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Instructions for use

Fogra Media Wedge CMYK V3.0

Dr Andreas Kraushaar

Member

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Dr Andreas Kraushaar
Ulrich Schmitt

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Contents

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Tel. +49 89. 431 82 - 0, Fax +49 89. 431 82 - 100, E-mail info@fogra.org
Internet www.fogra.org

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1 General Information

1.1 Development

An important factor in quality control of printed products, for both, conventional and digital printing processes, is the visualization of the expected output through a reference before the actual print run.
A lack of standardization led to a widespread use of overly colourful prints that were sent to the print service providers, serving as a potential reference. The print service providers often failed to reach the required appearance; reclamation and rework had been the consequences. This situation resulted in the development of a digital control element – the Ugra/Fogra Media Wedge. Version 1.0 was first published in 1997. The Media Wedge had become an essential part of the Media Standard Print (MSP), [1], a set of rules complementing the ISO standard 12647 around process control and printing [2]. The Media Standard print defines how to deliver proofs and prepress data - vendor independent and in step with the actual practise.

The Fogra Media Wedge had undergone a process of continuous development, taking respect to a changing framework. This evolution had lead from version 2.0., 2.2 with 46 patches to the current version, the Fogra Media Wedge CMYK V3.0 with 72 patches. Internationally established, the Media Wedge is best known for its easy recognition and integration in virtually every software based evaluation tool.

1.2 Colour and colour reliability

A major requirement for smooth print production processes is the clear communication of a reference printing condition between the originator of the image data and the print service provider. A printing condition concludes all quality related parameters like the print substrate as well as the colorimetric definition by means of a characterization-data set (e.g. FOGRA39). The primary and most important function of the Fogra Media Wedge is to make sure that the reference (e.g. a digital proof print) had been created for one defined printing condition and is technical realisable at the same time. Consequently a reference print has three important attributes, which are defining the character of colour reliability:

- The reference print is reproducible by the intended print production process. This means reaching the required appearance of the reference is possible when working in a standardized environment
- It shows the quality (integrity) of the image data set
- Reference in dispute

In order to realize these characteristics some additional criteria had been defined by Media Standard print beside the obligatory presence of the Media Wedge. These are in the first place the tolerances for colour accuracy, extracted from the corresponding ISO Standard (ISO 12647-7, [3]) during the ongoing development of the Media Standard Print. Further requirements are the presence of a human readable status line and the usage of consistent data formats (PDF/X).

In light of an increasing demand for higher quality on the print buyer side and an improving image quality of modern digital imaging devices, such as toner based printers, there had 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 especially cost and time efficiency plays an important role since the contract proof is not always adequate at this early stage. A "Validation Print" is therefore a defined and reproducible quality within the creative phase. An extension of the colour reliability to the validation print had been controversially discussed and is at the moment not part of Media Standard Print. Through the rising acceptance in the market and the successful publication of the ISO 12647-8 Standard in 2012 the Validation Print is described as an equally colour reliably visualization in Process Standard Digital (PSD). The two references are representing different use cases, and it is the responsibility of all parties involved in the printing process to agree on the best reference for the individual use case.
The presence of only one colour reliable reference is anyhow difficult to realize especially when softproof products are advancing on the market, as for the time being.

1.3 Conformance in digital production printing

Beside the original usage as a control element for assessing colour reliability the Media Wedge has found his way into another field in the course of standardization, which is digital production printing.
Here, when evaluating OK-sheets or print runs, we are talking about conformance assessment instead of colour reliability. In this conformance, assessment colour accuracy as the deviation between the actual print and the reference plays the dominating role. Research within the Fogra technical committee for digital printing (DPWG, Digital Print Working Group) had confirmed the Media Wedge as a highly convenient tool for digital printing. The layout and selection of colour patches are fitting well to the needs of digital production printing. Process Standard Digital therefore recommends the Media Wedge for the usage in conformance assessments as well as process control for CMYK-based processes.

1.4 Colour patches of the Media Wedge CMYK V3.0

Selecting colour patches faces two main challenges. Firstly to only take in account all CMYK tints that are specified in the pertinent ISO Standard (ISO 12642-2). This ensures all measurements of the Media Wedge can be extracted from established IT8-7/4 or ECI 2002 colour targets. This is for instance

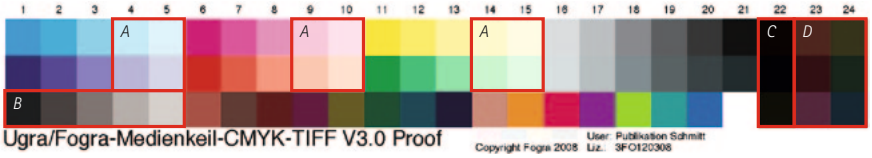


Fig. 1: The red highlighted boxes show the patches that have been added to Media Wedge versions 2.X.

not always the case with comparable wedges from other vendors then Fogra. Secondly this is the compatibility to the predecessor versions V2 and V2.2. When reducing the number of patches it is always important to find a compromise between a reasonable size and a colorimetric and printing process-related significance. A small number of patches guarantees for small size, quick measurements and evaluations. The smaller the number of patches the greater is the probability to loose important areas in the colour gamut or important process variables for the print evaluation. The current version was made to fit booth demands. Main process variables (primary- and secondary colours) are covered as well as additional colour areas (skin tones, memory colours etc.)
These criteria have also found their way into ISO 12647-7 and -8, now specifying the requirements for a control wedge according to these standards.
Comparing to its predecessor, the newly added patches are highlighted in figure 1.

A) Patches in the highlight area (10 % and 20 % tone value) (columns 4, 5, 9, 10, 14, 15)
B) Second grey patch sequence (patches C1 to C5)
C) Chromatic colours overprinting black (column 22)
D) Patches in the shadow area (columns 23, 24)

Grey Patches

The upper grey patch row (patches A16 to A21) contains only black (grey) patches having the tone values 10 %, 20 %, 40 %, 60 %, 80 % and 100 %. The grey patches directly below the upper row (patches B16 to B21) contains cyan, magenta and yellow (composed grey) patches based on a former printing condition for paper type 1 and screen 60/cm as specified in the standard ISO 12647-2 [4]. In Version 3.0 additional grey patches (patches C1 to C5) with the tone values 100 %, 70 %, 40 %, 20 % and 10 % have been added. The same tone values in cyan, magenta and yellow have been used. These patches are not included in the evaluation of grey conditions (ΔH in ISO 12647-7 or ΔC_h in ISO 12647-8). These patches are important when creating ICC profiles.

The status line

The status line below the patches displays the data format (TIFF or PDF), the version number and license information (license holder and license number). Additional 3 % highlight patches of the CMYK primary colours can be found in this area for visual appraisal only. Newer layouts do not contain data format information.

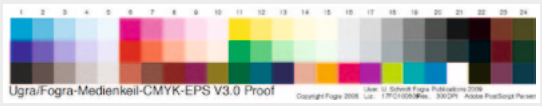
2 Layouts and data format

2.1 Standard layouts V 3.0, V3.0a, V3.0b and V3.0 LFP

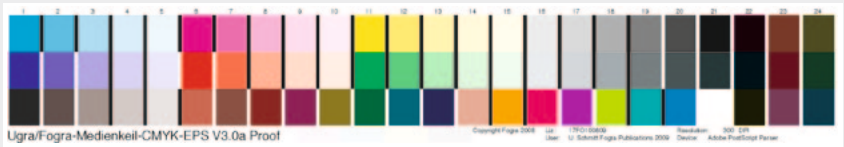
One important goal in the development of the Fogra Media Wedge was a standardized layout which can be measured by a great number of different measurement devices and software tools. This explains the reduction in the number of layouts to one standard version which shall be used for all normal use cases. This includes versions V3.0, V3.0a and V3.0b, which distinguish only in patch size and the art of patch separation, see fig. 2.

V3.0 LFP

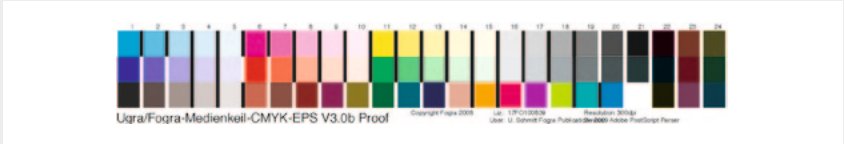
Wide or large format printing (LFP) usually demands for a lower screening frequencies then small format commercial production printing. The screening frequencies are comparable to those of conventional screen printing and can usually be found in an area between 20



Fogra Media Wedge CMYK V3.0 for manual evaluation – Patch size 6 mm × 6 mm, total size: 154,3 mm x 25,4 mm.



Fogra Media Wedge CMYK V3.0a for automatic evaluation – Patch size 8,5 mm × 10 mm, total size: 228,6 mm x 37,4 mm.



Fogra Media Wedge CMYK V3.0b for automatic evaluation – Patch size 6 mm × 7 mm, total size: 168,3 mm x 27,9 mm.

Fig. 2: Standard layouts of the Fogra Media Wedge CMYK V3.0 (illustrations are scaled).
Not shown here:
Fogra Media Wedge CMYK V3.0 LFP, patch size: 19 mm x 13 mm, overall dimension: 257 mm x 107 mm.

lines per centimetre (lpc) to about 40 lpc. Possible higher resolutions would decrease productivity and are simply not required for many print applications observed within a greater viewing distance. Checking colour accuracy with the Fogra Media Wedge presumes a precise colour measurement. Therefore a patch size that allows for an adequate detection (averaging) of the used halftone dots is of major importance. If this is not the case, repeated measurements within one patch could cause a measurement disagreement beyond the normal range of instrument agreement. For this reason a large patch size is essential for lower screening sequences, especially in large format printing.

Why not scaling the exiting layouts?

At first glance increasing patch size seems to be very easy by simply scaling the existing layout. At second glance it seems to be very difficult because most of the holder mechanism (ruler) for scan-measurements, that most of the existing devices are coming up with - are simply too small for measuring an extended wedge. A restriction back to single measurement mode only would not be economic in the light of increasing automation. In the therefore mandatory development of a new layout the focus lied again primarily on an easy recognition of the Fogra Media wedge. Looking at the new layout depicted in figure 3, the new implementation is illustrated comparing to the Fogra Media Wedge V3 layout. The layout comprises 12 rows and 6 columns. The primary and secondary tone value scales are no longer aligned horizontally but vertically. Furthermore the six composed grey – grey (K only) pairs are now integrated in one single block on the right side. Completing the 72 patches, the remaining patches are aligned in rows 8 and 9 as well as in the last column.

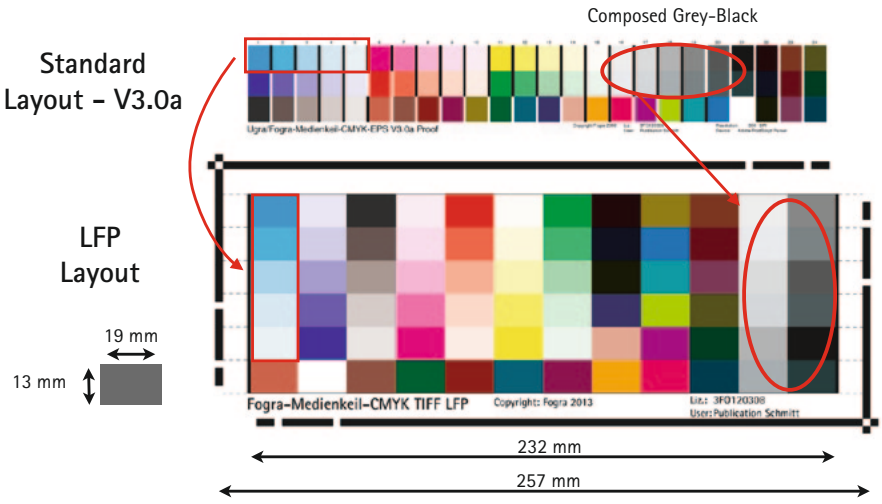


Fig. 3: Fogra Media Wedge CMYK V3.0. Comparison of the basic layout (top) with the new LFP layout (bottom).

2.2 Extra layouts (special versions)

The continuing development in wide format printing led to printing systems with integrated colour measurement devices who allow for an automated calibration. The integrated devices do have individual requirements onto the design of a measurable target or control wedge; reaching from different sizes to different layouts to additional positioning patterns. The usage of individual control wedges complicates the coordination between all parties involved in the proofing process because it does not guarantee for a standardized measurement with the usual tools.
The possible required changes in layout will, for this reason, only be developed on the behalf of printing system vendors. In light of a consistent appearance these layouts will be communicated and distributed as separate layouts. The separate layout will also be communicated in the designation of the same, currently supporting Canon (XC, Extra Canon, fig. 4 on page 6) and two sets for Epson (E1Z, E2, E3Z and XE 1Z, XE 2Z, XE 3Z, Extra Epson, fig. 5 on page 6). The distribution of these wedges is restricted to Media Wedge licensed partners who are also taking care about an accurate integration into various software tools and its support.

2.3 Supported file formats

All Media Wedge layout versions are coming in pixel format (TIFF) as well as vector format. Old layouts will be delivered in the EPS file format, following the established production process, whilst all new layouts will be published in the PDF file format (Tab. 1).

	TIFF	EPS	PDF
Standard layouts			
V3.0	X	X	
V3.0a	X	X	
V3.0b	X	X	
V3.0 LFP	X		X
Special versions			
V3.0 XC	X		X
V3.0 E1Z	X	X	
V3.0 E2Z	X	X	
V3.0 E3Z	X	X	
V3.0 XE 1Z	X		X
V3.0 XE 2Z	X		X
V3.0 XE 3Z	X		X

Tab. 1: File formats of the Fogra Media Wedge.

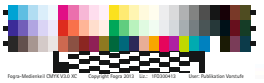
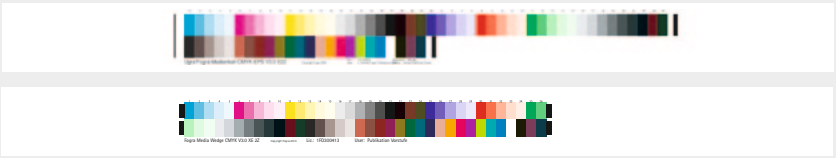
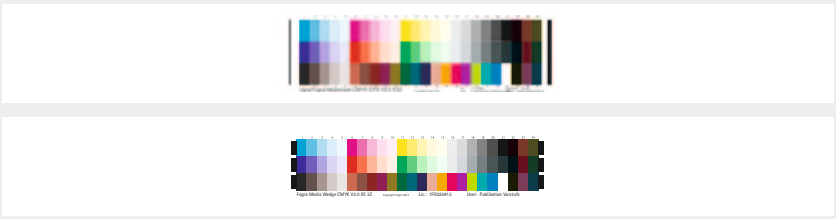


Fig. 4: Extra layout Canon (illustration is scaled); Fogra Media Wedge CMYK V3.0 XC.
The XC special version comprises only one layout – Patch size: 7 mm x 11 mm, total size : 180 mm x 52 mm.

Fogra Media Wedge CMYK V3.0 E1Z (top)
– Patch size 7 mm x 15 mm, total size: 555 mm x 24 mm.
Fogra Media Wedge CMYK V 3.0 XE 1Z (bottom),
– Patch size 7 mm x 12 mm, total size: 511 mm x 18 mm.



Fogra Media Wedge CMYK V3.0 E2Z (top)
– Patch size 7 mm x 15 mm, total size: 350 mm x 39mm.
Fogra Media Wedge CMYK V 3.0 XE 2Z (bottom),
– Patch size 7 mm x 12 mm, total size: 259 mm x 30 mm.



Fogra Media Wedge CMYK V3.0 E3Z (top)
– Patch size 7 mm x 15 mm, total size: 182 mm x 54 mm.
Fogra Media Wedge CMYK V 3.0 XE 2Z (bottom),
– Patch size 7 mm x 12 mm, total size: 175 mm x 42 mm.

Fig. 5: Extra layouts Epson (illustrations are scaled).

3 Handling and evaluation

3.1 Media Wedge output

It is very important that the Media Wedge undergoes the same transformations as the corresponding image content to be evaluated by the Media Wedge. Furthermore, the Media Wedge shall not be scaled as this can make an automated measurement (scan-mode) impossible. A bigger change in dimensions could also have an affect on colour appearance. An unprinted white area of approx. 1 cm left and right of the Media Wedge is necessary for scan-mode measurement and therefore important.

3.2 Reference printing conditions

Checking for colour reliability requires the definition of a reference printing condition. This is usually done through a characterization data set or the corresponding ICC output profile. For all Fogra characterization data a separate package containing data sets with the 72 CMYK tone value patches is available. Basically the Media Wedge can be used for every CMYK based reference printing conditions.

3.3 Colour measurement

Measurement mode

When measuring the 72 colour patches the measurement mode should be taken into account. Hence the reference printing condition should be considered primarily. The measurement mode can usually be found in the header of the characterization data set. The header typically looks the following:

Illuminant:	D50
Backing:	White backing (wb)
Filter:	"No-Filter", meaning no UV or polarization filter
Observer:	2° observer

Currently a change in the industry regarding the measurement mode is about to take place: Away from the

established ISO 13655:M0 (D50 Measurement, UV content of a incandescent light bulb) towards ISO 13655:M1 (D50 measurement, best match to D50-UV). Yet, all existing Fogra characterization data sets are in compliance with measurement mode ISO 13655:2009/ M0. Currently M1 conforming printing conditions are under development so that choosing the correct measurement model will become more important in the near future.

Target reference

A basic requirement for colour measurement is a target reference file. The reference file connects the position of the patches with the measured values. Reference files are provided by measurement device or software tool vendors.

Inter Instrument,
Inter Model Agreement

Checking conformity or colour reliability depends on an accurate colour measurement. To minimize application- and conceptual errors the understanding of the used measurement mode is significant.

Despite the correct usage differences between devices of the same or different vendors can occur. These differences can be divided into "Inter Instrument Agreement" and "Inter Model Agreement".

IIA - Inter Instrument Agreement

- Identical measurement devices with the same aperture

IMA – Inter Model Agreement

- Same measurement devices with different apertures
- Measurement devices from different vendors
- Measurement devices with different design, same vendor

The reasons for possible variations can be subdivided in vendor and user originated differences:

Vendor:

- Differences in the design of devices that are in compliance with the specification of the relevant ISO standard (e. g. ISO 13655)
- Different calibration standards (NIST, PTB, NPL etc.)

User:

- Lack of knowledge for a correct handling of the device
- Lack of knowledge for substrate properties (lateral diffusion, opacity, translucence etc.).
- Poor care and maintenance (incorrect or no cleaning of the white reference tile)
- User errors (different apertures, wrong measurement settings, different backings)
- Calibration media error; calibration (tuning) on one material can result in major differences when measuring materials different from the media used for tuning

A correct care and maintenance is of great importance for the used devices. The drift of the devices over time should be reported as well. Guidance can be found in the ProcessStandard Digital (PSD).

3.4 Media Wedge evaluation

The Fogra Media Wedge CMYK 3.0 is directly supported by most digital front ends and proof and quality control software tools. The evaluation basically comprises three different categories:

- Checking colour reliability (contract proof according to ISO 12647-7 or Validation Print according to 12647-8)
- Conformance check according to an existing standard (e.g. conformance according to PSD against a defined reference printing condition)
- Conformance check according to individual aims (process control according to individual aims and tolerances)

In case of any problem or question, please directly contact your system or software vendor.

For test proposes only, a MS-Excel spread sheet will be provided , allowing for an evaluation of the first two categories. For the usage of the spreadsheet it is necessary to paste the CIELAB values from the clipboard or load them from an external measurement file. The spreadsheet is subject for further development. The usage is not recommended for daily use.

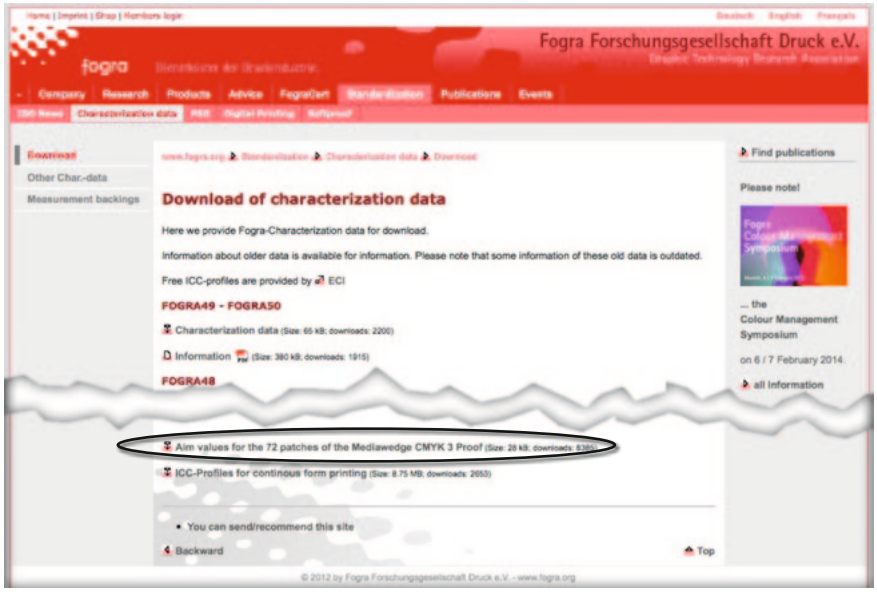


Fig. 6: Screenshot from the Fogra website, downloadable data sets for Fogra characterization data: www.fogra.org/en/fogra-standardization/fogra-characterizationdata/fogra-characterizationdata-download/

4 Licence agreement

The following is hereby agreed between
Fogra
Graphic Technology Research
Association, Streitfeldstraße 19,
81673 Munich, Germany,
referred to hereinafter as the licenser
– on the one hand –
and
the purchaser of the software,
referred to hereinafter as the licensee
– on the other hand –

§ 1 Subject of the contract

The subject of the present licence agreement is the image database 'Fogra Media Wedge'. This also includes all updates of these files which the licenser subsequently makes available to the licensee. The licenser is entitled, but not obliged, to produce updates of the software at his own discretion. The licenser reserves the right to offer further developments (i.e. extra layouts) which are subjected to charging.

§ 2 Licence

The licenser grants to the licensee, for the duration of the present contract, a simple licence to use the software on a single computer system at a location of his choice. If this single computer system is a multi-user system, this right of use applies to all the users of this one system. The licensee is permitted to transfer the software in physical form (i.e. stored on a data carrier) from one computer system to another. The licensee is not permitted to alter, translate, or – by reverse engineering – develop the image database, or to produce packages derived from the files. In addition, the licensee is prohibited from copying, or from otherwise reproducing, the image database either wholly or partially, whether in its original or in an altered form, or in a form which is mixed together with, or included in, other software. The licensee is permitted to create a single backup copy.

§ 3 Transfer and sub-licences

The licensee is not authorised to transfer the licence to third parties, to issue sub-licences, or in any other way to render the image database to be used by third parties, unless the licenser gives his express permission for the files to be transferred to the third party.

§ 4 Obligations to provide protection

The licensee undertakes that he will in no way change the licensed Media Wedge without the express agreement of the licenser. The licensee further undertakes that he will store the licensed Media Wedge safely, so that access by unauthorised persons, and in particular copying, are prevented.

§ 5 Right of inspection

The licensee grants to the licenser the right either himself to carry out an inspection, or to cause third parties to carry out an inspection.

§ 6 Guarantee

Should the data carrier which carries the image database of the Media Wedge be faulty, the licensee may, during a guarantee period of 6 months from the time of delivery, demand that a replacement delivery be made. For this purpose he must return to the licenser, or to the dealer from whom the Media Wedge was obtained, the data carrier, as well as any backup copy that may have been made, the accompanying documentation which was supplied to him, and a copy of the invoice or of the receipt.

§ 7 Limitations of liability

1 The licensed Media Wedge is a standard control device. Consequently, the licenser cannot guarantee that the licensed Media Wedge meets the licensee's requirements. Moreover, he cannot in the nature of the matter be liable for ensuring that the licensed Media Wedge is free of faults or that any faults that may exist can be corrected. As a result, the licenser is not liable for indirect damage or consequential damage arising from faults in the licensed Media Wedge. The licenser's liability is limited to liability for fraudulently withholding information concerning deficiencies.

2 The licenser does not know of any third parties' rights which would impair the licensee from using the Media Wedge. However, the licenser is not liable for the question of whether the licensed Media Wedge is free of third parties' rights. If – with the licensed Media Wedge being used in accordance with the agreement – any third parties assert rights against the licensee, the licenser will grant to the licensee, at the licensee's request and the licensee's expense, every possible assistance in defence against the claims being made against the licensee.

§ 8 Contractual conditions

Both contractual partners may terminate the contract for specific reasons, particularly

1 if the licensee is using the licensed Media Wedge on more than one computer system,

2 if the licensee inadmissibly copies the licensed Media Wedge in any other way or

3 if a contracting party commits other breaches of an essential contractual obligation and a period of 10 days has elapsed after the issuing of a notice by the other party without effect.

§ 9 Rights after the termination of the agreement

1 All the licensee's rights to use the Media Wedge which has been made available to him end when the contractual relationship ends.

2 The licensee undertakes – within one week of the contractual relationship coming to an end – to destroy the software which has been made available to him, to destroy any backup copy which may have been created, and also to destroy all the documents concerning the software, especially the documentation included in the delivery.

§ 10 Saving clause

Should a provision of the present contract be or become invalid, or should the contract contain a hiatus, the legal validity of the remaining provisions remains unaffected by this. Instead of the invalid or missing provision, a valid provision which, in terms of economics, comes the closest to the provision desired by the parties is deemed to have been agreed upon.

§ 11 Amendment of the Agreement

Any amendment to the present agreement must take written form in order to be valid. No oral agreements have been reached or will be regarding the present agreement.

§ 12 Place of jurisdiction, and applicable law

It is agreed that the Patent Litigation Chamber of the "Munich I Landgericht I" [Regional Court] is competent for all disputes arising from the present agreement. For this purpose the law of the Federal Republic of Germany is applied.

5 Literature

[1] N. N.:
Media Standard Print 2010 – Technical Guideline for Data and Proofs
Wiesbaden: Bundesverband Druck und Medien e.V., 2010

[2] Standard Series ISO 12647
Graphic technology – Process control for the production of half-tone colour separations, proof and production prints – Parameters and measurement methods
Acquisition: Beuth-Verlag, Berlin

[3] Standard ISO 12647-7:2007
Graphic technology – Process control for the production of half-tone colour separations proof and production prints – Proofing processes working directly from digital data
Acquisition: Beuth-Verlag, Berlin

[4] Standard ISO 12647-8:2012
Graphic technology – Process control for the production of half-tone colour separations, proof and production prints – Validation print processes working directly from digital data
Acquisition: Beuth-Verlag, Berlin

[5] KRAUSHAAR, A.:
PSD ProzessStandard Digital
München: Fogra, 2012

[6] BELZ, H.:
ProzessStandard Offset Printing
Berlin: Bundesverband Druck & Medien e.V., 2013 (in preparation)

[7] Standard ISO 12642-2:2008.
Graphic technology – Prepress digital data exchange – Input data for characterization of 4-colour process printing
Acquisition: Beuth-Verlag, Berlin

[8] N. N.:
Altona Test Suite 2.0 Application Kit
Wiesbaden: Bundesverband Druck & Medien e.V., 2013

[9] Standard ISO 3664:2009
Graphic technology and photography – Viewing conditions
Acquisition: Beuth-Verlag, Berlin

[10] Standard DIN ISO 13655:2009
Graphic technology – Spectral measurement and colorimetric computation for graphic arts images
Acquisition: Beuth-Verlag, Berlin

Fogra
Forschungsgesellschaft Druck e.V.
Streitfeldstraße 19
81673 München
Deutschland/Germany

Tel. +49 89. 431 82 - 0
Fax +49 89. 431 82 - 100

info@fogra.org
www.fogra.org