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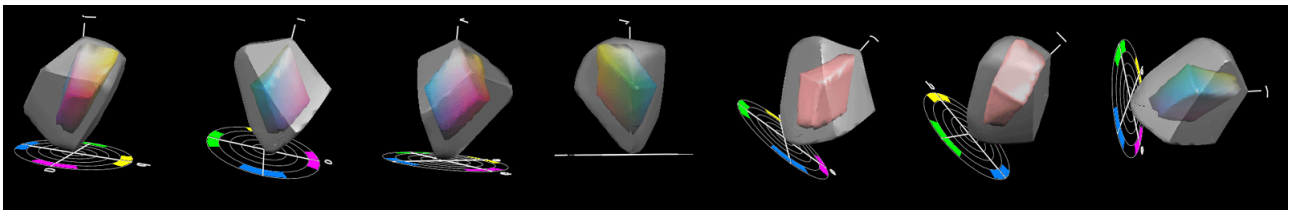
THE POINT ABOUT 2015 ISO 12647-x STANDARDS FOR CMYK PRINT AND PROOF WORKS

French version: https://www.color-source.net/Documentations/Archive/LE_POINT_2015_SUR_LES_NORMES_CMJN_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,**
- New **For producing your color proofs complying with ISO12647-7 on a simple A3+ EPSON inkjet costing less than 300 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 EFI ES-x equivalent, or Techkon 45/0° scanning spectrophotometers,**
- New **For knowing ISO12647-2:2013 version and understanding the quite useless changes it promotes,**
- New **For controlling efficiently all PANTONE and other special inks,**
- **For updating and enhancing your CMYK ISO or G7/IDEAlliance ICC profiles.**

(*) NB: It seems G7/IDEAlliance have revised their (bad) copy by publishing new CMYK ICC profiles complying with ISO12647-2:2013 and their new ICC profiles will be reviewed in a future revision of this document.



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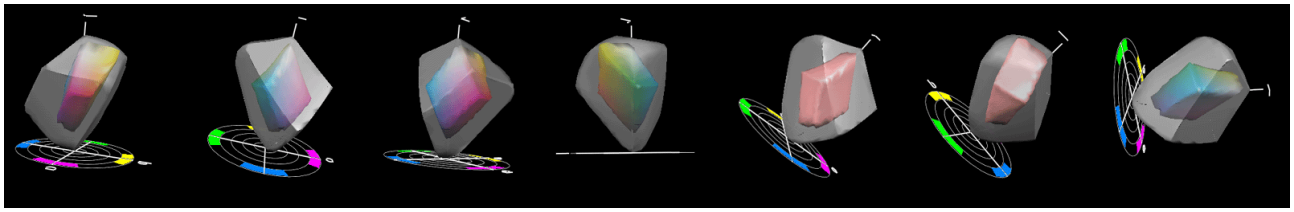
April 2015 summary



Editorial: How some Vendors get along on the back of Graphic Industries and their Clients

Already 20 years ago, I imported in France the “Colortron” that was the first spectrophotometer connected to Macs and PCs all Graphic Industries Professionals could easily afford.

I thought that spreading color measurement and scientific approaches in Graphic Industries not only would allow Professionals getting more competitive, but would also allow them developing minimal critical spirit and skepticism regarding the numerous tales spread by too many Vendors, and thus optimize their investments.

After heavily denigrating the Colortron for two years, X-Rite bought its American manufacturer Light Source, and explained as soon all their Customers and Dealers the Colortron was an excellent product ;-)

Real progresses have been made in the past 20 years, but the 2013 evolution of ISO12647-2 standards is a good illustration of a good agreement between Vendors for increasing their profits without bringing any benefit to Print Industries and their Customers, as this present 2015 update of our ISO12647 review will prove you.

For example, replacing existing ISO12647-2 ICC profiles is nonsense, because theses profiles work perfectly and remain too poorly known and used today. Moreover, pretending that using new M1 measurement condition instead of the traditional M0 measurement condition can produce better print results is an intellectual swindle.

Actually, the 2013 version of ISO12647-2 standards brings the following advantages:

- It allows spectrophotometers Vendors explaining their customers they have to replace all their existing equipment,
- It allows Vendors of proprietary and uselessly expensive color proofing systems explaining all their Customers they should buy a new spectrophotometer and pay for service for implementing the new standard target profiles,
- It allows “ISO12647 certifications” vendors selling new certifications, when their very expensive existing certifications never brought any serious quality insurance to any print buyers.

And what are doing professional Graphic Industries, color quality organizations and professional federations for protecting Graphic Industries from so numerous abuses from their suppliers? As usual: Nothing. As we say in France the soup is good!

As a result, numerous Print Houses are submitted today to a real “Certification blackmail” from a number of print buyers, and they are asked for investing dozens of thousands of Euros even when they already produce superior print quality! This situation can only satisfy Print Houses that have consequent marketing budgets for buying such certifications and advertising them to print buyers. Print buyers should rather do their job and control the quality of what they pay for.

So that we can only advise our Friends following the wise advice of our well-known French gastronome Mr. Jean-Pierre Coffe:

Stop eating shit!

Yes. Nothing and nobody will oblige you to, if you know your business better than your Suppliers and Customers do.

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 were mainly of optical origin. Their CMYK primary colors were not standard, and differed from the presses CMYK inks, 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 USB connected 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 well anticipate 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.

Matching ISO 12647-x standards by simple methods can be achieved by using standard papers and CMYK inks. In these conditions, it may require using only a specific print curve for each printing form, and using the appropriate solid ink densities that produces the appropriate ISO specified Lab values for primary and secondary colors.

Most of Print Houses already own all necessary hardware and prepress workflow to get their presses matching ISO 12647 standards: Only small investments for appropriate press-setting software, D50 light and appropriate training may be necessary, whether they wish to become "ISO 12647 certified" for (bad) marketing reasons, or not.

Matching ISO 12647 standards - or any other standard specifying some arbitrary CMYK chromatic response - consist into knowing how to print every day the same colors starting from the same CMYK file, on each printing press. It is thus simply making proper use of your production tools for producing decent CMYK prints.

Producing good color proofs simulating the various CMYK ISO 12647-x color targets, is also very easy and inexpensive today, as well as checking these color proofs quality.

Please note that ISO12647-6 standards for flexographic printing do not fix completely the chromatic response of flexographic prints. Indeed, considering the wide diversity of ink types, clichés and screenings, ISO12647-6 very reasonably only specify for each major print medium type:

- The Lab D50 2° apparent colors of solid CMYK and ΔE76 tolerance,
- RGB superimpositions Lab D50 2° colors and ΔE76 tolerance,
- Usual print media colors and tolerance,
- The CMYK TVI curves.

The diversity of chromatic responses is such that no standard ICC CMYK profile can be published. This means that involved Print Houses have to use the proper tools for matching their presses to the relevant ISO12647-6 colors and TVI curves, and then have to make and publish themselves the according CMYK ICC profiles.

If they don't, producing optimized color separations and color proofs is impossible at repro stage, or they will not be able simulating received generic color separations, such as Fogra39 ISOcoatd_v2 or else, on their presses.

On this issue, we strongly advise flexographic print houses (or any Print House needing to make and publish their own specific ICC profiles), to use our free **ICC_Normalize** application that they can download with its user's guide at: https://www.iso12647solution.com/Downloads_and_links.htm.

ICC_Normalize application not only allows them publishing and recording every created print standard, but also normalizing each one of the according ICC profile in order this profile does match perfectly their published standard. And this in spite of the inherent remaining small imperfections of any test print run.

In April 2015, a critical review of ISO12647-2 and its evolution to ISO12647-2:2013 becomes quite necessary because of very strange and obnoxious technical choices:

- Which are the good reasons to make ISO 12647 standards change?
- Which are the technical limits and more questionable prospects of ISO 12647-x standards?
- What about ISO12647-2:2013 and the promoted ICC profile changes for offset printing?

You will find at the end of this document useful Internet links for downloading additional technical information, readymade generic CMYK ISO profiles, and the official characterization data allowing you computing your own ISO CMYK profiles 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, and G7/IDEAlliance 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.

As a final point, you will find in **Appendixes 1 and 2**:

- A brief history of ISO 12647-x CMYK ICC profiles, since their first publication in 2002,
- And a copy of August 2008 X-Rite announcement about their invention of a new system distorting the spectral reflectance measurements and their invention of a new undocumented C.I.E. Lab color measurement system bound to solve their own internal marketing problems ;-))

2) Summary of up-to-date ISO 12647-2-3-4-6 ICC profiles April 2015:

You can download all valid or obsolete generic CMYK ISO profiles on the **excellent ECI (European Color Initiative) website**, and you can download their original press characterization files free of charge on the Fogra or ECI websites.

ISO 12647-x standards and the according CMYK ICC profiles are constantly evolving, for reasons we analyze later in this document. You should only use up to date CMYK profiles for prepress and color proofing, but you will find in the **Appendix 1** at the end of this document a brief history listing all ISO 12647-x ICC profiles since their first publication, because a few obsolete CMYK ICC profiles may still be in use.

2-1) Category names of ISO12647 standard papers:

Standard paper according to ISO types 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: Uncoated yellowish (Recycled), 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 ISO 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 (Hence the replacement of **PSR SC** ICC profile by **PSR_SC_STD_V2_PT**).

Standard media types according to ISO 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.

2-2) ISO 12647-2 and G7/IDEAlliance CMYK ICC profiles for sheet fed and continuous offset presses:

ISO12647-2 standard offset printing configuration	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0* characterization data and TVI curves
Paper types 1 & 2: HWC 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)	**ISOcoated_v2_eci.icc** **ISOcoated_v2_300_eci.icc**	Fogra39L.txt K: Curve B CMY: Curve A
Paper types 1 & 2 printed according to **ISOcoated_v2_eci.icc** target, and then laminated with glossy OPP film.	PSO Coated v2 300% Glossy laminate (ECI) For color seps. and proofs only.	**PSO_Coated_v2_300_Glossy_laminate_eci.icc** For color seps. and proofs only.	Fogra 50L.txt TVI curves changed by lamination process.

ISO12647-2 standard offset printing configuration, continued	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0* characterization data and TVI curves
Paper types 1 & 2 printed according to **ISOcoated_v2_eci.icc** target, and then laminated with matte OPP film.	PSO Coated v2 300% Matte laminate (ECI). For color seps. and proofs only.	**PSO_Coated_v2_300_Matte_ laminate_eci.icc** For color seps. and proofs only.	Fogra 49L.txt TVI curves changed by lamination process.
Paper types 1 & 2: HWC matte, semi-matte or glossy paper. Better than **ISOcoated_v2** profile for 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_ ISO12647_eci.icc**	Fogra43L.txt K: Curve F CMY: Curve F
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**	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**	Fogra46L.txt K: Curve C CMY: Curve B
Paper type 4: Wood-free uncoated white papers. Typical 150 dpi AM screening.	PSO Uncoated ISO12647 (ECI)	**PSO_Uncoated_ISO12647_ eci.icc**	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 ICC profile.	PSO Uncoated NPscreen ISO12647 (ECI)	**PSO_Uncoated_NPscreen_ ISO12647_eci.icc**	Fogra44L.txt K: Curve F CMY: Curve F
Paper type 5: Yellowish uncoated recycled papers. Typ. 150 dpi AM screenings.	ISO Uncoated Yellowish	**ISOuncoatedyellowish.icc**	Fogra30L.txt K: Curve D CMY: Curve C
SC papers (SC-A and SC-B): Super Calendered Papers. Typ. 150 dpi AM screenings.	SC Paper (ECI)	**SC_paper_eci.icc**	Fogra40L.txt K: Curve C CMY: Curve B
MFC papers: Machine finished coated papers. Typ. 150 dpi periodic screenings.	PSO MFC Paper (ECI)	**PSO_MFC_paper_eci.icc**	Fogra41L.txt K: Curve C CMY: Curve B
Continuous offset on type 2 papers. AM screening typ. 150.	ISO Continuous Forms Coated	**ISOcofcoated.icc**	Fogra 31L.txt K: Curve D CMY: curve C
Continuous offset on type 4 papers. AM screening typ. 135.	ISO Continuous Forms Uncoated	**ISOcofcoated.icc**	Fogra 32L.txt K: Curve E CMY: Curve D
GRACoL interpretation of ISO 12647-2. Paper types 1 & 2: HWC matte, semi-matte or glossy paper, ranging 80 to 250 g/m². 150, 175... ~ 240 dpi AM screenings.	GRACoL2006_Coated1v2	**GRACoL2006_Coated1v2.icc**	GRACoL2006_ Coated1.txt Poorly derived from FOGRA39. NPDC** TVI curves

ISO12647-2 standard offset printing configuration, end.	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0* characterization data and TVI curves
SWOP interpretation of **ISO 12647-2**. Web offset on LWC thin coated paper.	SWOP2006_Coated3v2	**SWOP2006_Coated3v2.icc**	SWOP2006_ Coated3.txt Poorly derived from Adobe USWebCoated v2 NPDC** TVI curves
Other **SWOP** interpretation of **ISO 12647-2**. Web offset on Yellowish uncoated recycled papers	SWOP2006_Coated5v2	**SWOP2006_Coated5v2.icc**	SWOP2006_ Coated3.txt Poorly derived from Adobe USWebCoated v2 NPDC** TVI curves

(*) M0 spectral data measurement condition: Please see technical details at paragraph 6.2 at page 28.

(**) NPDC stands for Neutral Print Density Curves: Please see paragraph 11 pages 42 to 45.

2-3) ISO 12647-3: 2005 CMYK ICC profile for coldset web offset press:

ISO12647-3 standard offset printing configuration.	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0 characterization data and TVI curves
Coldest web printing on Standard News Paper. Typ. 100 dpi periodic screenings.	ISO Newspaper 26	**ISOnewspaper26v4.icc**	IFRA26.txt K: Curve E CMY: Curve E
Heatset web printing on Standard News Paper. Typ. 100 dpi periodic (AM) screenings.	PSO SNP Paper (ECI)	**PSO_SNP_paper_eci.icc**	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**	Fogra 48L.txt K: Curve D CMY: Curve C

2-4) ISO 12647-4 CMYK ICC profiles for CMYK publishing gravure printing:

ISO12647-4 standard gravure printing configuration.	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0 characterization data and TVI curves
Gravure LWC typ. 51 g/m² Coated paper.	PSR LWC Standard (ECI)	**PSR_LWC_STD_V2_PT.icc**	ECI_PSR_LWC_STD_V2.txt or ECI_PSR_LWC_STD_V2_L.txt
Gravure LWC typ. 51 g/m² Gloss coated paper.	PSR LWC Improved (ECI)	**PSR_LWC_PLUS_V2_PT.icc**	ECI_PSR_LWC_PLUS_V2.txt or ECI_PSR_LWC_PLUS_V2_L.txt
Gravure SC paper typ. 52 g/m².	PSR_SC_STD_V2_PT	**PSR_SC_STD_V2_PT.icc**	ECI_PSR_SC_STD_V2.txt or ECI_PSR_SC_STD_V2_L.txt
Gravure SC Plus paper.	PSR_SC_PLUS_V2_PT	**PSR_SC_PLUS_V2_PT.icc**	ECI_PSR_SC_PLUS.txt or ECI_PSR_SC_PLUS_L.txt

ISO12647-4 standard gravure printing configuration, end.	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0 characterization data and TVI curves
Gravure MF or INP papers typ. 55 g/m².	PSR MF	**PSRgravureMF.icc**	PSRgravureMF_ECI2002.txt or PSRgravureMF_ISO12642.txt

2-5) ISO 12647-6 CMYK ICC profiles for CMYK flexographic printing:

ISO12647-6 standard flexographic printing configuration.	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0 characterization data and TVI curves
Corrugated board.	No standard ICC 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.
White coated paper and cardboard.	No standard ICC profile can reasonably be specified.	Idem	Idem
White uncoated paper and cardboard.	No standard ICC profile can reasonably be specified.	Idem	Idem
Plastic or metallic film or foil.	No standard ICC profile can reasonably be specified.	Idem	Idem

2-6) The future CMYK ISO ICC profiles in beta versions complying with ISO 12647-2:2013:

ISO12647-2:2013 standard offset printing configuration.	Internal name of the CMYK ICC ISO profile (Name shown by applications)	File name of the CMYK ICC ISO profile	M0 & M1 characterization data and TVI curves
Paper types 1 & 2: HWC matte, semi-matte or glossy papers, ranging 80 to 250 g/m². Typical 150, 175... ~ 240 dpi AM screenings.	PSO_Premium-Coated_PC1_F51_Test_Mar2014_M0_p PSO_Premium-Coated_PC1_F51_Test_Mar2014_M1_p	**pso_premium-coated_pc1_f51_test_mar2014_m0_p.icc** **pso_premium-coated_pc1_f51_test_mar2014_m1_p.icc** Tentative replacement of Fogra 39	M0 measurement file: **fogra51_mar2014_m0.txt** M1 measurement file: **fogra51_mar2014_m1.txt** **CMYK: Curve B**
Paper type 4: Wood-free uncoated white papers, ranging 80 to 250 g/m². Typical 150 dpi AM screening.	PSO_Wood-free_Uncoated_PC5_F52_Test_Mar2014_M0_p PSO_Wood-free_Uncoated_PC5_F52_Test_Mar2014_M0_p	**pso_wood-free_uncoated_pc5_f52_test_mar2014_m0_p.icc** **pso_wood-free_uncoated_pc5_f52_test_mar2014_m1_p.icc** Tentative replacement of Fogra 47	M0 measurement file: **fogra52_mar2014_m0.txt** M1 measurement file: **fogra52_mar2014_m1.txt** **CMYK: Curve D**

Of course, we have already updated Colorsource press-setting applications in order you can set up your presses matching both above future standards, but we consider as irrelevant and disastrous this initiative of replacing Fogra 39 and Fogra 47 by new profiles, for numerous technical, practical and economic reasons we expose at paragraph 4, pages 16 to 24 of this document.

2-7) ISO 12647-2-3-4-6 Lab target value for solid and complementary colors:

All ISO12647 C.I.E. Lab D50 2° M0 and Self-Backing apparent colors to be matched are contained in the original Fogra or ECI press characterization files. Each according ISO CMYK ICC profile thus gives (by CMYK to Lab conversion using absolute RI), the Lab D50 colors of any CMYK screened tone, among which the primary and secondary solid colors. For example:

ISO 12647-2 configuration	C 100%	M 100%	Y 100%	K 100%	M + Y 100%	C + Y 100%	C + M 100%
ISOcoated_V2 (ECI) Fogra 39L	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
PSO Uncoated ISO12647 (ECI) Fogra 47L	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

As no standard CMYK ICC profile can be published for Flexographic printing, you can refer to the published ISO 12647-6:2006 standard for knowing the target colors.

You can also download Colorsource **MagicPress** application trial version that is designed for computing on-press the optimal CMYK inks densities and/or their optimal pigment concentration: This application can display all target colors of all up-to-date **ISO 12647-2-3-4-6** and **G7/IDEAlliance** standards.

Please note that historically all C.I.E. Lab D50 2° target colors of all **ISO12647-2-3-4-6-7** ICC profiles that are used today, have been measured using M0 and Self-Backing (SB) measurement conditions.

The ISO12647 publication of target colors measured in Black-Backing mode (BB) is irrelevant, because BB measurements vary a lot with the paper thickness and opacity, contrarily to the much more consistent Lab values measured in Self-Backing mode.
Let us add that a Colorsource application allows computing from Self-Backing measurements the colors and densities you would get if using BB measurements (and vice-versa) by using one single measurement of the paper opacity. In real life, this is not very useful for matching your press to ISO12647 but this clearly demonstrates the ISO vanity of publishing any reference Lab value measured in Black-Backing mode.

2-8) ISO 12647-2-3-4-6 target TVI curves (Tonal Value Increase curves):

2-8-1) ISO12647-2 and 3 target TVI curves for offset printing:

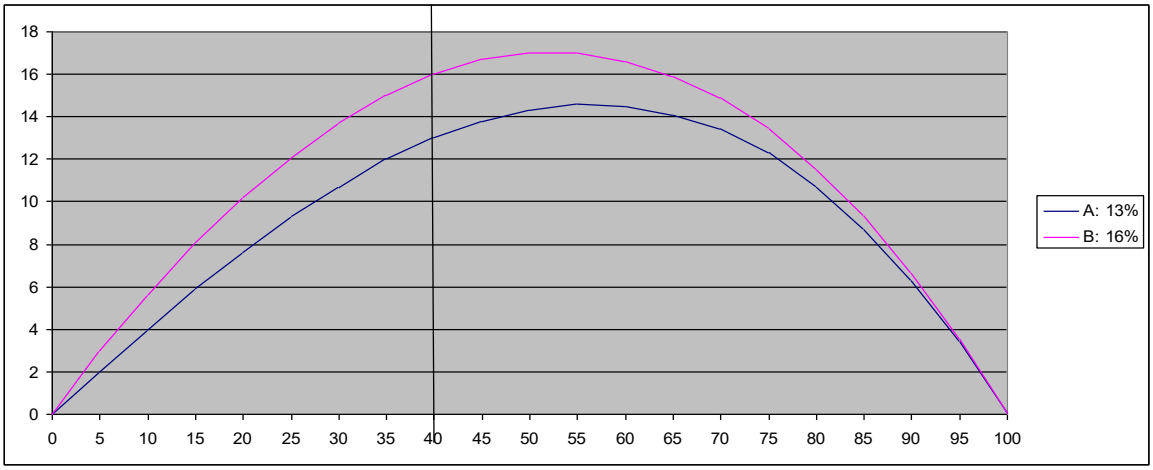
ISO 12647-2 specifies a set of standard tonal curves named A, B, C, D, E, and F. The A, B, C, D, E, and F TVI curves for offset printing are specified by ISO 12647-2:2004. Their respective dot gains at 40% are 13, 16, 19, 22, 25, and 28%. For knowing these full TVI curves specifications, you can freely download Colorsource **MagicPrepress** application trial version that is designed for computing the optimal CMYK printing forms correction curves. This application can display all **ISO12647-2-3-4-6** target TVI curves values.

For offset printing, three identical arbitrary TVI curves are specified for C, M and Y ink layers, and a higher dot gain curve is specified for blacK, except for stochastic screenings where four identical target TVI curves are specified. These A to F curves are not contained in the published generic ISO CMYK profiles, or in the published press characterization measurement files, because they only contain D50 2 ° colorimetric data and no spectral data.

Quite reasonably, ISO12647 do not pretend that their arbitrarily chosen target TVI curves are ideal, but at least their chosen TVI curves do not cause any problem and do work perfectly.

Of course, matching your press to any ISO standard requires using the appropriate densities for matching the solid inks Lab target colors AND requires matching the appropriate target TVI curves. For example:

- Curve A is the generic ISOcoated_v2 (Fogra 39) print curve for C, M and Y layers,
- Curve B is generic ISOcoated_v2 print for K layer (First laid color).



2-8-2) G7/IDEAlliance target TVI curves for offset printing:

IDEAlliance have promoted in United States three standard press CMYK ICC profiles, made by the experts of **GRACoL** (General Requirements for Applications in Commercial Offset Lithography) and **SWOP** (Standard Web Offset Printing) US organizations.

These CMYK profiles for offset are: **GRACoL2006_Coated1v2.icc**, **SWOP2006_Coated3v2.icc**, and **SWOP2006_Coated5v2.icc**:

GRACoL2006_Coated1v2.icc is the US equivalent for **"ISOcoated_v2":** Thick matte or glossy coated paper,

SWOP2006_Coated3v2.icc is the US equivalent for **"PSO_LWC_Improved_eci.icc":** White thin coated paper,

SWOP2006_Coated5v2.icc is the US equivalent for **"ISOuncoatedyellowish.icc":** Yellowish uncoated recycled papers.

However, the US experts apparently look mainly concerned about keeping their expertise Market, with such a strange implementation of ISO12647-2 standards! Maybe they were afraid that good quality and productivity allowed by simple methods would somewhat drop a shadow on their "Black Art" empirical and ancient methods.

Because the technical documents **IDEAlliance** publish on their web site show the press setting methods they are promoting are rather irrational and with a rather poor conception. These methods are also quite uselessly complex to implement if you follow the bad press setting methods they suggest!

Obviously, the average US Print House will have little chance to set properly their printing presses without asking for an expert ;-). A brief critical review of the official documents published by **IDEAlliance** is offered at paragraph 11, pages 42 to 45 of this document, and shows the limited using conditions of these ICC profiles.

Even if quite satisfied by the European implementation of **ISO12647-2**, that provides excellent results with easy and fast offset test print runs, and for purely (bad?) "Marketing" reasons, **Colorsource** have updated their **CMYK_Print_and_Proof** quality control application, and their dedicated CMYK press-setting applications, in order to include not only the **ISO12647-2** European targets, but also the US **G7/IDEAlliance** (**GRACoL** and **SWOP**) targets.

For knowing the full specifications of the "NPDC" target TVI curves you should use for matching G7/IDEAlliance standards, you can freely download the Colorsource **MagicPrepress** application trial version that is designed for computing the CMYK printing forms engraving curves. This application can display all **ISO12647-2-3-4-6** and **G7/IDEAlliance** target TVI curves values.

(*) NB: It seems G7/IDEAlliance have revised their (bad) copy by publishing new CMYK ICC profiles complying with ISO12647-2:2013 and their new ICC profiles will be reviewed in a future revision of this document.

2-8-3) ISO12647-4 target TVI curves for gravure printing:

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 gravure 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.

2-8-3) ISO12647-6 target 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** target TVI curves values.

3) Why do "standard" ISO profiles change?

ISO 12647 standards specify for each mainstream commercial CMYK publishing print configuration, an average state of the art chromatic response that any Print House can match by proper use of its existing production tools.

It is indeed only possible to standardize a limited number of print technologies, on a very limited number of print media and with a limited number of primary inks and screenings.

An ISO12647-x profile is not a real press profile with known inks and paper, but an average generic profile representative of the color gamut of an average printing configuration in Print Houses who care about controlling and optimizing their industrial processes.

3-1) Good reasons justifying ISO12647 standards evolutions:

In above conditions, most of ISO 12647-x standards evolutions have been justified by good reasons, until the ISO12647-2:2013 version we will study later in this document:

- By need of more simplicity: Too many standards kill standards,
- By better knowledge of the Market average press real chromatic response, allowing submitting a more representative average ICC profile. E.g., in 2007, this led to drop the **ISOcoated** profile (Fogra27) for the new **ISOcoated_v2** profile (Fogra39),
- By growing market share of some paper types: Any paper type taking a significant market share becomes a de facto standard and can be taken into account, which leads to more standard profiles, such as MFC or SC papers profiles,
- By progresses of paper manufacturing: For example, the **ISOwebcoated** profile described a LWC paper with exaggerated yellow cast when compared with modern thin coated papers. Recent test prints for establishing a more representative ICC profile led to two distinct generic CMYK ICC profiles with two different paper tints, for replacing the initial **ISOwebcoated** generic profile.

  In the same mood, using higher quality SC papers (SC-A: smoother surface allowing better ink transfer) and better-adapted drums gravure allowed a significant increase of color gamut for gravure printing on Super Calendered papers.
- For more accurately taking in account screening influence on the overall chromatic response:

  For example, using stochastic screenings induces very high optical dot gains. Under these conditions the necessary print curves for matching the apparent 150 dpi classic AM screen dot gains can lead to banding

problems on vignettes, depending on the PostScript RIP being used. Note these banding problems can appear or not, depending on the quality of the prepress workflow algorithms for applying the corrections curves and screening each ink layer.

Even if this banding problem is avoided, matching the C, M, Y, and K Fogra 39 target colors and TVI curves does not always allows matching Fogra 39 target colors on screened tones.

These problems were taken into account by publishing supplementary generic ISO CMYK profiles characterizing offset printing on coated and uncoated papers with stochastic screenings. These ICC profiles specify much higher press target dot gains (curve F), in order to avoid any banding problem.

3-2) More questionable evolutions of ISO 12647 standards:

ISO12647-x ambition was promoting to Graphic Industries good practices that allow getting at any time and from a same file the same colors on all presses:

This requested minimal standardization of CMYK inks and papers, and specifying realistic and reasonable solid colors for major market print technologies and print media, which cannot all receive the same ink quantities.

Of course, this requested as well an accurate specification of colors and densities measurement conditions in order to avoid any confusion.

This excellent initiative has very efficiently contributed optimizing repro, proofing and prepress work and allows simple, efficient and fast press setting.

Moreover, these methods are quite pedagogic and can easily be expanded for creating and documenting all kind of private print standards, which is necessary as soon as you use spot colors and/or special primary inks and/or special print media and/or N-Color printing with or without a CMYK base. For example, specifying and documenting your own print standards is almost always necessary for Packaging print applications.

ISO 12647 standards evolutions and changes are not awkward insofar as matching any existing arbitrary CMYK standard or their replacement requires the same tools and expertise, and is an excellent exercise for controlling and optimizing the Print House industrial processes.

However, ISO 12647 standards multiplication and their frequent evolutions aggravate the persistent problem of good awareness and proper use by many Graphic Industries actors, including Repro houses, advertising agencies, and Print buyers.

More questionable, some ISO 12647 evolutions seem to be intended for revamping erroneous technical choices resulting from bad knowledge and bad use of color science by some Market Vendors. Because most of the ISO committee members are Vendors who try promoting their products and services, which too often causes small arrangements with reality, inconsistencies and hazardous technical choices.

This is a well-known danger of any standardization process: For example, Europe has long protected some carrots or bananas origins by instituting very strict criteria about their size and their shape, when it should be well known that size is not the most important. Too many standards are diverted from their initial goal, with the detriment of real quality, diversity, and prices.

It is thus necessary keeping vigilant so that ISO 12647-x standards continue serving the real interests of Graphic Arts community. We will return there while detailing evolutions of Color Proofing standards that are technically irrelevant, and far away from the initial goals expressed by **ECI** in their founding Whitepaper: See on this issue pages 1 to 7 of ECI Whitepaper at following link:

http://www.eci.org/lib/exe/fetch.php?id=en%3Adownloads&cache=cache&media=downloads:eci_general_downloads:eci_whitepaper_1_1_eng.PDF

And today the ISO12647-2:2013 version is an excellent example of hazardous commercial drifts:

4) An aberrant evolution of ISO12647 standards: Critical review of ISO12647-2:2013:

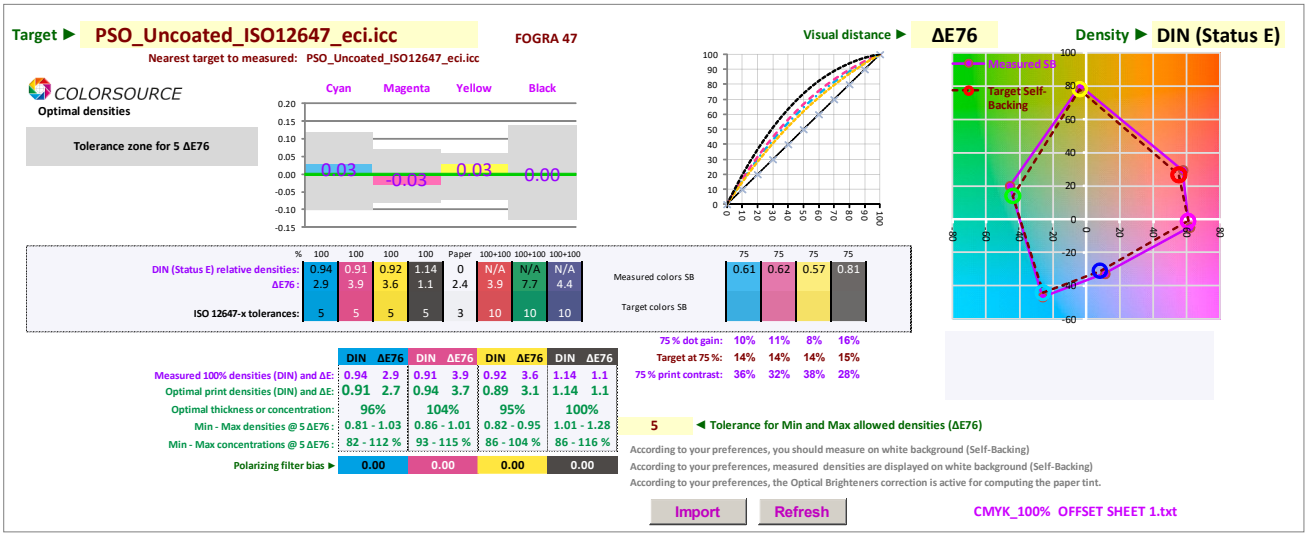
ISO12647-2:2013 standard is not yet used in the field because the scarce published press characterization files and according ICC profiles are only available as beta versions. Unfortunately, not only this ISO 2013 version does not enhance the previous versions technical choices, but also brings quite useless costs and complexities.

4-1) ISO 12647 persistent use of an obsolete visual distance estimation formula:

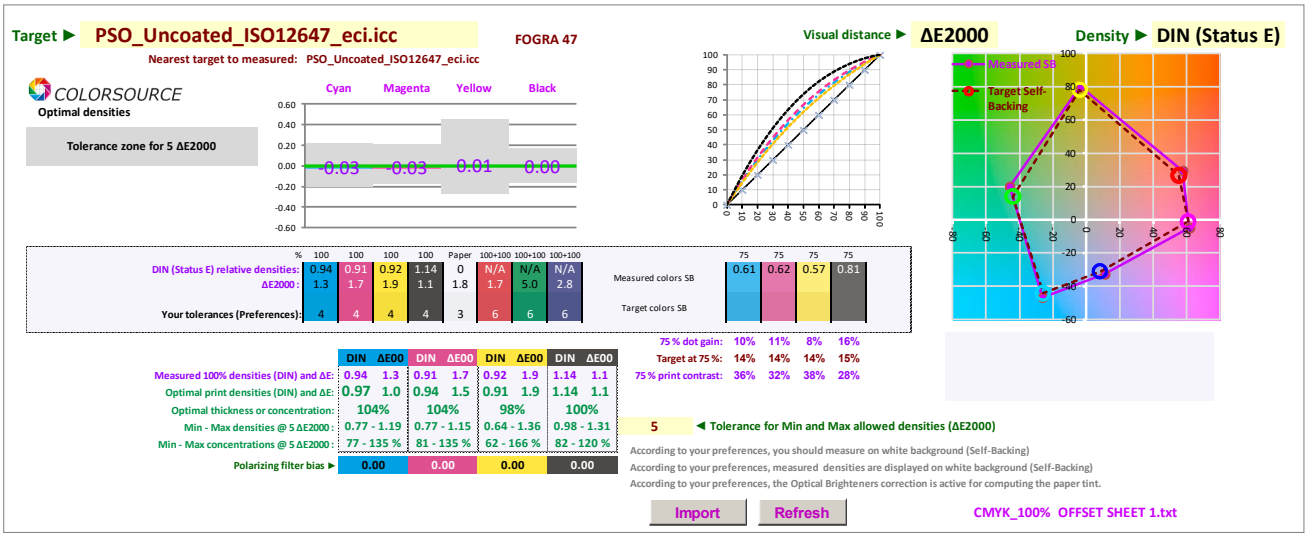
ISO12647-2:2013 tolerances are still using the obsolete ΔE76 visual distance estimation formula that no other industry keeps using today.

And the optimal solid inks densities for setting your press matching any ISO12647 target are different when you use the much better ΔE2000 visual distance estimation formula:

As shown hereafter, for minimizing the ΔE76 visual distance, the requested optimal CMYK densities are respectively 0.91, 0.94, 0.89 and 1.14:



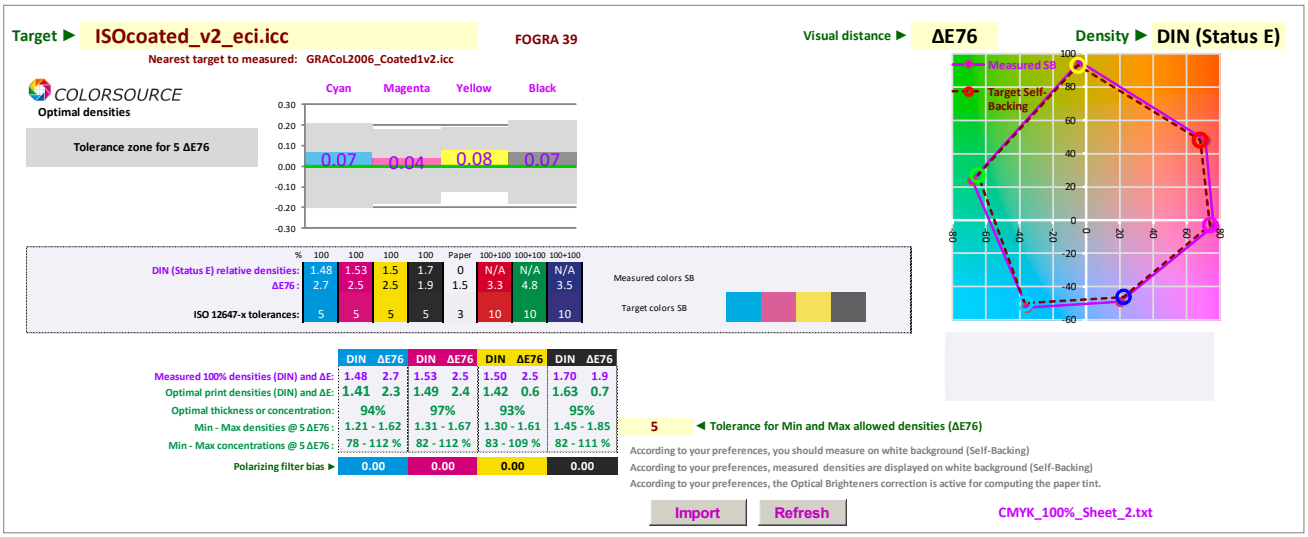
But as shown hereafter, for minimizing the much more relevant ΔE2000 visual distance, the requested optimal CMYK densities are respectively 0.97, 0.94, 0.91 and 1.14:



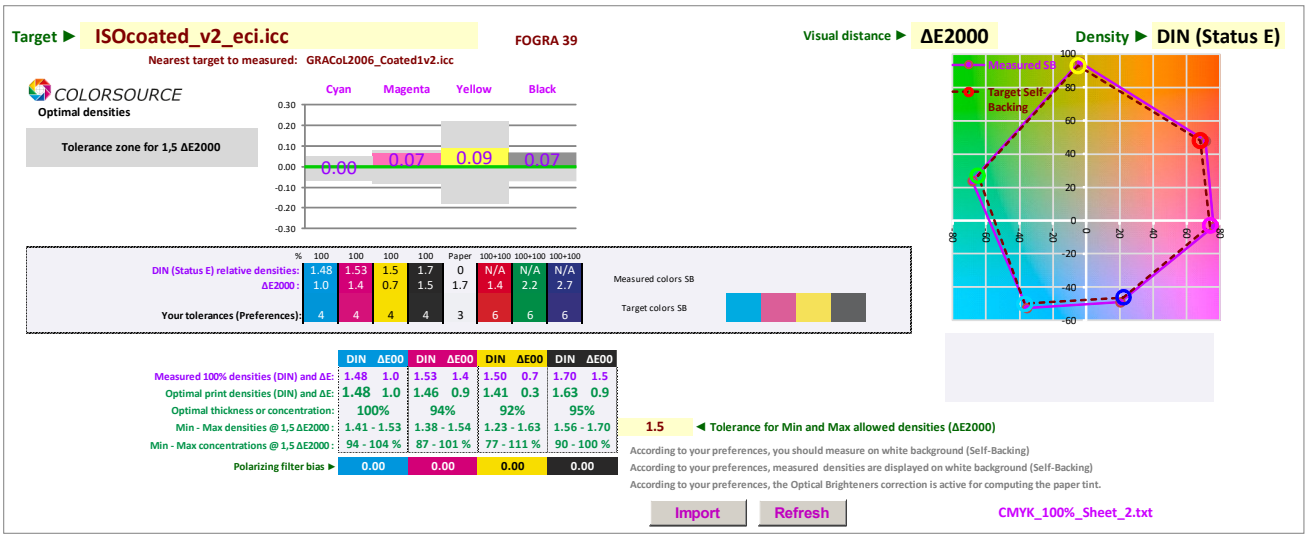
4-2) Bad specification of quality control tolerances:

Using the obsolete ΔE76 visual distance has led to specifying uselessly complex and sometimes aberrant tolerances: The following example shows that for complying to the 5ΔE ISO12647-2 tolerance on solid colors, you can print a Cyan ink with densities ranging from 1.21 to 1.62, i.e., use ink thickness ranging from 78 to 112% of present thickness (See results line Min-Max concentration), i.e., change of nearly 44% of the Cyan ink thickness!

This shows that matching ISO12647 solid colors can be achieve with very different densities that will induce quite different dot gain curves:



The good solution consists into using ΔE2000, and not be satisfied with low ΔE2000 visual distances: You must get as close as possible to the optimal ink thickness (100%) when printing offset, and as close as possible to the optimal ink concentration (100%) when using gravure of flexographic print processes, which requires using on the present example the following computed optimal densities 1.48, 1.46, 1.41 and 1.63 for C, M, Y and K:



4-3) Useless and aberrant specification of new color measurement conditions:

The different M0, M1, M2 and M3 measurement conditions normalized by ISO13655:2009 are described in this document in paragraph 6.2 page 28. We have nothing against the **Eye-One Pro 2 or 3** spectrophotometers that allows M0, M1 and M2 measurement conditions. They are excellent equipment we frequently recommend to our Customers since Eye-One Pro "1" is no longer available.

No doubt that **Eye-One Pro family** is the best X-Rite equipment, because used with Colorsource software, it replaces very advantageously all the other X-Rite press-room spectrophotometers such as eXact ☺

And with little search on Internet, you will find brand new **Eye-One Pro 2 Basic** for less than 1000 Euros, which will avoid you wasting precious time with Salesmen explaining you that **Eye-One Pro** cannot measure offset plates, or would not be accurate enough for setting your printing presses, in order to sell you far more expensive and less performing solutions.

However, our ISO experts pretend that using M1 measurement condition (Spectrophotometer built-in light source not too far from D50, with stronger UV content than an incandescent light source) allows more accurate measurements of perceived colors than using the traditional M0 measurement condition (Incandescent A source), and would help good measurement of paper tints using strong optical brighteners such as for white uncoated papers.

This is false and only aims at convincing all misinformed Professionals they have to change all their spectrophotometers.

Indeed, when a tint contains no optical brightener or fluorescent pigment, the UV content or the "UV/Visible" ratio of the spectrophotometer built-in light source has no influence on the measured reflection spectrum, and thus no influence on the Lab D50 2° apparent color. At worst, using a filter for converting an A light source to a D50 light source strongly attenuates its intensity and could produce less accurate M1 measurements by decreasing the S/N ratio, unless you increase each measurement exposure time.

Consequently, using M0, M1 or M2 measurement conditions can only modify the measured spectral reflectance for paper tints using optical brighteners and for low density CMYK screened tones that do not fully mask the paper.

On papers containing optical brighteners:

- Using a UV-cut filter (M2 measurement condition) does not solve the problems, because you measure the paper not as bluish as we perceive it,
- Using the traditional M0 condition, the spectrophotometer computes a Lab D50 2° paper tint clearly bluer than the color we perceive,
- Using M1 measurement condition, the spectrophotometer computes a Lab D50 2° paper tint even more exaggeratedly blue than the color we perceive, because the paper optical brighteners are excited by stronger UV content.

So that using M1 measurement condition does not solve any problem. The real problem is that the C.I.E. Lab apparent color measurement system is a primitive old color appearance model (1976) with limited performances, which does not allow computing fluorescent paper Lab colors identical to the ones we perceive when using D50 light.

We perceive the fluorescent paper tints not as blue as the Lab tint measured by the spectrophotometer simply because our chromatic adaptation (The automated human vision white balance) is made neither on the paper (We would then perceive it as neutral), neither on the light source (We would perceive it as blue as the spectrophotometer does in M0 or M1 conditions).

The good solution for computing the paper apparent color is to use more sophisticated than C.I.E. Lab human vision models. And this has been done successfully since a long time: It is what ProfileMaker optical brightener's correction does, or what Colorsource press-setting or print control applications do for computing paper tints.

Using a D50 (M1 condition) instead of A (M0 condition) light source in the spectrophotometer may only require changing a few parameters of the optical brighteners' correction.

Since a long time, C.I.E. Lab is used only as a valid and quite convenient tool for digital encoding of all apparent colors, and no longer as a valid color appearance model properly simulating the human vision.

4-4) Adding unnecessary confusion for ISO12647 standards users:

The M0 Self-Backing press characterization files and according ICC profiles we use today for offset printing are working perfectly. But they stay largely unknown and unused by Graphic Industries protagonists. For example, large print houses printing each week magazines with continuous offset presses on LWC paper still receive every week HWC Fogra39 color separations with F39 color proofs and need converting them to Fogra45 or Fogra46 LWC color spaces.

In these conditions, replacing existing standard ICC profiles will only create more confusion. Moreover, as shown in the following paragraph, the new ICC profiles and press characterization files available in beta version do not bring any technical advantage or better color gamut.

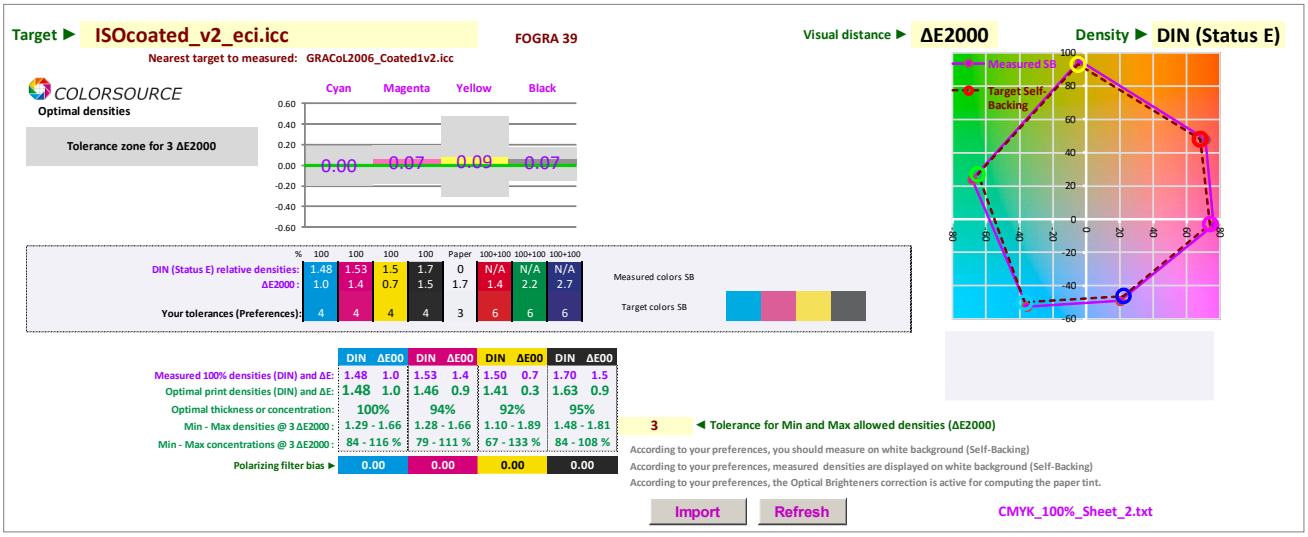
4-5) « New » ISO profiles with color gamut's nearly identical to the existing ISO profiles they are bound to replace:

4-5-1) PSO_Coated-Premium (Fogra 51) profile bound to replace Fogra 39:

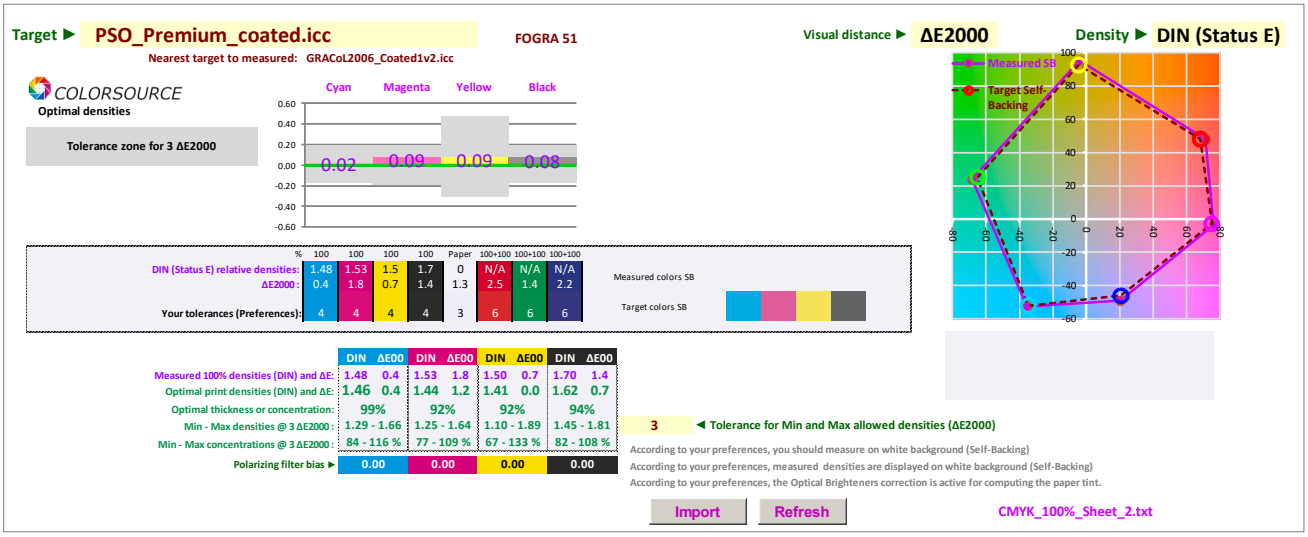
a) Required optimal CMYK print densities:

These densities depend on the paper and ink batches, but **MagicPress** application shows that the optimal density differences are insignificant. For example, hereafter (Sheet-Fed Komori with 175 dpi AM screening):

Fogra 39 press-setting: The computed CMYK optimal densities are 1.48, 1.46, 1.41 and 1.63 for computed residual visual distances 1.0, 0.9, 0.3 and 0.9 ΔE2000:



Fogra 51 press-setting: The computed CMYK optimal densities are 1.46, 1.44, 1.41 and 1.62 for computed residual visual distances 0.4, 1.2, 0.0 et 0.7 ΔE2000:

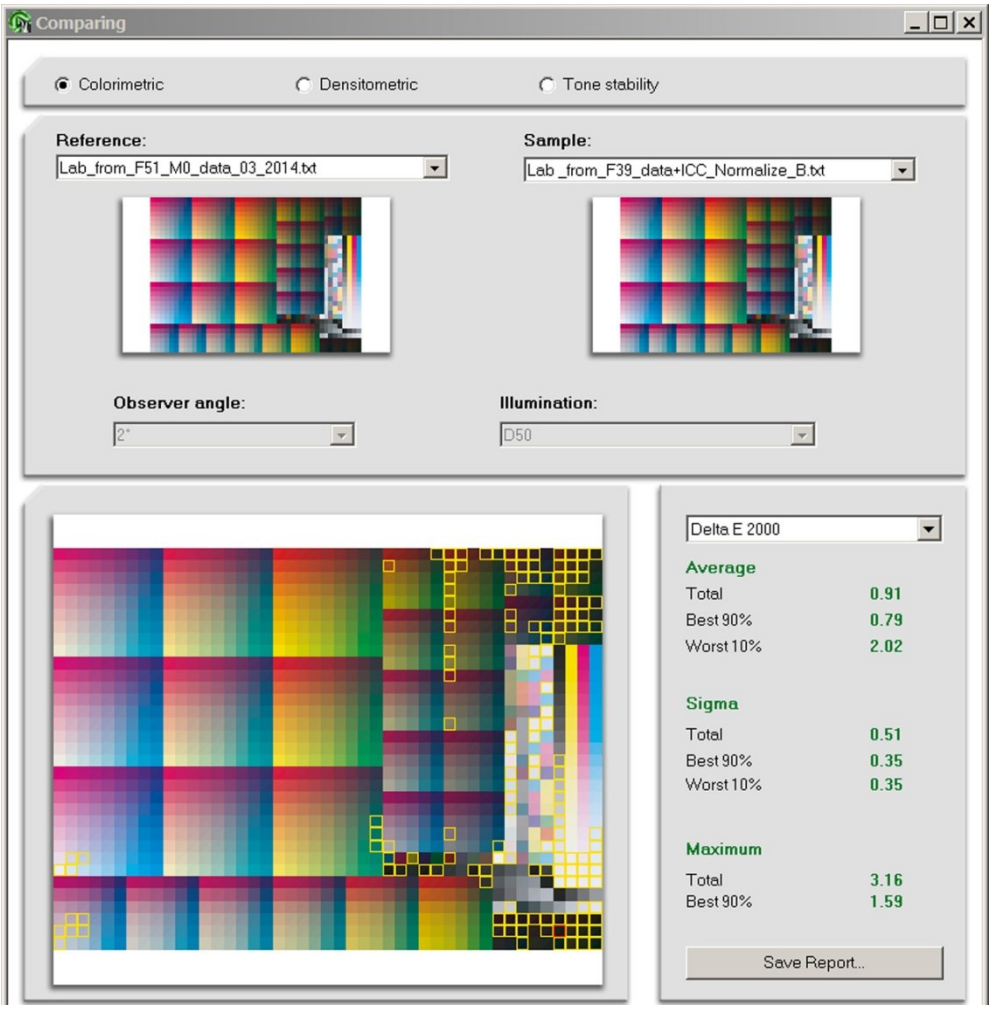


b) Target TVI curves:

The four Fogra 51 specified target TVI CMYK curves are identical: Curve B, when Fogra 39 respectively specifies for C, M, Y and K the A, A, A and B TVI curves.

Why not? OK for us, but this change does not justify making new print runs for establishing the Fogra51 ICC profile, because Colorsource **ICC_Normalize** freeware used with ColorLab freeware and ProfileMaker **ProfileEditor** software module allows computing from the Fogra39 ICC profile (e.g., ISOcoated_v2_300_eci.icc), the new press ICC profile if new press TVI curves are used!

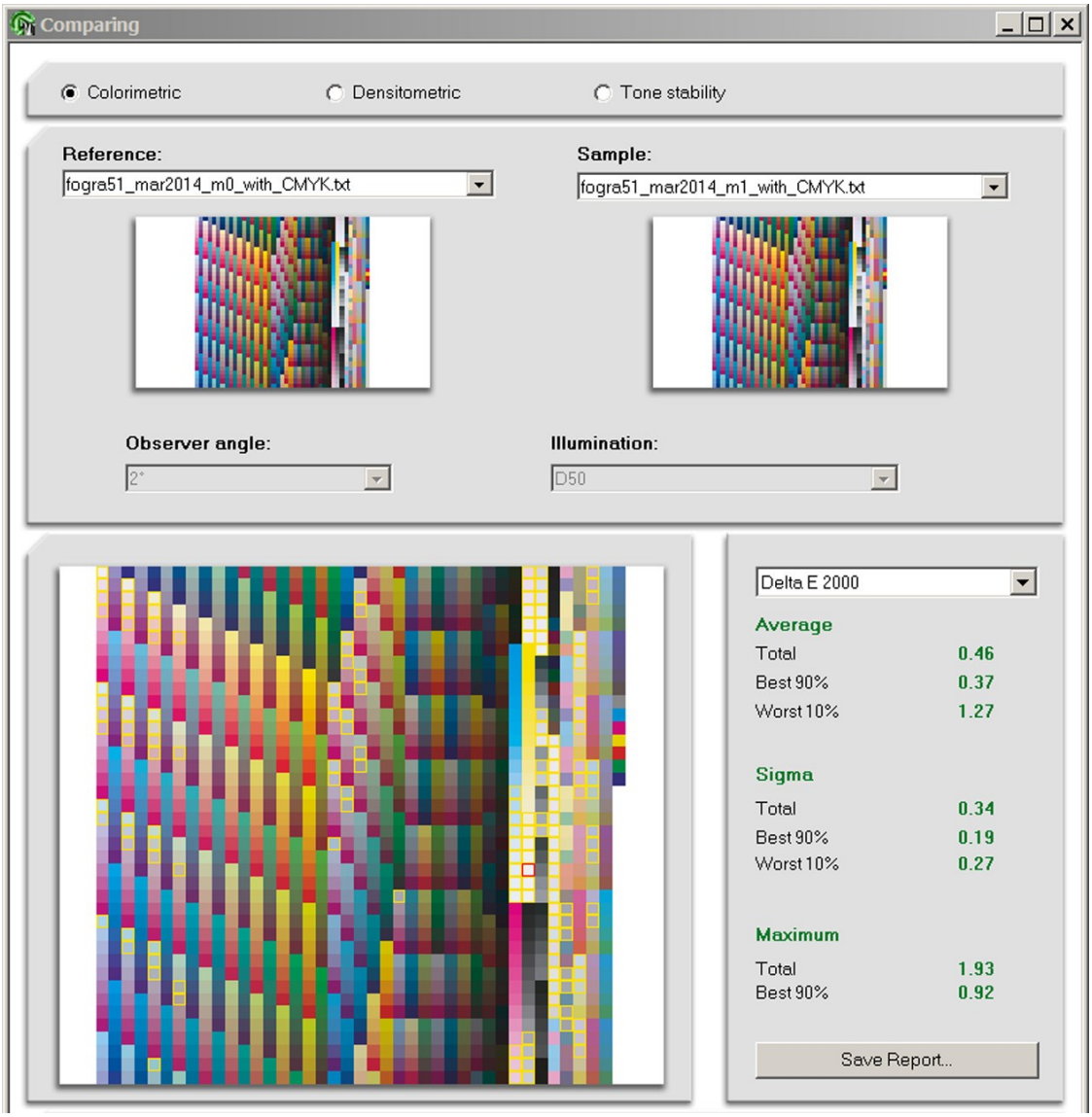
So that we have computed the Fogra 51 ICC profile from Fogra 39 profile using our software, and we compared it to the Fogra 51 profile computed directly from the **fogra51_mar2014_m0.txt** press characterization file**.** And then we compared the colors produced by both profiles on an ECI2002 CMYK chart:



The average difference between the ICC profile computed from Fogra 51 M0 characterization data and the ICC profile deduced from Fogra 39 by using free **ICC_Normalize** application taking into account the CMYK TVI curves changes, is only 0.91 ΔE2000, and this in spite of non-correcting the optical brighteners of Fogra 51 and in spite of CMYK solid colors and strapping differences between Fogra 51 and Fogra 39 (See hereafter):

%	100	100	100	100	Papier	100+100	100+100	100+100	
VISUAL densités relatives :	0.75	0.72	1.03	1.62	0	N/A	N/A	N/A	Couleurs mesurées SB
ΔE2000 :	1.3	0.5	0.2	0.3	2.2	1.5	0.9	1.0	
Vos tolérances (Préférences) :	4	4	4	4	3	6	6	6	Couleurs cibles SB

c) Comparison between Fogra 51 M0 and Fogra 51 M1 press characterization data:



Above image clearly shows the difference between M0 and M1 characterization data is negligible (Average 0.46 ΔE2000).

Moreover, the real difference will be much smaller when the appropriate optical brightener's correction is used.

Indeed, choosing M0 or M1 condition can only affect can only affect the measurements of paper tint and light screened tones, and above Lab D50 2° values have been computed with no optical brightener's correction:

Uncorrected M0 HWC paper tint: L, a, b = 94.9, 1.0, -4.0 (Too blue)

Uncorrected M1 HWC paper tint: L, a, b = 94.9, 1.5, -6.0 (Even more blue)

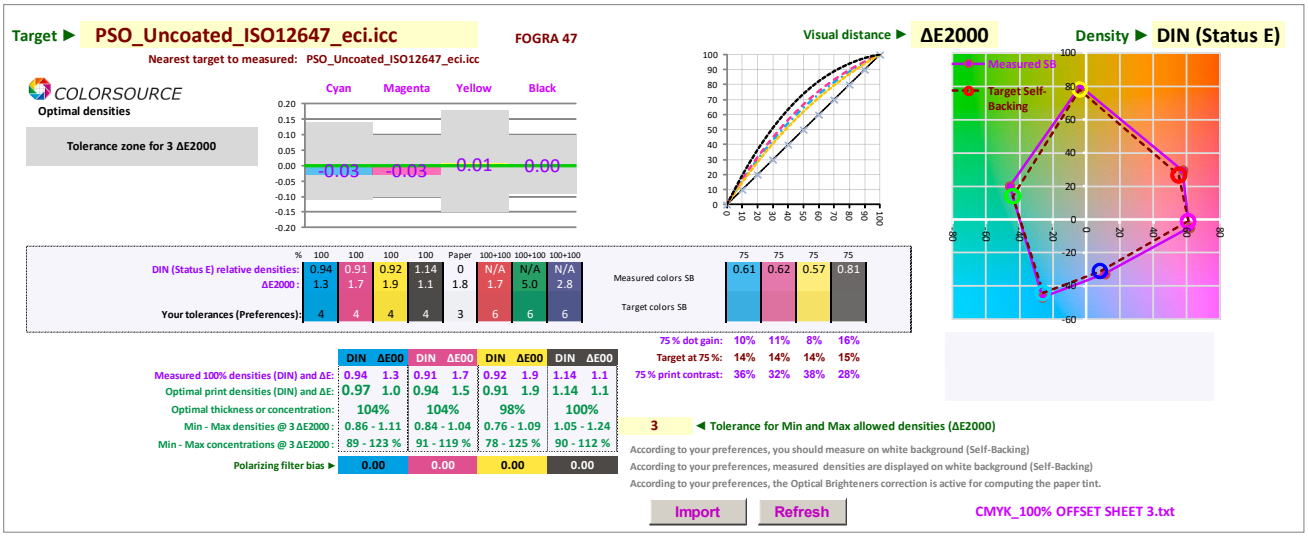
This brief comparative study of Fogra 39 (M0) and Fogra 51 (M0 or M1) proves what was obvious: The ISO12647-2:2013 request of using M1 measurement condition for replacing M0 is quite useless.

4-5-2) PSO_wood-free_uncoated (Fogra 52) profile bound to replace Fogra 47:

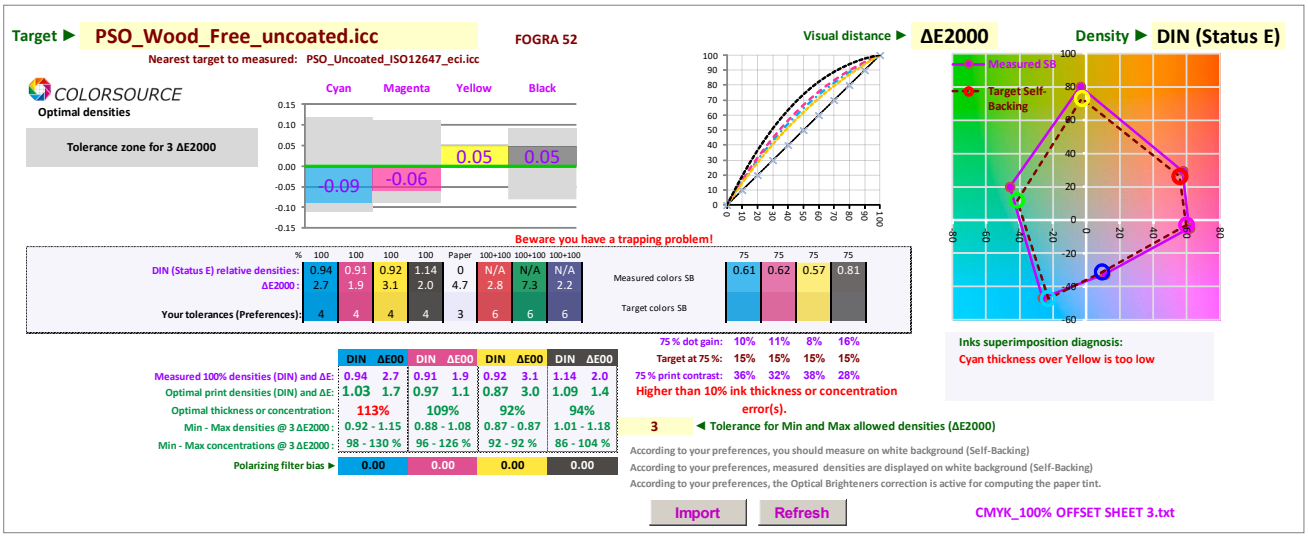
a) Required optimal CMYK print densities:

These densities depend on the paper and ink batches, but **MagicPress** application shows that the optimal density differences are insignificant. For example, hereafter (Sheet-Fed Heidelberg with 175 dpi AM screening):

Fogra 47 press-setting: The computed CMYK optimal densities are 0.97, 0.94, 0.91 and 1.14 for computed residual visual distances 1.0, 1.5, 1.9 and 1.1 ΔE2000:



Fogra 52 press-setting: The computed CMYK optimal densities are 1.03, 0.97, 0.87 and 1.09 for computed residual visual distances 1.7, 1.1, 3.0 and 1.4 ΔE2000:



b) Target TVI curves:

The four Fogra 52 specified target TVI CMYK curves are identical: Curve D, when Fogra 47 respectively specifies for C, M, Y and K the C, C, C and D TVI curves.

So that we have computed the Fogra 52 ICC profile from Fogra 47 profile using **ICC_Normalize** application and we compared it to the Fogra 52 profile computed directly from the **fogra52_mar2014_m0.txt** press characterization file. And then we compared the colors produced by both profiles on an ECI2002 CMYK chart:

The average difference between the ICC profile computed from Fogra 52 M0 characterization data and the ICC profile deduced from Fogra 47 by using free **ICC_Normalize** application taking into account the CMYK TVI curves change is only 2.9 ΔE2000.

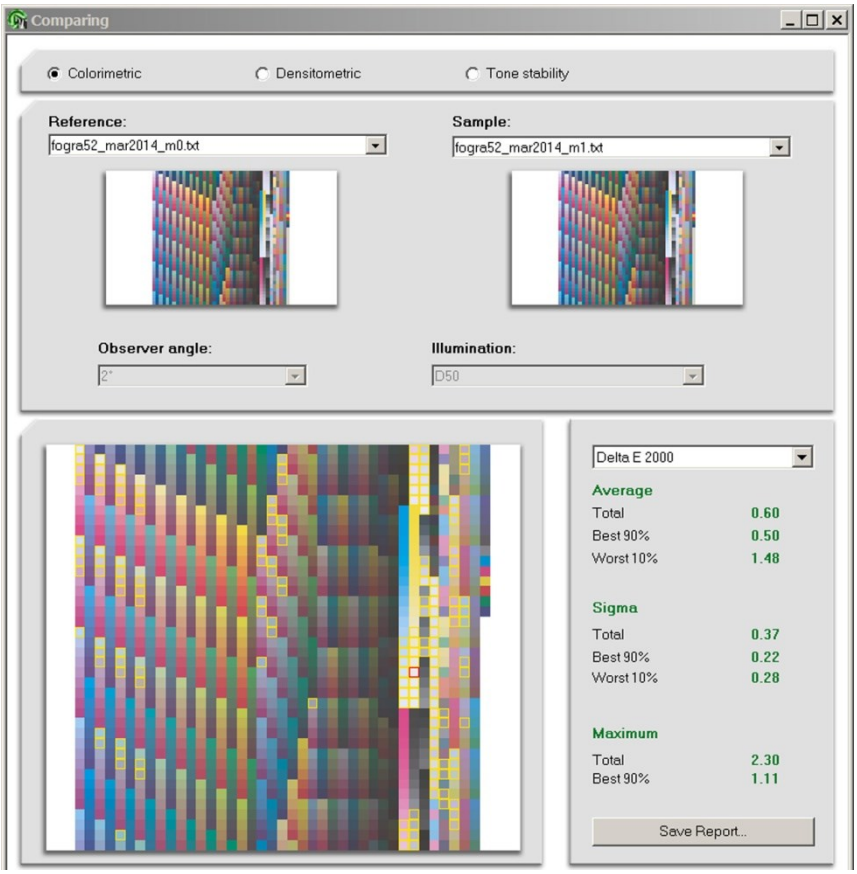
This comes from different solid and trapping colors used for Fogra 52 and Fogra 47, and above all from the fact the Fogra 47 press characterization data are released using strong optical brighteners correction (Otherwise the Fogra 47 paper tint would be blue) when we have applied no OBA correction to the Fogra 52 M0 data.

%	100	100	100	100	Papier	100+100	100+100	100+100
VISUAL densités relatives :	0.6	0.56	0.82	1.12	0	N/A	N/A	N/A
ΔE2000 :	2.2	1.7	1.6	1.5	5.2	1.4	2.4	1.1
Vos tolérances (Préférences) :	4	4	4	4	3	6	6	6

Couleurs mesurées SB

Couleurs cibles SB

c) Comparison between Fogra 52 M0 and Fogra 52 M1 press characterization data:



Above image clearly shows the difference between M0 and M1 Fogra 52 characterization data is negligible (Average 0.60 ΔE2000).

Moreover, the real difference will be much smaller when the appropriate optical brightener's correction is used.

Indeed, choosing M0 or M1 condition can only affect can only affect the measurements of paper tint and light screened tones, and above Lab D50 2° values have been computed with no optical brightener's correction:

Uncorrected M0 white uncoated paper tint: L, a, b = 93.4, 1.9, -7.5 (Far too blue)

Uncorrected M1 white uncoated paper tint: L, a, b = L, a, b = 93.5, 2.5, -10.0 (Even more exaggeratedly blue)

This brief comparative study of Fogra 47 (M0) and Fogra 52 (M0 or M1) proves what was obvious: The ISO12647-2:2013 request of using M1 measurement condition for replacing M0 is quite useless.

4-6) Useless costs and no benefits for a printing world in crisis:

ISO12647-2:2013 ukase specifying replacement by M1 of M0 measurement condition shows that our dear Vendors of equipment and certifications of all species are as thick as thieves for mowing more wool on the back of Graphic Industries and their Clients, who will pay for the bill.

If their goal was simplifying the existing Fogra39 and fogra47 by instituting for each standard a same CMYK target TVI curve, using **ICC_Normalize** and ProfileMaker **ProfileEditor** applications for computing the according new ICC profiles was enough.

On this issue, it is very strange X-Rite stopped marketing **ProfileMaker,** which their **i1Profiler** application cannot replace. **i1Profiler** is OK for desktop publishing studios or for digital print houses with basic applications, but does not offer **ProfileMaker** power and the flexibility that keep compulsory for traditional printing applications. Because X-Rite claim **i1profiler** is an advantageous replacement of **ProfileMaker**, they should very logically offer a free **ProfileMaker** license to each **i1Profiler** Customer. Same as Microsoft allowing you using Office previous version if your new Office version shows bugs or drawbacks regarding your applications.

Moreover, and this being extremely strange, our ISO experts from UGRA and FOGRA and ISO12647 committee DID NOT SPECIFY if the ISO12647-2:2013 requested Lab, D50, 2°, M1, Self-Backing measurements should be tweaked according to the X-Rite XRGA fake standard! (See paragraph 6.3 starting page 29).

And all this in the deafening silence of professional associations and employers' federations!

We think most of these Vendors should rather spend their efforts training properly their staff when we see in the field the disastrous installation quality of so many equipment's.

Actually, the only potential advantage of using M1 measurement condition is to allow a better long-term stabilization of the spectrophotometers built-in source UV spectrum. In this prospect, the future belongs to built-in LED sources without any doubt. But the only existing spectrophotometer today offers so many useless light source emulations and is so expensive compared with Eye-One Pro that I could never find a valid reason to recommend it to any Customer.

Lastly, as we will see it in following paragraphs, focusing on ISO paper tints have no interest, because the generic ISO paper tints are almost never the stock paper tints, and for optimal repro and proof work, you need editing the ISO ICC profile generic paper tint with the real stock paper tint. Alternatively, you can use this paper tint edited profile in the prepress workflow if it was not done at repro stage.

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

5-1) ISO CMYK ICC 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 a color separation profile computed from the text measurement file characterizing the considered printing configuration (See tables pages 8-11 for offset and gravure printing).

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

Introducing the real stock paper tint into any CMYK ISO ICC 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 ICC profiles from the press characterization data, you can use one of the relevant generic ICC profiles available free of charge on the **ECI** website, but these profiles are not flaw-free (See paragraph 5-3 on pages 26-27). This however allows all small design studios calibrating their RGB monitors with a few hundred dollars probe enhancing 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 ICC 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)

In above three cases, the Print House will have to simulate your color proof on its printing press, by properly using ICC 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 ISO12347-6 standard or to their own documented private flexographic press setting standard.

More generally using ICC 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** (Fogra 39) color separations for a final print run on standard news print (Fogra 42), does not allow qualified Repro Operators making the best reproduction aesthetic choices for each original: In this case simulating the Fogra 39 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 ICC 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 standards.

5-2) ISO CMYK ICC 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 ICC 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 ICC 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 ICC 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 ICC 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 ICC profile paper tint, in order to take into account, the real stock paper tint, rather than the ISO ICC profile generic paper tint.

5-3) 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 ICC 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., FOGRA 39L) is a larger 1617 patches test chart.

For offset printing, measuring too many patches is useless. Better is worth making an average measurement files 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 matched press CMYK ICC profile with real inks and paper, by using the average spectral measurements of the 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 ICC profiles are properly computed and used.

6) Color and density measurement conditions for matching ISO12647-x:

6-1) Print measurement conditions: Measuring with Self-Backing or Black-Backing?

ISO12647 publish their target D50 Lab colors for solid CMYK inks and their superimpositions with Black-Backing measurement (BB), which is a mistake because the colors you measure with Black-Backing strongly depend on the paper opacity and thickness, and moreover using BB does not match the most frequent viewing conditions when you read documents.

As a result, NOBODY is using these BB target Lab colors in real life: All Fogra and IDEAlliance press characterization files, hence the ISO 12647-x CMYK ICC profiles you use for color separating and proofing, are made with white background measurements (More exactly with Self-Backing measurements (said "SB") where you pile a few stock papers layers). So that the best ISO 12647-x and IDEAlliance target D50 Lab values are SB measurement values.

As a consequence, it is natural - and easier in real life - measuring all your print control bars in SB mode.

6-2) Important note about recent spectrophotometers complying with ISO13655:2009 measurement standards:

Graphic Industries color measurement standards have changed; in order to try and convince you that you should change all your spectrophotometers, which is false. (See paragraph 4 pages 16 to 24).

For summarizing hereafter, **FOUR different measurement conditions have been normalized by ISO13655:2009** (Spectral measurement and colors computing in Graphic Arts).

M0 measurement condition: The measured colors are computed as C.I.E. L*a*b* D50 2°, and the spectrophotometer internal light source for reflection measurements matches incandescence (approx. 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 internal light source for reflection measurements matches daylight (approx. 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 internal light source for reflection measurements contains no UV.

M3 measurement condition: Only for density measurements: The spectrophotometer internal light source for reflection measurements is matching incandescence (A Illuminant) and is filtered by a polarizing filter.

For any ISO12647-2-3-4-6 press-setting, you should use your spectrometer in M0 measurement conditions with white background (Self-Backing), because all published ISO12347-2-3-4-6 and G7/IDEAlliance standards specify measured target colors measured in M0 measurement condition and using Self-Backing (SB).

The advantage of measuring with Self-Backing is that the reference D50 Lab values you get do not depend on your paper thickness or opacity, as long as you use a few superimposed white sheets for backing.

Please note a few pressroom scanning spectrophotometers are using black-backing measurement, so that the Lab values you measure on your print largely depend on your paper thickness and opacity. No problem: You just need inputting to your system the density corrections values computed by MagicPress application.

Using M3 measurement conditions on your press for density measurements is allowed, but does not bring any advantage because ISO12347-2-3-4-6 and G7/IDEAlliance standards do not specify any density to be matched: The appropriate CMYK solid ink densities are the ones that allow you matching your ISO target solid colors with minimal possible visual distance. So that the density measurement conditions have no importance, as long as you do not change and confuse them. Only mind you should use DIN spectral response for computing your density correction curves because ISO12647 TVI curves have been established using this spectral response.

6-3) The X-Rite "XRGA" so called color measurement standard:

An important supplier has decided to solve his own marketing problems by inventing his own color measurement standard: The launch in August 2010 of a private and undocumented color measurement standard jeopardizing Graphic Industries color quality is showing once again that Graphic Industries and their professional trade organizations are not able mastering their Suppliers and preventing them doing stupid things.

The consequence is that today you have to be very careful when specifying D50 Lab 2° M0 Self-Backing reference colors for CMYK or for spot colors printing. In ANY other Industry than graphic industries, the technical awareness of Customers, End users and their trade organizations would have immediately forbidden a Vendor distorting the specifications of an established measurement unit!

This deserve following explanations: The base problem was that when measuring D50 Lab 2° M0 Self-Backing apparent colors, some delta E was found whether measuring with GretagMacbeth or with X-Rite spectrophotometers. This imperfect *inter-manufacturer agreement* was due to GretagMacbeth measuring reflectance using normalized 45/0° geometry from 380 to 730 nm by 10 nm steps, and X-Rite using non-normalized 0/45° geometry from 400 to 700 nm by 20 nm steps.

On this issue let us remind that, of course, all **ISO12647** and **IDEAlliance** reference colors have been established in self-Backing and M0 measurement conditions, using the normalized 45/0° geometry of SpectroEye or Spectrolino or Eye-One Pro spectrophotometers that give coherent measurements.

X-Rite marketing problem was that, with their usual subtlety, they had explained American Printers for years that X-Rite spectrophotometers were excellent and the GretagMacbeth ones were terribly bad! May be American Printers have not quite a well-informed judgment. Many of them actually believed there were weapons of massive destruction in Iraq.

So that X-Rite put themselves in a very bad situation on their own domestic market when they bought GretagMacbeth:

- On the color management market, nearly all X-Rite hardware and software products had to be replaced by the much better equipment of GretagMacbeth origin,

- On the press-room market, the X-Rite spectrophotometers DTP5xx series were completely obsolete as well: On Publishing markets they were unable to compute the optimal printing densities for ISO12647-x or IDEAlliance press settings, and on packaging markets they were unable to measure a simple blue or violet % density step chart!

So that obviously the DTP5xx series should have been discontinued as well, and replaced by the much better GretagMacbeth SpectroEye. But after years and years of denigrating their Competitors, X-Rite did not dare explaining their American customers that SpectroEye was in the end a much better production tool with a much better software. And American printers buying the SpectroEye could not understand the Delta E's with their existing DTP5xx Spectro's.

So that X-Rite invented the following market trick:

- Modify by software the spectral reflectance measured by X-Rite origin equipment,
- Modify by software the spectral reflectance measured by GretagMacbeth origin equipment, in order to try harmonizing their Lab measurements with the bad X-Rite values,
- Explain the Market that their new private and undocumented "XRGA" standard (where they create de facto a new unknown Lab system!) is a BIG progress!

The immediate result is that a same 100% cyan ink measured in same conditions (D50 2° M0 Self-Backing) can have today FOUR different D50 2° M0 Self-Backing values:

- The original **GretagMacbeth** measurement from SpectroEye or Eye-One Pro **without tricking** the measured spectral reflectance (They produced all normalized ISO12647-x or IDEAlliance 45/0° D50 2° Lab values),
- Original **GretagMacbeth** measurement from SpectroEye or Eye-One Pro **WITH tricking** the measured spectral reflectance for producing "XRGA Lab" (Non normalized and undocumented values),

- Original **X-Rite** measurement from DTP5xx **without tricking** the measured spectral reflectance, (Non normalized values),

- Original **X-Rite** measurement from DTP5xx **WITH tricking** the measured spectral reflectance for producing "XRGA Lab" (Non normalized and undocumented values),

So that we consider X-Rite created a big technical mess on the color quality Market since August 2010: They did not hesitate jeopardizing their Customers businesses for solving their own internal marketing problems that they had created by themselves on their local domestic American market.

The worst in this affair is not this X-Rite initiative, but the fact that Graphic Industries professional and color quality organizations apparently did not even notice the problem. Graphic Industries are not suffering so much the competition of the new electronic media: They are suffering of their own persistent problems of non-industrial approaches.

Of course, many Colorsource Customers immediately saw the big problem and refused wasting time and money for upgrading their SpectroEye(s), inks formulation and in color quality software to XRGA and then get marginal undocumented Lab measurements, when their existing color measurements standards had worked perfectly well since so many years.

Some of our Customers were forced to make very expensive upgrades to XRGA when X-Rite managed convincing some perfectly incompetent print buyers that XRGA was a progress! Probably the same kind of print buyers who use the so-called "ISO12647-x color certifications" of their suppliers as an umbrella, but are not able controlling the quality of what they buy. "We have been screwed by X-Rite" are our Customers own words about these forced updates.

For your information you will find the X-Rite announcement of "XRGA standard" by email dated August 2010 in **Appendix 2.**

6-4) Summary of color and density measurement conditions:

The spectrophotometer must measure the spectral reflectance without UV or polarizing filter and using an incandescent spectrum (A) internal light source (M0 conditions). Colors and densities are computed from the measured spectral reflection curves. All measurements must be carried out in “Self-Backing” mode.

Color Measurement: Colors are expressed as C.I.E. Lab D50 2° values in conformity with ICC profiles connection space specifications.

Note that for demanding applications, it can be necessary for computing the D50 Lab co-ordinates, using not the actual C.I.E. D50 spectral values but the measured spectral values of the real D50 light booth, even if it does match ISO 3664:2009 viewing conditions standards, in order to avoid strong metamerism effects with the ink-jet proofs. However, the press ISO ICC profiles being based only on colorimetric data, this action has a limited effectiveness as long as you do not compute yourself the press ISO ICC profile from measured spectral data.

Densitometry: Densities are measured using DIN RGB spectral response (named “Status E” on original X-Rite products). Of course, you can use different spectral responses as long as you do not confuse apples and pears, because the good reference densities are the ones that produce the good Lab values for solid primary and secondary colors.

However, please note that changing the spectral response have significant effects on the computed gradation curves, and the ISO12647-2-3-4-6 target TVI curves have been specified using the DIN (Status E) spectral response, so that you should use this DIN spectral response for computing your printing forms correction curves.

Using a polarizing filter (M3 measurement condition) would penalize color measurements accuracy by darkening the light source (S/N ratio) and can bias the color measurements. A polarizing filter would bring a better sensitivity for density measurements on fresh offset inks, but this advantage would only be perceived for very high densities, when ISO12647 standards only require reasonable solid ink thicknesses that any Print House can easily reach.

It is thus logical proscribing any light source filter on spectrophotometers, which does not prevent using the existing polarized densitometers (M3 measurement conditions) for checking offset press densities: Indeed, when you have determined by using a non-filtered spectrophotometer the solid inks densities producing the relevant ISO 12647 solid

CMYK colors with your inks and paper batches, you can measure and record the densities using a polarized densitometer. You then get two reference densities for each primary ink: The paper relative densities with and without polarizing filter.

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.

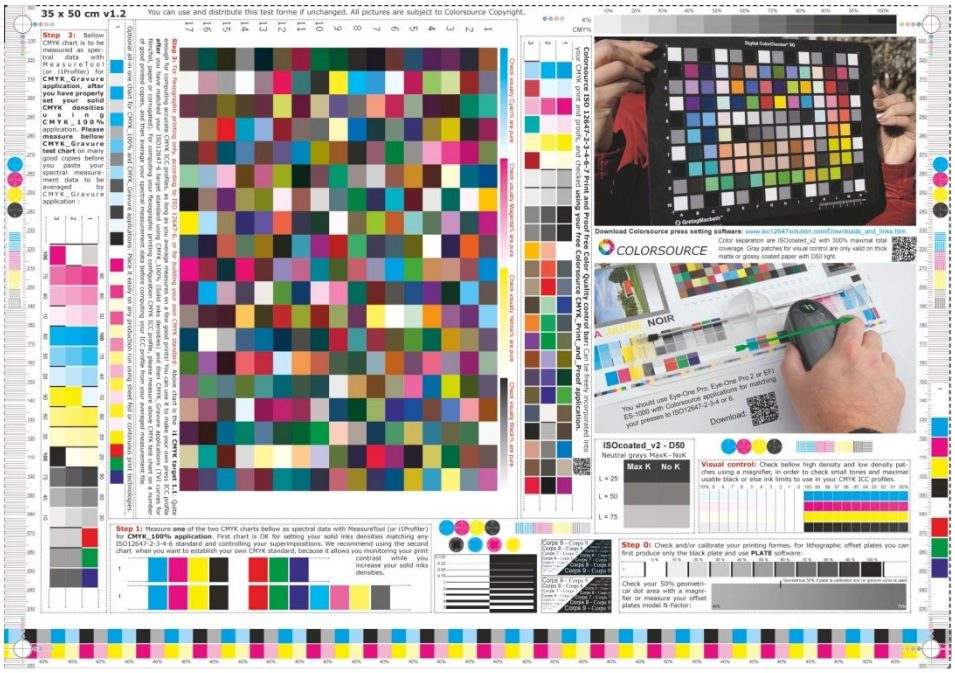
With a press in good condition, if no solid ink density allows you matching the ISO specified C.I.E. Lab color within the ISO ΔE tolerances, it means the ink you are using does not meet ISO **2846-x** standard, or that sometimes your paper is the problem, or that your press needs to be washed or maintained.

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:

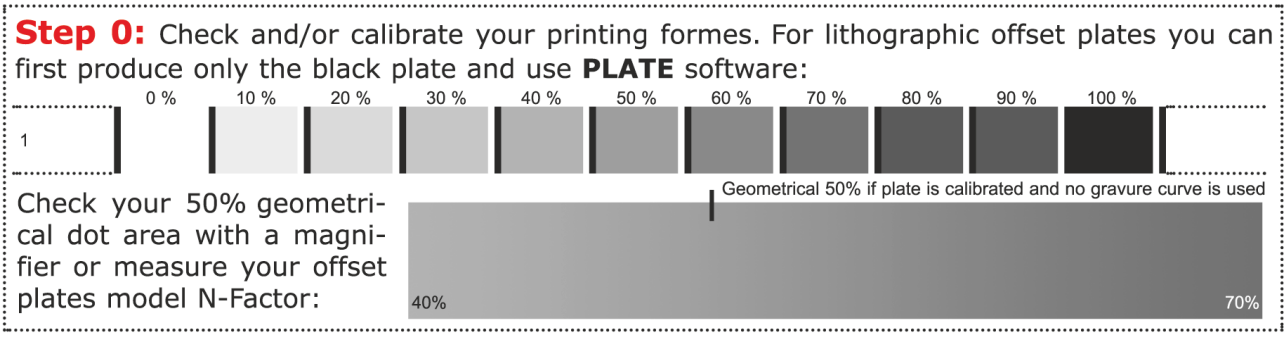
Colorsource have developed the necessary software tools for accurately computing the optimal print density for each CMYK ink, and the appropriate CMYK printing form correction curves for matching any **ISO12647-2-3-4-6** or **G7/IDEAlliance** specified target, by using the measured spectral characteristics 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**, **EFI ES-1000**, **Eye-One Pro2** or **EFI ES-2000**. Other 45/0° spectrophotometers can also be used, but mentioned models are the best ones, thanks to their fast measurements' ability in scan mode and thanks to their very affordable prices. (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.

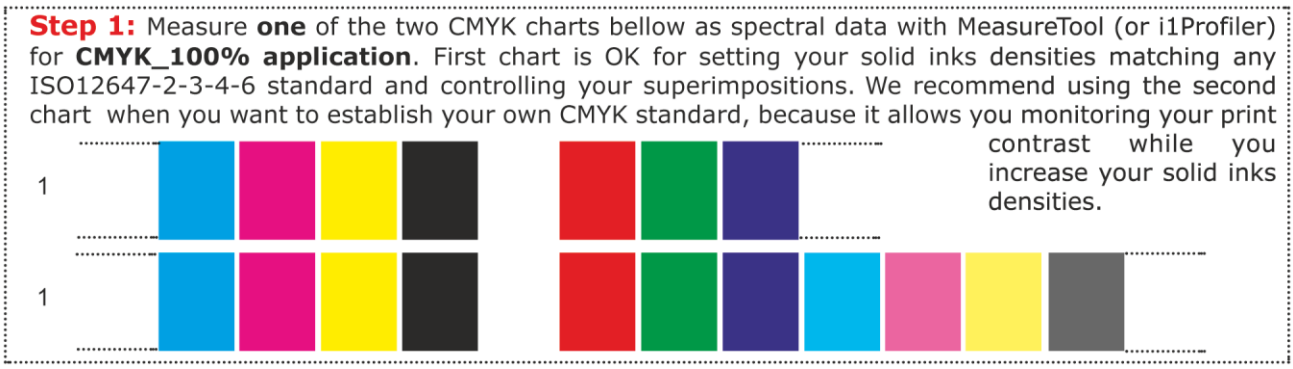
For offset printing, you can first produce only the black plate of one of the Colorsource test forms, where a zone is dedicated to plate control and CtP calibration. **PLATE** application allows easy CtP calibration using a simple 45/0° spectrophotometer:



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:

8-2-1) 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:



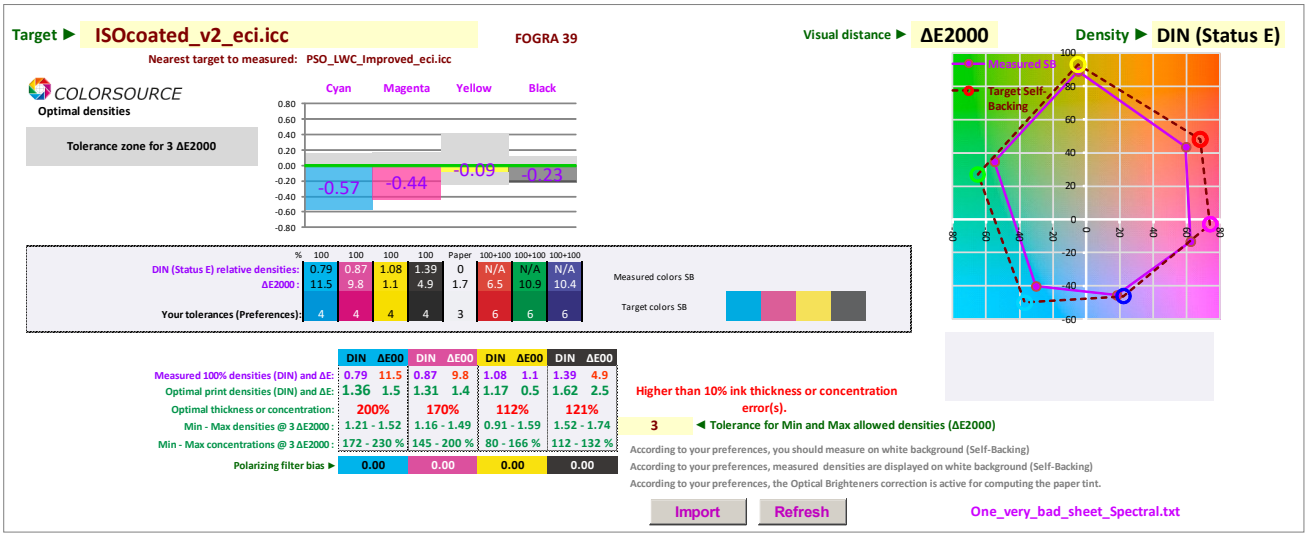
This step is crucial for any traditional or digital print process, because it largely determines the print process dot gains and color gamut, that strongly depend on the solid inks' thicknesses and/or concentrations. A classical mistake in Graphic Industries is neglecting this first step, although producing 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 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.

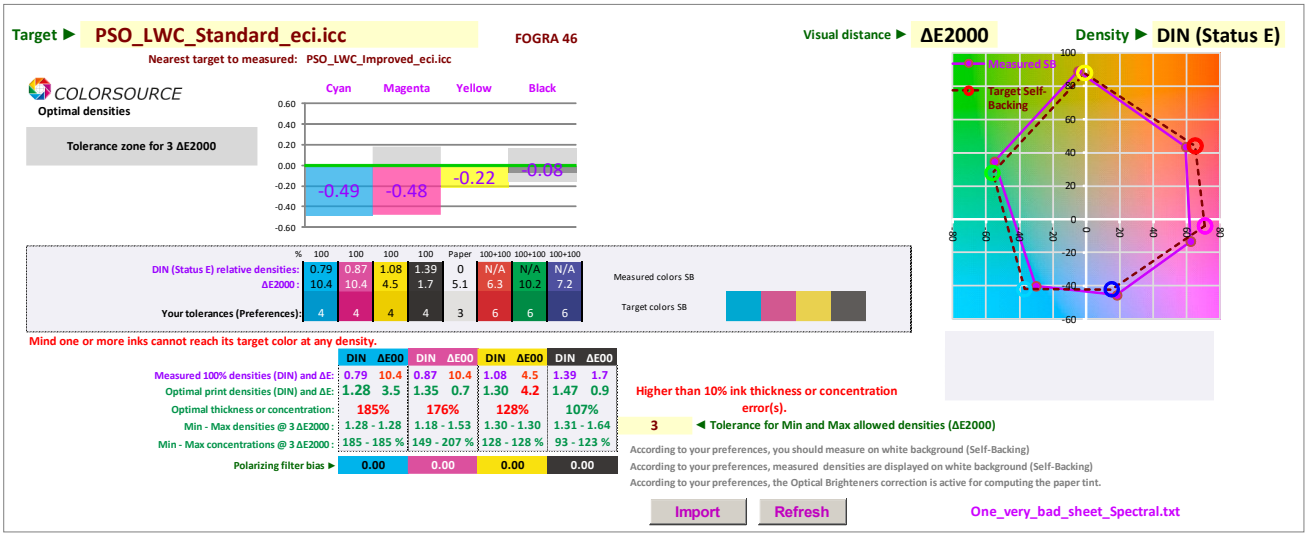
The minimal and maximal authorized print densities and/or Ink thicknesses or concentrations within your own ΔE tolerance are displayed as well:

For example, **MagicPress** application computes hereunder that CMYK densities should be respectively increased by 0.57, 0.44, 0.09 and 0.23 D, for reaching respective 1.5, 1.4, 0.5 and 2.5 ΔE2000 minimal possible visual distances:



The application shows as well that reaching the optimal densities requires increasing your CMYK ink thicknesses or pigment concentrations respectively by 200%, 170%, 112% and 121%.

The application sometimes predicts that one or more of the CMYK inks cannot reach its 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.

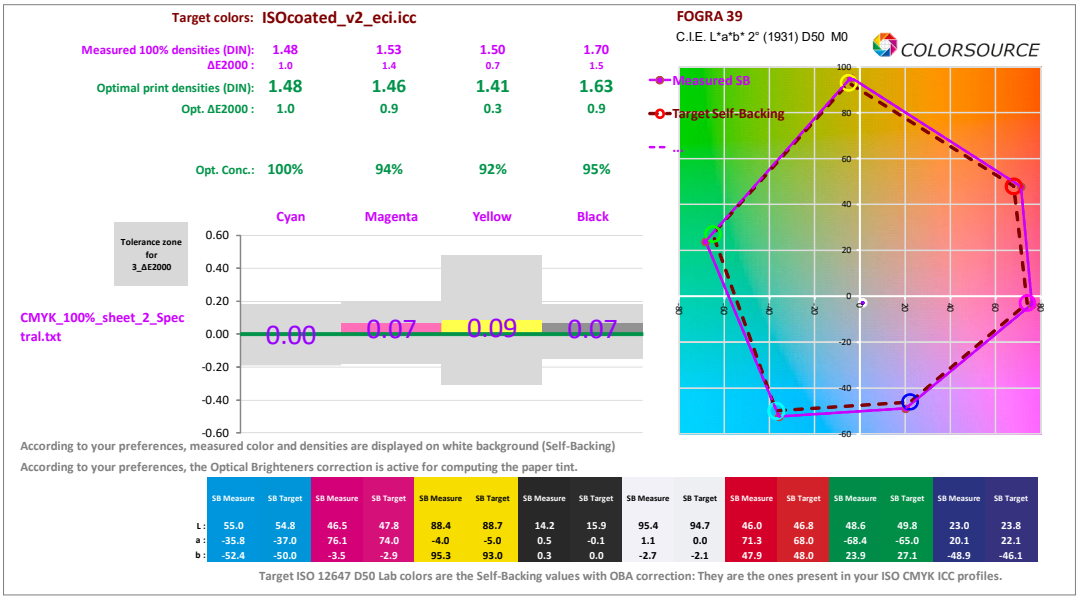
When the four CMYK inks are set to their computed optimal densities, check the red, green and blue superimpositions do match the according ISO colors. Checking trapping colors is quite useful when printing with wet offset technology, where you can be OK on solid inks and be bad on their superimpositions.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

Download link of the application: https://www.iso12647solution.com/MagicPress_density_setting_software.htm

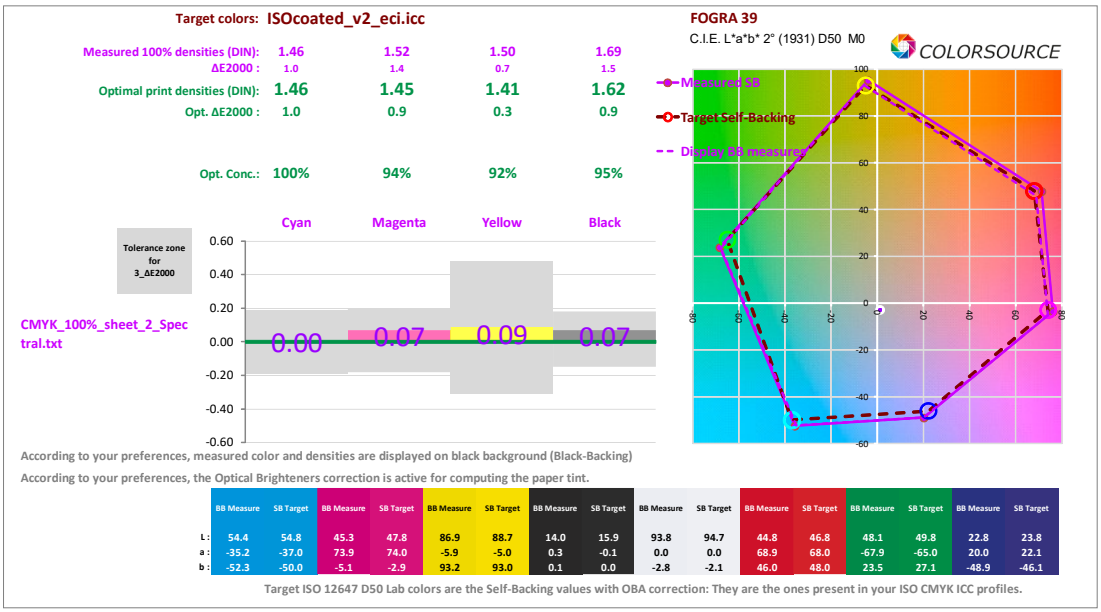
MagicPress application holds all **ISO12647-2-3-4-6** and **G7/IDEAlliance** solid Lab target colors, which have been measured using Self-Backing for establishing all classical ISO12647 and IDEAlliance CMYK ICC profiles.

However, some private Colorsource applications can measure the print with Self-Backing and display the colors and densities you would get if measuring with Black-Backing, and vice-versa, as shown hereafter:

CMYK-Paper-RGB measurement of an HWC sheet in Self-Backing mode and display of the Self-Backing measured colors and densities:



Same CMYK-Paper-RGB measurement of an HWC sheet in Self-Backing mode, with display of the colors and densities that would have been measured if measuring in Black-Backing mode: The requested ink thicknesses (or concentrations) are the same, but they produce different densities and colors when BB measurement is used:



Nevertheless, the main interest of this nice application feature is pedagogic, for closing sterile debates between measuring using SB or BB!

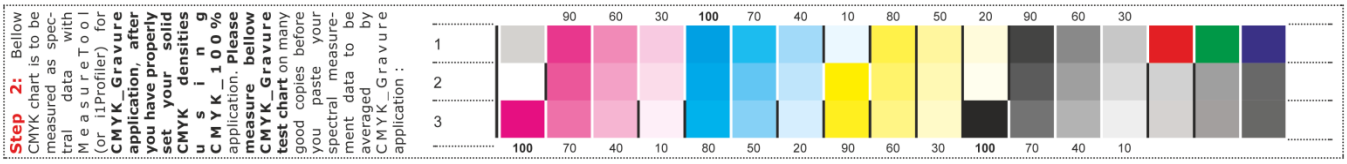
In real life you will most often use Self-Backing because a good black measurement background is not always available in the press-room.

And if your ink-keys scanning spectrophotometer measures on black-background and/or with a polarizing filter, you just need using the density correction values computed by **MagicPress** application, which are very close in SB and BB modes.

8-2-2) Computing the CMYK printing forms correction curves for matching ISO12647-x:

Once you have set your CMYK inks to their optimal densities, you have to measure your average press dot gains in this appropriate printing condition, and compute a specific correction curve for each printing form, that will allow you matching the CMYK TVI curves imposed by your public or private CMYK standard.

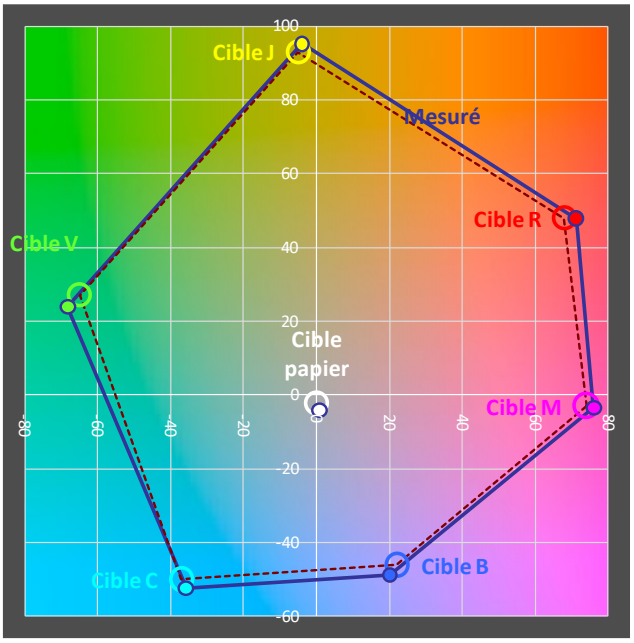
This will ensure an excellent color matching on not only your primary inks and their superimpositions, but also on all CMYK screened tones:



This method is very simple and it harmonizes all the Print House printing presses chromatic responses.

Determining theses engraving curves for matching the ISO or IDEAlliance ICC profiles dot gain curves is quite easy.

Using non-ISO2846 complying inks fortunately does not have too much incidence on most of printed images colors, but mind the saturated solid colors (blues etc.). If possible, do use ISO2846 compliant CMYK Inks: Today almost all inks Vendors offer one or more ISO2846 compliant CMYK ink sets references and this allows you sourcing your inks from various Vendors without bad surprises.

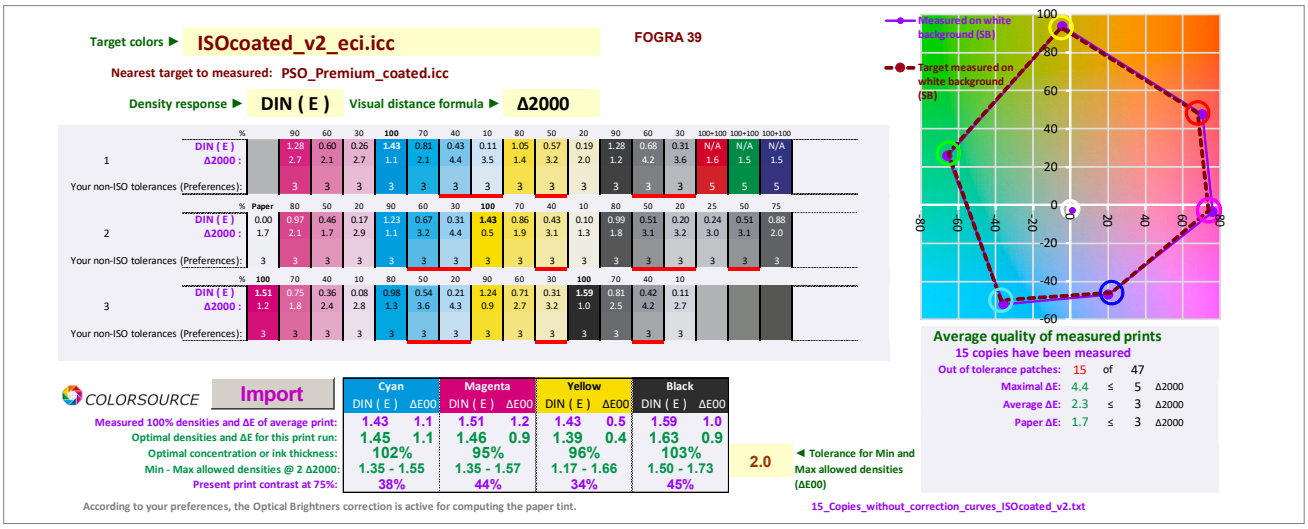


E.g., for offset printing using AM screening, produce “straight plates” (i.e., file x% gives x% on the plate), measure the apparent dot gain on the print at appropriate CMYK inks thicknesses, and then compute each plate engraving curve that allows matching the ISO profile specified TVI curves.

Mind that 100% CMYK spectral reflectance curves not being standard, matching the ISO generic dot gains on a 50% cyan does not ensure best possible C.I.E. Lab color matching for this 50% cyan.

At this stage, matching the ISO 12647-x standard target TVI curves for matching CMYK screened tones target colors needs a specific correction curve be computed and then applied to each printing form

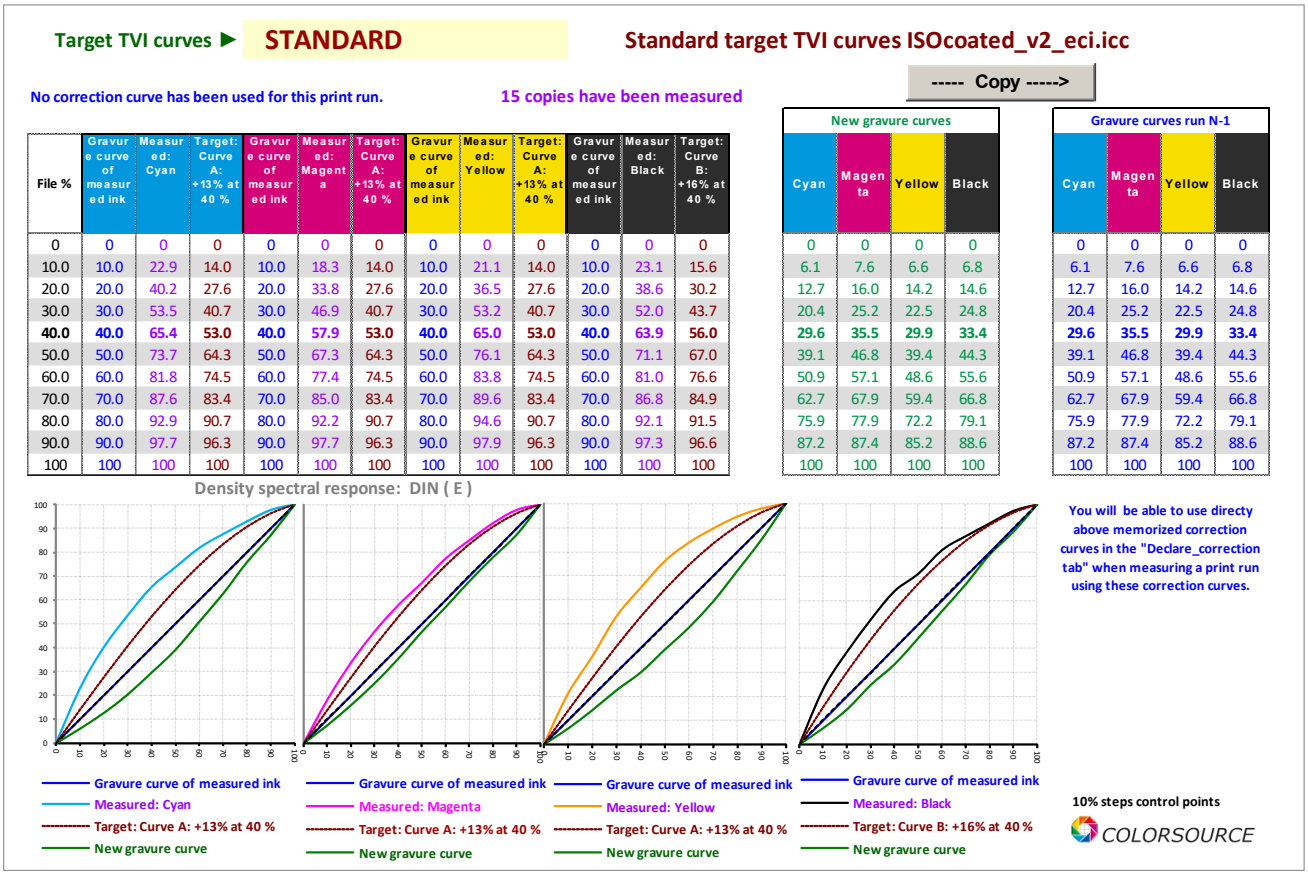
Colorsource **MagicPrepress** application allows computing the optimized printing forms correction curves by measuring a few good printed copies:



Please note **MagicPrepress** application allows using commercial production print runs for computing the press optimal correction curves, which allows Print Houses using continuous print processes saving a lot of paper.

They can easily incorporate a single line CMYK chart to commercial print runs, and take into account the existing prepress workflow printing forms correction curves for computing the ideal correction curves to be programmed into the prepress workflow:

The print forms correction curves allow excellent, easy, and fast press settings:



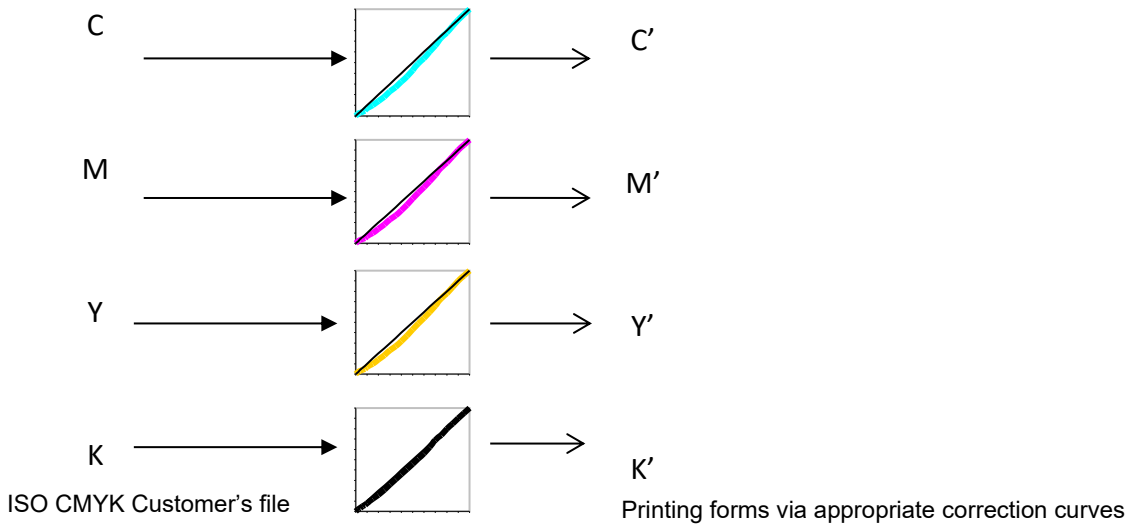
File %	Gravure curve of measured ink	Measured: Cyan	Target: Curve A: +13% at 40 %	Gravure curve of measured ink	Measured: Magenta	Target: Curve A: +13% at 40 %	Gravure curve of measured ink	Measured: Yellow	Target: Curve A: +13% at 40 %	Gravure curve of measured ink	Measured: Black	Target: Curve B: +16% at 40 %
0	0	0	0	0	0	0	0	0	0	0	0	0
10.0	10.0	22.9	14.0	10.0	18.3	14.0	10.0	21.1	14.0	10.0	23.1	15.6
20.0	20.0	40.2	27.6	20.0	33.8	27.6	20.0	36.5	27.6	20.0	38.6	30.2
30.0	30.0	53.5	40.7	30.0	46.9	40.7	30.0	53.2	40.7	30.0	52.0	43.7
40.0	**40.0**	**65.4**	**53.0**	**40.0**	**57.9**	**53.0**	**40.0**	**65.0**	**53.0**	**40.0**	**63.9**	**56.0**
50.0	50.0	73.7	64.3	50.0	67.3	64.3	50.0	76.1	64.3	50.0	71.1	67.0
60.0	60.0	81.8	74.5	60.0	77.4	74.5	60.0	83.8	74.5	60.0	81.0	76.6
70.0	70.0	87.6	83.4	70.0	85.0	83.4	70.0	89.6	83.4	70.0	86.8	84.9
80.0	80.0	92.9	90.7	80.0	92.2	90.7	80.0	94.6	90.7	80.0	92.1	91.5
90.0	90.0	97.7	96.3	90.0	97.7	96.3	90.0	97.9	96.3	90.0	97.3	96.6
100	100	100	100	100	100	100	100	100	100	100	100	100

Cyan	Magenta	Yellow	Black
0	0	0	0
6.1	7.6	6.6	6.8
12.7	16.0	14.2	14.6
20.4	25.2	22.5	24.8
29.6	**35.5**	**29.9**	**33.4**
39.1	46.8	39.4	44.3
50.9	57.1	48.6	55.6
62.7	67.9	59.4	66.8
75.9	77.9	72.2	79.1
87.2	87.4	85.2	88.6
100	100	100	100

Download link of the application and its user's guide:

https://www.iso12647solution.com/MagicPrepress_correction_curve_software.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 ICC or DeviceLink profiles on your prepress workflow, in order to change your Customer's CMYK PDF’s into Press C'M'Y'K' PDF’s. 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 for press setting, 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.

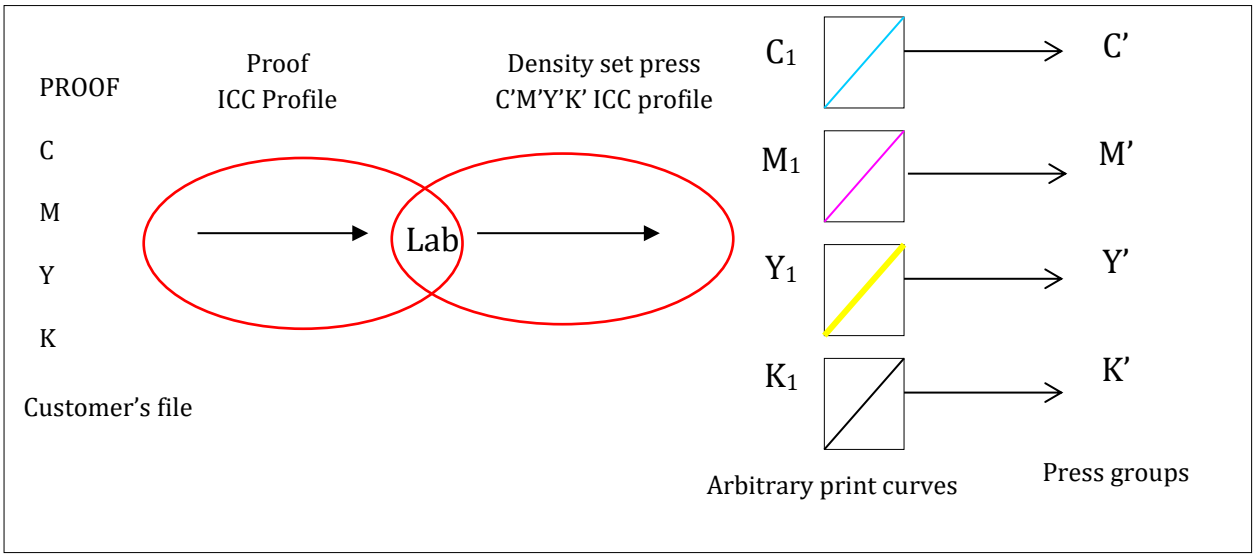
This example illustrates an important point about color proofing: Whether a proof simulates a printing press, or whether a press simulates a color proof, the proof and print are not two documents with identical C.I.E. Lab colors, would this only be for matching their apparent neutral grays.

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 ICC profile, or at least to be able to establish this ICC 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/ICC_Profile_Convertor_software.htm

9-3) How to save CMYK inks:

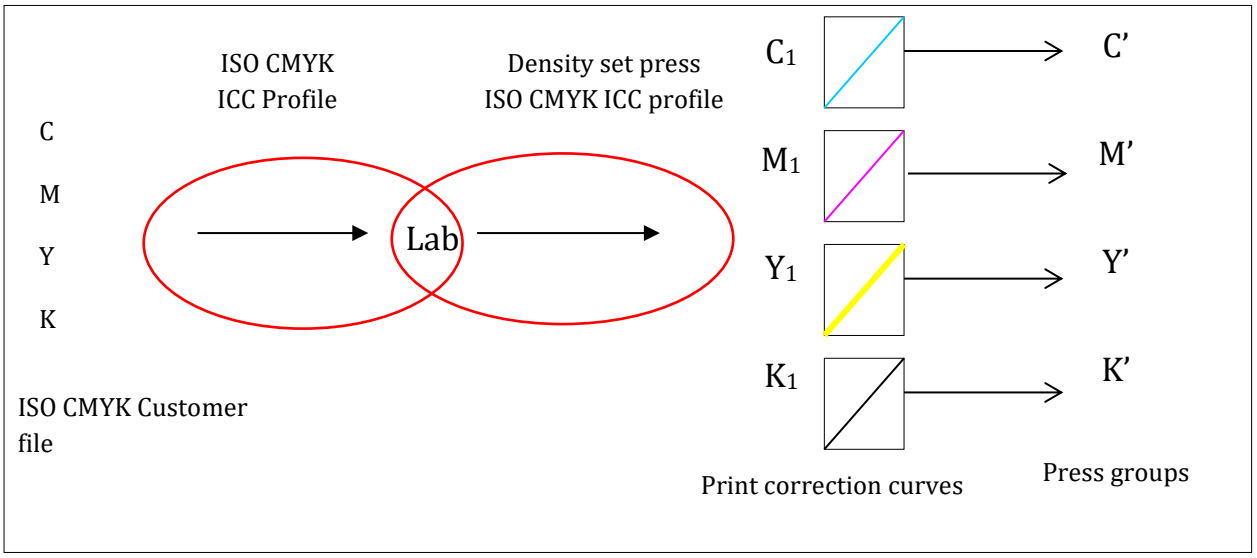
The subject recently became fashionable, when excellent and inexpensive solutions are available since… more than 18 years, in form of color management tools and appropriate software allowing applying the necessary color spaces changes to the finished document layouts:

- 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.

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 ICC 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 ICC 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!

10) Visual monitoring of gray balance on ISO 12647-x prints matching European ICC 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 C%M%Y% equivalent of any K% black only depends on the press CMYK ICC 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 C%M%Y% 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 ICC profile, and your D50 viewing booth measured light.

11) How to set a press for matching G7/IDEAlliance US interpretation of ISO 12647-2?

11-1) Brief critical review of G7/IDEAlliance press-setting methods:

The documents **IDEAlliance** publish on their web site for justifying their implementation of **ISO12647-2** standards and building their three standards **GRACoL2006_Coated1v2.icc**, **SWOP2006_Coated3v2.icc**, and **SWOP2006_Coated5v2.icc** offset ICC profiles, would deserve a detailed study that is not in the scope of this document trying to bring **solutions** to Print Producers and Print Buyers.

The **IDEAlliance** documents we refer to, are "**Methodology for Establishing Printing Aims Based on a Shared Near-Neutral Gray-Scale**" (October 8, 2011), "**The G7 Specifications 2008**" (Final Working Draft 2008/09/12) and "**Calibrating**, **Printing and Proofing by the G7 Method**" Version 6 August 2006.

Hereafter is a brief summary of our critics:

1. **IDEAlliance** assume that for each CMYK press or other print device, some ideal TVI curves are existing that allow optimizing the print set up and neutral grays reproduction.

Their great idea is that if all CMYK presses - or other print engines - are each set with correction curves allowing them to share same neutral reproduction of CMYK neutral grays, this will help optimizing, and harmonizing the color reproduction on all print engines.

This attempt of optimizing the arbitrary TVI curves of each print processes is quite interesting. Because the arbitrary ISO A to F TVI curves, that perfectly work when appropriate plate correction curves are used, are arbitrary and maybe not ideal curves for all printing press models.

The problem is that according to **IDEAlliance**, their "ideal" correction curves were inspired by the principle of positive film recorders density calibration. The tradition is to calibrate film recorders in order R=G=B grayscales print as neutral grays. A "Status A" densitometer is used for measuring a native R=G=B exposed density grayscale, allowing computing three RGB correction curves that will allow any R=G=B value producing a neutral gray. This allows fast correction of gray balance drifts induced by each photographic film batch and by small drifts of the film development process. It may also allow better use of the film recorder RGB channels dynamic range.

But **IDEAlliance** approach seem to ignore that calibrating film recorders gray balance never allowed producing accurate professional colors. Even 25 years ago, this density calibration step was supplemented with using a three-dimensional proprietary DeviceLink profile, long before the existence of modern standardized ICC and DeviceLink profiles.

In addition, a specific DeviceLink profile (Often preceded by a new specific density calibration), had to be computed for each photographic material reference, in order to get professional color accuracy. Because good colors were sought and not only good grays. Apparently, **IDEAlliance** were inspired by non-professional photo labs approaches that were happy with a mere gray balance setting of their film recorders, when professional photo labs were already using density calibration, plus process-specific 3D profiles.

So that pretending a same gray balance can help harmonizing various CMYK print processes looks as strange as saying a digital camera or scanner gray balance is enough for getting accurate colors. In addition, even it should be **demonstrated** that it could help harmonizing various CMYK print processes, or even help a better reproduction of neutral grays.

On this basis, **IDEAlliance** seem to be polarized on tonal curves of their invention they name "NPDC" for "Neutral Print Density Curves", that would be more interesting than the traditional print process TVI curves. Moreover, demonstrating the advantages of their NPDC curves apparently asked them many dialectical acrobatics!

All their documents constantly try hiding that in the end, any qualified Printer who wants to set properly a CMYK press with standardized CMYK inks, need knowing its target solid and trapping colors, **and needs knowing the four target TVI curves allowing him to produce properly his four plates**. And nothing else.

On this issue, what we find far too often in the field is that press Conductors tend to play on solid CMY densities for getting neutral grays, because they are given plates not matching their printing press configuration and characteristics. This helps grays but destroys colors.

2. On these fragile foundations, **IDEAlliance** based the practical computing of their "NPDC" curves on empirical formulas that cannot properly replace the real press measured characteristics. All this seem inherited of old times, when people only focused on the gray balance, by lack of the appropriate measurement and computing tools.

3. On same fragile basis, **IDEAlliance** compute their "ISO12647-2" ICC profiles by tweaking existing press characterization files or profiles:

> **GRACoL2006_Coated1v2.icc** is the US equivalent for **"ISOcoated_v2":** Thick matte or glossy coated paper,
>
> **SWOP2006_Coated3v2.icc** is the US equivalent for **"PSO_LWC_Improved_eci.icc":** White thin coated paper,
>
> **SWOP2006_Coated5v2.icc** is the US equivalent for **"ISOuncoatedyellowish.icc":** Yellowish uncoated recycled papers.

For example, **GRACoL2006_Coated1v2.icc** profile has been approximated from **Fogra 39**, in order to offer **almost** same color gamut than **ISOcoated v2**, with using **almost** "NPDC" curves…

Following their genesis, **SWOP** and **GRACoL** profiles more look like **IΔEAlliance** profiles.

It would have been quite easy computing, for each existing European ISO12647-2-3-4 CMYK ICC profile using the arbitrary A to F TVI curves, an equivalent ICC profile with exactly same color gamut and properly computed NPDC curves, with nearly zero ΔE visual distance, simply by using free Colorsource **ICC_Normalize** application!

4. Last point, the recommended **IDEAlliance** press setting method (Document "**Calibrating**, **Printing and Proofing by the G7 Method")** for matching one of above **IDEAlliance** ICC profiles, is itself quite uselessly complex, because it requires printing and **measuring** CMY grays patches for test print runs.

Of course, printing target-based neutral CMY grays patches can always be useful for any print run, for visual control, because you can easily keep within ISO 12647-2 tolerances and still print colder or warmer grays.

However, MEASURING CMY grays for setting an offset press is useless, because the press gray balance is implicitly written in any CMYK target ICC profile you choose, that may be any of European or IDEAlliance or other CMYK profile. You only need correcting your plates in order to match your target ICC profile TVI curves.

By the way, IDEAlliance are publishing many words… but NOT the TVI curves of their published ICC profiles!

IDEAlliance document "**Calibrating**, **Printing and Proofing by the G7 Method"** mentions on page 22 at paragraph 6.4 **"Adjust device-level gray balance"**, that if their CMY = 50, 40, 40 patch is not measured neutral, you should adjust the CMY solid densities "in allowed tolerances" to try getting it neutral: That is what press Conductors have always done when they are given bad plates, and what amateur photographers do when they confuse getting neutral grays and getting accurate colors.

5. Provisional conclusions*:

We think the only interest of **IDEAlliance** approach is the quite interesting question of searching optimized arbitrary target TVI curves for each printing device, but their answers are not demonstrated, and the practical implementation of these answers is bad.

What is quite surprising is that **IDEAlliance** rhetoric's could impose such CMYK standards in U.S.A., who often are leading pioneers for engineering and high technologies.

All qualified Engineers we have discussed this issue with, who work for well-known Graphic Industries Vendors, are sharing our skepticism. However, for "marketing reasons" and for keeping "politically correct", most of the Graphic Industries Vendors, including a few color management Vendors, now officially support G7/IDEAlliance standards. This is how, once more in Graphic Industries, non-demonstrated assertions of self-clamed experts became truth!

We think all these Graphic Industries Vendors, and more importantly their Shareholders, should rather ask themselves the only relevant good marketing question:

> Can they go on taking Graphic Industries Professionals and Print Buyers for idiots, by comforting them on technological dead-ends, and hope, at the same time, this will help developing well their business?
>
> For Colorsource the obvious answer is NO. Alas, it is precisely because their Equipment do not sell well enough, despite their great usefulness and their great benefits for Graphic Industries, that so many Vendors are ready to support any existing weird standard. If they go on, we will alas ALL have less and less Customers. Because badly informed or deceived Customers are not able to make the right investment choices for their future. Color management market keeps abnormally low in Graphic Industries, and bad information does not help.

Of course, and as usual, Print Buyers are paying for the bill. As for the famous "Brunner" so called ideal dot gain curves that were promoted as the ideal offset TVI curves for 20 years, ISO12647-x standards are too often becoming today a source of non-quality:

1. Many Print Houses are using ISO12647 as an alibi, by passing so-called "ISO12647 certifications",
2. Many Print Buyers are using ISO12647 as an alibi, by using their suppliers "ISO12647 certifications as an umbrella, and not setting up the appropriate quality control procedures at reception of the prints they buy.

Print Buyers who want to optimize their costs and their quality should hire qualified Engineers spared by Graphic Arts irrationality, who will never accept being explained two and two are five.

(*) NB: It seems G7/IDEAlliance have revised their (bad) copy by publishing new CMYK ICC profiles complying with ISO12647-2:2013 and their new ICC profiles will be reviewed in a future revision of this document.

11-2) Colorsource solution for setting offset press matching IDEAlliance standards:

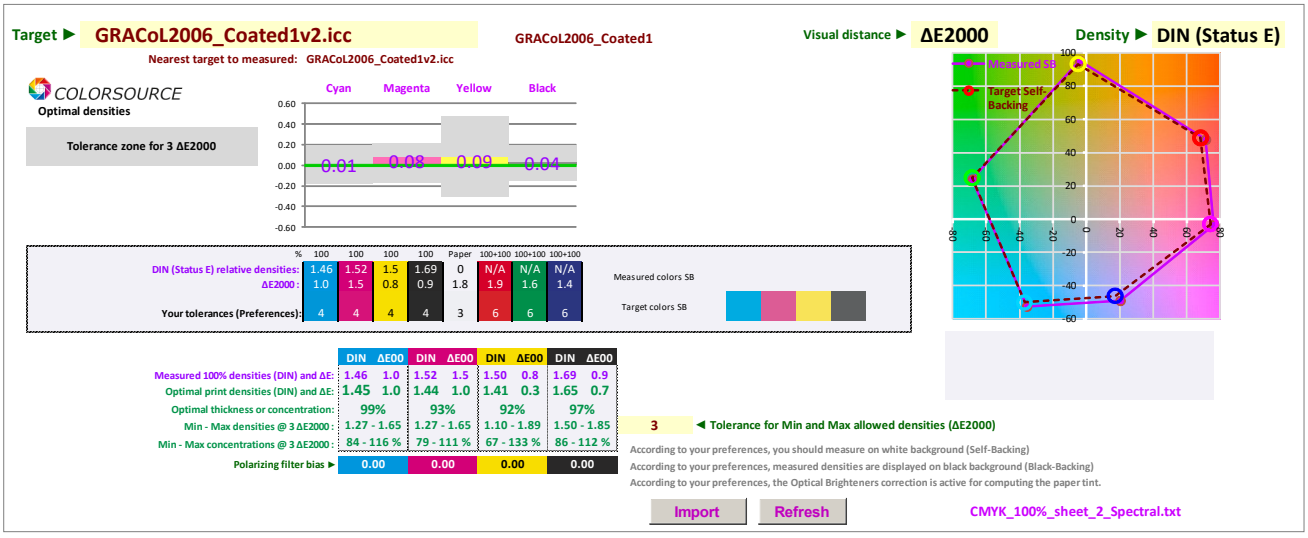
A solution could be computing for each existing or new European ISO12647-x ICC profile using A to F curves, the equivalent ICC profile with "NPDC" TVI curves.

For example, **ISOcoated_v2.icc** could get an equivalent profile named e.g., **ISOcoated_v2_NPDC_0ΔE.icc**, etc.

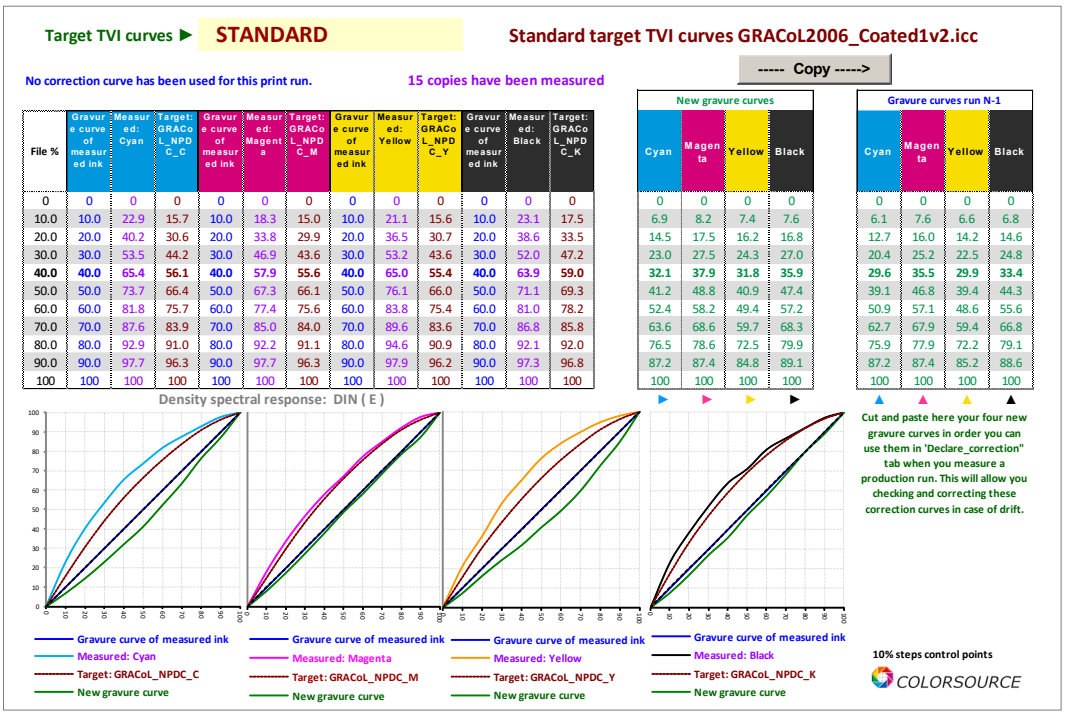
Why not? However, multiplying by two the number of standard ISO ICC profiles … for non-demonstrated benefits …may not be such a good idea.

For setting presses on **G7/IDEAlliance** standards Colorsource have supplemented their **MagicPress** and **MagicPrepress** press setting applications as follows:

1. **MagicPress** application now contains the three **IDEAlliance** standards, allowing computing the optimal solid inks densities for matching **IDEAlliance** target colors:



2. **MagicPrepress** application also contains **IDEAlliance** standards, in terms of target colors, and in terms of the target "NPDC" TVI curves that are imposed by each **IDEAlliance** ICC profile. Because whatever **IDEAlliance** can say about TVI curves, matching any published **IDEAlliance** ICC profile by densitometry settings, can ONLY be achieved if the implicit TVI curves **imposed** by this profile are matched:



MagicPrepress application allows matching IDEAlliance targets as for any other CMYK target.

MagicPrepress does NOT and it will NOT offer bad cooking recipes, **for trying tweaking the gray balance for CMYK inks sets**, **print processes**, **screenings or print media that are NOT covered by published IDEAlliance ICC profiles**.

Because if you want to print a **SWOP2006_Coated3v2** proof on **SC paper**, it is **MUCH** easier, safer and more productive setting your press matching the **ISO SC_Paper_eci.icc** target, and the changing your color separation from **SWOP2006_Coated3v2** color space to **SC_Paper_eci** color space, than trying to tweak your gray balance via your plate's correction curves!

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

12-1) 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 ICC 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 ICC 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 ICC 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 ICC profile generation software take 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.

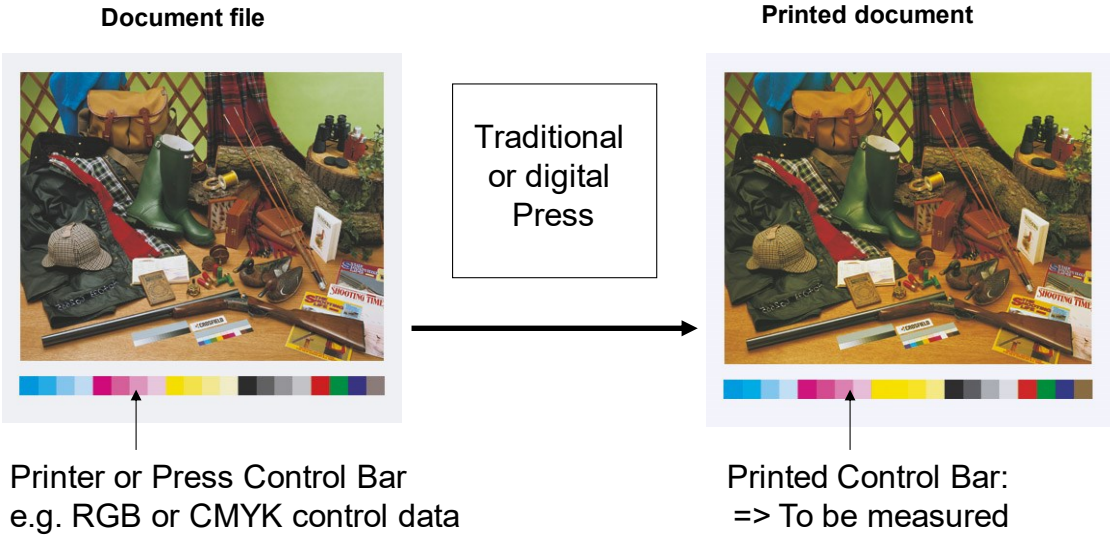
12-2) Valid principles for checking a color proof:

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.

12-3) 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 Fogra 47L (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.

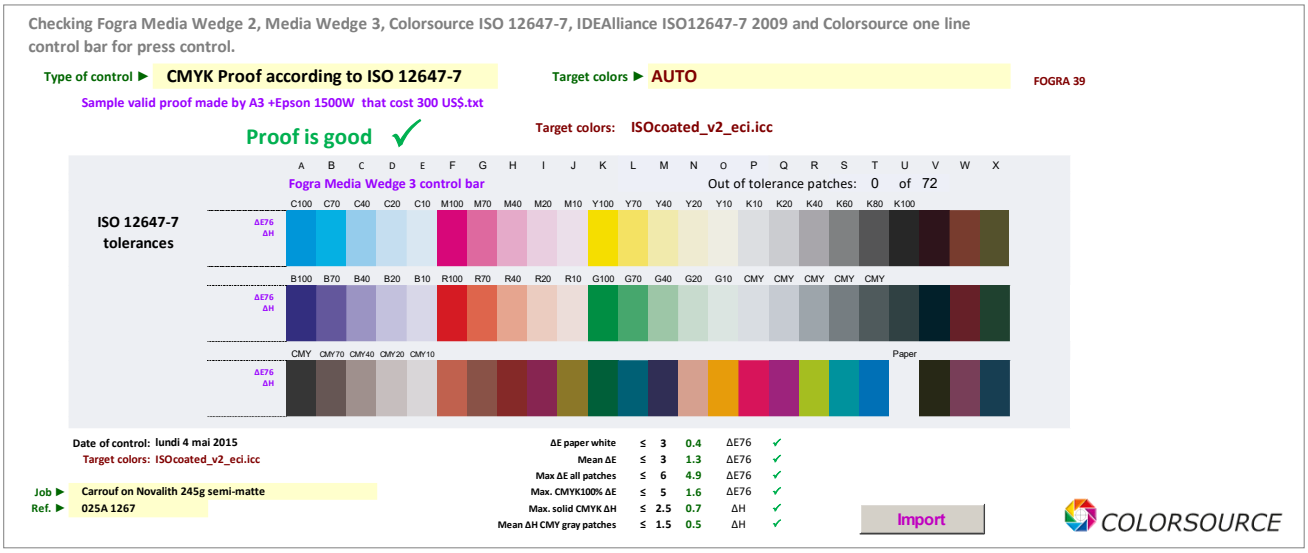
Standardization committees modified the Fogra 47 measurements file by registering a less bluish paper tint (L, a, b = 95, 0, -2) than the typically measured tints (e.g., b = -6 … -10). Otherwise, the color proofs produced by some Market color calibration systems would have shown a strong blue cast. However, methods that "almost always work" always prove to be only bad methods.

12-4) Production and control of ISO12647-7 compliant A3+ proofs using a 300 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 1500 W** inkjet printer costing less than 300 Euros (20% VAT included) allows producing excellent proofs:

Hereafter a sample control report produced by our excellent **CMYK_Print_&_Proof** free application:



The **EPSON 1500 W** 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 ICC 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 ICC profile have been computed using **i1Profiler Photo** application that is enough for computing the **EPSON 1500 W** RGB ICC 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.

12-5) 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	N/A	N/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!

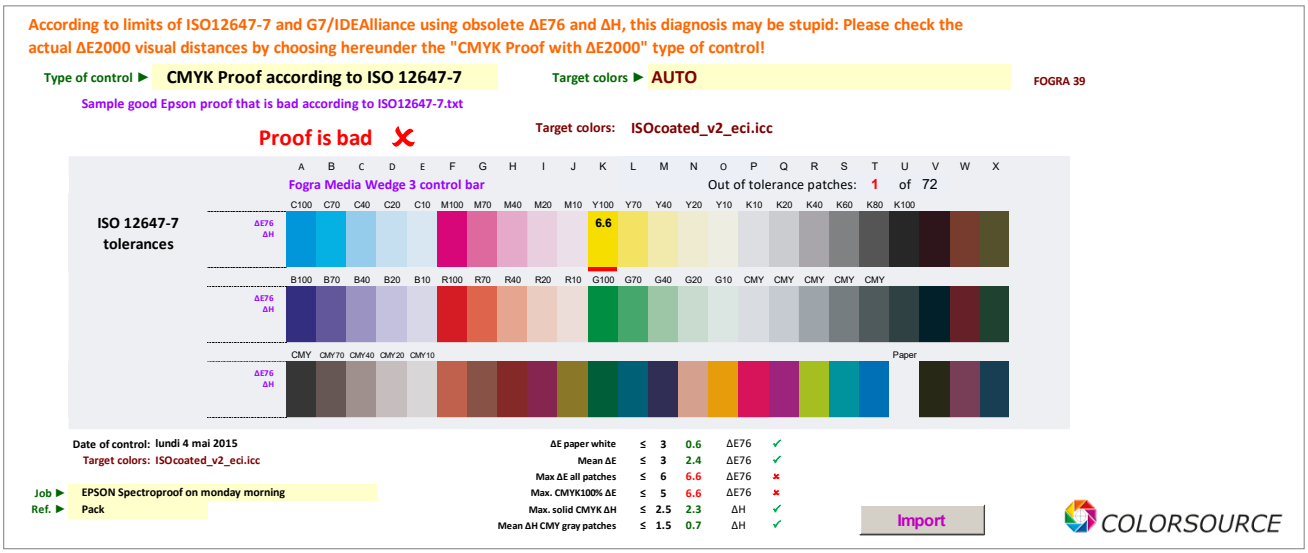
The problems for simulating presses on proofs and vice-versa, come from appearance effects related to the great diversity of valid D50 light sources, papers whiteness's, optical brighteners of traditional and digital printing papers, and inks reflection curves. These problems are aggravated by strong 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 CMYK_Print_&_Proof** 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.

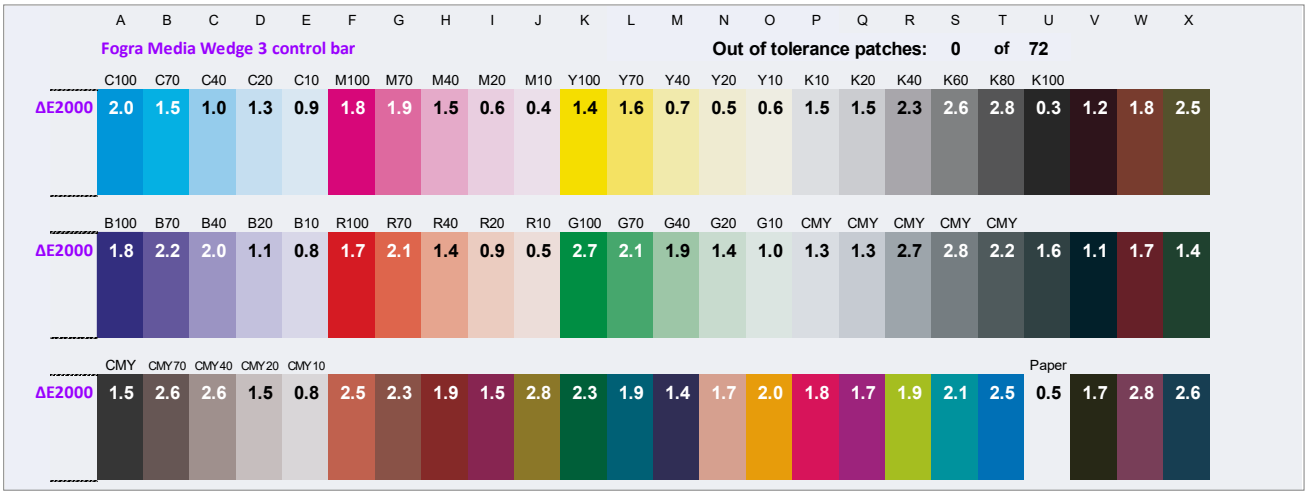
The following example shows one of the present ISO12647-7 control flaws. The following proof is considered as bad by ISO12647-7 because solid yellow simulation is out of tolerances:

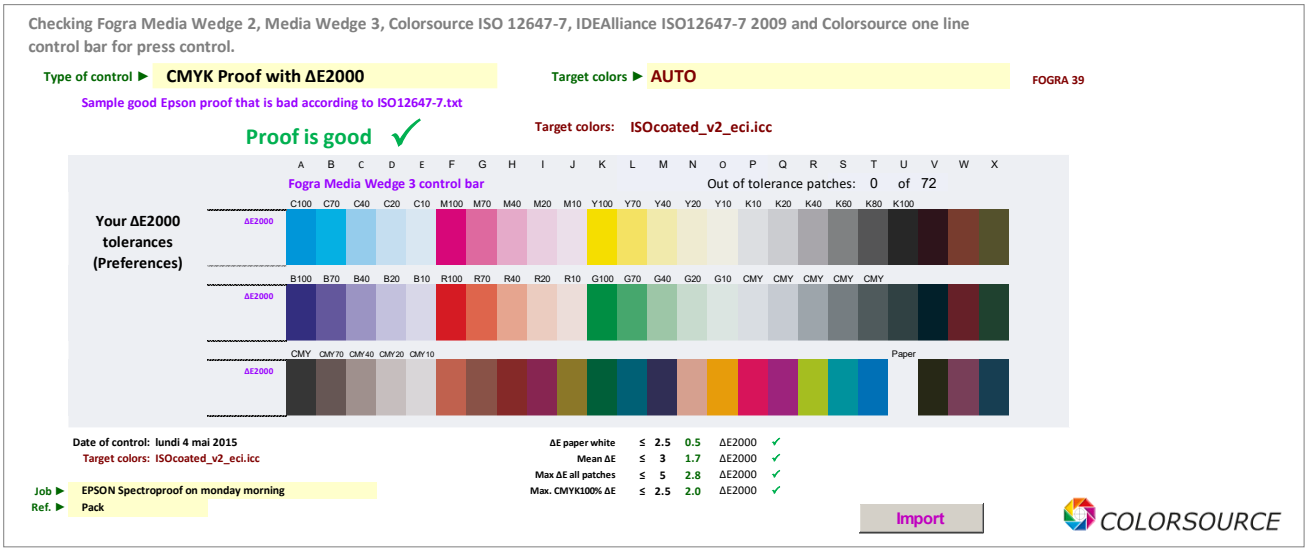


But if you examine the detailed ΔE2000 visual distances on each CMYK patch, you can see that actually the press Y100% color is simulated more accurately than the solid Cyan and Magenta patches:

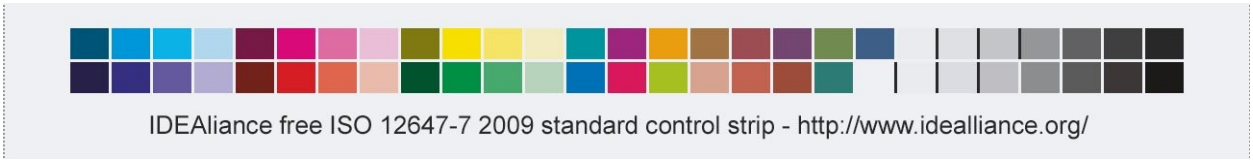
COLORSOURCE

Detailed **CMYK_Print_&_Proof** ΔE2000 report:





CMYK_Print_&_Proof is Colorsource freeware allowing **Fogra Media Wedge 2**, **Fogra Media Wedge 3**, **Colorsource ISO12647-7** and **IDEAlliance ISO12647-7 2009** proof controls according to ISO12642 and ISO12647-7, and using as well much better visual distance estimation formulae such as **ΔE2000**.



Download link: https://www.iso12647solution.com/CMYK_Print_&_Proof_control_software.htm

12-5-2) 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 Fogra 39 proof colors under these conditions.

12-6) The practical approach of Polestar Group Inc. for gravure:

I never had the pleasure to work with Polestar Group, but Mr. Gary McCrorie communication published on the ECI website is quite interesting and I try to summarize it hereafter. It is available on ECI website at following link:

http://www.eci.org/lib/exe/fetch.php?id=en%3Adownloads&cache=cache&media=downloads:presentations:20090625_gmccrorie_polestar_en.PDF

For historical reasons, Polestar Group has a long time ago formulated its own CMYK inks for gravure printing, which are different from "PSR V1" and more recent "PSR V2" CMYK ISO colors.

Specified before ISO 12647-4 reference frames, Polestar gravure CMYK inks were optimized for printing their own proofs resulting from in-house repro work, by inks density adjustments and appropriate engraving curves.

The purpose of this internal CMYK standard was also to optimize reproduction of the many analogue offset proofs received at the time to proof color separations intended actually for a gravure printing.

When “PSR V1” standards appeared, Polestar kept their inks, and successfully simulated the good or bad proofs of their Customers by properly using ICC profiles. They asked that any color proof received from a Repro House would be fitted with a control bar, but also asked for a reference color proof with full CMYK ECI2002 test chart, in order to be able to compute the accurate ICC profile of each Repro House color-proofing standard.
I know an excellent French gravure Print House who had to follow the same path. Customers are highly demanding for gravure print works since this technology allows laying very accurate and very stable CMYK inks quantities on all print area.

Within this framework, Polestar working method offers the following great advantages:

- It takes into account the real proof C.I.E. Lab colors by re characterizing each Repro House internal proofing standard, which depends on each Repro House proofing system configuration (Print engine, inks, paper, color calibration …) and on the visual appearance model used for its color calibration.
- It allows printing well the apparent colors of the visually accepted proof, as long as its control bar shows proper repeatability, (Control bar ΔE visual distances are applicable as regards repeatability).
- It allows optimizing the reproduction of Customer’s proof apparent colors, even if the inks and paper used for gravure printing do not authorize same color gamut (e.g., LWC gravure proof simulated by gravure printing on SC paper).
- It allows taking into account the ICC profile of the good or bad but visually accepted proof, the gravure press ICC profile with Polestar formulated inks, and the measured spectrum of real D50 light booth, to avoid any metamerism effect.

It should be said that this approach is more easily applicable for gravure than for offset printing, because gravure printing is using a limited number of paper types and “screenings”, for very large print runs where only a limited number highly qualified Repro Houses are generally involved upstream, and for print runs on a limited number of increasingly productive gravure presses.

We see here Polestar Group are using very well the available modern color management tools in order to optimize their reproduction of Customer’s visually accepted proofs, with their own inks, their own engraving curves, and without trusting the approximate ISO12647-7 proofs validation process.

Mr. Gary McCrorie stresses out he would wish to avoid having to re characterize each Repro House “certified” proofs, and he thinks “PSR V2” standards have improved the proofs quality.

About this issue of “color proofs improvement thanks to the new PSR V2 gravure standards”, my understanding is that a proprietary color proofing system frequently found in gravure Repro and Print Houses (This proprietary system is advertised as being a “Fogra certified” panacea, thanks to measuring thousands of colors patches for its characterization…), ended up into finally producing less approximate proofs thanks to new proprietary calibration profiles established for proofing the new “PSR V2” standards. Otherwise, this sudden improvement of gravure color proofs, which would only be due to changing the CMYK target colors, would be extremely mysterious!

According to Mr. McCrorie, the new ISO “PSR V2” standards associated with appropriate reformulation of Polestar Group inks should allow using purely density-based adjustment of their gravure presses for simulating the new “PSR V2” standards. Simulation of Clients proofs by using ICC or DeviceLink profiles would only be kept for gravure printing of other print standards or of previous ISO “PSR V1” gravure standards.

The pragmatic and industrial approach of Polestar Group is thus quite interesting, and I think that it actually underlines the inherent limits of any - inevitably generic- standard, when top quality results are sought:

Standards based on C.I.E. Lab colors cannot completely specify the prints perceived colors. In addition to these appearance effects, the wide color gamut of inkjet printers used for gravure proofing is causing very strong metamerism effect. The differences between ISO3664 complying D50 lights with very good CRI and ideal C.I.E. D50 are often large enough to induce fake magenta colorcasts in grays.

On this issue, only appropriate software tools will improve the situation in the field, by communicating for each proofing system and each press all relevant technical data to specify fully the apparent colors of print and proof, among which the measured power spectra of the “ISO” D50 lights being used.

12-7) 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 ICC profiles based on spectral measurements,
- Using sophisticated color appearance model for the ICC 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.

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

13-1) 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 ICC 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.

13-3) 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 his 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 49 you can easily produce excellent A3+ color proofs using a 300 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.

13-3) 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.

14) 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:

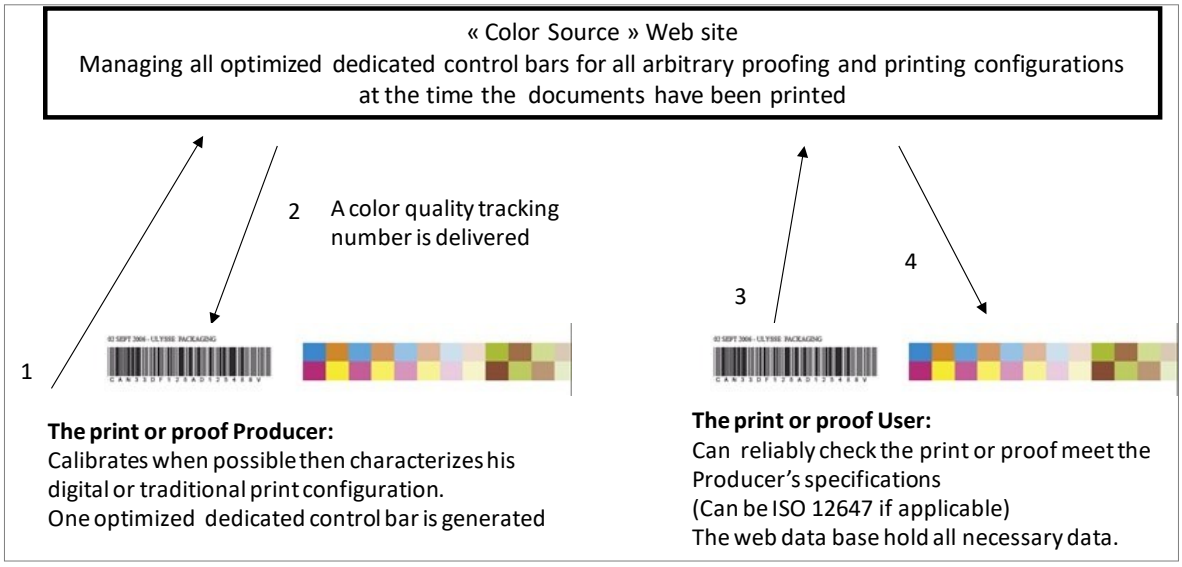
- Controlling CMYK prints matching some standards or not,
- Controlling the near infinite number of printing configurations which are required for Packaging, digital printing and traditional printing on special medias with spot colors and/or special primary inks,
- Controlling the color proofs simulating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



15) 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 ICC 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 ICC profiles and their beta version M0 and M1 characterization files on page: http://www.eci.org/en/projects/fred15

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

BVDM website: https://www.bvdm.org

See **MediaStandard_2006.PDF** on which present document is based.

Fogra website: https://fogra.org

D50 2° Offset press characterization text files: (Access via « Products » then « ICC char's data » as well):

https://www.fogra.org/index_icc_en.html

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

ISO TC130 web page: (Graphic Technologies) ISO 12647 texts:
https://www.iso.org/iso/fr/iso_catalogue/catalogue_tc/catalogue_tc_browse.htm?commid=52214

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

ProfileMaker 5.0.10 download link:
https://www.xrite.com/service-support/downloads/P/ProfileMaker_v5_0_10

i1Profiler download link:
https://www.xrite.com/fr-fr/service-support/downloads/i/i1profiler-i1publish_v3_2_0

Colorsource solution for efficient global corporate color quality control:
https://www.iso12647solution.com/Colorsource_print_and_proof_quality_control_solution.htm

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

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

COLORSOURCE

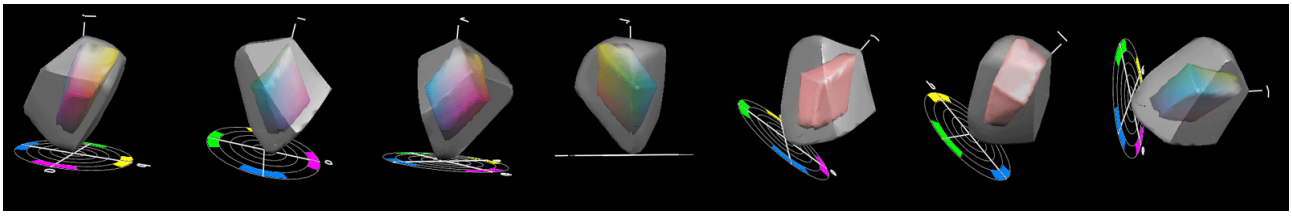
Colorsource free CMYK_Print_and_Proof control application:
https://www.iso12647solution.com/CMYK_Print_&_Proof_control_software.htm

Colorsource ISO12647-x press-setting software and users guide free trial and free applications:
https://www.iso12647solution.com/Downloads_and_links.htm

Wilfrid Meffre

wme@color-source.net

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



Appendix 1: Brief history of «standard» CMYK ISO profiles

1) ISO CMYK profile of European origin:

All valid or obsolete generic CMYK ISO profiles are downloadable free of charge on the **excellent ECI (European Color Initiative) website**, and the original presses characterization files allowing ISO ICC profiles computation are downloadable free of charge on the Fogra or ECI websites.

First published ISO standards were too complex. They specified as many as four different CMYK ICC profiles for traditional sheet fed offset printing on thick matte or glossy coated paper:

1. One profile for 150 dpi positive plates, with CMYK characterization test chart measured on white background (SB for "Self-Backing"),
2. One profile for 150 dpi positive plates, with CMYK characterization test chart measured on black background (BB for "Black Backing"),
3. One profile for 175 dpi positive plates, with CMYK characterization test chart measured on white background (SB for "Self-Backing"),
4. One profile for 175 dpi positive plates, with CMYK characterization test chart measured on black background (BB for "Black Backing").

On eci.org website, the archive "**eci_offset_2002-2003_expert.zip**" contains sixteen CMYK ICC profiles for web and sheet fed offset printing, and the PDF files indicating their respective conditions of use.

In **2004**, in order to make it more sensible, this printing configurations were simplified into one single ISO profile for 150 dpi (60 l/cm) positive plates per main generic paper type, made from CMYK characterization test charts measured on white background, given that measuring charts on white background avoids nonrealistic darkening of measurements. The dot gain increase when using 175, 200 dpi or stochastic screenings can be more or less successfully compensated by using suitable plates engraving curves:

On eci.org website, the archive "**eci_offset_2004.zip**" contains four ICC profiles for web and sheet fed offset printing (**ISOcoated.icc**, **ISOwebcoated.icc**, **ISOuncoated.icc**, **ISOuncoatedyellowish.icc**), and the PDF documents indicating their using conditions.

The archive "**eci_offset_cont_2004.zip**" contains two profiles for printing continuous forms on drum web offset presses (**ISOcofcoated.icc** and **ISOcofuncoated.icc**) and the PDF documents indicating their using conditions.

Between **2002** and **2004**, **ECI** also published three generic ICC profiles for gravure CMYK Publishing applications:

> On eci.org website, the "**psrgravurelwc.zip**" archive contains **PSRgravureLWC.icc** profile for gravure printing on LWC papers (Light Weight Coated) and the original press characterization file.
>
> The "**psrgravuresc.zip**" archive contains **PSRgravureSC.icc** profile for gravure printing on SC papers (Super Calendered) and the original press characterization file.
>
> The "**psrgravuremf.zip**" archive contains **PSRgravureMF.icc** profile for gravure printing on MF papers (Machine Finished) and the original press characterization file.

Prefix **PSR** means: Process Standard Rotogravure printing. Regarding the new gravure ICC profiles published in June 2009, these "old good gravure profiles" are now mentioned as "PSR V1".

In **2005**, **ECI** published a generic ICC profile for the gravure printing on HWC paper:

> The "**psrgravurehwc.zip**" archive contains **PSRgravureHWC.icc** profile for gravure printing on HWC papers (High Weight Coated = Enhanced coated ~ 70 g/m²) and the original press characterization file.

In **2007**: **ECI** modified one of the most frequently used profiles for offset and added a new standard:

ECI modified the generic ICC profile for offset printing on glossy or matte thick-coated papers (Paper types 1 and 2): The "good profile" **ISOcoated.icc** was replaced as from April 2007 by the new "good profile" **ISOcoated_v2_eci.icc**, which is provided with two different inks coverage,

ECI also introduced new generic profile for offset printing on SC papers (Super Calendered): **SC_paper_eci.icc.**

The "**eci_offset_2007.zip**" archive contains five profiles for web and sheet fed offset printing (**ISOcoated_v2_eci.icc**, **ISOcoated_v2_eci_300.icc ISOwebcoated.icc**, **ISOuncoated.icc**, **ISOuncoatedyellowish.icc**, and **SC_paper_eci.icc**), and the PDF documents indicating their respective English and German user's guides.

In **2008**: **ECI** published four new generic ICC profiles for offset printing:

For type 1 and 2 papers (Thick gloss and matte coated paper), a new generic profile intended for stochastic screenings is provided with two versions of ink coverage: **PSO_Coated_300_NPscreen_ISO12647_eci.icc** (300%) and **PSO_Coated_NPscreen_ISO12647_eci.icc** (330%), in supplement of periodic screenings **ISOcoated_V2** profiles.

For uncoated white papers with stochastic screenings, a **PSO_Uncoated_NPscreen_ISO12647_eci.icc** profile is supplementing the periodic screenings **ISOuncoated.icc** profile.

For offset prints on MFC papers (Machine Finished Coating), a **PSO_MFC_paper_eci.icc** profile is proposed.

A **PSO_SNP_paper_eci.icc** profile (SNP = Standard News Print) characterizes printing on standard newsprints with heatset drum web offset presses.

Prefix **PSO** stands for: Process Standard Offset and **NP** for: "Non-Periodic".

The "**eci_offset_2008.zip**" archive contains eleven profiles for web and sheet fed offset printing: (**ISOcoated_v2_eci.icc**, **ISOcoated_v2_eci_300.icc**, **ISOwebcoated.icc**, **ISOuncoated.icc**, **ISOuncoatedyellowish.icc**, **SC_paper_eci.icc**, **PSO_MFC_ paper_eci.icc**, **PSO_SNP_paper_eci.icc**, **PSO_Coated_300_NPscreen_ISO12647_eci.icc**, **PSO_Coated_NPscreen_ISO12647_ eci.icc**, **PSO_Uncoated_NPscreen_ISO12647_eci**), and the PDF documents indicating their using conditions. All printing configurations text measurement files are available on Fogra website.

In **June 2009**, **ECI** modified existing profiles for offset and gravure:

Replaced the offset **ISOwebcoated.icc** profile (Thin coated paper) by two new distinct generic ICC profiles **PSO_LWC_Standard_eci.icc** and **PSO_LWC_Improved_eci.icc**, matching two different paper whiteness's,

Replaced the generic **ISOuncoated.icc** profile (uncoated white papers) by new generic ICC profile **PSO_Uncoated_ISO12647_eci.icc**,

Replaced the generic gravure "PSR V1" profiles **PSRgravureLWC.icc**, **PSRgravureHWC.icc** and **PSRgravureSC.icc** by three new profiles named "PSR V2" respectively **PSR_LWC_STD_V2_PT.icc**, **PSR_LWC_PLUS_V2_PT.icc** and **PSR_SC_STD_V2_PT.icc**.

The "**eci_offset_2009.zip**" archive contains the twelve up to date CMYK profiles for web and sheet fed offset printing:

ISOcoated_v2_eci.icc,
& ISOcoated_v2_eci_300.icc
PSO_LWC_Standard_eci.icc
PSO_LWC_Improved_eci.icc
PSO_Uncoated_ISO12647_eci.icc
ISOuncoatedyellowish.icc
SC_paper_eci.icc
PSO_MFC_paper_eci.icc
PSO_SNP_paper_eci.icc
PSO_Coated_NPscreen_ISO12647_eci.icc,
& PSO_Coated_300_NPscreen_ISO12647_eci.icc
PSO_Uncoated_NPscreen_ISO12647_eci.icc

As a reminder the "**eci_offset_cont_2004.zip**" archive contains the two profiles for printing continuous forms with drum web offset presses (**ISOcofcoated.icc** and **ISOcofuncoated.icc**) for matte coated paper 150 dpi and uncoated paper 135 dpi.

The "**psr_v2_pt.zip**" archive contains the three up to date profiles **PSR_LWC_STD_V2_PT.icc**, **PSR_LWC_PLUS_V2_PT.icc** and **PSR_SC_STD_V2_PT.icc** respectively intended for gravure printing on LWC paper (Light Weight Coated), HWC paper (High Weight/Improved Light Weight), and SC-A papers (Super Calendered in A quality class). The characterization

measurements files were not published to date, but could be computed for any CMYK test chart from the published gravure ICC profiles.

In **June 2010**, **ECI have documented the new profiles for CMYK gravure publishing "PSR V2" profiles and added one new profile for gravure:**

> The archive "**eci_gravure_psr_v2_2009.zip**" updated on 26 September 2010 does contain the **PSR_LWC_STD_V2_PT.icc**, **PSR_LWC_PLUS_V2_PT.icc and PSR_SC_STD_V2_PT.icc** characterization text files plus a new profile named **PSR_SC_PLUS_V2_PT.icc** bound to printing on high quality Super Calendered papers.

In **2012**, **ECI have added following ICC profiles:**

1. **Two ICC profiles characterizing CMYK offset prints on thick-coated papers after their lamination with OPP** (Oriented Poly Propylene) **glossy or matte film**, named respectively:

PSO_Coated_v2_300_Glossy_laminate_eci.icc and **PSO_Coated_v2_300_Matte_laminate_eci.icc**

Above profiles take into account the color changes induced by lamination of **ISOcoated_v2** CMYK prints so they are useful at color separation and proofing steps. **The press should be set for matching ISOcoated_V2_eci.icc** (or equivalent **ISOcoated_v2_300_eci.icc**) target. Both profiles are supplied with Colorsource press setting application software only for checking laminated **ISOcoated_v2** prints and proofs, and not for setting the offset press.

2. **One ICC profile characterizing web offset prints on improved newspaper**, the **PSO_INP_Paper_eci.icc** (INP stands for Improved News Print).

Lastly in **2014**: **ECI** published two new offset generic ICC profiles in beta version complying with ISO12647-2:2013:

1. **PSO_Premium-Coated M0 and M1 (Fogra 51) ICC profiles bound to replace Fogra 39 (ISOcoated_v2_eci.icc),** in form of two press characterization files in M0 and M1 measurement conditions: **fogra51_mar2014_m0.txt** and **fogra51_mar2014_m1.txt,** which are nearly identical after optical brighteners' correction.
2. **PSO_Wood-free_Uncoated M0 and M1 (Fogra 52) ICC profiles bound to replace Fogra 47 (PSO_Uncoated_ISO12647_eci.icc),** in form of two press characterization files in M0 and M1 measurement conditions: **fogra52_mar2014_m0.txt** and **fogra52_mar2014_m1.txt,** which are nearly identical after optical brighteners' correction.

2) ISO12647-2 CMYK profile of US origin:

Even if quite satisfied by the European implementation of **ISO12647-2**, that provides excellent results with easy and fast offset test print runs, and for purely "marketing" reasons, **Colorsource** have updated their free **CMYK_Print_and_Proof** quality control application, and their dedicated CMYK press-setting applications, in order to include not only the **ISO12647-2** European targets, but also the US **G7/IDEAlliance** (**GRACoL** and **SWOP**) targets.

IDEAlliance have promoted the CMYK ICC press profiles thought by the American Experts of **GRACoL** (General Requirements for Applications in Commercial Offset Lithography) and **SWOP** (Standard Web Offset Printing) organizations.

Three CMYK profiles are promoted and used in United States: **GRACoL2006_Coated1v2.icc**, **SWOP2006_Coated3v2.icc**, and **SWOP2006_Coated5v2.icc**:

> **GRACoL2006_Coated1v2.icc** is the US equivalent for **"ISOcoated_v2":** Thick matte or glossy coated paper,
>
> **SWOP2006_Coated3v2.icc** is the US equivalent for **"PSO_LWC_Improved_eci.icc":** White thin coated paper,
>
> **SWOP2006_Coated5v2.icc** is the US equivalent for **"ISOuncoatedyellowish.icc":** Yellowish uncoated recycled papers.

However, the US Experts apparently look mainly concerned about keeping their expertise Market, with such a strange implementation of ISO12647-2 standards!

Maybe they have been afraid that good quality and productivity allowed by simple methods would somewhat drop a shadow on their "Black Art" empirical and ancient methods.

Because the technical documents **IDEAlliance** publish on their web site show the press setting methods they are promoting are rather irrational and with rather poor conception. These methods are also quite uselessly complex to implement if you follow the press setting methods they suggest!

Obviously, the average US Print House will have little chance to set properly their printing presses without asking for an Expert ;-). A brief critical review of the official documents published by **IDEAlliance** is offered at paragraph 11, page 42 to 45 of this document.

(*) NB: It seems G7/IDEAlliance have revised their (bad) copy by publishing new CMYK ICC profiles complying with ISO12647-2:2013 and their new ICC profiles will be reviewed in a future revision of this document.

Appendix 2: How a market Vendor solved... his OWN problems

From: X-Rite, Incorporated [mailto:info@email.xrite.com]
Sent: Friday 13 August 2010 17:38
To: wme@color-source.net
Subject: Introducing the X-Rite Graphic Arts Standard - XRGA

To view this email as a web page, go here.

Dear Sales Partners,

We are pleased to announce the new X-Rite Graphic Arts Standard (XRGA), a new calibration standard for the Graphic Arts industry. By taking advantage of advances in color science and in order to adhere to new international standards (ISO), XRGA will improve inter-model agreement on our 0°/45° and 45°/0° instruments so that our customers can enjoy high-quality data exchange between sites that use different instrumentation, regardless of their legacy affiliation.

As you know, the former X-Rite and the former GretagMacbeth each had, for historical reasons, different calibration standards for graphic arts instrumentation. While it was important to

ensure both standards were maintained to guarantee continuity for both companies' customers, our goal with XRGA is to eliminate systematic discrepancies between instruments so that all measurements taken for a particular color sample reflect the same data, and can be seamlessly communicated within your workflow. This does not reflect any change in the particular use case of any given instrument; we still recommend that you use instruments appropriate to the particular task at hand in your prepress or pressroom workflow.

To help us define this standard, we conducted a detailed study designed to quantify the systematic differences between measurements obtained using instruments from both former companies to ultimately arrive at the definition of a new corporate standard for our graphic arts instrumentation. Based on the results, the XRGA achieves the following goals:

- Is applicable to all 0°/45° and 45°/0° instruments.
- Incorporates improved methods for calibration
- Maintains traceability to the American National Institute of Standards and Technology (NIST)
- Offers best implementation with respect to existing international ISO standards
- Improves inter-model agreement for existing instruments
- Preserves good agreement among former X-Rite instruments and former GretagMacbeth instruments
- Provides a single standard for all future graphic arts instruments to be delivered by X-Rite
- Improves data exchange

In addition to developing an improved, single factory calibration process for XRGA standard instruments, we have also developed a set of transforms to enable measurements taken by either a former X-Rite or a former GretagMacbeth instrument to be easily expressed in the new XRGA standard.

A number of our graphic arts products already conform to XRGA, notably ColorMunki Photo, ColorMunki Design and EasyTrax. All future graphic arts instruments and software delivered by X-Rite will conform natively to XRGA. Because former X-Rite instruments are already very close to XRGA, the switch will result in very small differences in measurement values; many customers will not need to make any changes. For

customers who have experienced greater differences in measurement values between former X-Rite and former GretagMacbeth instruments, we will provide seamless means to move existing databases to the new XRGA standard.

Over the next several months, new orders of existing X-Rite products, which are still available for sale, will begin to be manufactured to the new XRGA standard at the factory.

Upgrade Procedures and Pricing

Existing customers wishing to upgrade their current instruments can do so by following the procedure for the instrument in question, which will be outlined at xrite.com/xrga/support beginning September 15, 2010.

Product	How to Update Existing Units	Target Date for new Units
i1 Solutions (i1Pro, i1iSiS & i1iO)	ColorPort 2.0 and X-Rite Device Services (XRDS) available to convert data to the new standard. Available for download at www.xrite.com/xrga/support	July 2010
InkFormulation / ColorQuality	InkFormulation 6 / ColorQuality 6 Software Update	November 2010
X-RiteColorMaster	Software Update	March 2011
Color iQC/ X Color QC	Software Update	June 2011
528/530/939	Updates to the new XRGA will be included in the regular annual re-certification or during flat rate repair at our worldwide service centers. All units sent in for Service after November 2010 will be updated. For those customers that want to send a unit in	November 2010

	for the XRGA update without Repair/Re-Certification there will be a minimal Service & Handling Fee (fee tbd). This process is the same for in warranty or out of warranty units.	
SpectroEye	Updates to the new XRGA will be included in the regular annual re-certification or during flat rate repair at our worldwide service centers, if the update is explicitly requested. There will be specific firmware that conforms to the new XRGA standard. If the customer does not have the latest polarization filter for the SpectroEye (according to ISO 13655), this will also be updated at the same time as the update to XRGA. Note: Only those customers that specifically request the update will receive it.	November 2010
NetProfiler	Customers who request their SpectroEye to be updated to XRGA will also need to order a new NetProfiler Card. p/n: NP2SPE-XRGA. Note: SpectroEye and NetProfiler should be updated at the same time.	November 2010
IntelliTrax	XRGA will be introduced with a new software release. Customers can order the software update CD (update CD p/n: 2246-03-CD), and it will also be made available for download.	TBD - Target Q1 2011

Launch plan outline

X-Rite Webinars for our Sales Partners:
We will host a series of WebEx meetings for our sales partners:

- What Does XRGA Mean To You And Your Customers
- How to update your X-Rite Product(s)

Sessions in English: Register Here >

Monday, August 30th	10AM - 11AM EDT
Monday, August 30th	3PM - 4PM, EDT
Wednesday September 1st	9AM - 10AM EDT
Thursday, September 2nd	9AM - 10 EDT

Sessions in German: Register Here >

Tuesday, August 31st	4PM - 5PMM CET
Thursday, September 2nd	1:30PM - 2:30PM CET

Public Relations

- Worldwide press release scheduled for September 15th.
- Press briefings with key worldwide publications scheduled for August/September timeframe. One on one briefings to be scheduled for Graph Expo, and other regional industry tradeshows worldwide.
- Editorial coverage in the works for September - December 2011 in a variety of industry trade publications

Public Webinars:

- WhatTheyThink Educational Video Series - series of (5) five 3-5min videos to be aired on WhatTheyThink.com in September and October 2011; series will be archived for viewing thereafter.

Online Banner ads: online click thru to xrite.com/xrga

- WTT
- PrintPlanet
- PrintCEO
- PrintWeek UK
- German placement tbc

Communications tools

Marketing tools & reference documents available for download in the resource room and at www.xrite.com/xrga including:

COLORSOURCE

L7-462 XRGA Whitepaper
Available in EN, DE, FR, IT, ES, CN, JP
Whitepaper describes the reason for developing XRGA as well as what measurement differences to expect from various instruments. This should be distributed to customers that want to know more details about the new standard. No NDA required.

L7-476 XRGA Sales Presentation
PowerPoint presentation suitable for general use; available in English only.

L7-473 XRGA Frequently Asked Questions (FAQ); available in English only.

"How To" Documents -This document will explain by product how to implement or update existing units to the new standard. These will be available in the Resource Room and on xrite.com/xrga on or around September 1st.

If you or your customers have any questions about XRGA, you can go to www.xrite.com/xrga or contact your local sales representative.

Kind regards,

Laura Pursley
Product Manager and XRGA Team Leader

End.