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Control tools of modern quality management in prepress

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The previous issue of the Printers` Guide gave a summary of the different possibilities to control color reproduction in the production process of print media. This issue will now focus on the control tools available in prepress systems.

It`s in the prepress stage that the groundwork is laid for the quality of the final product. Color settings or color space conversions which are made at an early stage, unfortunately often wrong, cannot be remedied at all or only with a loss in quality during the subsequent processing stages. Therefore, consistent control of all color parameters is of crucial importance.

Softproof

An easy and comparatively cost favourable control option is the contract color proof on the monitor (soft proof). The soft proof, however, still does not fulfil the most important requirement which is trueness of colors. The reason is that the evaluation of reproduced colors is still made with measurement methods that have not yet been standardized. As a consequence, the soft proof is (not yet) legally binding at present.

The validation of the soft proof as a component of an ISO standard has not been completed either, so that it is only a supplement to the traditional proof prints. Monitor manufacturers are, however, offered certification for specific output condition by the Fogra (Foundation of the German Society for the Promotion of Research in the Graphic Arts Industry) within the scope of the fogra.cert programme. In future, checks of soft proofs produced as contract proofs for print products on the monitor will no doubt gain in importance.

Digital proof

Color proofing of print data with inkjet printers is very common at present. In the course of the last ten years, these systems have made great progress with regard to color gamut, stability and speed. Nevertheless, a control wedge is needed in order to check these systems on a continuous basis (e.g. the Ugra/FOGRA media wedge or the System Brunner Proof Zebrastrip®). Deviations in the print results may very well occur since parameters like printing substrate, pigmentation of inks or the contamination of single components often change without the change being noticed.

Like the data to be checked, the control wedge is calculated in the RIP system in the same way. The simulation of the printing conditions or the simulated substrate must comply with the planned production run. For simulation, the standard paper types 1 to 5 or an in-house paper type for which a profile has been prepared are used. The evaluation of the control wedge is carried out with a spectrophotometer and analysis software with preset reference data for the respective paper.

Paper type	Reference file
1/2	FOGRA39L
3	FOGRA28L
4	FOGRA29L
5	FOGRA30L

For the tolerances permitted for the measured values, the standards of Medien-Standard Druck (www.bvdm-online.de/English/) and ISO 12647-7 (digital proof/print match) are taken as an orientation. The processes for the correct production of a digital proof are documented in the same ISO and specified there for every user to see.

The Ugra/FOGRA media wedge

The Ugra/FOGRA media wedge has been available since 1997 – currently in the third generation. In production environments, nearly only the versions 2 and 3 are now used. The media wedge consists of, respectively, 46 (version 2.x) and 72 (version 3.x) measurement patches which essentially correspond to the much more comprehensive IT8 and/or ECI 2002 (standard from ISO 12642) color charts.

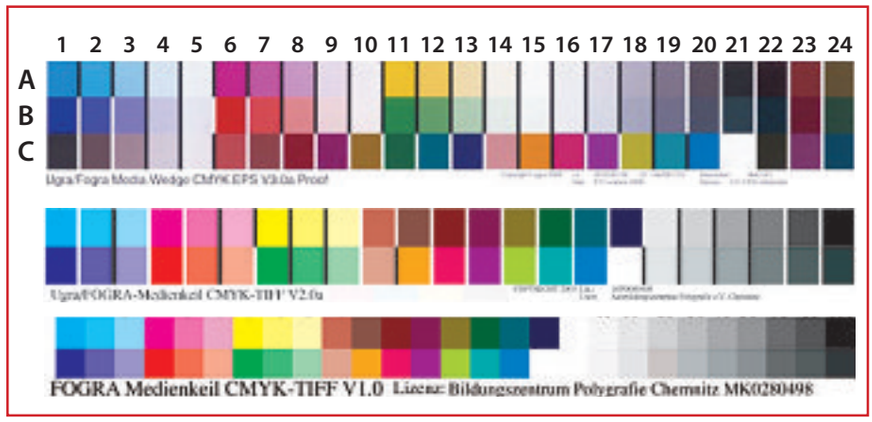
Both versions are available in different layout variants for different application purposes. Below, the latest version 3 of the media wedge shall be explained in detail.

Fogra

Fogra was founded in 1951 in Germany by companies of the printing industry. The name is derived from Foundation of the German Society for the Promotion of Research in the Graphic (Arts) Industry. Fogra has developed into a leading research institution for the international graphic arts industry. Similar institutions are UGRA in Switzerland and the US-American GATF.

The layout of the wedge mainly differs with regard to the size of the measurement patches as well as the use of a separator. The standard kit of the media wedge V3.0 comprises the versions 3.0 (6x6 mm), 3.0a (8.5mm, plus 1mm separator patch, x10mm) and 3.0b (6mm, plus 1mm separator patch, x7mm). They ensure that the correct layout is available both for automated measurement systems (with separators) and manual measurement systems (without separators).

The fields A1 - A15 are the patches for the primary colors cyan, magenta and yellow. For each color, there are 5 patches with 100, 70, 40, 20 and 10 percent tone value. They represent the characteristic tonal value curve. The patches A16 - A21 are called greyseries. They represent true grey with tone values of 10, 20, 40, 60, 80, and 100 percent.



The Ugra/Fogra media wedge versions 3.x (top), 2.x (centre) and 1.x (bottom)

The evaluation can be made using software and measurement devices of a large number of different manufacturers. The example shows the evaluation with the Proof Verifier Tool from EFI™ (Electronics for Imaging), which is part of the software package ColorProof XF. The FOGRA specifies maximum tolerances (dE) for all measurement patches of the wedge depending on the paper class. The result of the test is documented in a protocol.

Colorproof XF Verification

Print created by:	Thomas Schubert	**Measuring device:**	-
Last calibration:	18.10.2010	**Measurement conditions:**	EyeOne
Proofing system:	EFI ColorProof XF		
Control strip:	None	**Measuring underlay:**	white backing
Delta E format:	dE CIE76	**Printer:**	E 4800
Reference profile:	ISO coated V2	**Proof profile:**	-
Reference data:	FOGRA 39 MK	**Proofing substrate:**	FS74291
Reference printing conditions:	ISO 12647-2 PT1/2	**Colorant:**	-

Summary

Criteria		Difference			Tolerance	Status
Cyan		4.17	dE	Patch 1	5.00	Passed
Magenta		1.12	dE	Patch 6	5.00	Passed
Yellow		3.40	dE	Patch 11	5.00	Passed
Black		1.64	dE	Patch 21	5.00	Passed
Paper white		0.64	dE	Patch 69	3.00	Passed
Max. average all patches		1.71	dE	-	3.00	Passed
Max. peak all patches		4.17	dE	Patch 1	6.00	Passed
Hue diff. Max. average gray		0.54	dH	-	1.50	Passed
Hue diff. Max. average - CMYK		2.31	dH	-	2.50	Passed
Tone value diff.		2.30	%	Patch 4	5.00	Passed
Max. peak for 95% of patches		3.82	dE	Patch 54	6.00	Passed
Max. average outer gamut patches		-	dE	-	6.00	-

Overall Result

PASSED

Evaluation protocol MK3 with EFI ColorVerifier and EyeOne spectrophotometer

The patches 22 A-C simulate chromatic color overprinting on black. The patches 23 A-C and 24 A-C are the shadow areas of the colors (lightness L ≤ 35) which are difficult to reproduce in digital printing.

The B1 - B15 patches are the secondary colors blue, red and green (consisting of equal parts of 2 primary colors). They are output with 200 % (100 % M and Y each), 140 %, 80 % 20 % and 10 %. The B16 - B21 patches simulate a composed grey analogous to the true grey series for which the chromatic composition corresponds to the reference values specified in ISO 12642. The C1 - C5 patches are a second grey field condition. The C6 - C20 patches comprise different critical mixed colors (tertiary colors) of a large variety of hues. The C21 patch represents simulated paper white.

Proof Zebrastrip®

As an alternative control tool to check proofs, System Brunner AG from Switzerland is offering the Proof Zebrastrip®. Based on the EUROSTANDARD developed by this company, the Proof Zebrastrip® enables to evaluate digital proof prints. In the evaluation, a stronger focus is placed on the grey balance since differences in this range are visually perceived very clearly.

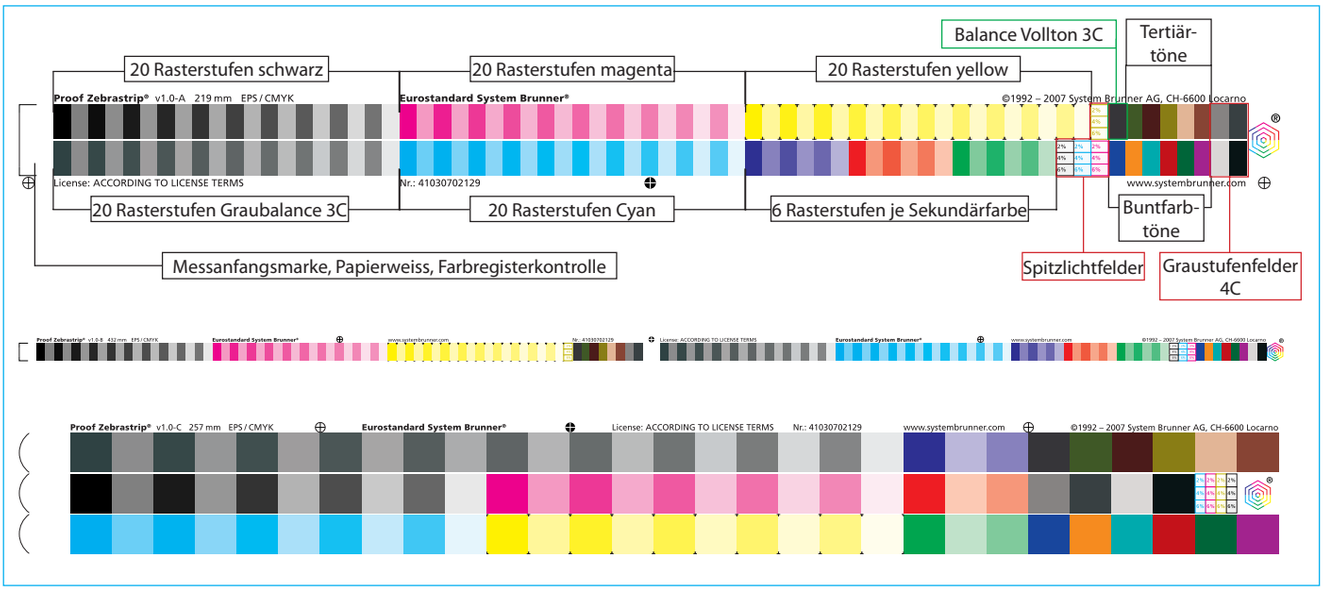
The wedge is available in three different layout versions. Version 1.0-A, consisting of two lines, and 1.0-B, consisting of one line, all for automatic evaluation with an RS 800/900 spectrophotometer from Techkon in scanning mode. Thanks to the small size of the measurement patches of 3 x 6mm it requires very little space on the paper. Version 1.0C with larger measurement patches (8.5x10mm), consisting of two lines, has been optimised for evaluations with the widely used X-Rite EyeOne spectrophotometer.

Separators between the individual measurement patches as can be found in the media wedge are not necessary since the measurement gradations can clearly be seen due to the large tone value differences of the adjacent patches. This is also the reason for the striking zebra stripe structure of the wedge. Version 1.0A shall be described in more details below.

System Brunner AG

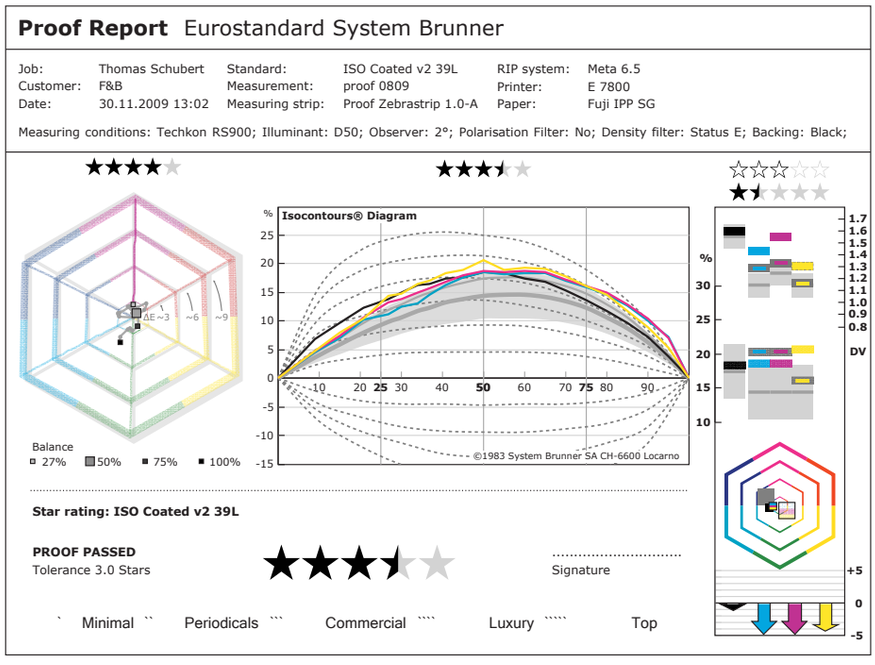
System Brunner AG with headquarters in Locarno, Switzerland, has developed measurement methods and programmes for the supervision and control of all printing methods for more than 35 years. Their developments include standards like EUROSTANDARD and GLOBALSTANDARD. The most important parameter for output control is always the grey balance. Control systems from System Brunner are now integrated in web and sheetfed offset printing machines of a wide range of manufacturers.

System Brunner



Proof Zebrastrip v1.0-A (top), v1.0-B (centre) and v1.0-C (bottom) of System Brunner AG

The Proof Zebrastrip® consists of groups of measurement patches with 20 screen steps each for the grey balance (CMY overprinting) as well as 20 screen steps for the primary colors. The screen value steps are not the traditional 5, 10, 15 to 100 percent tone value steps, but are derived from the visual equidistance of the halftone areas. The result is uneven figures like 9, 15, 21, 24, 27 to 100 percent. They represent well-known problems from offset printing, like sudden dot gain at the points where chain dots touch (tonal value jump), in an excellent way.



In addition, the Proof Zebrastrip® comprises 6 screen steps of each secondary color, tertiary tones in the yellow, brown and green range as well as saturated hues. The wedge ends with grey stabilization patches with a high black portion. They cause hardly any problems in the offset printing process, but are difficult printing situations for inkjet proofing systems.

Evaluation is carried out with the ProofChecker software from System Brunner and the RS800/900 and EyeOne, respectively. The Brunner star rating system defines 5 quality levels. They range from minimal quality (1 star) to top quality (5 stars) and give a quick survey of the precision of the digital proof print, with 3-4 stars representing good quality proofs.

Due to the fact that the focus is on the evaluation of the grey balance as the most important criterion, the concept of System Brunner AG is an interesting alternative to the purely color distance (dE)-based evaluation of the Ugra/Fogra media wedge. In addition, the evaluation is not limited to two conditions (passed or failed), but shows different quality levels just as is the case in daily production.