

## How about the colour reference in digital printing?



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Based on the brief description of the synopsis from the on press proof to the contract proof this article describes typical use cases and substantial properties of the so called „Validation Print“. For that reason, the pertinent discussions within the graphic arts technical committee ISO TC130 will be explained. They constitute the basis of the work item proposal [ISO/NWIP 12647-7], which serves as the basis for the current FograCert Validation Printing System certification. Finally, an outlook on a digital production standard will be given.

### From on press proof to contract proof

Until the 1990s, the on press proof, aiming to simulate the visual characteristics of the finished print product as closely as possible, has been the most widely used means in order to create a colour reference. Such a proof showed a quite good appearance match between the proof and the final production run, since most of the printing parameters such as plates, screen, paper and printing ink might be identical to those used for production printing. Only ink trapping sometimes caused differences between proof and print when flat bed printing units have been utilized in wet-on-dry printing.

Beside the conventional printing processes more and more photographic and toner-based imaging techniques such as Kodak Approval, FUJI Final Proof, Analog- and later Digital-Chromalin, 3M Matchprint, Coulter Stock LC Colourproofing and Iris Graphics have been used for creating the so called digital proofs. The advent of these technologies was mostly driven by the cheaper price and the ease of use compared to the handcrafted creation of on press proofs. On and off press proofs basically serve the following needs:

- Colour reference for the printer and the print buyer
- Proof for suitable data preparation
- Reference in case of dispute

### Quality control

In the light of the standardization mostly driven by the German Printing and Media Industries Federation [bvdm] and Fogra aim values and associated tolerances have been established for on press proofs. Basically, by tightening the existing tolerances for the production run this has been derived. Due to the

lack of widely used and affordable colour measurement devices densitometric criteria, such as the solid ink density, tone value increase [dot gain], spread or the ink trapping was used. As useful the densitometrical evaluation has been proven to be for process control, it shows significant flaws in the colour match between two prints not being made up of the same constituents [ink, paper]. For that reason, the visual match between the digital proof and the OK-sheet or the production run sometimes have not been perfect.

### When is a digital print a proof?

The previously mentioned lack of colorimetrical evaluations as well as the rise of modern and inexpensive digital printers, such as inkjet photo printers, lead to widespread use of overly colourful prints sent to the printer as the reference for the OK-sheet. The printer often failed to reach the required appearance; reclamation and rework have been the consequences.

Though the question arose of how a digital print might be assessed on an objective basis in order to be a [technical realisable] colour reference for a given printing condition using a reasonable control element to be imposed on each document. This has been the hour of birth of the "Farbverbindlichkeit" – the colour reliability. Though the colour reliability is a property that has to be checked for each site or document separately. For that reason, a compact control wedge, like the Ugra/Fogra Media Wedge CMYK, reflecting the trade off between a small size and a good correlation to the page content is essential for an easy assessment of the colour reliability. That automatically rules out test charts, such as the ECI2002, or charts testing the resolution or smooth

vignettes for each print in the daily production. Such tests have to be scrutinized in the past by the means of the system or creation certification to be explained in the next paragraph.

reliability differently. They might define other control elements, pick or alter other requirements from ISO 12647-7 or add individual requirements to check a typical proof for the daily production.

**The „Validation Print“ – The colour reference in the design stage**

In light of the increasing demand of print buyers for higher quality and improving image quality of modern digital imaging devices, such as toner based printers, there has been a customer and industry need for a less stringent set of quality criteria. This „second level“ should be used primarily in the creative process and reflects a high quality validation of the proposed job content. Here espe-

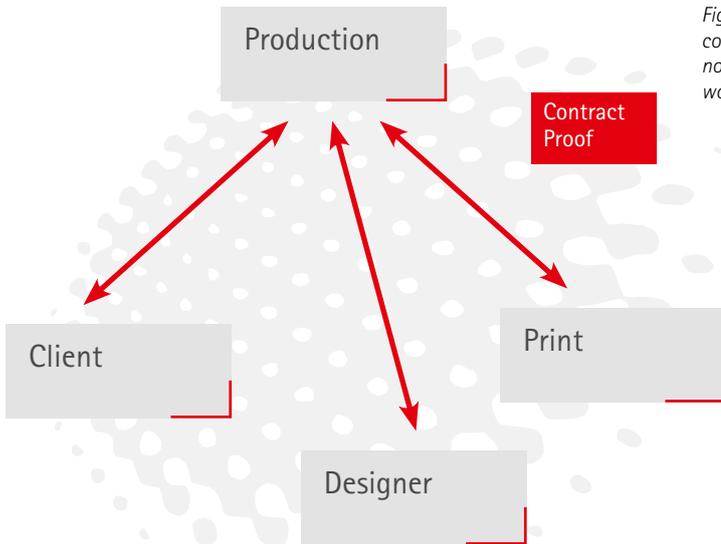


Fig. 1: The role of the contract proof within nowadays production workflows.

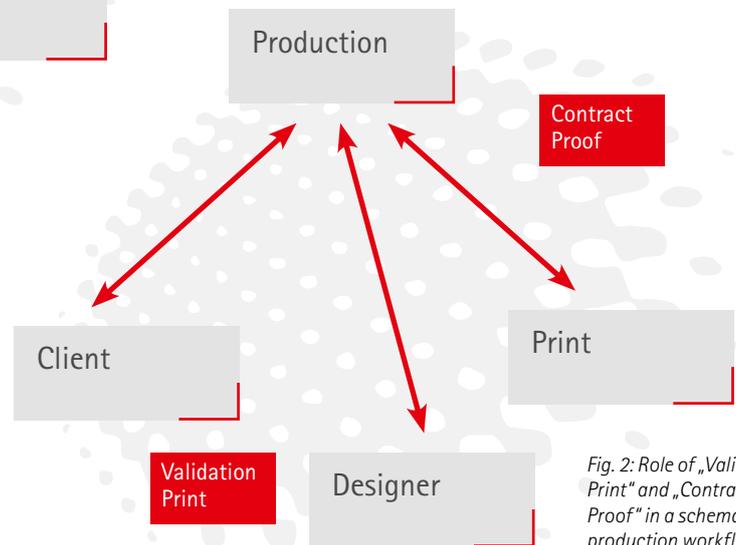


Fig. 2: Role of „Validation Print“ and „Contract Proof“ in a schematic production workflow.

A proof becomes a contract proof or a colour reliable proof only when certain criteria are met. The MediaStandard Print [MSD] published by bvdm, a technical specification and an accepted trade standard in the graphic arts industry, requires the Ugra/Fogra Media Wedge, the compliance to colorimetric tolerances taken from ISO 12647-7 as well as a complete human readable status line as prerequisites on each print. A label to be printed on each proof comprising the pertinent information often documents this. A colour reliable proof therefore guarantees that a printer, meeting the ISO aims, such as solid coloration and tone value increase curves derived by a suitable process calibration, can be assured that they can reach the given appearance by using the over and under inking capabilities of their press. Trade associations or companies being active in different regions or markets and using other aims, such as those defined in the MSD, may define colour

**The role of the colour reliable proof within the workflow**

Fig. 1 shows a simplified printing workflow consisting of a client, designer, production agency and print shop [printer]. The colour reliable proof will mostly be used at the end of the creative work in the production chain. It shows the consistency of the data by giving the appearance to be expected when the printer prints according to the printing condition for which the data has been separated. In addition, it is the final place to see if something has to be corrected in the data. In that case, the data has to be corrected and is subject to be proofed again.

cially cost and time efficiency play an important role since the contract proof is not always adequate at this early stage. The Fig. 2 illustrates the role of the so-called "Validation Print" in the colour and layout design stage of the production workflow.

A "Validation Print" is therefore a defined and reproducible quality within the creative phase and not primarily a colour reliable reference for the final production run. If prior agreement among all parties [client, printer and production] have been made even a "Validation Print" might be used as a colour reliable reference meaning that it represents the reference for the production and in case of a dispute. This might be the

case if the production run is subject to be conducted using digital printing [e.g. using the same substrates].

## Certification, ISO standardization and day by day production

The increasing number of incompatible proofing certifications across different markets and regions led to the cumbersome situation where manufacturers of proofing systems had to certify their system several times. Manufacturers therefore came to Fogra asking for the establishment of an international agreed upon standard stipulating objective criteria for the certification of a proofing system and the proof creation process. This goal was reached by the end of 2007 with the published standard ISO 12647-7 „proofing process working directly from digital data“. The FograCert test procedures always kept track of the development by reflecting the ISO 12647-7 during that time. Here, the FograCert Contract Proofing System certifies the tested proofing system for the tested combinations of software, printer, paper and the printing condition to be simulated in compliance with the defined criteria. The FograCert Contract Proof Creation certifies com-

pliance to the pertinent criteria within ISO 12647-7, and therefore, the ability of the proof provider to create contract proofs according to ISO 12647-7. In 2006 the Japanese delegation brought up the discussion of the incorporation of second, less stringent level of conformance into ISO 12647-7. They provided concrete recommendations for certain requirements, mainly taking the existing ones with adapted tolerances and proposed to name that level „Design Proof“. There was a strong feedback from a number of national bodies recommending not using the term “proof” in the naming of this second level – TC130 WG3 has recently agreed upon the term “Validation Print“. The second issue has been around the incorporation into the part 7 rather than to put it into a different part – ISO 12647-8 for example. Consensus has been reached by incorporating the Validation Print into the existing part 7, not in the published 2007 version, but at the immediate revision of ISO 12647-7. This started immediately after the publication of the standard and is currently at the new work item proposal stage – NWIP. This has been done in order to avoid two almost identical standards. In order to reduce confusion between “Contract

Proof” and “Validation Print“, the status line [margin information] shall include the term “Validation Print according ISO 12647-7” or “Contract Proof according ISO 12647-7” respectively.

## Digital Printing System and Digital Print Creation and Colour Reliability

As already described, ISO 12647-7 defines the process agnostic criteria for a certified contract proofing system as well as for the process of contract proof creation. However it does not explicitly define the colour reliability. Based on ISO 12647-7 and the MSD, the user finds a concise and stringent three-fold hierarchy from the digital printing system [Contract or validation printing system] over the digital print creation process [Contract Proof or Validation Print] up to the definition of colour reliability. This hierarchy has been summarized in Table 1.

## Fogra is working on a digital production standard

Finally it should be mentioned that Fogra is starting a new digital printing work group. It aims for the identification of digital printing use cases, the

Type	Contract Proof	Validation Print	FograCert
Digital Printing System designation	Contract Proofing System	Validation Printing System	FograCert Contract Proofing System and FograCert Validation Printing System
Digital Print designation	Contract Proof [digital print of high colour accuracy, useable as reliable visual colour reference for printing, and as a part of a commercial agreement]	Validation Print [digital print showing the intended appearance and layout, usable as a communication tool primarily during the design stage]	FograCert Contract Proof Creation and FograCert Validation Print Creation
Colour reliable?	Yes, see Table 2	Not explicitly. This requires prior agreement between all parties, including the client, production, and printer.	Requirements: – Ugra/Fogra Media Wedge CMYK V2/V3 – Conformance to given tolerances [see Table 2] – Complete margin information [see Table 3]

Table 1: Overview of the certification stipulated in ISO/NWIP 12647-7 and the corresponding FograCert certifications.

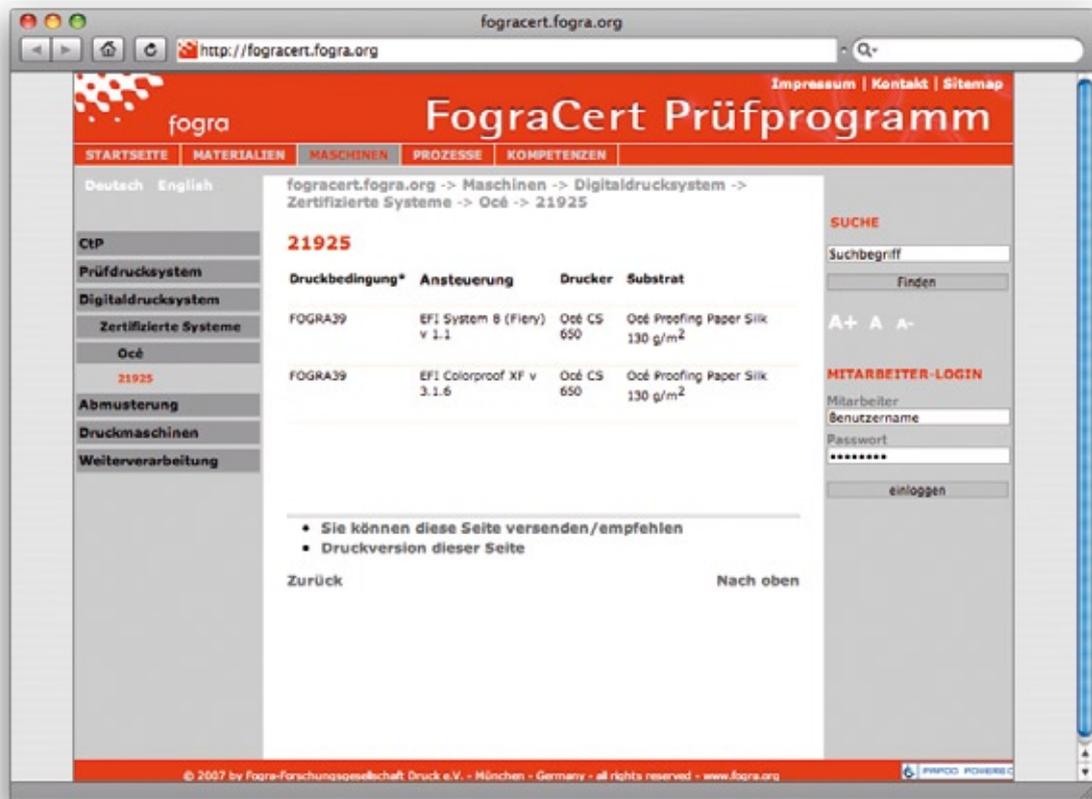
	Paper simulation	All patches	Composed Grey	Primaries	Primaries
Deviation tolerance [Contract Proof]	$\Delta E_{ab}^* \leq 3$	Maximum $\Delta E_{ab}^* \leq 6$ Average $\Delta E_{ab}^* \leq 3$	Average $\Delta H \leq 1,5$	Average $\Delta H \leq 2,5$	Maximum $\Delta E_{ab}^* \leq 5$
Deviation tolerance [Validation Print]	$\Delta E_{ab}^* \leq 3$	Maximum $\Delta E_{ab}^* \leq 8$ Average $\Delta E_{ab}^* \leq 3$	Average $\Delta H \leq 1,5$	Average $\Delta H \leq 2,5$	Maximum $\Delta E_{ab}^* \leq 5$

Table 2: Criteria of the Ugra/Fogra Media Wedge CMYK V2 or V3 for colour reliability.

appropriate and necessary research to be needed and to work on foundations of a digital printing production standard. Contrary to the Validation Print a production standard has to cope with all criteria being important for the production run. This work starts with the collection of the research that has already been conducted at Fogra, which includes the previous work commissioned by the German printing magazine "Druckspiegel". The first meeting will be held at Fogra on October 23<sup>th</sup> 2008.

Human-readable commentary line comprising:
conformance level: "Contract Proof according ISO 12647-7" or "Validation Print according ISO 12647-7"
the printing system designation
the driving software [Digital Front End]
colorant and substrate material types
the colour management profile[s] used
the printing condition to be simulated
the time and date of printing
the time and date of last calibration

Table 3: Required items of the status line.



Screenshot of the FograCert webpage, showing the current certified validation printing systems [Océ exemplarily].



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