

The standard data format
for print production

PDF/X-3



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Wuppertal



FACHHOCHSCHULE STUTTGART
HOCHSCHULE DER MEDIEN

callas
software



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Foreword

Since the end of the 1990s, PDF has spread throughout the prepress sector at what seems in retrospect an enormous speed. Today, just about every company is confronted regularly with PDF. But the way in which PDF is used is by no means always to the full satisfaction of all concerned: sometimes fonts are missing or image resolution is too low, occasionally the content or colour of the production print differs significantly from the proof print given to the customer. This frequently leads to bitter arguments about who is at fault, and more than once the desire has been expressed for a return to the good old days before PDF.

The fact is that PDF cannot be ignored. The clever user will not waste his time moaning and groaning, but instead take a proactive approach, on the one hand by protecting himself against the imponderables of PDF and on the other hand utilising the undisputed advantages of PDF. However, not everyone has the time and patience, in addition to his daily work, to train to become a PDF specialist. Nevertheless many details must be clarified, e.g. which settings to use and which rules to follow for the creation, processing and output of PDF, and how the suitability of PDF for use in production can be determined.

These questions were dealt with by a Working Group attached to the Technical Committee 130 of the International Standards Organisation (ISO) and, with the participation of numerous international experts, a standard was developed called PDF/X, of which the most important parts were approved and published in 2001 and 2002. This standard may be considered in much the same way as a set of rules for controlling road traffic: priority for vehicles coming from the right, stop at the red light, observe speed limit, etc., but also for vehicle registration or a driving licence. The principle applies that: provided that everyone obeys the rules, they will all get ahead faster – and not to forget – arrive safely at their destination. But the comparison is not quite accurate in all aspects: there is no liability insurance or even comprehensive coverage insurance for PDF/X. Nor is there a PDF/X police, though a PDF/X-3 inspector does exist. It is in any case essential to think ahead and take care – also in the PDF data traffic.

This report sets out to give an introduction to the PDF/X standard and its implementation in practice. Numerous tips regarding useful software and more detailed information offer orientation for those interested in this topic.

1 ISO standard "PDF/X-3"

In April 2002, the ISO standard 15930-3:2002 (PDF/X-3) for the PDF-based transmission of digital printing copy was approved. This standard provides for the first time a clear set of rules for the safe and flexible use of the PDF format that is already highly popular in the graphics industry. It offers both manufacturers and all service providers the urgently required reliable basis for the development and introduction of modern solutions and work processes.

The following organisations contributed to the preparation of the PDF/X-3 standard: Bundesverband Druck und Medien (bvdM), EMPA/Ugra (Eidgenössische Materialprüfungs- und Forschungsanstalt/Verein zur Förderung wissenschaftlicher Untersuchungen in der grafischen Industrie, Switzerland), Ifra (INCA-FIEJ Research Association), European Color Initiative (ECI) and FOGRA (Forschungsgesellschaft Druck e.V.). Olaf Drümmer and Stephan Jaeggi, acknowledged PDF experts, were tasked with preparing the text of the standard.

The most important objectives of the development of the PDF/X-3 standard were: simplicity, practicality for use by as wide a range as possible of both profession and semi-professional users, guaranteed safety of use in the future, economically attractive possibilities of implementation.

Especially for the purpose of promoting the fast and widespread establishment of PDF/X-3, bvdM, EMPA/Ugra and Ifra financed a freely-available software for producing and checking PDF/X-3 files. As "PDF/X-3 Inspector (Freeware)", this Acrobat plug-in for Macintosh and Windows can be downloaded free of charge from the web site www.pdfx.info. In the meanwhile, a number of commercial tools and systems has become available that support PDF/X-3 directly or indirectly (a continually updated overview can be accessed under www.pdfx.info).

PDF/X-3 is also not the only standard in this area. Strictly speaking, PDF/X is a family of standards, the members of which cover different requirements. The PDF/X-1 version permits only CMYK and spot colours and is favoured in the U.S.A. In contrast, PDF/X-3 also permits device-independent colour spaces, therefore offering advantages for colour management, the practice of which is gradually becoming more widespread. As opposed to this, PDF/X-2 is a standard that – other than PDF/X-1 or PDF/X-3 – focuses on the transmission of incomplete printing copy, e.g. low-resolution space savers for image data. Appendix A contains a list of the various PDF/X standards.

2 Fundamental principles of PDF/X-3

2.1 PDF/X-3 – Consolidation in times of technical change

At first glance it may not seem necessary to everyone to regulate the transmission of digital printing copy by means of an ISO standard. After all, in the past – though not always without difficulty – it was possible to successfully produce printing copy and transmit it to publishing and printing operations. Nevertheless, there have been so many changes in the graphics industry during the last years to make an orientation aid, such as a mature and practice-based ISO standard can offer, seem more than desirable.

At the beginning of the 1990s, desktop publishing arrived to take the place of composition and EIP systems. A de-professionalisation of printing copy production can be observed in many areas. The rapid fall in prices for devices and software gives impetus to this development – and raises expectations that such equipment can be used to produce printing copy in a quality that is immediately suitable for all types of printing runs, even without professional know-how.

For as long as films continued to be exposed and analogue proofs were made from them, there was a simple and clear control procedure. Serious faults could be detected in time, either at the exposure stage or at the printing plant.

Those who already early on began to supply digital printing copy worked with the market-leading QuarkXPress layout program that – at least provided that only the Apple Macintosh platform was used that was also predominant in the graphics industry – acted extremely consistently and reliably. The obstacles and few weakpoints were generally known and there was a great deal of practical experience available of working with XPress, especially also as regards film separation.

With XPress, exactly as with other DTP applications, it was always the DTP application itself that did the separation required for film exposure – by methods that emerged about 1990 and became established during an entire decade as seldom formally acknowledged, de facto standards. Independent of the output device used, these separations – nearly all of single pages – always turned out the same, whether it was a b/w printer with PostScript capability used for test separations or the film imager that was concerned.

The trend towards Computer-to-Plate technology that took off in the second half of the 1990s called for the digital separation of complete printing formes, which first had to be imposed as PostScript or increasingly PDF digital. PostScript files nearly always involved very large data volumes. As opposed to this, PDF had much leaner data files and in addition could be displayed at will on the screen – as a single page or an imposed sheet – and therefore quickly developed to become a very welcome alternative for the transmission and processing of finished pages.

But not every PDF that looked good on the display screen or on a colour printer could be exposed without dif-

ficulty. Adobe Acrobat simulates missing fonts in an impressive approximation of the original font, too-low image resolutions are not directly noticeable on the display screen. In addition, PDF and Acrobat offer numerous possibilities for application areas other than the prepress sector. Interactive elements, such as notes or forms fields, appear not only on the display screen, but occasionally also in print, and are nearly always in colours that are unsuitable for print reproduction. The frequency of “suboptimal” PDF files increased strongly also because tools for their production became very low-cost and are now in very widespread use. The Apple Mac OS/X operating system even offers direct storing of PDF from standard programs, such as Microsoft Office.

In the light of these developments, it seemed especially urgent to “clip” the overpowerful and multi-faceted PDF format in such a way that all important advantages are retained, but risky aspects avoided. Moreover, it was also aimed to establish a uniform approach to using PDF for transmitting printing copy. Thus the ISO PDF/X standard not only defines a subset of PDF, but also determines important aspects of producing and processing PDF/X.

2.2 What is the difference between PDF/X-3 and PDF?

Since Acrobat 4 and PDF version 1.3 became available in 1999, the use of PDF to transmit digital printing copy has become very popular. It is already used successfully and has largely replaced analogue film at many operations. Despite this, lesser or greater imponderabilities are repeatedly encountered, especially if the service providers concerned have difficulty in exactly defining the nature of the PDFs to be transmitted. Because the graphics industry is only one of many areas of application for PDF, there is a whole series of settings and properties that can adversely affect the processing of PDF – for example, a note on a page could unintentionally be burned-out. This is where PDF/X-3 comes in and exactly defines the minimum requirements a PDF/X-3 file must satisfy, and which properties are inadmissible because they could disturb the reliable processing. The most important aspects are listed in the table on page 7.

A more technical, complete list and description of the formal requirements of a PDF/X file is included in the PDF/X-3 Inspector Technote “Conversion and verification of PDF/X with PDF/X-3 Inspector (Freeware) and pdfInspector2”. This list is also suitable for use as a basis on which to evaluate other PDF/X-3 tools for their support of the PDF/X-3 standard.

2.3 Who invented PDF/X-3?

PDF/X-3 is the European reaction to PDF/X-1. As far back as 1996, the CGATS – the Committee for Graphic Arts Technologies that is a part of the U.S. ANSI standards or-

Property	PDF	PDF/X-3
Version	current version 1.5	1.3 (and previous versions)
Page geometry	specifications open	precise specifications concerning the size of the trimmed page (TrimBox) and – where relevant – the bleeding (BleedBox)
Compression	no limitations	LZW not permitted because patented by Unisys
Notes, comments, forms fields	no limitations	permissible only outside the page area to be printed
JavaScript, Actions	no limitations	not permissible
Embedded PostScript	use not recommended, but allowed	not permissible
BX...EX (instruction that unknown commands may be ignored)	no limitations	not permissible (all commands must be processed in accordance with PDF 1.3 specification)
Information about trapping status (Trapped key)	optional	it is vital to state whether the PDF/X-3 file is undergoing trapping (or no trapping required respectively) or whether the receiver is responsible for the trapping
Embedding of the used fonts	optional	obligatory (in which case fonts can be embedded optionally totally or as sub-groups); in addition, each PDF/X-3 processing software must use the embedded fonts and may under no circumstances use fonts that may possibly already be installed on the workplace computer or RIP
Transfer curves	no limitations	not permissible
Screen settings	no limitations	permitted; but receiver may ignore screen settings; if the sender expects the included screen setting to be observed, this must be agreed separately with the receiver.
OPI comments	no limitations	not permissible; all images must be contained in a full resolution that is suitable for print production.
Colour	no limitations	only device-dependent colours of the printing process (therefore usually CMYK and spot colours) and device-independent colours may be used. If device-independent colours are used, both the embedded ICC profiles and the Rendering Intent defined in the PDF must be taken into account in the further processing.
Preseparated pages	no limitations	only unseparated (composite) pages are permissible in a PDF/X-3 file.
Embedded non-PDF data	enables embedding of data otherwise unavailable in the PDF format, e.g. TIFF/IT or Copydot files.	data required for processing a page must without exception be in the PDF format and must be part of the page description in the PDF/X-3 file.

Property	PDF	PDF/X-3
Specification of the intended printing process, including colorimetric characterisation (OutputIntent)	introduced with Technote 5413 (January 2001) or PDF 1.4 respectively; optional	obligatory; it is also essential that the specifications in the OutputIntent must also be used for producing proofs as well as converting device-independent colours for the separation into the process colour space of the output device.
PDF/X identification (GTS_PDFX key)	introduced with PDF 1.4; optional	obligatory
Transparency	defined, or permissible respectively, from version 1.4 of the PDF format	transparency not permissible because PDF/X-3 is based on PDF 1.3.
JBIG2 compression	defined, or permissible respectively, from version 1.4 of the PDF format; JBIG is a compression process for line data (bitmaps), obtainable in loss-free as well as loss-afflicted versions. It is usually much more efficient than the “CCITT Fax Group 4” compression process previously in widespread use.	JBIG2 not permissible because PDF/X-3 is based on PDF 1.3.

ganisation – began to consider a PDF-based standard for the exchange of digital printing copy. The “ANSI PDF/X-1:1999” national standard that was developed between 1996 and 1999 was originally intended to be introduced in parallel also as an ISO standard. However, numerous European specialists did not approve of several somewhat unfortunately phrased elements in this U.S. draft proposal. Such reservations were expressed, for example, by Stephan Jaeggi on behalf of the ECI and the Technical Committee of the bvdm at the ISO meeting in autumn 1998 in St. Gallen.

From the U.S.A. came the promise to revise the draft standard in the light of these reservations – but this, in fact, never happened. Against this background, the German and Swiss ISO members felt compelled to develop their own strategy. At the ISO meeting held in spring 2000 in Mesa, Arizona, the direction of this strategy was formulated in a slightly tense atmosphere and it was made clear that an unchanged PDF/X-1 draft would be opposed not only by Germany and Switzerland. At the same time, bvdm and EMPA/Ugra commissioned the two PDF experts, Stephan Jaeggi and Olaf Drümmer, to prepare an alternative PDF/X draft standard.

This draft – that was later approved as PDF/X-3 – was presented and discussed intensively at the next ISO meeting in autumn 2000 in Swansea. It emerged that the work of Jaeggi and Drümmer had led to a more highly conclusive and practical draft standard than the U.S. PDF/X-1 standard. Advocates of PDF/X-1 also very quickly expressed the wish to incorporate the good qualities of the

PDF/X-3 draft. But it proved impossible to agree to combining both draft standards to a single standard. PDF/X-1 only allows CMYK and spot colours, while PDF/X-3 also permits device-independent colour spaces, something that the Europeans, mainly due to the rapid technological developments in the graphics industry, considered a vital component from the start. Thus ISO finally decided to take the following approach:

- > there would be two separate standard parts (the numbering system, that at first glance seems disconnected, resulted from the second standard part of the standard “PDF/X-2” that is likewise already at the preparation stage and that – in deviation from the strategy in PDF/X-1 and PDF/X-3 – focuses on the safe transmission of incomplete data; which can be high-resolution images or fonts that are not contained in the transmitted file. PDF/X-2 at present has the status of a technical specification because the actual finalisation of this standard part is experiencing considerable delays due to several serious technical problems.)
- > the first part (PDF/X-1) would only permit CMYK and spot colours
- > the other part (PDF/X-3) would also permit ICC-based colour spaces and Lab
- > where possible, both parts should be worded identically.
- > the first part should be revised on the basis of the advantages of the PDF/X-3 draft.

This meant considerable work that was then performed between September 2000 and April 2002. PDF/X-1 was officially approved as an ISO standard in May 2001 and

published by ISO in December 2001, PDF/X-3 was accepted in April 2002 and published in September 2002.

2.4 What can I do with PDF/X-3, and what not?

PDF/X-3 is a standard for the transmission of press-ready digital printing copy. To that extent, PDF/X-3 is ideal for cases where digital printing copy must be transmitted to a different site. Put another way: for such cases in the past when analogue film or ready-for-use application files requiring no further intervention by the receiver had to be supplied, today PDF/X-3 can and should be used.

PDF/X-3 provides defined transfer points between the parties involved in the production of a print object. This is all the more important in cases where the parties do not know each other or are unable to agree all details.

PDF/X-3 was not designed for internal workflows, where it is theoretically possible to completely control the work processes, so that having printing copy in the PDF/X-3 format does not necessarily have advantages. But it is not easy to define clear limits here. For example, if in a larger company there are newsrooms, prepress departments and printing divisions, then making available printing copy as PDF/X-3 can have considerable advantages.

2.5 How do I produce PDF/X-3?

In most cases, the first step is to produce a PDF file prepared in accordance with production requirements, and in a second step convert it to a PDF/X-3 file. The most efficient and reliable way to produce PDF files at the prepress stage continues to be to write a PostScript file with subsequent distilling of this PostScript file with Acrobat Distiller 5.05. The suitable settings for PostScript file production and the distilling process are described in detail in the "PDF/X cooking recipes".

Recommended as a tool for converting from PDF to PDF/X-3 is the callas "PDF/X-3 Inspector (Freeware)" that can be downloaded free of charge from www.pdfx.info. This is a plug-in designed for use with Adobe Acrobat under Macintosh (Mac OS 9.04 to Mac OS 9.2.2 as well as Mac OS/X from 10.1.3) and Windows (98 SE, ME, NT,

2000, XP). Unfortunately, it cannot be used with the free-of-charge Acrobat Reader.

Pay-for commercial alternatives to PDF/X-3 Inspector (Freeware) are:

- > pdfInspector2 from callas software (www.callassoftware.com); offers more extensive proofing possibilities and automation capability;
- > MadeToPrint XT from callas software (www.callassoftware.com); permits the production of PDF/X-3 from QuarkXPress;
- > PitStop or PitStop Server from Enfocus (www.enfocus.com); more extensive proofing possibilities as well as optional corrections;
- > PDF/X CheckUp from Apago (www.apago.com); more extensive proofing possibilities.

Further solutions from several manufacturers for the production of PDF/X-3 files are expected to become available in the next months. A corresponding, continuously updated list can be viewed under www.pdfx.info.

Since May 2003, it is possible with Acrobat 6.0 Professional to produce PDF/X-3 directly from PostScript. Distiller 6.0 offers corresponding configuration possibilities, carries out the necessary checks on observance of the standard at the time of conversion to PDF/X-3 and directly generates the PDF/X-3 file. Moreover, installation of Acrobat 6.0 Professional installs, an "Adobe PDF" printer driver that can produce (PDF and) PDF/X-3 directly from nearly every application. In addition, the preflight module – a version of the callas software pdfInspector2 – integrated for the first time, offers the possibility to produce PDF/X-3 from existing PDF files as well as to check PDF/X-3 files. For users of Acrobat 6.0 Standard – which does not include the preflight module and PDF/X functions – it is recommended to continue to use the PDF/X-3 Inspector (Freeware).

Since November 2003, the new version of the Adobe Indesign 3.0 layout program offers direct export of PDF/X from the application, without the extra step of print output or Distiller application.

Although Quark integrated an extensive PDF support into the new version of the QuarkXPress 6.0 layout program that was released in summer 2003, the user must continue to manage without direct export to PDF/X.

3 PDF/X-3 production – a quick run-through

In order to give an impression of how a PDF/X-3 file is produced and processed, the most important steps are shown in the following. Much more detailed instructions are given in the “PDF/X-3 cooking recipes” that can be downloaded under www.pdfx.info.

Producing printing copy in a layout or graphic application

For the PDF/X-3 standard it is of little consequence which application is used to produce printing copy. Frequently-used applications are QuarkXPress, Adobe PageMaker, Adobe InDesign, Adobe Illustrator, Macromedia Freehand, CorelDraw, etc. In the following, due to its widespread use, we shall confine our comments to QuarkXPress. In addition, we will not deal in greater detail here with the use of device-independent colour, such as ICC or Lab-based colour spaces.

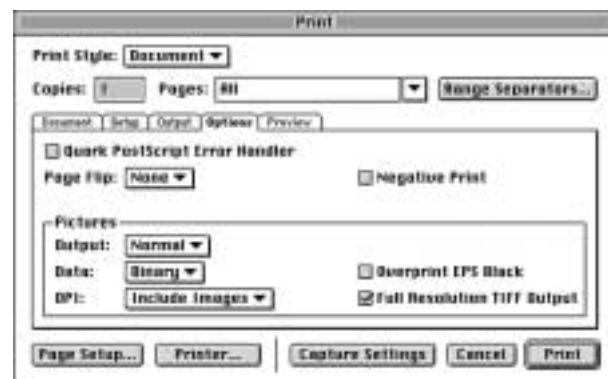
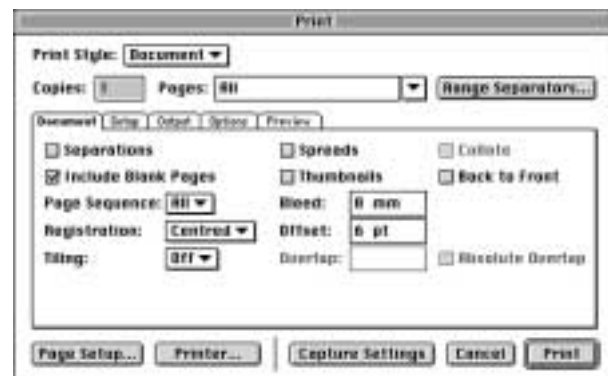
Ideally, the pages are designed in accordance with the size of the trimmed, finished pages and any objects that do not fit are positioned about 3 mm outside the page margin. Objects in XPress are coloured with suitable CMYK values or as spot colour, images imported as TIFF or JPEG and graphics as EPS.

For outputting TIFF images or special colour gradations, XPress produces suboptimal PostScript code. In such cases, it is recommended to use the free ColorTIFF XTension for XPress and the Distiller Assistant from Creo (download free of charge www.prinergy.com).

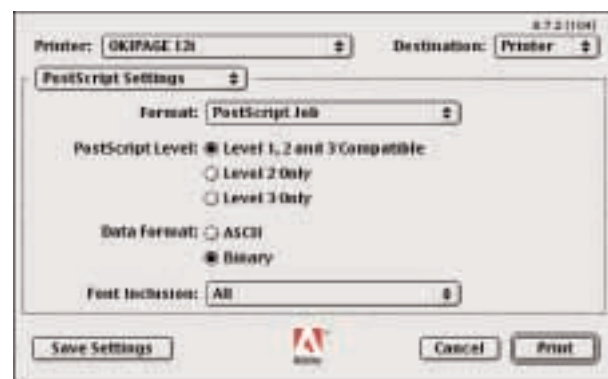
Producing PostScript

When producing the PostScript file destined for conversion to PDF with the Acrobat Distiller, the following points should be taken into account:

- > it is recommended to use the Distiller-PPD;
- > the page format should be suitably set; cutting marks require 30 point per page margin in the basic setting, with a net A4 page size it is possible to manage without the otherwise necessary mental calculation and input for the page width “210 mm + 60 pt” (60 pt = 2 x 30 pt corresponds to the required width of the cutting marks for left and right in each case). The page depth can be calculated automatically by XPress. As alignment, select “left edge”;
- > once the cutting marks are activated, Distiller recognises automatically the net page dimensions;
- > the bleeding instruction should be set in the usual way (basic setting: 3 mm);
- > output must be done, unseparated, in CMYK mode;
- > images must be output in full resolution;
- > fonts must be completely embedded already at the time of PostScript production.



Settings in the Xpress printing dialogue



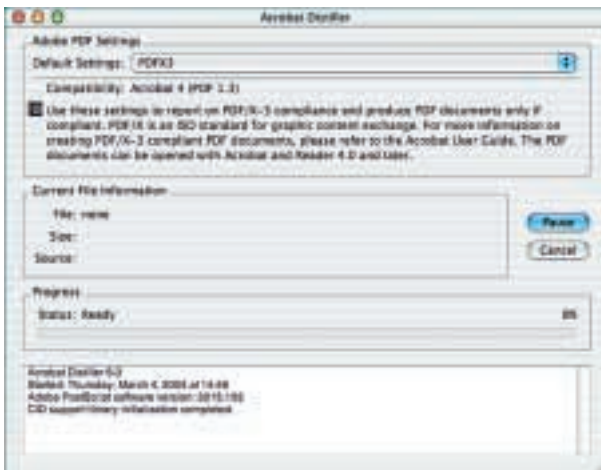
Settings in the operating system printing dialogue:

PostScript after PDF distilling

- > as a first step, the “PDF-X_Distiller5.joboptions” presetting file supplied together with the PDF/X-3 Inspector must be copied into the “Settings” folder of Distiller 5.
- > if spot colour gradations were used in XPress, then the Distiller Assistant from Creo should be installed (download free of charge under www.prinergy.com);
- > in Distiller itself, before distilling the “PDF-X_Distiller5” setting is selected and the PostScript file converted to PDF

Inspecting PDF

The produced PDF file should under all circumstances be opened in Acrobat 5.05 and inspected in order to ensure



Setting PDF-X_Distiller5 joboption:

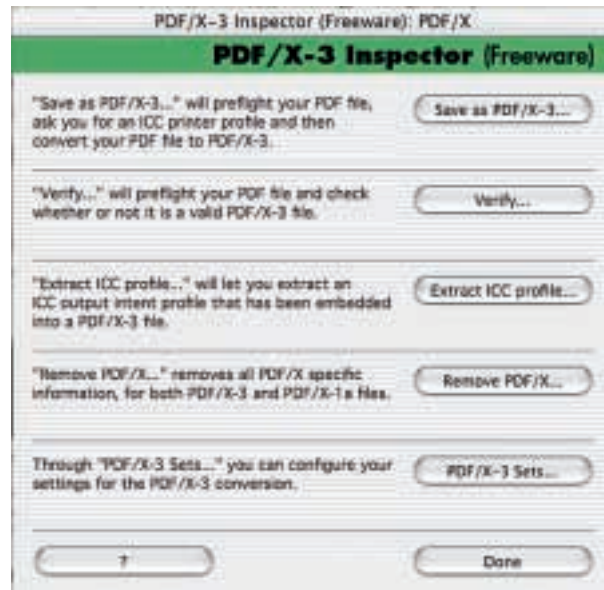
that its content and colour corresponds to expectations. To do so, it is vital to deactivate “Use local fonts” in Acrobat in order to be able to recognise non-embedded fonts in due time.

- > with the “Geometry Editor Plug-In” from Creo (free-of-charge download from www.prinergy.com) it is possible to check the settings for the page geometry (size and position of net page – referred to in PDF as TrimBox – and bleed – referred to as BleedBox) and correct as necessary;
- > soft proofing can be done already on the display screen by selecting the ICC output profile for the printing process for which the PDF file was prepared in the “Settings for proof printing”. The most common ICC output profiles for the most important printing processes are supplied with the PDF/X-3 Inspector.

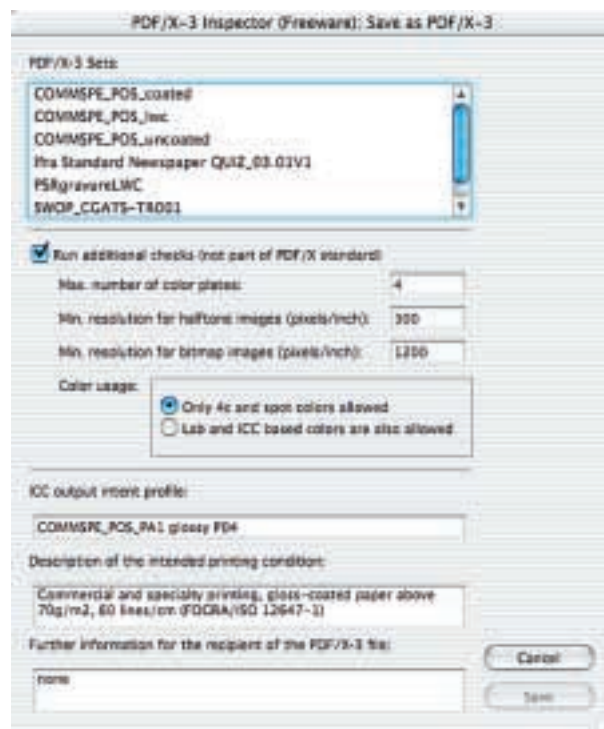
Converting to PDF/X-3

If the checking of the PDF in Acrobat is successful, the PDF can be converted to PDF/X-3 by means of the PDF/X-3 Inspector:

- > Retrieve the menu item “PDF/X-3 Inspector (Freeware)”
- > click “Save as PDF/X-3”
- > select desired printing conditions
- > as an option, additional checks can now be run that are not defined in the PDF/X-3 standard itself. For example, it can be set that only CMYK and spot colours should be permitted, a minimum resolution can be de-



Main dialogue of the PDF/X-3 Inspector

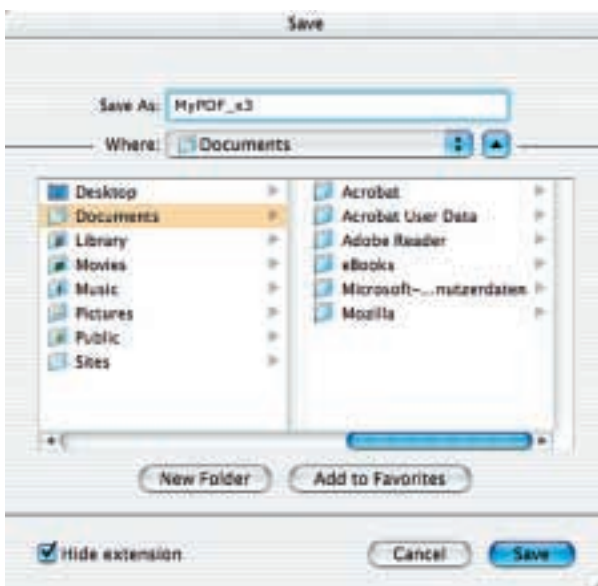


A selection of the planned printing conditions as well as optional additional checking settings

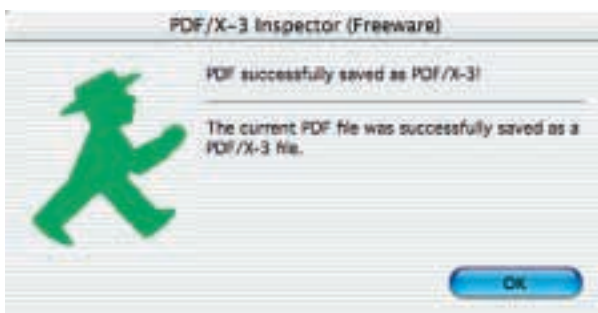
fined for images and a maximum number of colour separations.

- > click "Save"
- > state where the PDF/X-3 file should be stored

Provided that the PDF/X-3 Inspector has not detected any problems, the user receives confirmation that conversion to PDF/X-3 was successful.



Stating destination for saving the PDF/X-3 file



The PDF file was successfully saved as a PDF/X-3 file.



Storing as PDF/X-3 unsuccessful

If one or several errors are detected, the system informs the user that problems have been encountered.

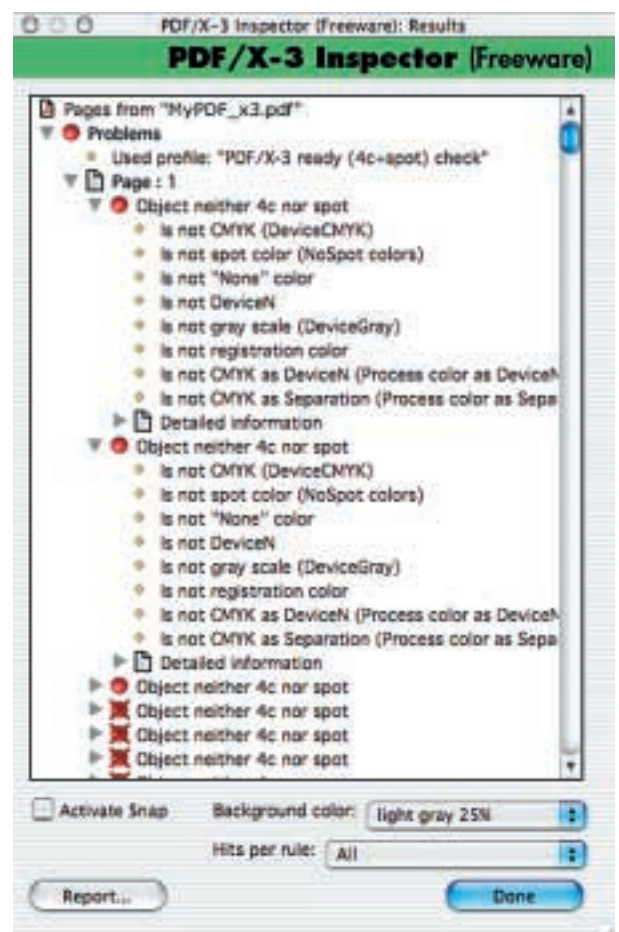
In such a case, problems have been encountered with the conversion to PDF/X-3. For more details, click "Anzeigen..." (view).

By clicking "Anzeigen..." the user obtains a more exact impression of where the problems lie (compare also the remarks in the following section).

Proofing

The PDF/X-3 standard specifies that the only binding proof is one that was produced from the PDF/X-3 file itself. For this purpose, the proofing system must be configured with exactly the same ICC output profile that was used also for the printing conditions when storing as PDF/X-3. If necessary, you can take a copy of the ICC output profile from the PDF/X-3 file itself by clicking on "Extract ICC profile" in the PDF/X-3 Inspector dialogue and storing the ICC output profile in a suitable way.

N.B.: It is important not to confuse the ICC profile for



The check result of the PDF/X-3 Inspector indicates that, in this case, the desired image resolution, though not required by the ISO standard, was not reached.

the proofing system with the ICC profile for the printing process that is to be simulated – two ICC profiles are always used for proofing. The proofer profile describes the colour behaviour of the proofing system when a specific paper as well as specific inks are used. The ICC profile for the print to be simulated does the same, but for the corresponding printing process. At the time of proofing, the PDF is first converted via the ICC output profile for the printing process to the colour space of the printing process that is to be simulated and from there, by means of the proofer profile, to the colour space of the proofing system. Because in most cases the proofing system is able to reproduce more colours than the subsequent printing process, it can in this way – as a type of illusionist – simulate the printing process.

At the receiver end, a PDF/X-3 file should be proofed in the same way in order to see the later printed result that awaits the sender.

Processing

A number of workflow systems and production environments are now available that are capable of working completely with PDF. Even in cases where total support for PDF/X-3 is not available it is usually also possible to produce successfully with PDF/X-3. The decisive factor is that – whether it is single PDF pages or imposed PDF sheets that are to be output – when separating use in-RIP separation in a modern PostScript RIP or PDF-RIP.

The same applies also if, for example, printing and separating is to be done from Acrobat as PostScript – be sure to set PostScript 3! In this case either the in-RIP separation can be activated in the PostScript-RIP or plug-ins such as Crackerjack from Lantana (www.lantanarips.com) or MadeToPrint (www.callassoftware.com) can be used.

If the workflow does not fully support PDF, the PDF data must be converted to EPS (once again, it is essential to ensure that this is exported as PostScript 3) and subsequently imported into the concerned applications. Here also, it is vital that the separation is done by means of in-RIP separation.

4 The problems most frequently encountered when converting to PDF/X-3

There are several problems that may repeatedly be encountered. Some can be overcome, but others require the source document to be changed or PostScript produced again.

4.1 Fonts not embedded

If, when the PostScript files were produced, it was forgotten to activate embedding of all fonts with the result that Distiller cannot find the font concerned, it will also not be embedded into the PDF. But embedding of the fonts is essential for a safe production. In this case, the font must be acquired or a different font used when producing the source document.

A similar problem can occur if fonts are used whose embedding is prohibited by licensing laws. Both TrueType and OpenType fonts may contain an element in the font itself that prevents embedding. As long as Type 1 fonts are used, at least from the technical point of view, this problem will not be encountered. In principle it can be stated that fonts which cannot be embedded are unsuitable for use in modern printing copy production. It is recommended to look for corresponding alternatives.

4.2 Page geometry

On an exposed film, provided that cutting marks are present, the human eye can easily recognise how large the net page should be. However, an imposition program or output system does not have eyes, so that information about the net page size and bleed must be available in digital form if PDF files are to be automatically positioned and output. The most important specifications here are:

- > TrimBox: position and size of the area for the trimmed page or net page
- > BleedBox: TrimBox plus the area for bleed
- > MediaBox: this is a type of virtual film role as "imagined" area on which the actual page – defined by TrimBox and possibly BleedBox – is located. MediaBox usually results from the page format that is set in the Set Page or Print Dialogue of an application.

In many cases, PDF files that contain no information in relation to TrimBox or BleedBox are produced from the PostScript distilling. But this is stipulated for PDF/X-3.

With the Acrobat plug-in "Geometry Editor Plug-In" (download free of charge under www.prinergy.com) it is possible to subsequently incorporate the corresponding information.

4.3 Transparency

Transparency was introduced with PDF 1.4 (PDF/X-3 based on PDF 1.3). Not least because the output of PDF documents with transparent objects has not yet been perfectly realised – especially where spot colours are involved – it is essential that transparency for PDF/X-3 files should be avoided.

4.4 RGB data

Especially when PDF documents are produced from applications that are unsuitable for prepress production, e.g. Microsoft Office, the page content is wholly or partially in RGB, which is not permissible for PDF/X-3 and output in CMYK process colours. With tools such as Quite A Box Of Tricks (www.quitea.com), Pitstop (www.enfocus.com) or iQueue (www.gretagmacbeth.com), such documents can be converted to CMYK in a controlled process.

4.5 No problem (anymore)

There are several properties that are not permissible in PDF/X-3 files which the PDF/X-3 Inspector automatically removes, or changes into permissible properties respectively, that the user therefore need not worry about:

Automatically solved problems:

- > **LZW compression** is patented by Unisys belegt, which is why ISO chose the equivalent ZIP compression. If PDF/X-3 Inspector encounters LZW compression when storing as PDF/X-3, this will be converted to ZIP compression automatically and without loss.
- > **Embedded PostScript** (as PostScript XObjects and PostScript Operator) is extremely seldom and is removed by PDF/X-3 Inspector.
- > **Transfer curves** can influence output in the RIP in an unpredictable way and are removed automatically by PDF/X-3 Inspector. In principle, it is preferable to have

this done at the time of distilling by the Distiller and to activate the application of transfer curves that may be present.

- > **BX...EX** ensures the backwards compatibility with older Acrobat versions - these may ignore everything positioned between BX and EX if they are unable to interpret it. At present, BX....EX is used mainly with Smooth Shades (resolution-independent, coded gradations). PDF/X-3 Inspector removes these BX...EX-

Codes, Acrobat from version 4 as well as all modern RIPs have no problem processing Smooth Shades.

- > **OPI comments:** Because a PDF/X-3 file must be complete in itself, the presence of OPI comments in a PDF-X-3 file is not permissible. PDF/X-3 Inspector removes all OPI comments that may be contained in a PDF file. In principle, it is preferable to switch off the receiving of OPI comments already at the distilling stage.

5 Additional checks in PDF/X-3 Inspector

Certain specifications, such as image resolution or number of expected colour separations, cannot be uniformly standardised – the requirements in practice are too manifold to establish uniform specifications for the entire printing industry. Despite this, such properties must be checked. In order to save the user having to carry out a separate checking step with one of the usual checking programs, the following additional checking possibilities – not included in the ISO PDF/X-3 standard – were integrated into the PDF/X-3 Inspector:

- > maximum number of colour separations: any number can be entered – e.g. “4” if checking is done for CMYK printing, or “2” if black must be produced with an additional colour.
- > minimum resolution for continuous tone images: for each printing process there is usually a typically required minimum resolution for images. Whereas in newspaper printing 150 dots/in suffice, high-quality commercial printing demands 300 dots/in. At the same time, in individual cases it can occur – e.g. screen shots – that the resolution does not exceed 72 dots/in. For this reason, it is recommended to preset the regular resolution and lower the resolution as required in individual cases, e.g. if a document contains screen shots.
- > minimum resolution for line artwork: the same applies as detailed in the above, but for line artwork (bitmaps). If Copydot scans – i.e. films scanned as bitmaps – are expected, the value should be set as high as the usually used exposure resolution in order to recognise unintentionally down-calculated Copydot scans in time.

6 Colour management and PDF/X-3

6.1 What about ICC profiles in PDF/X-3?

ICC profiles have a special importance for PDF/X. On the one hand, ICC profiles can be used in a PDF/X-3 file in order to exactly colour-define an image or other object. It is by no means obligatory to use ICC profiles in a PDF/X-3 file for images or other objects – indeed, it is absolutely permissible to build a PDF/X-3 file exclusively with CMYK and spot colours. On the other hand, an ICC output profile is used in the so-called “OutputIntent” to indicate the printing conditions for which a PDF/X-3 was created.

It should be noted here ICC profiles for objects on a PDF page always affect the result when displaying or outputting a PDF/X-3 file. As opposed to this, the ICC output profile in the OutputIntent serves initially only for information purposes – it tells the receiver of a PDF/X-3 file for which printing process that file was created. Furthermore, it should be used to correctly separate PDF/X-3 files that use not only CMYK and spot colours but also ICC-based or Lab-based colours.

Finally, it is specified that, for proof production, the ICC output profile embedded as OutputIntent should be used in combination with the ICC profile for the proofing system. It is extremely important for practical application that the ICC output profile is not used automatically in OutputIntent, but only by corresponding defaults, or settings in the processing routine of the receiver respectively.

Thus some proofing systems offer an option that automatically recognises the ICC output profile in OutputIntent and takes due account of it for the proof simulation. In the same way, both Colorserver and iQueue from GretagMacbeth automatically evaluate the OutputIntent and on its basis convert a PDF/X-3 file to a PDF that only uses CMYK and spot colours. Finally, there are PostScript-RIPs that automatically use the ICC output profile embedded as OutputIntent for the separation. But in all cases the user must activate the corresponding functions. Especially with PDF/X-3 files that only use CMYK and spot colours it is possible to carry out the separation without having recourse to the ICC output profile embedded as OutputIntent. A precondition for this is, naturally, that the OutputIntent suits the actual printing process – thus, for example, printing gravure data by the newspaper printing process causes considerable quality problems.

6.2 Which output profiles should I take for OutputIntent?

OutputIntent is intended to indicate the printing conditions for which the PDF/X-3 file to be transmitted was prepared. Accordingly, the ICC output profile in the OutputIntent is also the determining factor (at both transmitting and receiving ends) for the production of a bind-

ing colour proof. But which output profiles should ideally be used?

The impression could very quickly arise that every printing operation should produce an ICC output profile for its printing process with the most common types of paper to present to the data providers. However, this starts to get difficult if, at the time of preparing the printing copy, it is not yet certain at which printing site the printing will be done, or if several printing sites are supposed to produce the same object with the same content and colour. It has become very clear in the last years that it makes more sense overall from both the economical and technical point of view for a printing site to align its processes with the specifications of ISO 12647 and print in accordance with this ISO standard. Detailed information is contained in "Medienstandard Druck" published by bvdM, or the information published by Ifra on the "Newspaper Printing Quality Initiative (QUIZ)". In this case, it is fully sufficient to use ICC output profiles that correspond to the ISO standard and that match the desired printing process, such as are supplied with the PDF/X-3 inspector. In addition, this saves complicated conversion processes while retaining the possibility to carry out corresponding conversion processes if, for example, it is desired at short notice to produce an offset print object in a short printing run on a digital press.

6.3 Treatment of device-independent colour spaces in PDF/X-3 files at in-RIP separation

There are two aspects here that require special attention:

- > PDF/X files can either use device-dependent colours (CMYK and spot colours) only, or device-independent colours, such as ICC-based RGB (usually in addition as, for example, black for text will always be coded as device-dependent black).
 - > the target colour space for printing defined by OutputIntent either matches the actual printing conditions, or it does not.
- (a) if the PDF/X-3 files use exclusively device-dependent colours and the OutputIntent matches the actual print colour space, the in-RIP separation will be correct on every modern PostScript 3 RIP; no further steps be-

yond activating the in-RIP separation are necessary in order to output content and colour correctly.

- (b) if the PDF/X-3 file exclusively uses device-dependent colours and the OutputIntent does not match the actual print colour space, the device-dependent colours must be converted to the device-dependent colours that correspond to the actual printing process. Conversion can be done either during the in-RIP separation in the RIP, by setting the ICC profile in the OutputIntent as accepted source profile ("UseCIE" in PostScript 3), and in addition by loading the ICC output profile that characterises the actual printing process as target profile (as Color Rendering Dictionary, or CRD) into the RIP. Another possibility is to use a so-called Colorserver, such as the GretagMacbeth iQueue, and after conversion carry out the in-RIP separation.
- (c) if the PDF/X-3 file also uses device-independent colours and the OutputIntent matches the actual print colour space, then the ICC profile that characterises the ICC profile must be loaded into the RIP as target profile (as Color Rendering Dictionary, or CRD) and activated before the in-RIP separation can be carried out.
- (d) if the PDF/X-3 file also uses device-independent colours and the OutputIntent does not match the actual print colour space, then both the contained device-dependent colours must be converted into the device-independent colours of the actual colour space as well as firstly the device-independent colours into the colour space given in the OutputIntent and from there into the colour space of the actual printing process. The latter process in particular cannot usually be done with today's PostScript 3 RIPs. Instead, it is essential here to use a Colorserver, e.g. the GretagMacbeth iQueue, in order to be able to do the conversions in a suitable differentiated way. Because a Colorserver can carry out the conversion, in part in several stages, in a single step, there is minimum risk of inaccuracies in the conversion and corresponding colour faults, or tonal differentiation respectively.

Items (a) to (d) clearly demonstrate that it is vital to use exactly the ICC profile for the OutputIntent that characterises the actual printing process. Whereas it is possible to adapt to a different target colour space, this involves considerably more work.

7 Use of PDF/X-3 files

7.1 How do I check PDF/X-3?

It is recommended always to check whether data that is to be supplied or is received is genuinely in accordance with the PDF/X-3 standard. For this purpose, the same tools are used as in the above “How do I produce PDF/X-3?”

7.2 How do I proof PDF/X-3?

Every PDF/X-3 file should be proofed before transmission as well as on reception. This is the only way to guarantee both content and colour correctness. In individual cases, a proof that is produced at the transmitting end in a preceding production step – e.g. from the layout or graphic program – can deviate significantly from what is required and is not sufficient guarantee for the correctness of content and colour of the PDF/X-3 file.

Because proofing systems produce in part very different results – both in relation to content and colour – it is worthwhile to check the proofing system intended for use for its suitability for PDF/X-3. This can be done using the “Altona Test Suite” of the European Color Initiative (ECI) that can be downloaded free of charge as a set of three PDF/X-3 files, together with detailed information on how to use and evaluate the test pages, from the ECI web site (www.eci.org).

7.3 How do I process PDF/X-3?

PDF/X-3 is a standard for unseparated printing copy. Separation should be done exclusively via an in-RIP separation in a modern PostScript 3 RIP (in the case of RIPs based on Adobe technology from Revision 3015, or Harlequin-based RIPs from ScriptWorks 5.5).

Older RIP software does not offer sufficient production safety. It is strongly advised against so-called host-based separating out of QuarkXPress, likewise out of many newspaper systems – the processes used are not sufficiently powerful to separate reliably in regular PostScript 3 or PDF 1.3 set-ups – e.g. DeviceN (for duplex images or special colour gradations) or “smooth shades” (gradations defined independently of resolution). The PDF workflow systems of various manufacturers also work with in-RIP separation, even though the user often does not notice this as such. When using such workflow systems, however, care should also be taken to ensure that sufficiently recent versions (see above) of the RIP software concerned are used.

7.4 How do I incorporate PDF/X-3 into my working environment?

Many companies currently work with software that is not optimally prepared for the latest PostScript and PDF developments. The information stated in the above chapter applies with regard to separating. In order to be able to in-

corporate PDF/X-3 files into programs, especially ones that are not optimally prepared for PDF – including programs in such widespread use as QuarkXPress that, even in its current Version 5 uses an outdated PDF import filter – PDF/X-3 frequently must be converted to PostScript or EPS respectively. This can be done, for example, with Adobe Acrobat. However, care must be taken to ensure that the PDF/X-3 files is stored in the PostScript 3 format, as otherwise reliable conversion cannot be guaranteed. Storing a PDF/X-3 file (likewise any PDF 1.3 file) as PostScript Level 1 or PostScript Level 2 involves a high degree of risk, as corruptions must frequently be expected whenever PDF 1.3 structures are translated into PostScript Level 1 or 2.

EPS files produced in this way can be imported into nearly all regular programs. It should be borne in mind, however, that in the later output host-based separations from out of the programs do not produce the desired results – instead it is essential to use an in-RIP separation in a modern PostScript RIP (see above).

7.5 Separating and integrating

7.5.1 I separate my complete pages out of QuarkXPress – can I integrate PDF/X-3 files into my pages?

It is not possible to reliably separate pages from XPress, where PDF/X-3 data – previously converted to PostScript 3 EPS files – were imported into the Xpress document. Nor is import via the PDF Import Filter an option, as this is already unreliable as it is. The only sensible way to produce reliable separations out of XPress is to use in-RIP separation. This can be done from XPress by driving a suitable PostScript 3 RIP with activated in-RIP separation. Theoretically, the in-RIP separation can be activated also via a XPress XTension of a third manufacturer from the workplace computer.

7.5.2 I separate my complete pages out of Adobe InDesign – can I integrate PDF/X-3 files into my pages?

Although the host-based separation integrated into InDesign is much more powerful than those of other applications, a sufficient reliability does not exist here. Just as with QuarkXPress, the in-RIP separation of a suitable RIP should be used. It is beneficial here that, in InDesign, it is possible to activate the in-RIP separation of a suitable PostScript 3 RIP from out of Indesign.

7.5.3 I separate my complete pages out of Adobe Acrobat – can I integrate PDF/X-3 files into my pages?

Whereas Acrobat, also in Version 5, offers no support for the production of separations, other manufacturer software extensions (plug-ins) provide the corresponding functions. The most common of these are Crackerjack from

Lantana (www.lantanarips.com), pdfOutput Pro and MadeToPrint from callas software (www.callassoftware.com).

Not suited for separating PDF/X-3 files are pdfOutput Pro as well as host-based separating in Crackerjack. In contrast, driving in-RIP separation in Crackerjack, exactly like the corresponding function in MadeToPrint, are also suited for correctly separating PDF/X-3 files, but both presuppose a suitable, modern PostScript 3-RIP.

7.5.4 Are separations from different RIPs really always identical?

Sometimes different exposure results will be obtained if different RIPs are used. This is usually due to special settings in the RIP. Thus many RIPs offer a setting “Always overprint black” or “Ignore overprint settings in the PostScript/PDF”. Although these settings may be justified in some production contexts, they should always be deactivated in a PDF/X-3-conform workflow. As a general rule, it should be ensured that the RIP is used in a mode that is totally compatible with the PostScript 3 specification from Adobe. If necessary, the manufacturer of the RIP must be contacted in order to establish how the RIP should be set-up to work in this mode.

7.5.5 How can I check in-RIP separations without having access to a RIP?

A constantly growing number of senders of digital printing copy no longer has access to imaging systems. This eliminates the common practice in the analogue film sector of carrying out a final check before dispatching the printing copy. In this way, it is often very easily possible to see on the exposed separation films whether, for example, elements were correctly imprinted or left blank. A possible alternative, justifiable at least from the cost point of view, would be to use PostScript laser printers that support an in-RIP separation. At present the only known laser printers with corresponding functionality are the Apple LaserWriter 8500, no longer manufactured, and Xante laser printers. Using the Crackerjack plug-ins from Lantana or MadeToPrint from callas software, it is possible to realise an in-RIP separation from PDF/X-3 documents out of Adobe Acrobat on these laser printers. For a visual check, it is mostly of no consequence that these laser printers cannot output in the final resolution – the most important aspects, such as imprinting, leaving blank or outputting an element on the correct colour separation can be thus checked both effectively and economically.

In addition, there are several RIPs capable of outputting in TIFF bitmaps and that include a viewer for these bitmaps. With the aid of this functionality, it is possible – also without connected imager – to evaluate the quality of the separations. It is only important that, as for the later exposure, a modern PostScript 3 RIP should be used.

8 How do I know whether my workflow is PDF/X-3-compatible?

Because in every workflow – whether at the print copy originator or receiver end – there are many components with countless configuration possibilities that interact to obtain the desired result, it is often rather difficult to establish whether a workflow as a whole is PDF/X-3-compatible. Helpful for purposes of a corresponding evaluation

– as well as identification of possible weaknesses – is the aforementioned ECI. “Altona Test Suite”. If it proves possible to run especially pages 2 and 3 of this test suite through the entire workflow without causing errors in the output, then a workflow can be considered PDF/X-3-compatible.

Appendix A: The PDF/X variations

Version	PDF/X-1:1999 (ANSI)	PDF/X-1:2001 15930-1:2001	PDF/X-1a:2001 15930-1a:2001	PDF/X-3:2002 15930-3:2002	PDF/X-2:2003 (under preparation)
Basic PDF version	1.2	1.3	1.3	1.3	1.4
Embedded pixel images	Yes	Yes	No	No	No
Embedded fonts	Yes	Yes	Yes	Yes	Yes
OPI comments	No	No	No	No	Yes
Referenced PDF	No	No	No	No	Yes
2-Byte fonts	No	No	No	Yes	Yes
ICC colour spaces	No	No	No	Yes	Yes
ICC output profile	No	Yes	Yes	Yes	Yes

Appendix B: PDF/X Plus, Certified PDF

Other initiatives aimed at assuring the quality of PDF printing copy have emerged in connection with standardising PDF for print copy transmission. At present, PDF/X Plus is more a concept than concrete guidelines. PDF/X Plus is understood to be a combination of a PDF/X standard with additional specifications. Thus it is possible to imagine, for example, specifying the exclusive use of CMYK colours for printing copy supplied for the gravure process and stipulating an image resolution of 300 dots/in. However, for now the development of concrete, industry-specific recommendations is still pending.

In contrast to standardisation in the strict sense as well as industry-specific recommendations that could still come about under the PDF/X Plus label, Certified PDF is a proprietary technology that is not linked to a specific standard but intended instead to generally support the implementation of any desired specifications. Stephan Jaeggi (www.prepress.ch) wrote in early 2002:

“PDF/X and Certified PDF: In some countries (Belgium, France, the Netherlands, Switzerland), industry associations (in Switzerland, only VSD) recommend using Certified PDF from Enfocus. This has caused some confusion, as Certified PDF is not a quality standard such as PDF/X but a proprietary method of defining rules (so-called profiles) for producing and checking PDF files. This technique can be used to define profiles for totally different applications (Internet, archives, prepress). For this reason, the use of Certified PDF does not guarantee perfect printing copy. However, it is possible to define profiles that correspond to the rules of the PDF/X standard. More exacting criteria (e.g. minimum resolution) can also be defined for certain print products. Therefore Certified PDF is a complement to and not a competitor of PDF/X. The drawback of Certified PDF is that it is essential for all parties concerned to use the software components of Enfocus (PitStop plug-in 5.0, PitStop server 2.0, InstantPDF 2.0).”

Appendix C: PDF/X-3: so many problems – is it all worthwhile?

Users often criticise that PDF/X-3 creates more problems than it solves. A counter-argument is that nearly all problems that occur are experienced in any case when PDF or PostScript 3 data is processed. These problems are frequently simply ignored or paid attention to only in case of complaints or even completely unacceptable print runs. The unsuitable use of colours, non-embedded fonts, unprofessional proof production or unsuitable separating methods already now lead to unpleasant surprises. The PDF/X-3 standard addresses many of these problems, and the determined use of corresponding proofing software, such as the free-of-charge PDF/X-3 Inspector, regularly brings about a dramatic reduction in the number of faults in both print copy production and printing.

Of course, no ISO standard can prevent fonts from not being embedded, images in too-low resolution or the page format not being set-up correctly. However, the PDF/X-3 standard defines clear targets, so that on condition these are observed there will be a very high degree of reliability and very good reproducibility of the printing copy concerned. After all, it would make no sense to refrain from passing legislation against speeding on the road just because some people would continue to exceed the speed limit or the legislation would perhaps reveal a large number of such infringements of the law.

The problems are not caused by PDF/X-3, but by the way in which we produce printing copy at present. PDF/X-3 offers a very good basis for eliminating faults in print copy production and processing, as PDF/X-3 provides the essential orientation and clarity.

Literature, organisations, resources

Ugra-Empfehlungen für den Austausch von digitalen Daten in Form druckfertiger Seiten, Ugra-Arbeitsgruppe Datenaustausch, Ugra-Bericht 122, Februar 1997, 24 Seiten, A4.

Austausch von digitalen Daten in Form druckfertiger Seiten über ISDN, Ugra-Bericht 122/2, Juli 1998, 28 Seiten, A4.

Datenaustausch mit PDF, Gebrauchsanweisung zur Erstellung und Ausgabe von PostScript- und PDF-Dateien, Ugra-Bericht 122/3, Erwin Widmer, August 1998, 20 Seiten, A4.

Ugra-Testform „Datenaustausch“ vers. 1.5, Erwin Widmer, Ugra-Mitteilungen 2-1997, Seiten 15 – 18.

Ugra Datenaustausch-Testform 2.0, 9. März 2001, www.ugra.ch, A3,

Von PDF zu PDF/X, Karl J. Heuberger, Ugra-Mitteilungen 2-2002, Seiten 11 – 14.

MedienStandard Druck 2004 – technical guidelines for data and proof prints, see www.bvdm-online.de

“Make printing simple!” is the call of the advertising industry with a view to production in different printing processes, such as offset, gravure, newspaper, screen printing. This is exactly what the MedienStandard Druck 2004 sets out to achieve and thus increase the appeal and competitiveness of the print media on the advertising and communication markets. The fourth issue 2004 includes major development steps in standardisation (DIN-ISO), control and checking (Ugra/FOGRA) as well as practical realisation (workflow recommendations). MedienStandard Druck 2004 contains information on all important components required for correct application in the individual printing processes. MedienStandard Druck is complemented by “Technische Richtlinien Vierfarbeproduktion im Zeitungsdruck” (technical guidelines: four-colour reproduction in newspaper printing). This eight-page data sheet contains the important standard specifications and tips for reproduction, working with film, working with databases, and proofing.

ProzessStandard Offsetdruck see www.bvdm-online.de

In print production, it is vital that all parties concerned should have absolute control of the individual process steps. Especially the new digital processes cause many problems. This publication, the follow-on to the manual for standardisation in offset printing, is the essential standard reference for result-oriented process control. The completely revised work represents the current status of standardisation. The detailed presentation of basic principles and numerous work instructions guarantee safe tonal transmission in reproduction, platemaking and printing – both with and without film.

PDF/X-3 “Kochrezepte”, see www.eci.org and www.pdfx.info

Practice-oriented PDF/X-3 workflows based on ECI guidelines for colour management. Part 1: Process-compatible delivery with page layout in QuarkXPress; Part 2: Media-neutral delivery with page layout in Adobe InDesign 2

Ugra/FOGRA CMYK media wedge for checking proof prints, see www.ugra.ch and www.fogra.de

The Ugra/FOGRA CMYK media wedge is a manufacturer-independent tool for checking colour information and colour management, from image processing up to the digital proof. The digital proof shows the colours for selected printing processes and paper grades (media).

Bundesverband Druck und Medien, bvdm, www.bvdm-online.de

The Bundesverband Druck und Medien is the Employers' and Trade Association of the German printing industry. Its members are twelve independent regional associations, in which nearly 6000 printing and media operations are organised.

callas software GmbH, www.callassoftware.com

callas software is a manufacturer of numerous software extensions for Adobe Acrobat, QuarkXPress and Adobe InDesign. bvdm, EMPA/Ugra and Ifra commissioned callas software with the implementation of the “PDF/X-3 Inspector (Freeware)”, which is based on pdfInspektor2-technology.

European Color Initiative, ECI, www.eci.org

The European Color Initiative (ECI) is an expert group that focuses on the media-neutral processing of colour data in digital publishing systems. It was founded in June 1996 at the initiative of the publishing houses Bauer, Burda, Gruner+Jahr and Springer in Hamburg.

Eidgenössische Materialprüfungs- und Forschungsanstalt, EMPA www.empa.ch

EMPA is the multidisciplinary research organisation into sustainable materials and systems engineering. As an independent, neutral research organisation, EMPA solves selected tasks and problems of a scientific nature within its sphere of activities. It combines targeted applied research and development with high quality services. EMPA exploits its interdisciplinary skills to ensure an integrated approach.

Ugra is the association for the promotion or research in the graphic arts industry, www.ugra.ch

It is Ugra's objective to promote research and information exchange in graphics industry. The association carries out process research and materials testing, organises courses and conferences, publishes research results, develops and distributes measuring and control devices, promotes quality and environmental management.

Forschungsgesellschaft Druck e.V., FOGRA, www.fogra.de

FOGRA Forschungsgesellschaft Druck e.V. promotes printing research, development and application and makes available the results to the printing industry. For this purpose, this association has its own organisation with 56 personnel, including engineers, chemistry and physics engineers.

Ifra, www.ifra.com

Ifra, the world's leading association for media publishing, is a service organisation dedicated to the publishing industry worldwide. More than 2000 publishing companies and suppliers to the publishing industry are currently Ifra members. Ifra is their forum to exchange experiences and to learn from one another. Every item of information is accessible to Ifra members. Ifra is a member organisation and deals with all issues related to the production of publications in general

Prepress Consulting PPC, Stephan Jaeggi, www.prepress.ch

International Color Consortium, ICC, www.color.org

The International Color Consortium was founded by eight companies in 1993 with the objective of standardising and further developing an open, manufacturer-independent cross-platform colour management system architecture and to develop, distribute and encourage the use of its components. The result of this cooperation is the ICC profile specification.

International Organisation for Standardisation, ISO, www.iso.ch, (incl. Online Shop for purchasing ISO standards)

ISO is a network of national standardisation organisations from 140 countries that cooperates closely with international organisations, governments, industry, representatives of companies, and private persons.

PDF/X Website, www.pdfx.info

www.pdfx.info is a web site that offers detailed PDF/X information and tools free of charge. Several mailing lists in the English and German languages provide a forum for discussions about PDF/X and offer a point of contact for all parties interested in PDF/X.

Mailinglists: see www.pdfx.info and www.eci.org

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