYK ISO or your own private standard by the density setting method, (The ideal situation would be to reestablish its non-generic CMYK profile but this could only be afforded for expensive high end print works),
- This color proof simulation by the press brings many other advantages: for example, a 370% ink coverage color separation intended for thin-coated paper can be changed into a 280% separation with no change of color appearance- or can be adapted to another printing configuration - without having to remake all repro work.



As long as re computing the color separations is required, this method also allows proper printing of Clients files not only coded in form of "ISO CMYK PDF, but also coded as C.I.E. Lab or "wide gamut RGB", or better coded as "**ISO virtual RGB Press**" PDF, which is converted by the Print House prepress software into "Real Press CMYK".

This allows more productivity when a client regularly works with the same Print House, for example in Publishing Industry.

Please see on this issue: https://www.iso12647solution.com/I.C.C._Profile_Convertor_software.htm

9-3) How to save CMYK inks:

The subject recently became fashionable, when excellent and inexpensive solutions are available since… more than 18 years, in form of color management tools and appropriate software allowing applying the necessary color spaces changes to the finished document layouts:

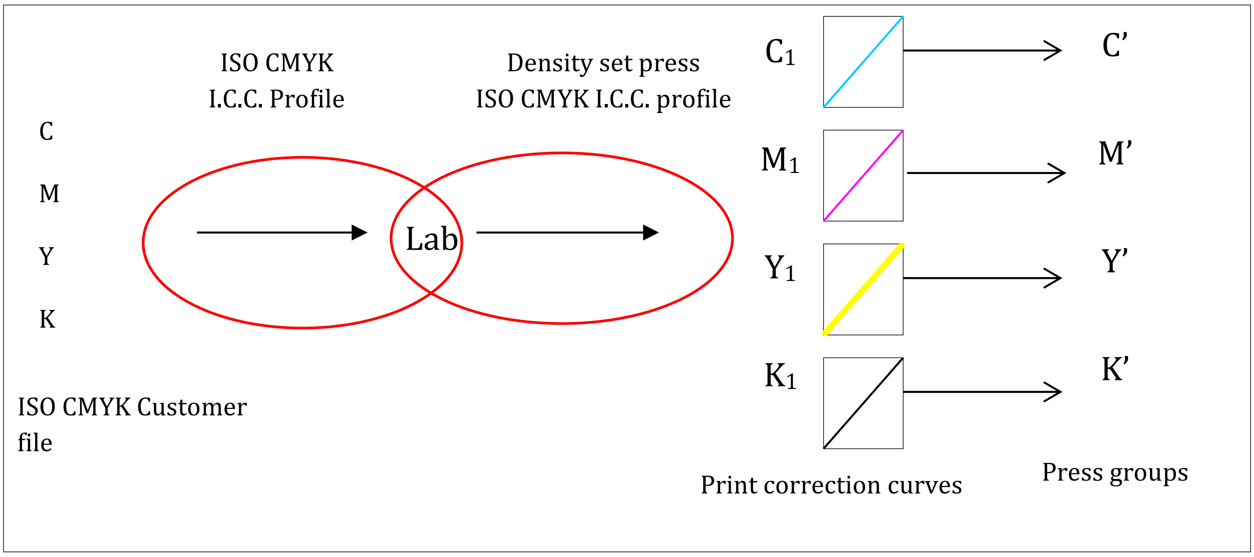
- PostScript pages: BatchMatcher PS Software … in 1997
- PDF pages: iQueue Software*, and now most of standard Print Houses prepress workflow software (E.g., Agfa Apogee, Kodak Prinergy, Heidelberg Prinect, FUJI XMF, OneVision Flow, Harlequin, GMC PrintNet Flow for digital printing and so many I forget!).

(*): iQueue software is no longer supported and its PostScript interpreter is obsolete.

And since many years you no longer need buying extra software because most prepress workflow applications offer applying I.C.C. profiles and/or DeviceLink profiles to the processed customer's PDF files.

The principle is very simple: a 370% ink coverage color separation intended for LWC paper can be changed into a 280% color separation for LWC paper. This method allows improving print ability and print quality while saving Inks.

On following diagram, the press is set to ISOcoated_v2 by density adjustments, and the ink coverage is reduced by using two identical CMYK ISO profiles (Or the according DeviceLink) as source and destination profiles:



Note that "CMYK ISOcoated_v2 to C.I.E. Lab" and then "C.I.E. Lab to ISOcoated_v2 with less ink" conversions may slightly "pollute" pure CMYK colors: For example, 100% Magenta can be turned into "1% C, 98% M, 0% Y, and 0% K".

If needed, using a DeviceLink profile with **ProfileMaker** (computed from the source and destination CMYK I.C.C. profiles) can keep primary and secondary colors pure. "DeviceLink" profiles are a standard "CMYK to CMYK" conversion table file format. The only interest of DeviceLink profiles is to avoid rounding errors of usual I.C.C. engines, but visual color matching remains OK in all cases.

Of course, the workflow software can be configured so that pure K% tones are not turned into CMYK grays.

Last but not least, let us add that using fine classic or stochastic screening that cause strong optical dot gains are an excellent way of producing more density with minimal ink quantities, i.e., to save ink:

A geometrical 50% Cyan at 240 dpi is denser than if using 150 dpi when you print same solid densities!

COLORSOURCE

10) Visual monitoring of gray balance on ISO 12647-x prints matching European I.C.C. profiles:

BVDM and ECI offer PostScript and PDF control bars allowing visual detection of press CMY gray balance drifts, by D50 visual comparison between three K30%, K50% and K70% patches and their respective C%M%Y% visual equivalents (Valid if using according standard ISO TVI curves).

The D50 visual CMY% equivalent of any K% black only depends on the press CMYK I.C.C. profile, and can easily be computed using this profile. It is thus necessary, for taking benefit from this visual control method, to use a specific control bar according to each ISO standard CMYK print configuration.

Using these control bars remains of limited use, because using fixed CMY% values can only cope with the generic ISO paper tints and with an ideal C.I.E. D50 light source.

So that you should rather compute yourself the appropriate CMY visual control bars taking into account your own spectral press I.C.C. profile, and your D50 viewing booth measured light.

11) Production and control of ISO compliant CMYK color proofs:

11-1) Practical realization of a good color proof:

Making a good proof starting from “ISO CMYK” encoded documents is very simple. It consists in transforming the document “press CMYK” values into C’M’Y’K’ values producing same *apparent colors* on the proof.

Color printers PostScript RIPs and/or Print House prepress workflow software can apply these color space changes such as “CMYK document to C.I.E. Lab” (input profile) and “C.IE. Lab to proofing printer C’M’Y’K’” (output profile), by using two I.C.C. profiles or the according DeviceLink profile.

- For simulating the press paper tint, the input profile should be used in absolute mode.
- The output profile rendering intent is chosen according to the respective color gamut of the press and proofing printer.

We then get best possible visual agreement, provided the source and destination I.C.C. profiles are computed by sophisticated software, and the PostScript RIP can properly use these profiles. *On this issue many PostScript RIP and workflow software do not allow choosing two distinct rendering intents for the source and destination profiles, whereas the same absolute rendering can be used for both profiles ONLY when the proofing configuration offers a large enough color gamut.*

Most of Ink-jet printers do provide a wide enough color gamut for simulating all ISO 12647-2-3-4-6 CMYK standards provided appropriate paper is used. However, even in this case, sophisticated I.C.C. profiles generation software does not try to produce identical C.I.E. Lab colors on print and proof.

Because the C.I.E. Lab apparent colors measurement system and its associated visual distance formulae such as ΔE76 or ΔE2000 are neither designed nor applicable for comparing two documents or for comparing a document and a monitor.

They are ONLY applicable for visual comparison of two patches placed side by side in a Daylight booth with flat neutral gray background enforcing our vision adaptation on the common white point.

Only under these viewing conditions, the primitive C.I.E. Lab system can be regarded as a color appearance model, and not merely as a convenient tool for digital encoding of apparent colors.

As soon as you compare a print and a proof with different media optical brighteners, producing on the proof the accurate print C.I.E. Lab colors does not lead to best visual matching, this phenomenon being often accentuated by the different natures of the inks on the press and proofing system.

Sophisticated I.C.C. profile generation software takes into account this reality, and do not try producing identical C.I.E. Lab values on the proof and print. Looking for exact C.I.E. Lab colors reproduction on proofing systems often leads to poor visual matching.

This basic aspect of Color Science is duly taken into account by the most basic monitor calibration software: If you want to display a red armchair with same apparent colors on a monitor with D50 white and on another monitor with a different white point, it is necessary to display two different reds for taking into account a different human vision adaptation on each monitor. The same is for paper color proofing, because each paper tint strongly modify our color perception, as monitors color temperature does.

Some proprietary color proofing systems unnecessarily ask for measuring several thousand patches CMYK charts in order to get very low ΔE on the proof, but this cannot ensure producing the best visual matching between proof and print.

Moreover, no proofing printer or printing press allow perfect printed colors repeatability, so that in practice, even when a suitable color appearance model is used for color calibration, averaging measurement files of reasonable size CMYK charts is much better than printing and measuring unnecessarily large test charts. Only very stable inkjet print engines can justify printing one single large CMYK charts. An approx. 1000 patches chart is then enough for accurate color proofing.

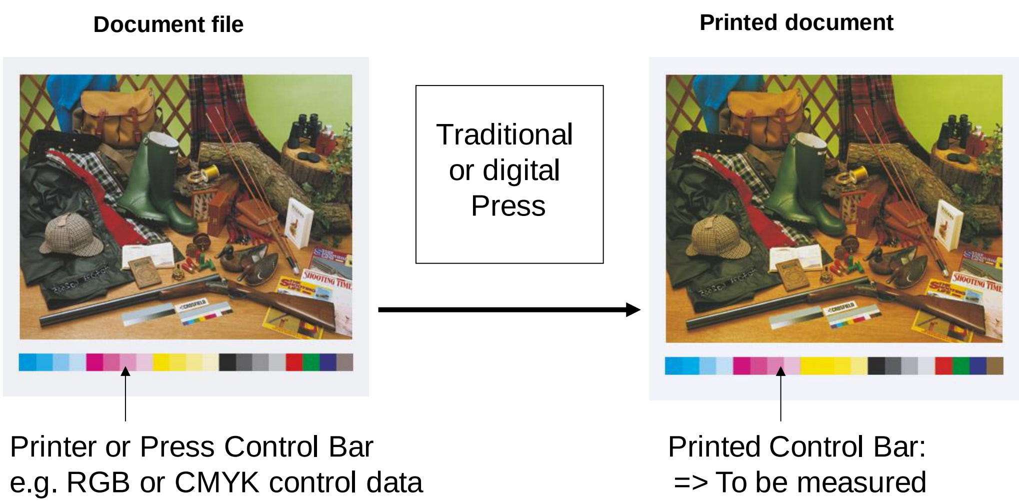
11-2) Valid principles for checking a color proof:

You can easily produce very good color proofs with ink-jet or laser printers (a spectrophotometer with a good profiling software cost less than 2000 €). Small design studios can today produce excellent A3+ proofs with domestic ink jet printers and without using a PostScript RIP, by using the print color management functions of modern page layout or Acrobat Professional software.

Laser printers are generally less stable than ink-jet printers and can require more frequent characterizations (or more frequent density calibrations when available), but they allow fast, good and cheap simulation of ISO CMYK apparent colors, when used with thick enough coated paper.

The color repeatability is similar for all ink jet color proofing systems, since they all use more or less the same print engines, such as Epson or Canon. Generally, the color reproduction stability of digital (and traditional) print engines can be optimized by using a temperature and moisture-controlled atmosphere and by good paper storage and cut. It can be improved further with print engines integrating a spectrophotometer or a densitometer for closed-loop feedback control.

For any Color proofing configuration, checking the proofs can be carried out by printing on each proof a control bar that can be more or less suited to the printing configuration to be controlled.



But whichever control bar is used, the control bar reference colors and densities values are depending on the color appearance model (human vision modeling) being used for the proofing system color calibration, hence on papers optical brighteners, inks and print technology.

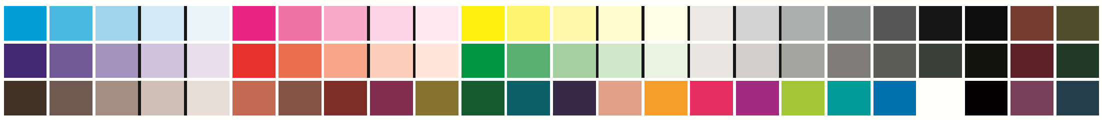
For example, if a proof is simulating the ISOcoated_v2 CMYK reference, the reference C.I.E. Lab colors of a 30% Yellow on the proof or the paper tint has neither reason nor need to match exactly the ISOcoated_v2 C.I.E. Lab D50 target colors if best visual matching is searched for.

11-3) Controlling proofs according to ISO 12642 and ISO 12647-7 standards:

Color proofs control principles standardized by ISO are resting on a false assumption that the ideal proof should have exactly same D50 2° C.I.E. Lab colors as the print, which explains many problems in the field when you look for the best results, whether you want to simulate a press on a proof, or simulate a proof on a press.

This is not some simplifying assumption that would have been necessary for setting ISO standards, but this is an erroneous technical choice misleading many Customers, as long as this C.I.E. Lab matching accuracy argument is widely used on Market by color proofing Vendors, who shout their color proofing systems are “Fogra Certified”. In addition, the irrelevant move from ISO 12642 to ISO 12647-7 proof control is only aggravating this situation!

The following control bar holds 72 arbitrary CMYK patches. It can be drawn as three lines of 24 patches for fast measurement using the spectrophotometer scan measurement mode:



Fogra Media Wedge 3 control bar. Mind using this control bar is NOT royalty free - www.fogra.org.

According to Fogra and Ugra, if a proof simulating CMYK ISOcoated_v2 (F39) is good, the color you should measure on each CMYK patch is the D50 2° C.I.E. Lab color held in ISOcoated_v2 CMYK profile - or in Fogra39.txt characterization file - within ISO 12647-7 specified tolerances.

So that according to our “professional Certifiers”, this control bar reference values only depend on the simulated CMYK ISO configuration, but not on the proofing system being used (paper, inks, printer type…), nor even on the color appearance model being used at color calibration stage for ensuring the best possible visual agreement between proofs and prints!

An exception had to be made for offset type 4 papers (uncoated white): The measurement file Fogra47L (and thus the generic profile **PSO_Uncoated_ISO12647_eci**.icc based on this file) contains a paper tint that is not the rough measured Lab tint.

This because uncoated white papers, “good” apparent whiteness is obtained by using strong optical brighteners, so that when paper tint measurement is done in D50 2° **M0** Self-Backing conditions, it indicates a bluish paper color. The fact we see these papers “not so blue” is an appearance effect, duly taken into account by more advanced than C.I.E. Lab color appearance models, which have to be used for good proof color calibration.

Standardization committees modified the **Fogra47** measurements file by registering a less bluish paper tint (L, a, b = 95, 0, **-2**) than the typically measured tints (e.g., **b = -6 … -10**). Otherwise, the color proofs produced by some Market color calibration systems would have shown a strong blue cast. However, methods that “almost always work” always prove to be only bad methods.

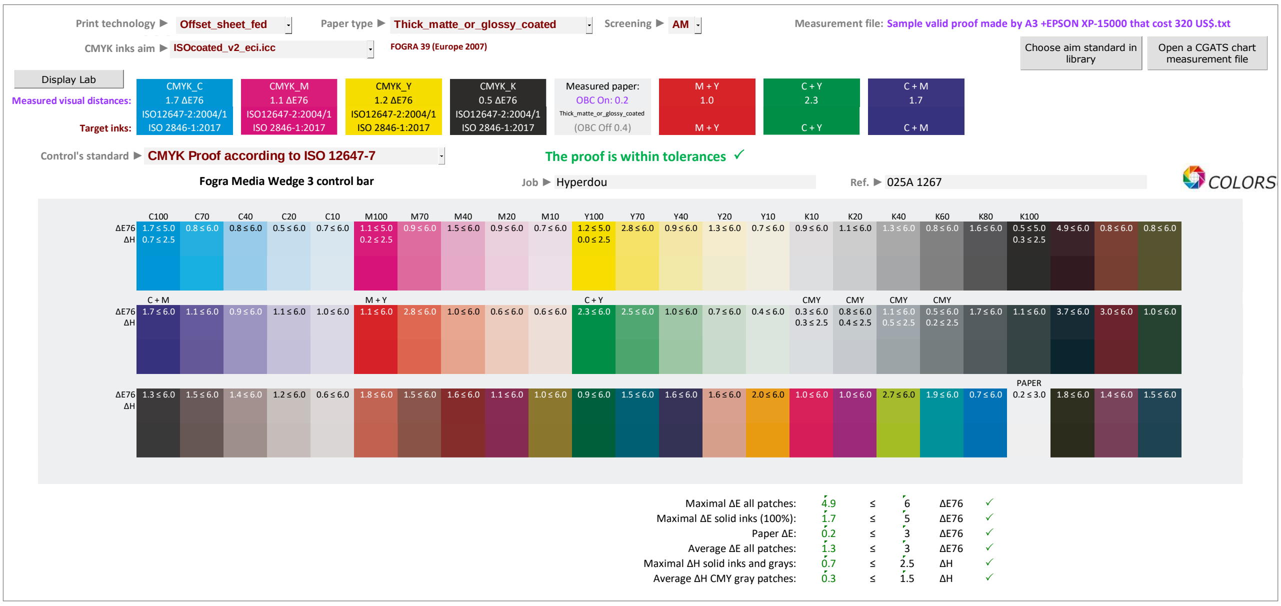
COLORSOURCE

11-4) Production and control of ISO12647-7 compliant A3+ proofs using a 330 US$ inkjet printer:

When some color proofer Vendors and members of ISO12647 committee, pretend that producing ISO12647-7 compliant color proofs is complex and may require using systems costing dozens of thousands of Euros (Without accounting for the maintenance contract costs, and for high service costs when the end users cannot even add new target standards by themselves!),

it is quite pleasant to show here that a simple **A3+ EPSON XP-15000** inkjet printer costing less than 330 Euros (20% VAT included) allows producing excellent proofs:

Hereafter a sample control report produced by our excellent **Magic_Proof_&_Print_Control** free application**:**



The **EPSON XP-15000** A3+ inkjet printer used with **Novalith Semi-matte 245 g/m²** paper prints excellent color proofs, in a quite stable, reliable and productive way.

The printer RGB I.C.C. profile have been established by measuring an RGB chart printed on a single A3 page, and then measured using **Eye-One Pro 2** in **M0** and Self-Backing measurement conditions. The I.C.C. profile have been computed using **i1Profiler Photo** application that is enough for computing the **EPSON XP-15000** RGB I.C.C. profile because it is used with no PostScript RIP. (Can be connected by USB, Ethernet RJ45 or Wi-Fi).

The desktop publishing Operators produce Fogra39 PDF files. These PDF are printed using Acrobat Professional that makes the CMYK Fogra39 to EPSON RGB color space conversion while printing.

11-5) What about ISO 12647-7 proofs control tolerances?

11-5-1) Evolution of color proofs acceptability tolerances with ISO 12647-7:

12647 standards are still using the obsolete ΔE76 visual distance estimation formula that no other Industry uses today.

This has led to obnoxious and quite uselessly complex ISO12647-7 tolerances specifications for controlling proofs, which does not avoid diagnosing as bad excellent color proofs and vice-versa!

ISO 12647-7 standard shrink the previous ISO 12642 proof control tolerances. Visual distance ΔE76 tolerances for ISO compliant control bars are as follows:

ISO control bar	Paper tint ΔE76	Solid C, M, Y or K Inks max ΔE76	Max ΔE76 for all CMYK%	Mean ΔE76 for all CMYK%	ΔH Pure C, M, Y or K%	ΔH « CMY Grays »
ISO 12642 Tolerances	3	5	10	4	K/A	K/A
ISO 12647-7 Tolerances	3	5	6	3	2.5	1.5

ΔE76 tolerances were tightened by ISO 12647-7 standards, and an additional control of ΔH tint error for some patches was introduced to try correcting the ΔE76 visual distance estimation formula flaws. (ΔH is the hue error as used for ΔECMC1: 1 and ΔECMC2: 1 visual distance computation).

- But former ISO 12642 tolerances consider as being good color proofs with sometimes very poor visual matching, by improperly using C.I.E. Lab and ΔE76,
- They often class proofs with optimized visual matching as being bad, when these proofs would allow any press Conductor to satisfy fully his customer.

Under these conditions, tightening ISO 12647-7 tolerances while keeping obsolete ΔE76 formula cannot ensure better color reproduction in the field: We can be interested by “ΔE” for assessing colors repeatability of successive proofs, for assessing the color gamut or display stability of an RGB monitor, but certainly not for assessing the visual agreement quality between prints and proofs!

The problems for simulating presses on proofs and vice-versa, come from appearance effects related to the great diversity of valid D50 light sources, papers whiteness’s, optical brighteners of traditional and digital printing papers, and inks reflection curves. These problems are aggravated by strong metamerism effects affecting the inkjet proofs and print visual comparison, even when D50 lights being used comply with ISO 3664 visual inspection standard.

Better proofs control will thus only be reached by appropriate software tools allowing quality control by technical exchange of all necessary data allowing full specification of the documents color appearance.

So that ΔE2000 visual distance will obviously be the best way to specify control bars color tolerance, when their target reference colors are duly adapted to each color-proofing configuration, and when present erroneous constant target C.I.E. Lab colors are no longer used. ΔE2000 visual distance will then allow specifying one single tolerance for all color patches of any control bar, since it evaluates visual distances better than ΔE76 according to all industrial color specialists.

On this issue, Colorsource offers **free Magic_Proof_&_Print_Control** application allowing controlling any CMYK proof according to ISO 12647-7 (ΔE76 & ΔH) or ISO 12642 (ΔE76) or IDEAlliance (ΔE76, ΔH, ΔL & ΔF) and also with using ΔECMC2: 1 and ΔE2000 visual distances. This application also allows controlling CMYK prints according to ISO12647-2-3-4-6, and checks the solid inks densities and TVI curves in this case.
If needed, the application allows programming your own custom target colors, in order to choose the target colors that ensure a close visual match between the print and proof. This is necessary for ISO12647-6 print and proof controls and for all CMYK digital print controls.

The following example shows one of the present ISO12647-7 control flaws. The following proof is considered as bad by ISO12647-7 because solid yellow simulation is out of tolerances:

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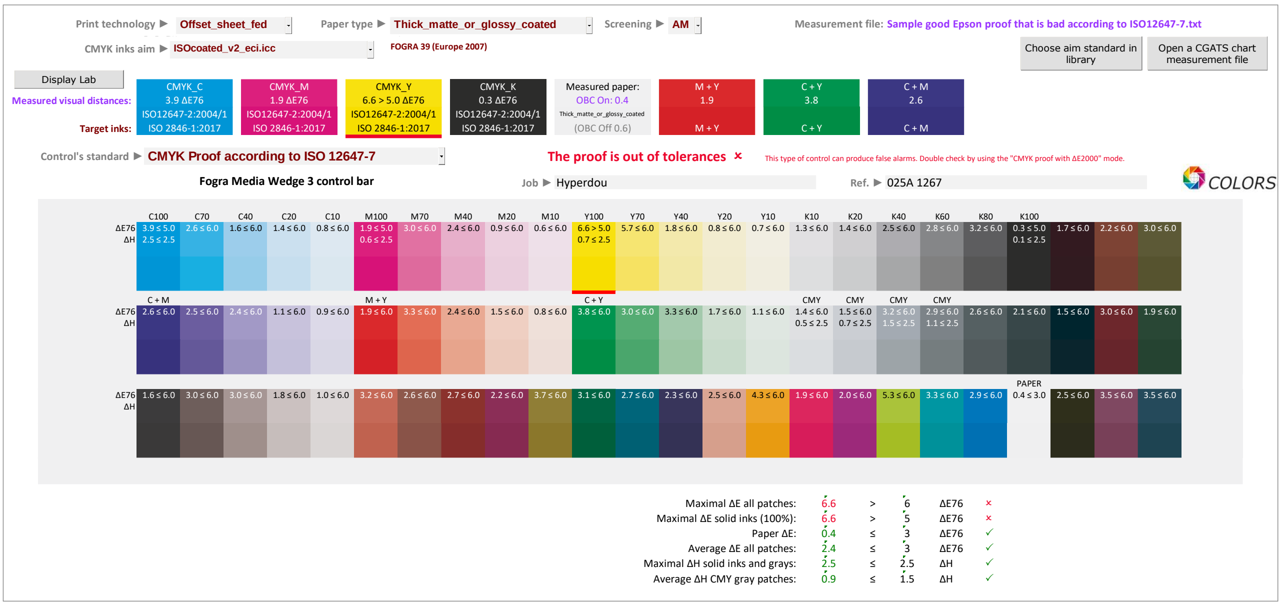
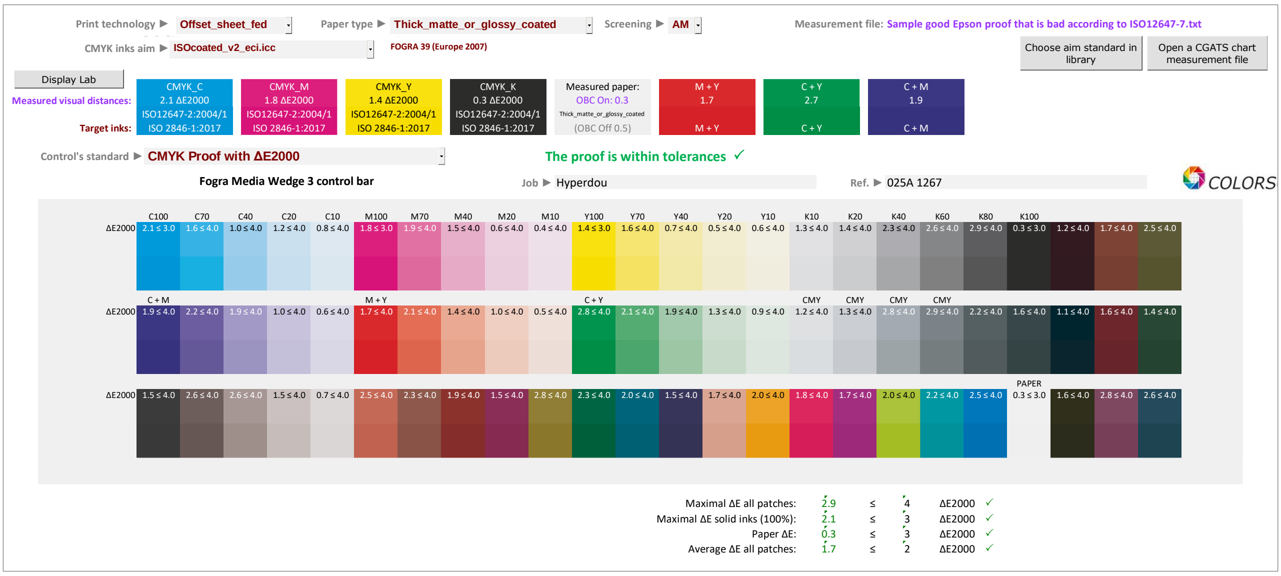
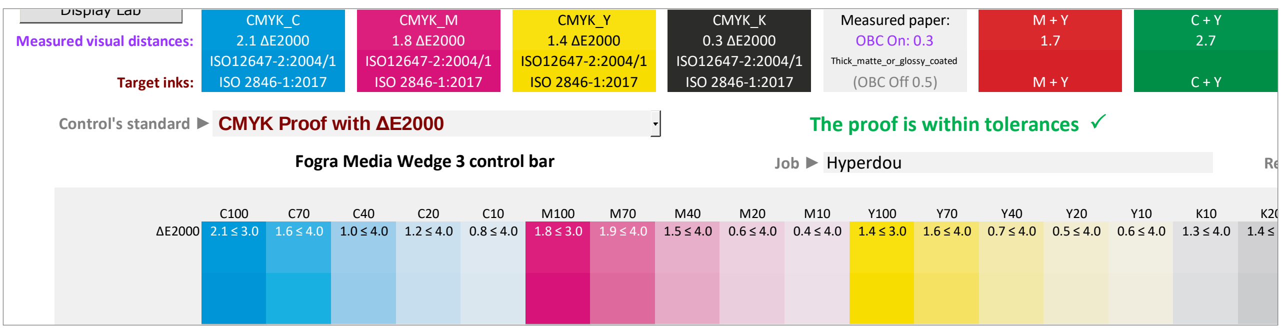


But if you examine the detailed ΔE2000 visual distances on each CMYK patch, you can see that actually the press Y100% color is simulated more accurately than the solid cyan and magenta patches:

Detailed **Magic_Proof_&_Print_Control** ΔE2000 report:





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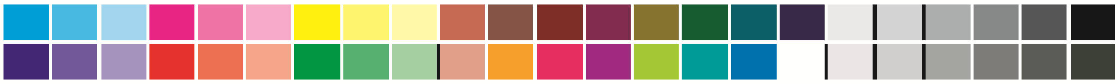
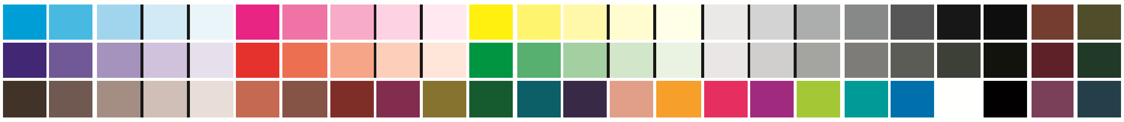
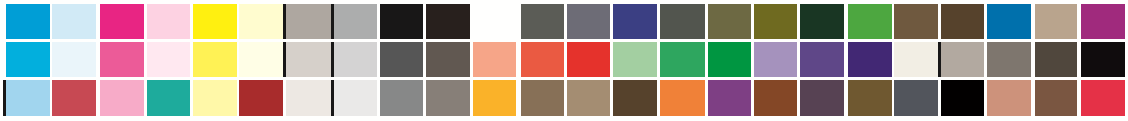
Magic_Proof_&_Print_Control is free Colorsource application to check **Fogra Media Wedge 2**, **Fogra Media Wedge 3**, **Colorsource ISO12647-7**, **IDEAlliance ISO12647-7 2009 and 2013** proofs according to ISO12642 and ISO12647-7, and offering as well much better visual distance estimation formulae such as **ΔE2000**.



UGRA/FOGRA media wedge 2 control bar - https://www.fogra.org



UGRA/FOGRA media wedge 3 control bar - https://www.fogra.org



Colorsource free ISO 12647-7 control bar - https://www.iso12647solution.com/

IDEAlliance free ISO 12647-7 2009 control strip - https://www.idealliance.org

IDEAlliance free ISO 12647-7 2013 control strip - https://www.idealliance.org

The type of control bar is recognized automatically, and the nearest found ISO12647-2-3-4-6 standard is automatically proposed as the control aim for CMYK inks.

But going much further, **Magic_Proof_&_Print_Control** also allows controlling any proof or print using one to ten inks, and with or without a CMYK base.

Download free **Magic_Proof_&_Print_Control** application:

https://www.iso12647solution.com/Downloads_and_links.htm

11-5-2) Applicability of proofing control methods as promoted by ISO 12647-7:

Fogra Media Wedge with ISO 12642 tolerances, in spite of their obvious flaws, make an applicable system for checking CMYK proofs without special tints insofar as they allow checking a proof is acceptable, when Print Houses still receive too many bad proofs. Therefore, I always recommended using ISO 12642 or much better ΔE2000 controls to all Market users while waiting for the availability of Colorsource control system that is far more relevant, reliable, and universal.

ISO 12642 ΔE76 tolerances control bars are large enough so that best color proofs can - often but not always - be validated, when their color calibration does not stupidly try producing C.I.E. Lab colors identical to the print. Narrowing these large-enough ΔE tolerances is a technical nonsense that can only mislead more Graphic Industries Professionals and Print Buyers.

On this same issue, current “RGB monitor proofing Certification software” are useless, since they only check displayed colors are matching the printed proof, when best monitor calibration software only cares about apparent colors by using far more sophisticated approaches.

Lastly, not only the ISO proof control process rests on erroneous guesses, but it is far too restrictive and limited in the field, since an imposition proof printed on uncoated paper with an ordinary inkjet printer such as HP 1050 can be optimized for good visual matching with the press coated print, even if its “C.I.E. Lab” colors are very far away from this offset coated print. Having this proof is always better than having no proof, and this proof need to be checked.

On this same issue, Print Houses often receive HWC ISOcoated_v2 proofs to be printed on other paper types such as LWC or white uncoated, and nobody would think of asking them an absolute match of the Fogra39 proof colors under these conditions.

11-6) Other limits of ISO promoted color proofs controls:

Some limits are the limits of any standardization process. Getting an optimal proof requires:

- Characterizing the press and proofing printer by two I.C.C. profiles based on spectral measurements,
- Using sophisticated color appearance model for the I.C.C. profiles computation,
- Taking into account the real D50 lighting booth spectra, and not ideal C.I.E. D50.

The erroneous principles promoted today for controlling paper and monitor proofs should neither be used to promote soft proof or hard proof color proofing systems, nor be used to sell so-called “Certifications” to proofing systems Vendors, to Graphic Arts Professionals and to their clients!

This ISO 12647-7 proof control process shows many other limitations:

- It is only possible standardizing a very limited number of printing configurations: As soon as spot colors, special primary colors, or special media are used, a standard control bar cannot be appropriate for checking proofs,
- Standard control bars do not control the proofing printer health since they specify “simulated press CMYK C.I.E. Lab reference colors” and not “Proofing printer C’M’Y’K’ reference data”. Consequently, this control bars can show neither the essential patches for fast visual monitoring of the proofing printer’s gray balance, nor the necessary patches for controlling its density calibration,
- Standard control bars allow checking a digital print only if this digital print is simulating the narrow color gamut of a CMYK press matching one of the few generic ISO standards! But this use shrinks the color gamut of digital prints and does not allow best marketing use of digital printers and presses.

12) Some marketing and contractual consequences of ISO 12647 standards:

12-1) An average industrial print quality for standard CMYK print works:

The word “quality” means here “constant industrial quality”: Just like Coca-Cola addressing to our reptilian brain, try to offer everywhere and always the same taste, the same product color, and the same packaging colors.

The product itself is not better than before: ISO12647 standards do not set the best possible color gamut for each printing technology, but an average standard chromatic response that all Print Houses can easily reach on each printing press, by simple and inexpensive ways if using standard inks and papers.

This standardization was essential to ensure constant quality with lower costs. Standardization is thus excellent for all Print Buyers and prepress actors.

However, this should not hide following reality: Print buyers can now put even more pressure on prices, since specific working habits and technical data exchange are no longer needed between Design studios, Repro houses and Print houses as long as an average ISO CMYK quality is sought.

Whether this prospect delights us or not, Print Houses who print standard CMYK products have no other choice than matching ISO standards, or other local alternative CMYK standards, or setup their own standards and publish them.

The pride of press Conductors was to know how to print unsuited repro work thanks to their professional experience. The trade becomes today knowing how to print repro works that are duly adapted to their press, in a repeatable way by using the appropriate measuring instruments and software tools.

The Client’s files densities adaptation to the press chromatic response is made at Repro stage and supplemented at the Print House by appropriate setting of their prepress software.

In worst cases, if the Client’s color separations are unsuited to the press, the Print House prepress workflow can match them as well as possible to the press by using appropriate I.C.C. or DeviceLink profiles: When a file prints with bad colors, the traditional or digital press calibration should never be modified: Only the file is to be modified. On this issue, color-retouching options offered by some PostScript RIPs are useless, since they tend to preserve very bad working habits.

12-2) The “ISO 12647 certifications” abuses:

For modern Graphic Industries, “PSO 12647 certification” processes appear to be anachronistic incongruities, and even go against sincere quality quest.

A "PSO 12647 Certification", even if renewed every two years or more frequently, does not bring any serious quality warranty to Print Buyers: Professional print buyers or their qualified delegates have to control by themselves each print run quality, as for any other B to B market in any other Industry. "ISO12647 Certifications" as they are sold today, are an alibi for professional Print Buyers who do not set up appropriate in-house quality control process for all ordered print works, and a marketing tool for Print Houses, when they are big enough for affording these "certifications" extra costs.

These inefficient, heavy and expensive color certification process are aggravating Print Houses and Print Buyers costs without answering the problems, and moreover tend to discourage a very large number of small and medium Print Houses to make the small investments in the appropriate trainings and low-cost tools allowing them to boost up their quality, because they imagine all this is very complex and expensive, when the whole necessary set of measurement and software tools for matching ISO 12647 standards at each press run costs less than 3 000 US$, including the spectrophotometer!

Certifying production tools, work force, or companies is certainly a profitable business. However, a certification can only be justified if it does bring a better quality on a day-to-day basis, or by imperious safety or environmental reasons. This is not the case for color that to our knowledge never killed anybody - except the color of the skin.

One seems to try once again spreading the idea that producing good proofs or good prints would be something very complex reserved for some elite, requiring moreover some exotic and expensive “certified” production tools and formal certifications! This when color management tools and appropriate trainings have brought color quality to Graphic Industries since more than 20 years! The problem is that Graphic Industries Professionals were always more deceived by these fairy tales than their clients were.

Moreover, in all industries, any Organization delivering certifications must of course be fully independent from Customers to be certified and from the Market Vendors: Organization delivering certifications should not sell any equipment, software, training, or service. However, this Market independence is neither achieved, nor achievable in Graphic Industries: How could a Certifier have - or even preserve - the necessary expertise, without being an active Supplier of Graphic Industries?

Moreover the 2013 version of ISO12647-2 standards strongly increases our doubts about the certification vendors independence: we did not hear any complain of any certification Vendor against the aberrant XRGA initiative or against the marketing bullshit explaining Graphic Industries that **M1** measurement condition would bring a better print quality, and this withdraws the little remaining credit they could still be granted.

There were always many "certifications" abuses in Graphic Industries, starting with the analogue color proofing systems "certifications" long before the digital age. Producing good color CMYK proofs is one of Color Science easiest applications, since it generally consists in simulating a limited press CMYK color gamut with a digital printer offering a broader color gamut. A misused “certified” color proofing system just prints craps, and is never safe from some hardware or software failures.

As shown by our sample color proof quality report page 44 you can easily produce excellent A3+ color proofs using a 330 US$ EPSON inkjet printer using quite an affordable paper.

All those who try accrediting the idea that producing decent color proof would require any certification process must live on another planet: Do they really want to enhance, democratize, and spread true color quality in Graphic Industries? Paperwork will never replace people doing their work.

Vendors of “certified” color proofing systems quite simply bet on Customers and Print Buyers ignorance and on their vain desire of any safety in these conditions. In this breach come more and more “certified” stuff such as certified papers and RGB monitors, whereas modern color management tools have long time cleared out most problems about color issues.

There is only one solution for checking a color proof: It will always belong to its users checking it. Just like any Print House buying CMYK ISO inks or D50 high CRI fluorescent tubes must control these supplies do meet their specifications.

So that the expertise allowing color quality certification must be present every day at Graphic Industries Producers and at Professional Print Buyers, and can thus only be guaranteed by appropriate training and motivation of their Staff.

On this issue, it should be known that a D50 2°C.I.E. Lab values are not merely three L, a and b numbers computed by a mysterious measuring instrument or software, that calibrating a graphic process is not trying to apply some user’s guide without understanding color, and that marketing certifications will never replace Companies know-how.

Last coming to the graphic certifications business, the recent X-Rite-PANTONE offer to Print Houses of becoming “PANTONE certified” print houses!

Let us remind on this issue you will find on our website https://www.iso12647solution.com/ free **CxFv3_to_CGATS** application allowing you extracting, from all up to date PANTONE libraries, all PANTONE spectral reflectance in the convenient CGATS text file format that can be used by best market applications including **SPOT_Color_Manager**. This application allows controlling PANTONE and other special inks at reception before they are installed on the press. It allows as well Customers controlling the PANTONE print works they buy.

12-3) Color Quality self-certification by all partners and clients of the manufacturing process:

Only the appropriate self-certification tools will solve all perceived color communication problems and color quality issues in Graphic Industries. Would this be only because most of traditional and digital publishing and packaging print processes just cannot be normalized - or it would then be necessary specifying billions of standards -, and not even need any standardization today for ensuring best possible color quality.

All Print Houses need the appropriate tools and internal competences allowing them matching ISO 12647 standards and building their own standards when necessary: it is quite simply their business. In addition, they must be able to track and self-certify their daily color quality for managing their internal manufacturing processes.

Industrial quality always rests on double-checking by the Producers and Buyers, this allowing important savings to all Partners. What is true for all manufacturing Industries is valid for Graphic Industries. Print Buyers, or their qualified agents, must trust the qualification of the Producer. Nevertheless, they must control the quality of all prints and proofs.

Qualified Producers and Buyers of Graphic Industries thus do not need formal certifications, but quite simply need:

- Knowing the existing standards and their application limits,
- Mastering modern printing technologies in order to get the desired print quality at production stage,
- Mastering the hardware and software tools standard allowing them to check every print and proof quality.

13) The universal Colorsource solution for proofs and prints control:

It is clear that meeting present and future needs of Graphic Industries and their Clients do require a better quality-control system allowing easier, faster, and more reliable control of proofs and prints.

This system has to allow:

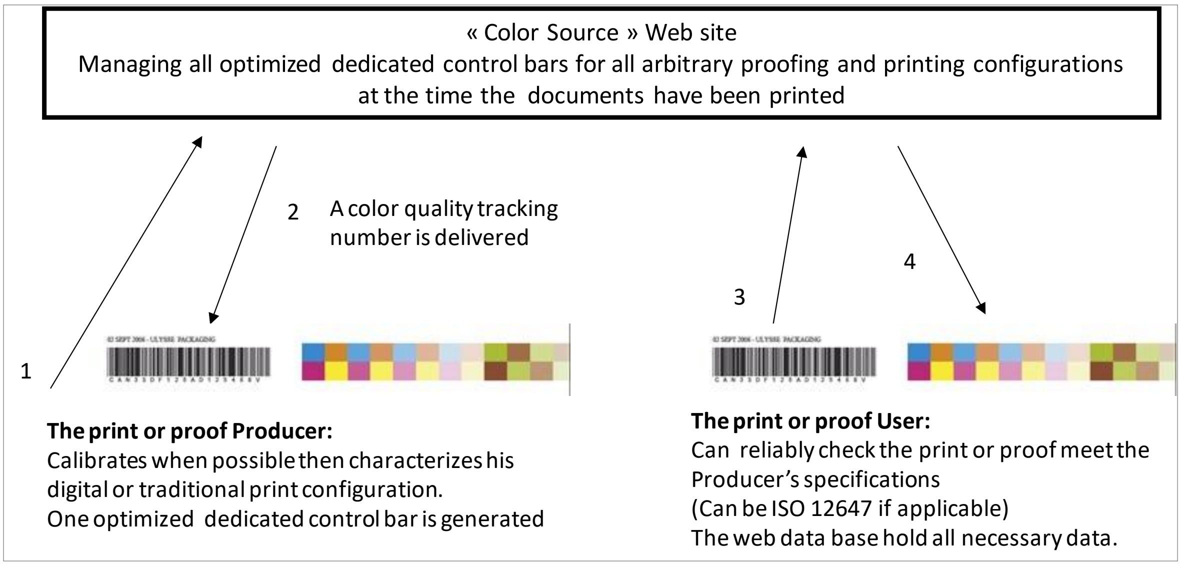
- Controlling CMYK prints matching some standards or not,
- Controlling the near infinite number of printing configurations which are required for Packaging, digital printing and traditional printing on special medias with spot colors and/or special primary inks,
- Controlling the color proofs simulating above infinite number of non-standard printing configurations.

It has moreover to allow these controls to print and proof Producers, to color proofs Users and more generally to all the graphic production process Partners and their Clients.

For this purpose, Colorsource is developing a universal quality control system based on using an alphanumeric identifier allowing any Producer self-certify certify its prints and proofs color quality, and allowing all Partners and Clients to double check this quality:

It allows all qualified Producers to set, document and communicate their own in-house production standards whether they are ISO or not. This offers the necessary flexibility for comprehensive and accurate color communication and control between all Players.

By using a simple identifier, Colorsource unifies control bars generation and their control process, for all traditional and digital prints and proofs, and this whether standardization is possible (and desirable) or not.



14) Where to find and download supplementary information?

ECI (European Color Initiative) website: http://www.eci.org

Download page: http://www.eci.org/doku.php?id=en: downloads

You can download all generic ISO CMYK I.C.C. profiles if you are not equipped for computing them yourself from FOGRA or ECI press characterization measurement files. But beware of the quality of saturation RI of these generic profiles.

You can download the tentative ISO12647-2: 2013 complying I.C.C. profiles and their beta version **M0** and **M1** characterization files on page: http://www.eci.org/en/projects/fred15

A few ISO CMYK profiles as well with rather different gamut mappings on I.C.C. (International Color Consortium) web site: https://color.org/registry/index.xalter

IFRA website: https://www.wan-ifra.org

BVDM website: https://www.bvdm-online.de/bundesverband-druck-medien/

Fogra website: https://fogra.org

G7/IDEAlliance standards documentation and profiles: https://idealliance.org/

ISO TC130 web page: (Graphic Technologies) ISO 12647 texts: https://www.iso.org/committee/52214/x/catalogue/

Learn more about **printing Pantone and else spot colors**, and about **N-Colors printing**:
https://www.color-source.net/INSTALLEURS_US/All_you_should_know_about_PANTONE_and_else_spot_colors.pdf

15) Software resources for matching your presses to ISO12647-2-3-4-6 standards:

Colorsource **free universal CMYK test forms**:
https://www.iso12647solution.com/Colorsource_universal_CMYK_print_test_formes.htm

COLORSOURCE

Colorsource free **Magic_Proof_&_Print_Control** control application:
https://www.iso12647solution.com/CMYK_Print_&_Proof_control_software.htm

MagicPress and **MagicPrepress** Quick start guide:
https://www.iso12647solution.com/Applications_downloads/MagicPress_and_MagicPrepress_Quick_start_guide_v1.0.pdf

MagicPress and **MagicPrepress** download page:
https://www.iso12647solution.com/Downloads_and_links.htm

Printing press setting frequently asked questions:
https://www.iso12647solution.com/Colorsource_Press-setting_FAQS.htm

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P.S.: Thank you to notify me any mistake that would have slipped into this document!