Standardised Print Production (SPP)

Achieving Accredited certification according to ISO 12647-2

Part 1:
Document Preparation and Prepress

A Digital Dots Publication

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Achieving accredited certification according to ISO 12647-2

Technical Reference Part 1:

Document preparation and prepress

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Table of Contents

Introduction

Over the last few years we have been heavily involved in standards work, working internationally with ISO and print federations in both Sweden and the UK. The Digital Dots Standardised Print Production (SPP) series explains what printing companies and print media buyers need to know about using the ISO 12647-2 standard for offset lithography process control. This standard can also provide a useful framework for digital press quality control.

The complete series provides all the information required to understand, implement and exploit ISO 12647-2 for high quality production control and colour prints, adding value, business performance improvement and competitive edge for print producers and media buyers. This part of SPP covers requirements for *document preparation and prepress,* in order to comply with ISO 12647-2. This foundation work must be done, if a printer wants to fully implement the ISO 12647-2 standard.

SPP: Prepress is organised in sections and following each section, there are short summaries of what the requirements mean specifically for a print media buyer and a print media producer. Subsequent parts of SPP provide an executive summary for the people not directly involved in production or print buying but who have a commercial interest in the successful implementation of ISO 12647-2. See digitaldots.org.

For the Print Buyer

These synoptic boxes provide print buyers with a quick section summary. Use them if you don't want to bother with the background and explanations. What's listed in these paragraphs can serve as a checklist.

For the Printer

These synoptic boxes are for printers. They provide a quick section summary, if you don't want to bother with the background and explanations. What's listed in these paragraphs can serve as a checklist.

Standardised Print Production (SPP)

SPP provides printers with a defined procedure for print production to guarantee both high print quality and cost effective production processes. The SPP guides follow international standards for graphic arts production and are consistent with established certification schemes based on ISO 12647-2. They integrate the core elements of ISO 9001 (requirements for quality management systems) with ISO 12647-2.

The SPP guides provide everything prepress professionals, publishers and printers need to know in order to produce high print quality and cost effective production processes. They provide all of the details required in order to prepare for (and hopefully pass) an accredited ISO 12647-2 audit. The guides support all international certification schemes, including those of the BPIF, The Swedish Printers Federation, Fogra, UGRA and IDEAlliance.

SPP does not require a full ISO 9001 implementation, however it does include some critical components relating to customer satisfaction, planning, measurements, analysis, improvements and control of non-conforming products. All of these are vital for successful and systematic quality control and colour management. Properly implemented they should improve overall efficiency and lead to enhanced business performance.

What This Means for the Print Buyer

You can use the SPP guide to improve your understanding of ISO 12647-2 and what is required of a printing company in order to achieve it. Work with your printer to make sure you have a complete understanding of their file delivery, preflight, proofing, viewing conditions and colour control requirements. All of these should be based on the requirements in ISO 12647-2.

What This Means for the Printer

The SPP guide gives you everything you need for a successful implementation of ISO 12647-2. Use it to prepare for audits and certification and/or to demonstrate to customers your ability to reach the standard. Make sure you communicate fully the value of this to your customers.

The Importance of Independent Certification

There are many ways in which a printing company can shout about its quality control using ISO 12647-2. Compliance is a simple claim that states that the printing company follows the primary process parameters and technical requirements of the standard. But it is no guarantee of a quality result. Some developers and industry associations have their own procedures, and issue certificates for compliance.

Keep in mind that a certificate's value depends on who has done the audit prior to the certification, and the scope of their authority. Only accredited and qualified external auditors can provide

independent and unquestionably credible certification to ISO 12647-2. An external audit is also invaluable for printers who want independent recognition of their production quality control standards.

Such certification is robust and credible, which is why it is so valuable for printers who want formal recognition for their production quality. It can also be an incidental aid to cost control and business performance improvement because compliance with a rigorous management and production scheme can help a business to get production and related factors under complete control. Certification is also of value to print buyers because it provides assurance that service providers can achieve a specified output quality, measured and judged to a robust compliance scheme. This in turn helps print buyers ensure value for money and to help them to select print service providers on the basis of proven and qualified competence.

Certification provides print buyers with assurance that service providers can achieve a specified output quality and helps them to ensure value for money. However print buyers should be wary of certifications provided by organisations that are also consultants to the company or which have related products to sell.

What This Means for the Print Buyer

If you want high quality colour prints you really should be working with a printer who understands ISO 12647-2. Ask your print provider about their level of conformance to international standards and how it is demonstrated. Make sure that you specify on all print orders that you want output quality that is compliant with ISO 12647-2 and be clear that this means the printer should be prepared to provide you with copies of certificates of compliance. Make sure the certificates are current.

What This Means for the Printer

If you are selling work on the basis of ISO 12647-2, make sure that you are able to fully demonstrate that you can meet the standard. Make sure your company is formally certified, either through an independent organisation or an industry association, and that your staff know how to communicate the information.

ISO 12647-2 in Context

ISO 12647-2 is one of several standards in the ISO 12647 series that standardise the control parameters for various printing processes. Each part in the series is specific to a different print method. 12647-2, the part for offset lithography, is the most widely implemented. Various bodies, such as the British Printing Industries Federation, the Swedish Printers' Federation, FOGRA in Germany, UGRA in Switzerland and IDEAlliance in the US, have developed certification procedures for ISO 12647-2, with more or less rigour. They provide certificates to companies who pass their series of tests for compliance.

Rather than develop our own certification procedures, Digital Dots has worked with certifying bodies and certification scheme developers. With SPP, we have developed comprehensive guidelines for implementing ISO12647-2 that are easy to follow and inexpensive to apply. These guidelines are based on work that we have done with the Swedish Printers Federation and the British Printing Industries Federation, to assist with the development of their certification schemes.

Useful ISO Standards

SPP refers to several ISO standards, which you should be familiar with to some extent in order to fully and successfully implement ISO 12647-2. These are:

ISO 12647-1	Parameters and measurement methods
ISO 12647-2	Offset lithographic processes
ISO 12647-7	Proofing processes working directly from digital data
ISO 2846-1	Colour and transparency of ink sets for four-colour printing
ISO 3664	Viewing conditions – Graphic technology and photography
ISO 9001	Quality management systems – Requirements
ISO 12642	Input data for characterisation of four colour process printing
ISO 12646	Displays for colour proofing
ISO 13655	Spectral measurements and colorimetric computation for graphic arts images
ISO 15076	Image technology colour management (ICC profiles)
ISO 15930	PDF and prepress digital data exchange (PDF/X)

Standardised Print Production: Prepress Requirements

Prepress control is fundamental to high quality colour printing, but there are only a few prepress sub-processes covered in 12647-2. In addition to what's included and referenced in the standard it is necessary for printers to appreciate the fundamentals of colour management and of data exchange, including document preparation and assessment (preflight checking).

Into the Light

Colour is all about light, so colour and data control in prepress begins with controlling ambient light and viewing conditions especially in the viewing booth. The processes required in ISO 12647-2 and SPP relate to visual control and colour critical inspection of hardcopy proofs and print samples. The main reference here is ISO 3664, the standard that describes viewing

The character of different light sources will effect how the colours are perceived when viewed. A proper viewing booth uses a light source with good spectral distribution of all the wavelengths, and with a white point at 5000 K. A light indicator card like the GATF RHEM card will show banding if the light isn't correct.

conditions for graphic technology and photography. According to this standard the light source under which colour is viewed should be of the correct colour temperature, spectral distribution and luminance, more commonly referred to as brightness. For instance, the colour temperature of the light should be 5000 K, corresponding to D50, which is one of the standards for daylight. The light source's luminance (brightness) should be between 1500 and 2500 lx (lux).

The spectral distribution for a light tube is given by its Ra-index (Colour Rendering Index), which must be of at least 90, but a value above 95 is preferable. For a visual control of the colour temperature, control strips for metamerism can be used such as, for example:

- GATF/RHEM Light indicators
- UGRA Light indicator
- UGRA Metamerism Card
- Pantone Lighting Indicator

The prepress department must have defined and documented routines for when the viewing booth tubes and/or lamps are to be replaced, as their performance degrades over time. Accurate measuring devices used for calibration or control, should be regularly maintained and related procedures should be documented. If the viewing booth has a meter to register the total hours of usage, this can be used to check whether the amount exceeds vendor recommendations.

What This Means for the Print Buyer

Make sure your designers and layout personnel have access to an ISO 3664 compliant viewing booth when evaluating proofs and prints for colour accuracy. This will save you time and money since colour reproduction will be accurate from the very start and the need for error corrections subsequently in the workflow will be reduced. The cost of error correction rises as your job gets closer to press, so this will help maximise return on your print media investments.

What This Means for the Printer

Work with your customers and production staff to ensure a fully colour managed workflow, including control over viewing environments for proofs and prints. Put a label on each viewing booth that indicates when it will be time to change the tubes. Offer to work with customers to improve operators' understanding of colour management, to save unexpected and costly reworking that you may not necessarily be able to charge back to the client.

Data Trails

The SPP processes for digital data exchange, document preparation and assessment, and preflight checking relate to receiving and assessing digital data files, checking incoming jobs and possibly file preparation on behalf of clients. Routines should be established for manual or software-based assessment of incoming documents. This includes checking that the correct ICC profile is used by designers and all prepress operators, and establishing procedures for how to handle nonconformities. Nonconformities include such things as documents and PDFs prepared for output on coated instead of uncoated stock, or ICC profiles with similar but not identical names.

Table 1 – Printing conditions according to ISO 12647-2 Paper Types (PT)

Printing condition	Characterisation data	ICC-profile
PT 1 and 2 (coated)	Fogra 39	From Adobe: Coated FOGRA39 From ECI: ISO Coated v2 (ECI), ISO Coated v2 300 (ECI)
PT3, LWC	Fogra 28	From Adobe: Web Coated FOGRA28 From ECI: ISO Web Coated
PT4, Uncoated	Fogra 29	From Adobe: Uncoated FOGRA29 From ECI: ISO Uncoated
PT5, Uncoated, yellowish	Fogra 30	From ECI: ISO Uncoated Yellowish

As with the requirements for light control, data control is also based on existing standards. All modern colour management uses ICC profiles to describe the output conditions. General ICC profiles are created using standardised characterisation data taken from print samples from several printing presses printing onto a specified paper. The ISO 12647-2 standard currently classifies five different paper types (listed as PT in the table above). The next version of the standard might have eight paper types or more, in recognition of market realities for paper types. What is important here is to realise that correct colour management is only possible if the ICC profile used is tightly correlated to the paper used for the print run.

What This Means for the Print Buyer

Make sure you prepare the documents using the ICC profile the printing company recommends for that particular paper. If you are not sure what paper you will use, keep the images in RGB for late conversion to CMYK using the correct ICC profile, once the paper type is known. Preferably choose the paper early in the workflow.

What This Means for the Printer

Inform your customers and production staff of your available paper types and which ones have been tested for conformance to ISO 12647-2. Mention on the order confirmation the recommended ICC profile for the particular papers to be used.

You can create your own characterisation data from test prints by printing and measuring one of the test charts supplied with your profiling software. This measured data characterises your output device and is used to create the ICC profile. Alternatively you can use published characterisation data sets from organisations such as FOGRA, the German graphic arts research organisation and IDEAlliance in the US. FOGRA's characterisation data set is one of the most commonly used in the industry. Several organisations have used these data sets as the basis of their own ICC profiles. Some popular ICC profiles are listed in Table 1 on page 7.

Once it's been decided which ICC profile to use for the paper type, the electronic documents (ideally a PDF file) must be prepared accordingly. Electronic documents must comply with a printer's expectation as defined according to the print method that will be used to print the file. For most workflows, and for SPP, we strongly recommend using the PDF/X-1a standard since the ICC profile will be embedded in the file and this data format supports CMYK separations, as well as the use of spot colours. By defining preflight settings for the PDF/X-1a files, they can be controlled to contain high enough resolution in the images, fine lines and small type.

An alternative to PDF/X-1a is PDF/X-4, but correct processing of PDF/X-4 depends on the Raster Image Processing (RIP) system being able to process it flawlessly, so run some tests before you stipulate PDF/X-4. Equally designers need to be sure that their design and layout software can generate and preflight PDF/X-4 files. Designers should also run some tests during the creative phase of the print media project to check for clean and accurate data processing. If in doubt, stick to PDF/X-1a.

If PDF files are produced in-house they should be produced in compliance with defined standards. A collection of preflight settings for most popular preflight softwares on the market is available at the Ghent PDF Workgroup web site (www.gwg.org). The Ghent Workgroup is a well-respected industry association established to create and share best practice data specifications for the graphic arts industry.

Recently two new versions of PDF/X have been introduced: PDF/X-4 and 5. However only a few applications can produce valid PDF/X-4 or 5 files and only a few RIPs can process them at this time. For now we recommend using the PDF/X-1a file format, unless there are very strong reasons to use an alternative. Submitting native layout files such as InDesign or Quark XPress documents, should be avoided, as these may not process correctly and could cause halts in the workflow or introduce random content errors.

If you find a similar, but not identical ICC profile in an incoming PDF file, do not automatically convert the document to the correct ICC profile in the RIP, without carefully checking the end

result. CMYK to CMYK colour conversions done in this way could lead to changes in colour appearance, or might confuse any ink-optimising software used in conjunction with the RIP process. Make sure that no colour change can happen in the RIP process.

Following these procedures should demonstrate that the service provider has a clear understanding of what happens if and when colour conversion takes place, and what is required to manage colour data to achieve a correct result.

What This Means for the Print Buyer

Make sure your designers and layout personnel understand the different options for how to create PDFs, preferably PDF/X-1a. Make sure also that they understand the cost and file processing implications of creating bad PDFs. This too will save you time and money since files will not have to be corrected in prepress. Remember, the cost of error correction rises as a file gets closer to the press.

What This Means for the Printer

Work with your customers and production staff to ensure files are correctly formatted and that submitted PDFs can pass flawlessly through your production system. The PDF/X format should be considered as the first choice for file delivery. Make sure customers understand how to create PDF/X files.

Softies

Once files are ready for production, they are generally viewed on a monitor. SPP requires colour critical evaluation of incoming documents and, when possible, comparisons with hardcopy proofs and reference prints. With the improved quality of monitors, not least the newer LCD monitors, the practise of proofing documents for colour accuracy on the monitor is gaining broader acceptance. It is very important that the monitor has a large enough colour gamut and that it is correctly calibrated.

The ISO 12646 standard defines how a display should be calibrated, and also defines other aspects such as luminance, colour accuracy, uniformity, colour temperature and sharpness. The goal is to simulate on screen how a hardcopy proof or print will look when evaluated in a viewing booth that complies with the ISO 3664 standard for viewing conditions. As in ISO 3664, ISO 12646 for display calibration has quite generous tolerances when it comes to luminance (brightness).

Originally the standard was written for CRT monitors, so it recommends using settings between 80-120 cd/m^2 (Candela per square metre). But since CRTs have disappeared from the market

and we now use LCD monitors, the brightness can be set to 160 cd/m^2 or higher. This makes it possible to use the monitor in general office lighting conditions, so there is no need to sit in a nearly dark room to do image retouching or softproofing.

The display should be calibrated according to the standard, taking into account monitor type, luminance, colour accuracy, uniformity, colour temperature and sharpness, as well as ambient light including the positioning of the display relative to other light sources and windows. A

The high end NEC SpectraView 241 can be hardware calibrated and will pass a stringent validation process.

validation process, using a measuring device, either a colorimeter or spectrophotometer, should be in place. In practice you will find that only so called "hardware calibrated" monitors will pass a stringent validation process and currently only high end monitors from Eizo, NEC and Quato conform to such specifications.

Another area with wide tolerances is the gamma value to use for the monitor. Gamma is essentially a measure of contrast. The gamma value is used to adjust the mid tones of a monitor so that the displayed colours match how the human eye perceives the grey scale. The higher the

value, the steeper the compensation curve will be. Traditionally a gamma value of 1.8 has been used for Mac OS workstations, but in Windows a gamma value of 2.2 is popular, since this is the assumed gamma setting for both sRGB and Adobe RGB reference colour spaces.

In practice the gamma value is embedded in the monitor's ICC profile, and if different gamma values are used in the workflow, this will be taken into account by the colour management

A monitor should be calibrated to the ISO 12646 standard if used for high end soft proofing. Checking the compability of the monitor with this standard can be done using for example UGRA's UDACT software, or other similar monitor validation tools.

system processing the colour data. Some research done at the Rochester Institute of Technology (RIT) suggests that using a gamma value of 1.8 would render the shadow areas of an image much better than when using a gamma value of 2.2.

Unless other reasons suggest different settings when calibrating an LCD monitor, we suggest the following: set white-point to 5000 K, the gamma to 1.8 and brightness to 160 cd/m^2. If the black-point can be set, use approximately 0.6 cd/m^2. A colorimeter or spectrophotometer measuring device is needed for accurate calibration, as well as a connection through a DVI cable, or the Display Port. A connection through an old VGA cable will not yield a good enough end result, since it limits the signal to 8 bits. This is too low for colour critical work, where 10 or 12-bit signal processing is needed.

With the stated settings the monitor can be placed in normal office light (at a maximum of 600 lux), but direct light from windows should be avoided. A monitor hood should be used to avoid reflections from possible light sources in the immediate environment. The monitor should be switched on at least 30 minutes before calibration to be fully warmed up, and screen savers should not be used on a workstation for softproofing. This is because it takes about 30 minutes for a monitor to stabilise in terms of temperature over the panels, which influences the quality of the light emitted. Also, a neutral grey background for the desktop should be used.

Since many papers today contain some amount of Optical Brightening Agents (OBA), it may be necessary to adjust the monitor's white point. Setting the white point to somewhere between

5500 and 5800 K can sometimes yield a better match to the actual print, when viewed in a viewing booth, side-by-side with the softproof on screen.

There are several software tools on the market that can check if a monitor and its ICC profile comply with ISO 12646. These include the UDACT (UGRA Display Analysis and Certification Tool), but several other monitor calibration software products contain similar verification tools.

What This Means for the Print Buyer

If you use the monitor for image retouching and softproofing, it should be calibrated according to ISO 12646, the standard for high-end graphic arts monitors. You will need a monitor that can be hardware calibrated to meet this standard. These monitors cost a bit more than ordinary monitors, but provide insurance that no substandard images or pages will get through to print production. They pay back your investment rapidly through time saved and reduction of errors.

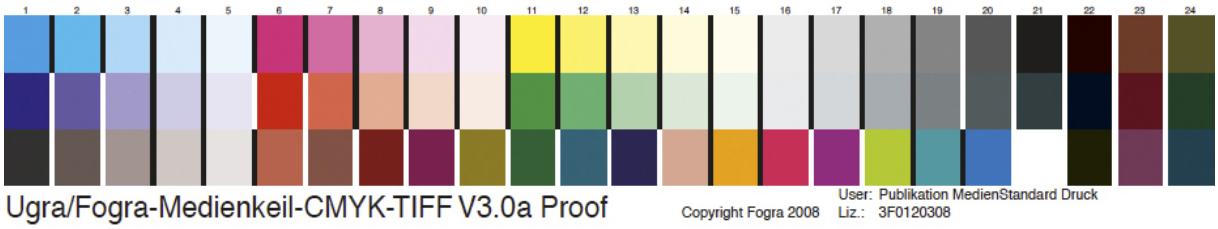
What This Means for the Printer

Softproofs are rapidly replacing hard copy proofs. If you use softproofing technology you must have a good enough monitor for judging both images and pages before passing them for print production. If you still use hardcopy proofs, a viewing booth compliant to ISO 3664 is imperative. You should also ensure that proofing engines produce accurate colour through regular maintenance and calibration. Only hardware-calibrated monitors pass the rigorous demands of ISO 12646, the standard for high-end graphic arts monitors.

Hardcore

Hard copy proofing requires assessment of incoming hardcopy proofs or of hardcopy proofs made in-house. However direct-to-plate production is rapidly superceding film-based work-flows, so contract proofs are generally printed on digital colour printers.

SPP follows the requirements covered in ISO 12647-7, the part in the series dedicated to proofing processes working directly from digital data. ISO 12647-7 defines factors such as the colour, gloss and brightness of the substrate, plus colour accuracy. The ISO 12647-7 standard defines what is required for high quality hardcopy proofs, but 12647-2 also contains references to proofing. It can be noted that the tolerances are narrower for contract (paper-based) proofs than for print production (the OK sheets). In addition to the colour, gloss and brightness of the substrate ISO 12647-7 also provides definitions of colour accuracy for more reference colour patches than for production print.



A hardcopy proof needs to be checked for compliance to ISO 12647-7, using a spectrophotometer and suitable colour control strip. One common control strip is the FOGRA Media Wedge.

Few of the factors in the ISO 12647-7 standard are likely to be evaluated on a daily basis at the print facility. SPP recommends using a proofing system that has been tested and certified against the ISO 12647-7 standard, and to select a few factors to check in daily hard copy proof (contract proofs) production. Hard copy proofs (also incoming proofs from the customers or third parties) should include a control strip where the parameters in table 2 of the ISO 12647-7 standard can be measured. Many proofing systems incorporate the UGRA/FOGRA media wedge control strip, which contains 46 or more colour patches for measurements.

Other factors to be controlled are rub resistance, repeatability, smooth reproduction of vignettes, registration, resolution and gamut. For hardcopy proofs produced in-house, the proofing system should be fully tested. The test should be done using a test form that includes both a control strip and a selection of sample images that are representative of the type of work produced. Comparisons should be made against final print on the paper stock in question. When measuring the control strip on the hardcopy proofs, the result should be within the specified tolerances provided in table 2 below (extracted from the ISO 12647-7 standard).

Table 2 – Tolerances for digital hard-copy proofs

Tolerances when measuring a control strip for a given paper type

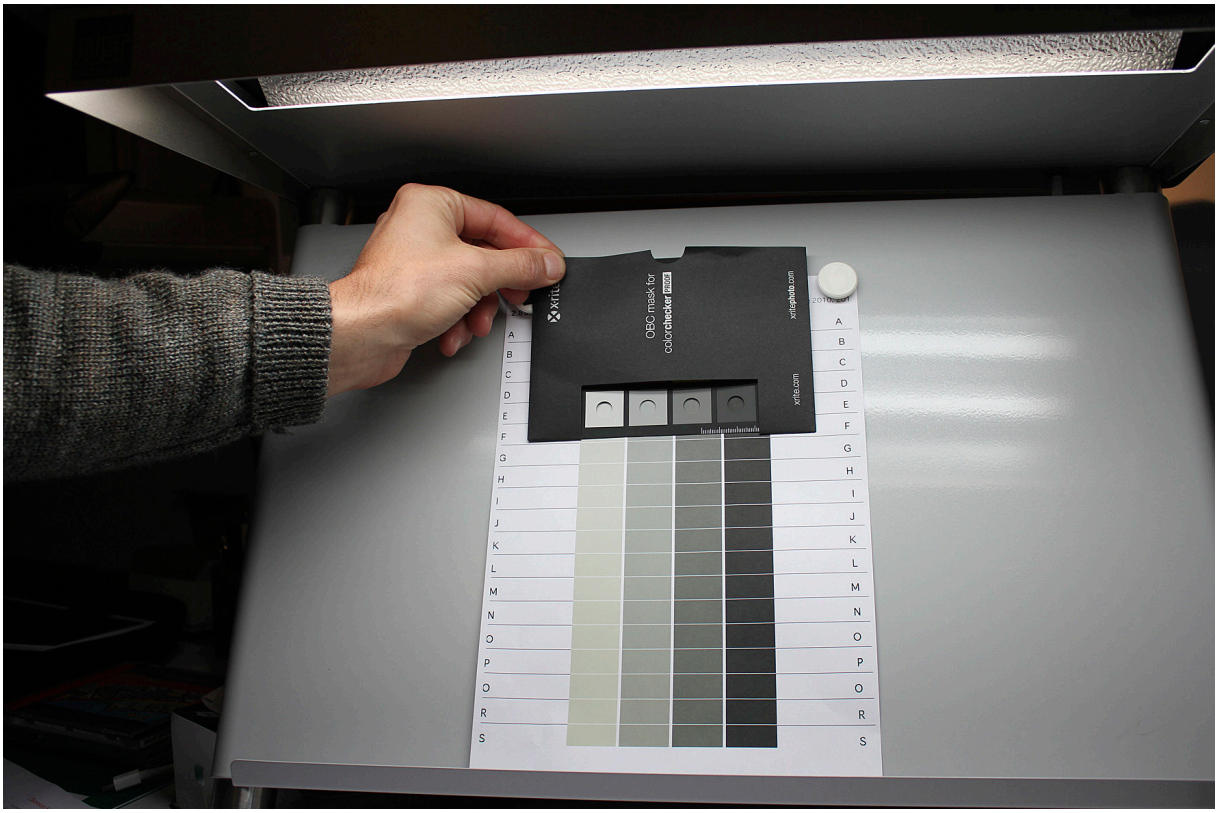
Primary colours (CMYK) maximum colour deviation ΔE 5 (ΔH 2.5, where H means Hue)

Maximum colour deviation for a single patch	ΔE 6
Average colour deviation for all colour patches	< ΔE 3
Maximum colour deviation for the gray balance patches	ΔH 1.5
Maximum colour deviation of the substrate colour (paper whiteness)	ΔE 3

A common problem in hardcopy proofing is dealing with papers that you suspect may contain a high amount of OBA, typically uncoated papers. It will help you if the spectrophotometer can perform measurements according the M1 measuring condition listed in the ISO 13655 standard

(Spectral measurements). More and more spectrophotometers support this mode, which means measuring with a D50 light source, including the UV-part of the spectrum (no UV-filter applied).

If, using CIELab, the b-value for paper white has a much larger negative value than expected, this is an indicator that the paper contains OBA. The OBA chemicals in the paper respond to UV light, which shows up in the measurements as a violet tone in the paper when using a spectrophotometer without a UV filter. This UV light is not detected by the human vision as violet, but it makes the paper look more cool white, than papers containing no OBA. The amount of OBA in papers is generally not published in the technical specifications the paper



More and more papers contain OBA (Optical Brightening Agents) which may confuse the colour management system. One way to correct the ICC-profiles used for printing or proofing is with the ColorChecker reference test chart from X-Rite, and suitable software.

manufacturers provide, however it can cause problems in colour management. This is especially true when creating ICC profiles that are also expected to perform well for contract proofs. If your proofing system doesn't have an obvious method for Optical Brightener Compensation (OBC), please ask the manufacturer for advice on how to do this, or try out other solutions. It's of course fundamentally important to achieve a very good match between proofs and final print, and learning how to both detect and compensate for OBA will help make this possible.

As with control procedures outlined in other parts of SPP, the responsibility and procedures for calibration and maintenance of measuring devices should be fully documented.

The hardcopy proofs should contain information about the type of ink and paper used, and the simulated printing condition using a correct ICC profile and paper type. It's also a good idea to inform the customer of the importance of viewing the proofs under correct viewing conditions.

What This Means for the Print Buyer

If you produce proofs in-house they should conform to ISO 12647-7, and this should be validated by measuring a control strip using a spectrophotometer. In all cases make sure you view proofs under proper lighting conditions: with D50 lamps at a brightness of around 2000 lux. Make sure your designers understand the importance of this to avoid colour shocks on final output.

What This Means for the Printer

Produce contact proofs on a paper that is as close as possible to the final production paper. Validate the proofs, for instance by measuring the control strip that should be printed on all proofs, before sending them off to the customer. Apply labels to the proofs that show they are compliant to ISO 12647-7 and the printing conditions at hand. Also remind the customer that proofs should be viewed under D50 light conditions, and advise them not to place proofs in bright sunlight, since this will shorten the lifespan of their colours. Some dye-based inks used in inkjet printers will change in colour appearance within four weeks, especially if exposed to direct sunlight.

Platemaking

The current edition of the ISO 12647-2 standard assumes the use of repro film in the workflow. However, SPP assumes Computer-to-Plate (CTP) production workflows, since this is the market norm. If an analogue workflow is used, i.e. using conventional film, contact frames and analogue plates, control mechanisms must be in place for the exposure and processing of both film and plates. The plates should be measured with a measuring device suitable for the plate type in question, for instance with a spot metre.

The ISO 12647-2 standard is in process of being updated and the new edition assumes direct to plate output. For US based printers, or printers who want to comply to US standard practices, the GRACoL standard and G7 calibration method should be considered when calibrating the CTP system and press. The difference between the ISO 12647-2 calibration method and G7, in short, is that in classical ISO 12647-2 press calibration the stronger emphasis is on compliance

with set TVI-curves. The G7 method has TVI-curves as a starting point and fine tunes the aim density values to achieve grey balance. We don't explain calibration according to G7 here, so if you need to comply to G7 you should contact the IDEAlliance for a list of certified consultants who can help you.

Platemaking requires calibration of the platesetter and validation of the imaged plates. If plates are made by a third party, appropriate control and validation procedures should be established and properly documented according to the requirements in ISO 12647-2. ISO 12647-2 recommends using AM screens of 110-200 lpi and to follow common practice for screen angles: 30° between C, M and K, 15° angle between Y and any of the other colours, and K normally at 45°.

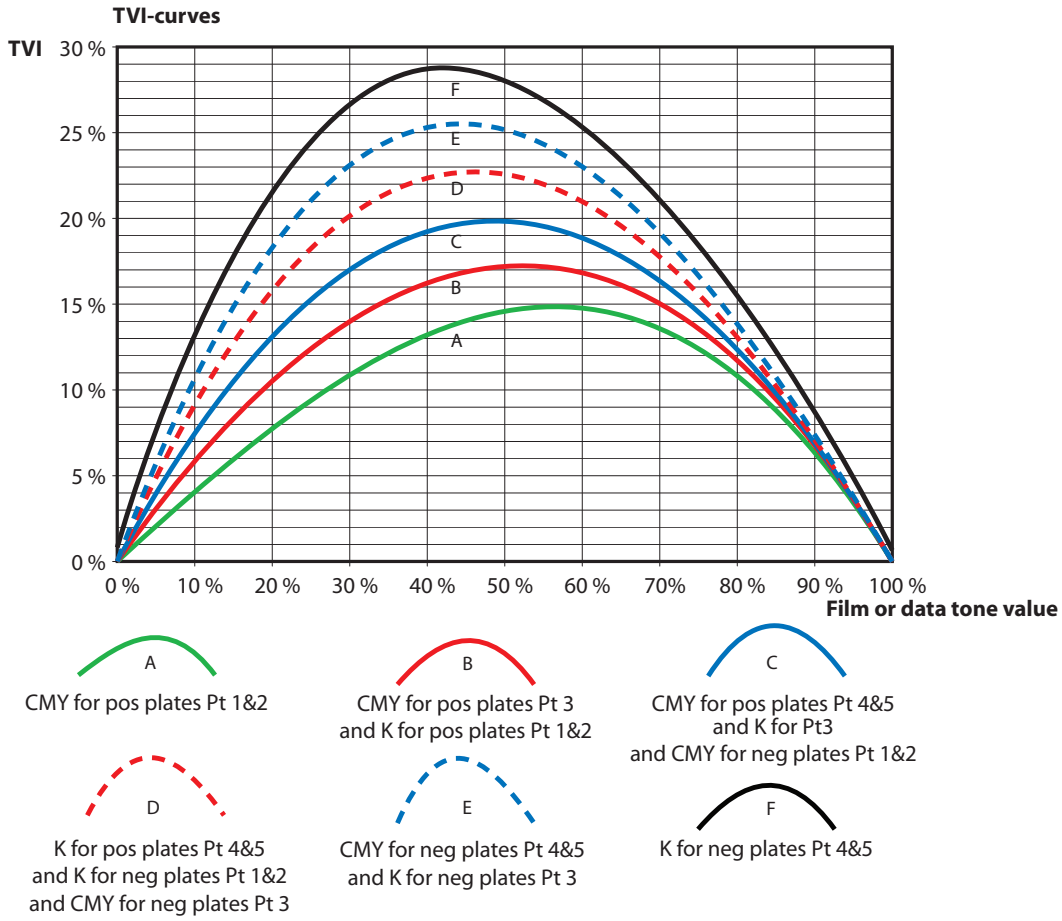
However screening technology has evolved dramatically over the last few years, with widespread use of improved FM screening as well as hybrid screens. A CTP workflow produces a first generation dot so it is possible to expect even higher quality in print using higher screen frequencies and more sophisticated screening technologies. It is also possible to work towards slightly lower dot-gain (TVI).

Table 3 – Recommendations on Tone-value sum (TIC, Total Ink Coverage)

Printing conditions	Recommended maximum
Sheet-fed offset, coated paper	300-330%
Web-offset and sheet-fed with perfecting, coated paper	300%
Sheet-fed and Web offset, uncoated paper	260-280%

Note: Both the "Uncoated FOGRA29" from Adobe and "ISO Uncoated" from ECI ICC profiles use a higher TIC than is recommended here.

It is normal practice to apply a calibration curve in the RIP driving the platesetter, but this practice may be split into two parts. First the laser must be linearised to establish its imaging accuracy. To do this expose a test document comprising multiple stepped tone values and measure them to to establish what corrections need to be made. This correction is used in the RIP to calculate the correct imaging output. The next step is for the RIP to compensate for dot gain by creating a dot gain (TVI) compensation curve or CTP curve. If two separate compensation curves are applied, it's important to check that posterisation doesn't occur, meaning greyscales are lost, because this causes banding. If your CTP system cannot handle a two-step linearisation process without a tendency towards visible posterisation, then you must linearise the plates and use an ICC profile based on linear plates.



A central task in plate preparation and press calibration is to check and adjust for dot gain, called TVI (Tone Value Increase) in the ISO 12647-2 standard. This will be different for different types of plates, papers, screen types and inks.

A linear plate is considered to be acceptable if the measured screen values are within +/- 1% of the desired value. The imaged plates should be uniform, which means that the variation of the screen dot size should be no more than 2%. If for example a screen of 50% is imaged over the whole plate, a variation in uniformity of between 48% to 50% or 51% to 53% is acceptable. In such cases the plate is uniform, but not entirely linearised. If, for example, the target is a 50% tone value, 49% and 51% would be acceptable, but not 48% or 52%.

Our recommendations on plate uniformity are based on industry practice supported by various organisations including FOGRA and IDEAlliance.

CTP plates should include a control strip placed outside the printable area, to check the plate exposure. Control strips such as the UGRA/FOGRA Digital Plate Control Wedge, or similar

control strips provided by the platesetter or plate manufacturer are suitable. Besides a control strip for plate exposure, the plate should also contain a control strip for measuring the print, according to various criteria, such as tone values. This control strip should include:

- Patches for visual evaluation of mid-tones
- Tone values in steps of 5 or 10%
- Tone values in smaller steps for the extreme highlights and deep shadows
- Positive and negative crosses and/or "stars" for evaluation of deformations of the printed image related to print orientation

The plate control strip should be visually checked in daily production, and measured regularly with a dedicated spot meter, and always when a new batch of plates is started.

If possible, the control strip for the plate should contain elements both with and without the TVI compensation curve applied. This makes it possible to check both the stability and linearisation of the platesetter, and that the correct TVI compensation curve has been applied. The prepress department should have a list of target TVI values for all the different paper types and presses used in the plant.

Several plates should be exposed and checked for uniformity prior to press calibration.

If a digital press is used instead of platemaking for a conventional press, the front end must be capable of processing incoming PDF/X files. It must also be able to correctly calibrate and linearise the press. In effect a digital press is operated as a proofing device, made to comply to ISO 12647-2 printing conditions.

In order to implement ISO 12647-2 fully, all of the topics covered in this part of SPP need to be understood by everyone in the print media supply chain, including publishers, print buyers and print media producers. Subsequent parts of SPP address the requirements for the press and overall quality control for the business.

What This Means for the Print Buyer

The most important part of your document preparation depends on knowing what paper will be used for the final print, so that you can use the correct ICC profile when making printed proofs or softproofing files on screen. The printer will then prepare plates accordingly, and the final print will look very similar to the proofs.

What This Means for the Printer

If several presses are used for ISO 12647-2 compliant print, you need to make sure that a single ICC profile can be used to represent them all, for that particular paper. If the actual TVI differs, this might mean that a dedicated computer-to-plate curve might be needed for each press. You may be printing the job on digital presses as well as conventional ones. If so, make sure the paper types are the same or as similar as possible.

About the authors

Laurel Brunner

Laurel started her career in 1978 as an accountant for a printing company. Since then she has worked exclusively in the prepress and publishing industries, with a particular specialisation in digital prepress, digital production and digital printing. She is managing director of Digital Dots, an international consulting group, and publisher of Spindrift. This is the industry's only independent, subscriber supported newsletter for the graphic arts, printing and publishing industries.

Laurel is active in standards development through her work with several ISO committees and is the convenor of ISO's Working Group 11 which is developing standards related to the environmental impact of print.

Paul Lindström

Paul Lindström entered the graphic arts industry in 1980 as a typographer and graphic designer. He has worked in computer assisted graphic design and print production ever since. Paul was the production manager and owner of a commercial printer where he became involved with digital printing, before moving to Elanders' Electronic Printing division. During his three years with Elanders Paul played a key role in developing the company's variable data management and print on demand strengths.

Between 1993 and 2003 Paul worked as technical editor for AGI, Scandinavia's leading graphics arts trade magazine. In addition he lectured part time for the Graphic Arts Department at Malmoe University, running degree courses on digital imaging, colour and quality management, the optimisation of workflow systems and production processes. Since 1998 Paul has been an UKAS accredited auditor for ISO 9001 and ISO 12647 certification, and is the co-editor of the certifications schemes in both Sweden and the UK. He is an appointed expert to ISO TC130, the technical committee responsible for authoring ISO standards for graphic arts and print media production.

Digital Dots is an independent graphic arts research group established in 1999. The company specialises in technology evaluations for digital prepress, printing and publishing applications and has conducted technology tests since its inception. Digital Dots also provides exclusive market research, testing and evaluation services for developers and buyers and is the publisher of Spindrift, a subscriber supported journal for the graphic arts.

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