Media Standard Print 2006

Technical Guidelines for Data, Proofs and Films

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Media Standard Print 2006 – Technical Guidelines for Data, Proofs and Films (PDF).

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Aims

"Make printing simple" is the call of the advertising industry faced with production using a range of different printing processes such as offset, gravure, newspaper printing and screen printing. The Media Standard Print 2006 is designed to do precisely this and so increase the competitiveness of printed media. The Media Standard Print is published by bvdm and supported by numerous industry organisations and associations across Europe. It serves as a foundation for standardised print production in accordance with ISO 12647 and for ensuring smooth technical co-operation between the customer, prepress service provider and printer.

At the instigation of bvdm, customers, prepress and printing experts, academics and software developers jointly drew up the first Media Standard Print in December 1997 [2]. In 2006, the fifth edition incorporates new ISO standardisation developments and their practical application. A standard printing condition for gravure printing (HWC paper) and information about the "ECI/bvdm Gray Control Strip" for visual gray balance control in production printing is included for the first time.

Application

The Media Standard Print 2006 contains information on the components necessary for its correct application in the individual printing processes. Section A contains information about color data formats and output processes for print production. The main section B, contains the guidelines for the supply of data, proofs and films for printing. Three typical workflows are explained and depicted graphically. In the Appendix C, control devices together with matching and measurement conditions are described. A comprehensive glossary, tables, figures, bibliography and sources provide further guidance for operators.

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Media Standard Print 2006 is based on current international printing standards (ISO 12647 series etc.). Media Standard Print 2006 contains standard workflow recommendations and standard printing conditions including characterisation data and ICC profiles. It is supported by many print/media associations in Europe and in other parts of the world.

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A General information*

This section provides an overview of the color formats to be used, the currently characterised reference printing conditions, as well as simulation processes and control devices.

A.1 Color data formats

A.1.1 Three component color data: CIELAB*, RGB* (e.g. ECI-RGB*, AdobeRGB)

A.1.2 Four and more component color data: CMYK, CMYK + spot colors

A.2 Output processes for print production (characterised reference printing conditions*)

A.2.1 Offset printing: 4 printing conditions, cf. ISO 12647-2

- Paper types 1 and 2: coated paper above 70 g/m² (positive plate, 60/cm** screen)
- Paper type 3: LWC paper (positive plate, 60/cm** screen)
- Paper type 4: uncoated, white (positive plate, 60/cm** screen)
- Paper type 5: uncoated, yellowish (positive plate, 60/cm** screen)

A.2.2 Continuous forms printing, direct mail: 4 printing conditions, cf. ISO 12647-2

- Paper types 1 and 2: coated paper above 70 g/m² (positive plate, 60/cm** screen)
- Paper types 1 and 2: coated paper above 70 g/m² (negative plate, 60/cm** screen)
- Paper type 4: uncoated, white (positive plate, 54/cm** screen)
- Paper type 4: uncoated, white (negative plate, 54/cm** screen)

A.2.3 Newspaper printing: 1 printing condition, cf. ISO 12647-3

- 40/cm screen, tone value increase 26 % (for USA different values apply)

A.2.4 Gravure: 4 printing conditions, cf. ISO 12647-4

- LWC paper (Light Weight Coated)
- SC paper (Super Calandered)
- MF paper (Machine Finished)
- HWC paper (brighter white, higher weight paper, improved LWC)

A.2.5 Screen printing: 6 printing conditions, cf ISO 12647-5

- 3 gamut classes: 1 = low, 2 = medium (offset), 3 = high
- Ink category 1: water-based UV inks; conventional solvent-based inks
- Ink category 2: conventional UV inks; water-based, air-dried inks

A.2.6 Flexo: 4 printing conditions, cf. ISO 12647-6, in prepration

* For all terms marked * see explanations in sections C
** A bandwidth of screen rulings (eg. 54/cm to 70/cm) is applicable according to ISO 12647-2.

A.3 Simulation of production print run

A.3.1 Monitor (screen proof or soft proof)

A.3.2 Digital off-press proof*

A.3.3 Analogue off-press proof*

A.3.4 On-press proof*

A.4 Control devices (see section C.1)

A.5 Typical workflows (see table 1 and figures 1, 2 and 3)

B Guidelines for the supply of data, proofs and films for printing

B.1 File formats

A composite file in PDF*-, TIFF/IT*- or TIFF*- format should be supplied. Application formats, "open" files (e.g. InDesign, Quark, Photoshop, etc.) should be avoided and only supplied following prior agreement.

The use of the international PDF/X-3* (ISO 15930-3 or 15930-6) standard [24] is specifically recommended for the generation or acceptance of files (until enough manufacturers support Part 6 of the standard, files should be generated in accordance with Part 3). To allow customers and service providers to use PDF/X-3, a software tool has been developed on behalf of bvdm, Ugra and ifra that allows generation, checking and processing to be carried out correctly for the print media (PDF/X-3 Inspector Freeware, download: www.pdfx3.org). This Adobe Acrobat plug-in is still to be used with versions 4, 5 and 6 Standard. From version 6 Professional on it is a part of the product.

ICC-profiles*: The source profile* of the device independent data and the output printing conditions profile used during proofing should be available, subject to agreement, the latter may be in the form of a clear reference to a generally known profile source.

B.2 General guidelines (data, films)

B.2.1 Screen angle and dot shape

Corresponding to the guidelines of the relevant part of the ISO 12647 series of standards [6] to [11]. Angle and screen rulings* of the colors are subject to the usual small variations due to the particular screening program.

Offset example

- Screen angle: in accordance with ISO 12647-2 [7] for chain dot screening; i.e. 60° between C, M and K. The Y must lie at 15° to one of the first three. The main color should lie at 45° or 135°.
- Circular or square dot: 30° between each of C, M and K. the Y must lie at 15° to one of the first three. The main color should lie at 45°.
- Dot shape*: modified chain dot with first dot joint not below 40 % (value depends on data set) and second dot joint not above 60 %. With print control strip: circular dot.
- Non-periodic screening: (previously FM screening) the smallest dot diameter should be between 18 µm and 22 µm. Smaller dots are unstable, larger dots on the other hand may be discernable and cause disruptive patterns. Note: the redigitisation of copy produced with non-periodic screens is not recommended. For newspapers, larger dot sizes are used.

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Type of data supplied	Media specific, device independent (see fig. 1)	Media neutral, device independent (see fig. 2)		Media specific, conventional (see fig. 3)
Color data format of scanner and digital camera sources	RGB with input profile	RGB with input profile		Direct separations in the CMYK target color space of the reference printing condition.
Color data formats for processing	CIELAB, RGB (e.g. ECI-RGB), CMYK, e.g. gravure color space. CMYK separations with rendering intent: perceptual.	CIELAB, RGB (e.g. ECI-RGB)		CMYK
Proof generation	Absolute colorimetric of the CMYK simulation color space in the CMYK proof color space, with original paper relative colorimetric.	Perceptual rendering intent: from the three channel color space in the proof color space		Directly from the CMYK data of the printing condition in the CMYK proof printer
Delivery for printing	CMYK data (8 Bit)	CIELAB, RGB data (e.g. ECI-RGB) (8/16 bit)		CMYK data (8 bit)
Proof delivery, ICC profiles	Proof for reference printing condition, reference print profile	Proof without reference print profile (not recommended)	1 proof and 1 reference print profile per printing condition	Proof for reference printing condition, possibly reference print profile
Contract proof or not	Contract	Non-contract	Contract	Contract

Tab. 1: Typical digital workflows from original copy to hand over of data for print.

Fig. 1: The media specific workflow (device independent) leaves data unchanged as long as possible in a three channel status. Only for proofing and delivery data must be changed into the CMYK of the intended printing condition. It is mandatory to deliver for each printing condition the appropriate ICC profile and a separate proof.

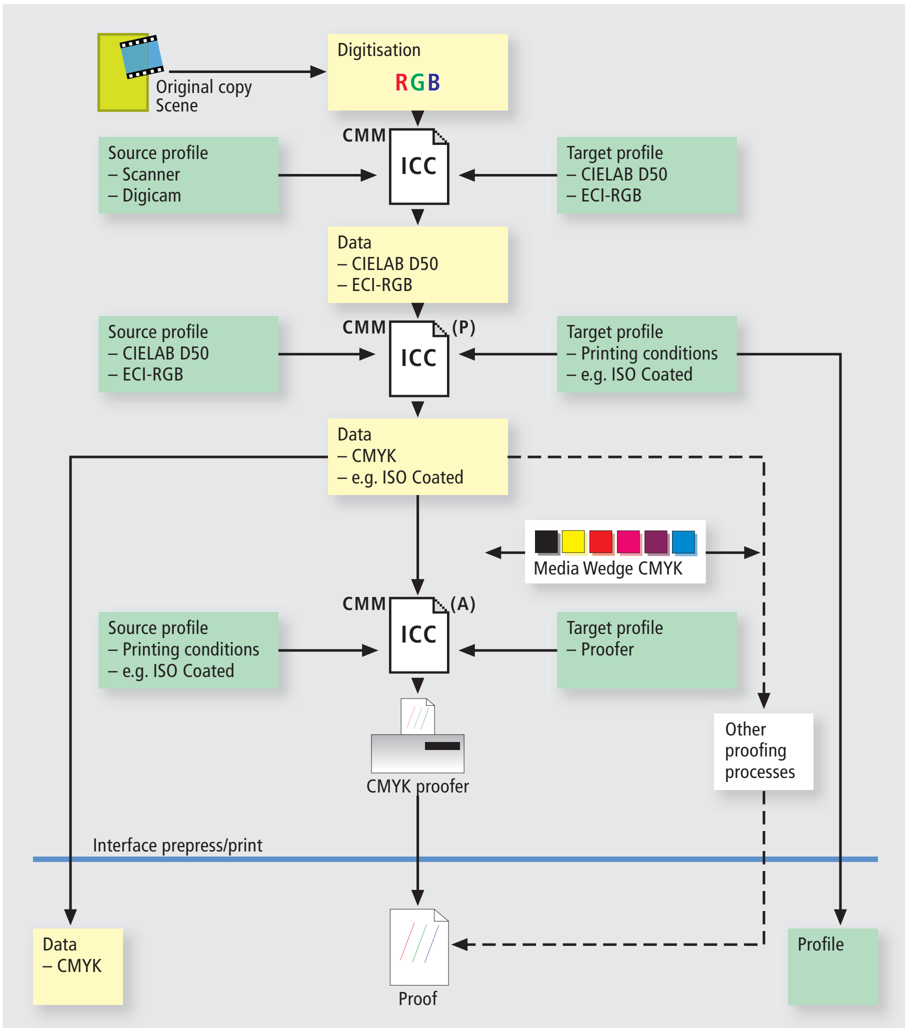
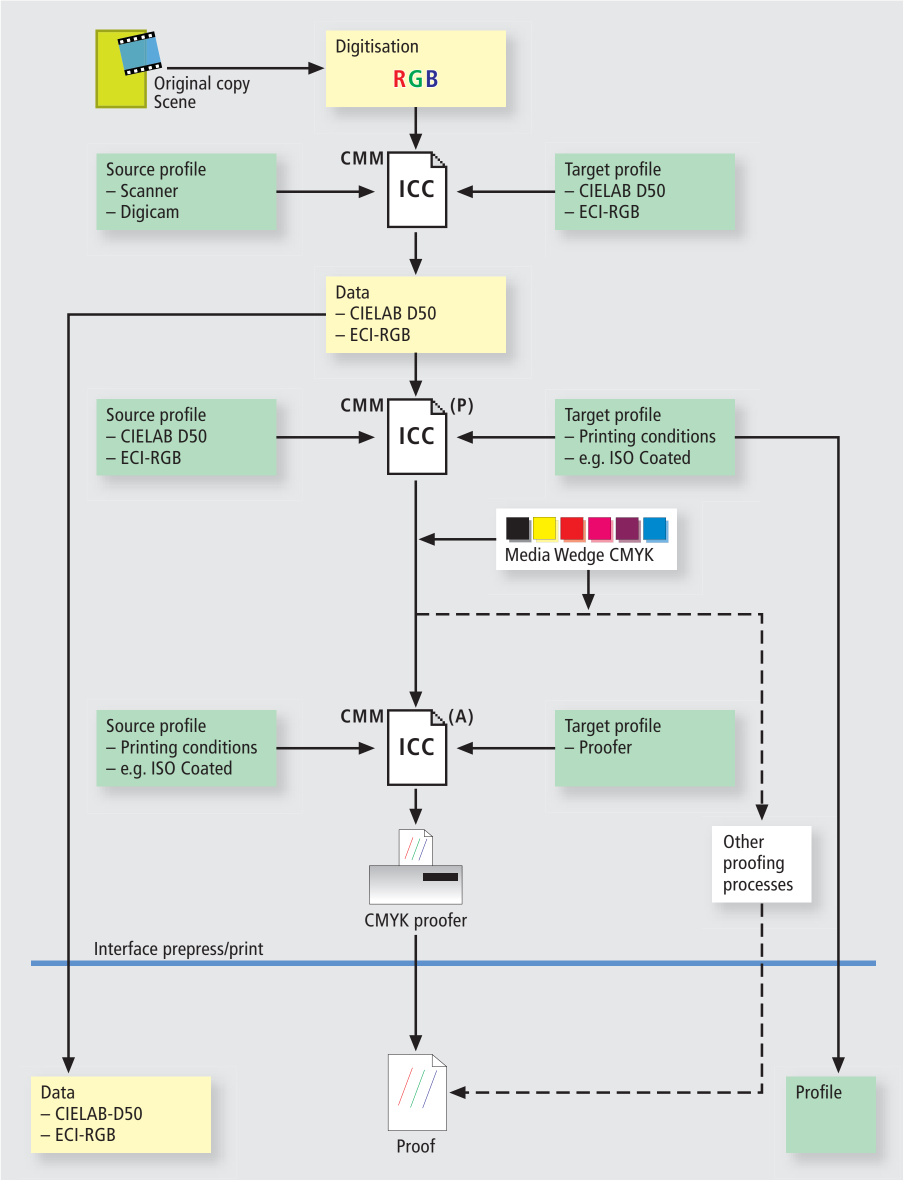


Fig. 2: When using media neutral workflow (device independent) three channel image data are provided. Separation into CMYK of the appropriate printing condition is done only at the printer. Only for proofing the repro shop is producing CMYK data for each single printing condition.



Legend

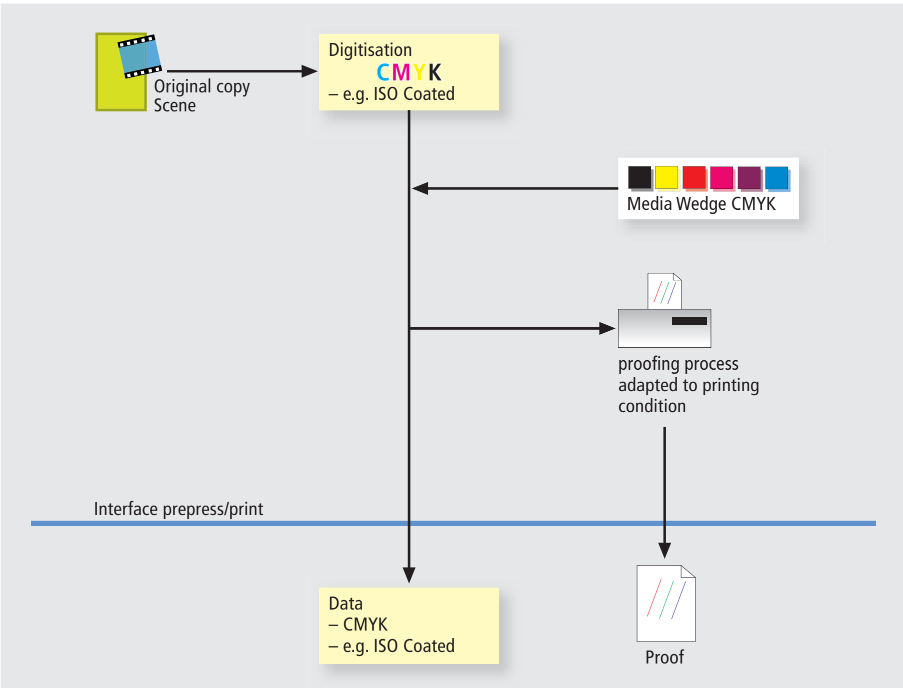
- alternative
- profile
- color space

CMM color transformation

PT1 = paper type 1

Rendering Intent
P = perceptual
A = absolute colorimetric

Fig. 3: The media specific conventional workflow is sometimes still in use today. This reproduction method produces printing condition specific CMYK data already when scanning the original copy. The image is processed in CMYK color space. For verification of data – after printing forme production – a printing press or a proof system adapted to the given printing condition is used.



B.2.2 Screen ruling*	Dependent upon the printing process in accordance with the guidelines of the relevant part of the ISO 12647series of standards [6] to [11]. If a screen with finer or coarser ruling is used than is stipulated by the standard, the reproduction should be adjusted accordingly, since this alters the print characteristic curve. For example: offset printing, 60/cm, continuous printing PT2 60/cm, PT4 54/cm. Other screens upon consultation, the gradation should be adjusted because of the altered tone value increase. Print control strips are laid out at 60/cm. In the normal screening programs the “screen ruling” and “screen angle” parameters of one color can be slightly altered in relation to the others in order to minimise moiré formation. Consequently, the “classic angular position” is seldom encountered in its precise form. Circular and square dot screen are not ideal for the subject.
B.2.3 Trim	Minimum of 3 mm.
B.2.4 Printable tone range	2 % to 98 % for 60/cm (offset + continuous forms) 4 % to 96 % for 80/cm (offset) 8 % to 92 % for 120/cm (offset) Important parts of an image should not involve tone values that (in the data or on the film) lie outside the printable tone value range.
B.2.5 Maximum tone value sum	Web offset: < 300 % Sheet-fed offset: < 350 %, if possible < 340 %
B.2.6 GCR Gray Component Removal	Long black with maximum black of 85 to 100 %. GCR factors not higher than 50 %
B.2.7 Printing marks	The angular position of corner, fold, centre and cutting marks must be precise. Register marks are to be placed 2 to 4 mm from the image margin. For images and graphics with trim the register marks are laid down directly on image edge. The line width of printing marks should not exceed 0.1 mm.
B.2.8 Black solids	In multicolor printing black solids should be underlain with c. 50 % cyan.
B.2.9 Trapping*	Appropriate trapping for the combination of image and line elements should be carried out shortly before output to the RIP*. The normal magnitude of this is based on the register tolerances of the applicable part of the ISO 12647 series of standards [6] to [11]. The instructions of the customer are necessary in order to be able to take paper sizes and materials, for example, into account in the magnitude of the trapping or choke. 0.1 mm trapping or more with light substrates.
B.2.10 Recommended gray balance	Quarter tone: C 25 % M 18 % Y 18 % Mid tone: C 50 % M 40 % Y 40 % Three quarter tone: C 75 % M 64 % Y 64 % These values do not apply when reference printing conditions are given (characterisation data and ICCprofiles). Here the actual gray balance conditions should be used.
B.2.11 Matching	An opaque, matte white backing should be used for matching (luminance L* > 92, chromaticity C* < 3, no optical brightener). Reflection copy, on-press proofs and image proof prints should be compared under the following lighting conditions: D50, 2000 lx ± 500 lx.
B.2.12 Completeness of the data	If no PDF/X-3 files are delivered, the fonts contained in the document should be embedded and imported image files and high resolution data (with OPI*) should also be supplied.

B.2.13 Resolution of the image data

In order to avoid excessively long exposure times, the resolution of the delivered data should be limited to normal values. This means that for unscreened data, the following values should apply:

- With periodic screens 2 pixels* per screen ruling* (eg 120 pixels/cm for a 60/cm screen)
- With non-periodic screens 1 pixel for every five diameters of the smallest halftone dot
- Specifically for gravure: 1 pixel per advance step

These pixel values should not be exceeded by more than a half.

B.3 Three component color data CIELAB, RGB (e.g. ECI-RGB)

An off-press/on-press proof that is specific for each printing condition should be available (see table 1, fig. 2, as well as B.3.1 and B.3.2). During data delivery the ICC reference print profile for the printing condition used for proof printer setting or separation should also be supplied.

B.3.1 Digital off-press proof

There must be an Ugra/Fogra CMYK-TIFF media wedge (see section C.1.1) on the proof. Its color values must match the target values of the reference printing process. In the event of deviations from the target values the following shall apply:

The mean of all CIELAB color differences of the color patches should be less than 4, a maximum value of 10 should not be exceeded. For the CMYK primaries there should be a maximum color difference of less then 5 from the respective target values, for the color of the substrate the maximum difference should be less than 3. See section C.2 for the measurement conditions.

The following details should appear in the bottom line of the proof print: file name, date, name of the source profile as well as of the ICC reference print profile for the printing condition.

B.3.2 Analogue off-press proof/on-press proof

There must be a print control strip on the sheet that allows the measurements of the solid colors and tone value increase* of the CMYK and spot colors to be checked. The on-press proof substrate must of the same type or the same gamut class as specified by the relevant part of ISO 12647 [6] to [11] as the substrate planned to be used for the print run. As far as possible the same should apply to off-press proofs.

The tone value increases must lie within the tolerances for the values laid down for off-press/on-press proofs in the appropriate part of the ISO 12647 standard [6] to [11].

The solid colors on the sheet must correspond to the CIELAB specification of the appropriate part of ISO 12647 [6] to [11] . The matching should carried out colorimetrically, for offset also visually in accordance with the process color solid standards for CMY, for black densitometric measurement is preferable.

The bottom line of the analogue off-press/on-press proof should contain the file name and the date of production as well as name of the source and reference print profile used for producing the forme for the analogue off-press/on-press proof.

Examples for reference printing conditions

- Offset printing [7]: paper types 1 and 2, positive plate, 60/cm screen: tone value increase at 40 %; 13 % for CMY, 16 % for K. Paper type 3, positive plate, 60/cm screen: tone value increase at 40 %; 16 % for CMY, 19 % for K. Paper type 4 and 5, positive plate, 60/cm screen: tone value increase at 40 %; 19 % for CMY, 22 % for K. All solids in accordance with table 3.
- Continuous forms printing [7]: paper types 1 and 2, positive plate, 60/cm screen: tone value increase at 40 %; 19 % for CMY, 22 % for K. Solids in accordance with table 3. Paper type 4, positive plate, 54/cm screen: tone value increase at 40 %; 22 % for CMY, 25 % for K. Solids in accordance with table 3.
- Newspaper printing [8]: tone value increase in the 40 % control patch, 40/cm screen: 26 % for CMY and K. Solid tones in accordance with table 4.
- Gravure printing [9]: tone value increase in the 40 % control patch 17 %. 54/cm to 70/cm engraving pitch for Y, 60/cm to 80/cm for C and M. Solids in accordance with table 5.
- Screen printing [10]: tone value increase in the 50 % control patch for 30/cm screen: 2 % for water-based UV inks and conventional solvent-based inks, 13 % for conventional UV inks as well as water-based, air-dried inks. Solids for three gamut classes in accordance with table 6.

Printing condition, paper type (PT)	Profile name	Name of profile file	Characterisation data
Offset 60/cm (150 lpi) PT 1	ISO Coated	ISOcoated.icc	Fogra27L
Offset 60/cm (150 lpi) PT 2	ISO Coated	ISOcoated.icc	Fogra27L
Offset 60/cm (150 lpi) PT 3	ISO Web Coated	ISOwebcoated.icc	Fogra28L
Offset 60/cm (150 lpi) PT 4	ISO Uncoated	ISOuncoated.icc	Fogra29L
Offset 60/cm (150 lpi) PT 5	ISO Uncoated Yellowish	ISOuncoatedyellowish.icc	Fogra30L
Continuous 60/cm (150 lpi) PT 2	ISO Continuous Forms Coated	ISOcofcoated.icc	Fogra31L
Continuous 54/cm (135 lpi) PT 4	ISO Continuous Forms Uncoated	ISOcofuncoated.icc	Fogra32L
		Download: www.eci.org	Download: www.fogra.org

Tab. 2a: Profile name, characterisation data process standard offset printing (ISO 12647-2) Note: Profiles and characterisation data are based on reference prints of Altona Test Suite Application Kit [26]. Information and order: www.altonatestsuite.com

Printing condition	Profile name	Name of profile file	Characterisation data
Newspaper printing 40/cm	ISO Newspaper 26	ISOnewspaper26v4.icc	IFRA26
Tone value increase 26 %		ISOnewspaper26v4_gr.icc 1)	

Tab. 2b: Profile name, characterisation data process standard newspaper printing (ISO 12647-3)
1)gray profile, mostly for internal application. Download: www.ifra.com

Printing condition (PT)	Profile name	Name of profile file	Characterisation data
Gravure publication LWC 51 g/m² (Light Weight Coated)	PSR LWC	PSRgravureLWC.icc	PSRgravureLWC_ECI2002.txt
Gravure publication SC 52 g/m² (Super Calandered)	PSR SC	PSRgravureSC.icc	PSRgravureSC_ECI2002.txt
Gravure publication MF 55g/m²*(Machine Finished)	PSR MF	PSRgravureMF.icc	PSRgravureMF_ECI2002.txt
Gravure publication HWC 70g/m²*(improved LWC)	PSR HWC	PSRgravureHWC.icc	PSRgravureHWC_ECI2002.txt
		Download: www.eci.org	

Tab. 2c: Profile names, characterisation data process standard gravure printing (ISO 12647-4).

Measurement according to ISO 13655 [22] (exception: white backing), D50, 2° observer, geometry 0/45 or 45/0.

Paper types (PT)

1 = 115 g/m² gloss coated white woodfree

2 = 115 g/m² matte coated white woodfree

3 = 65 g/m² gloss coated LWC (light weight coated)

4 = 115 g/m² uncoated white offset

5 = 115 g/m² uncoated yellowish offset

Paper type (PT)	**1 | 2**	**3**	**4**	**5**
Color values for white backing				
	L*/a*/b*	***L*/a*/b****	***L*/a*/b****	***L*/a*/b****
Black (K)	16/0/0	20/0/0	31/1/1	31/1/3
Cyan (C)	55/–37/–50	58/–38/–44	60/–26/–44	60/–28/–36
Magenta (M)	48/74/–3	49/75/0	56/61/–1	54/60/4
Yellow (Y)	91/–5/93	89/–4/94	89/–4/78	89/–3/81
Red (M+Y)	49/69/52	49/70/51	54/58/32	53/58/37
Green (C+Y)	50/–68/33	51/–67/33	53/–47/17	50/–46/17
Blue (C+M)	20/25/–49	22/23/–47	37/13/–33	34/12/–29
Paper shade	95/0/–2 | 94/0/–2	92/0/5	95/0/–2	90/0/9
Color values for black backing				
	L*/a*/b*	***L*/a*/b****	***L*/a*/b****	***L*/a*/b****
Black (K)	16/0/0	20/0/0	31/1/1	31/1/2
Cyan (C)	54/–36/–49	55/–36/–44	58/–25/–43	59/–27/–36
Magenta (M)	46/72/–5	46/70/–3	54/58/–2	52/57/2
Yellow (Y)	88/–6/90	84/–5/88	86/–4/75	86/–3/77
Red (M+Y)	47/66/50	45/65/46	52/55/30	51/55/34
Green (C+Y)	49/–66/33	48/–64/31	52/–46/16	49/–44/16
Blue (C+M)	20/25/–48	21/22/–46	36/12/–32	33/12/–29
Paper shade	93/0/–3 | 92/0/–3	87/–1/3	92/0/–3	88/0/6
Difference of measuring on black and white backing				
	L*/a*/b*	***L*/a*/b****	***L*/a*/b****	***L*/a*/b****
Black (K)	–0,3/–0,3/–0,1	–0,5/–0,3/–0,6	–0,7/–0,1/–0,3	–0,2/–0,1/–0,5
Cyan (C)	–1,0/0,9/0,9	–2,6/2,3/0,5	–1,5/0,7/0,9	–1,2/1,4/–0,2
Magenta (M)	–1,8/–2,5/–1,6	–3,4/–4,6/–2,9	–1,6/–2,6/–1,1	–1,5/–2,6/–1,6
Yellow (Y)	–2,6/–0,7/–2,8	–4,9/–1,4/–5,8	–2,8/–0,2/–3,0	–2,7/–0,4/–3,8
Red (M+Y)	–1,8/–2,8/–2,1	–3,5/–5,2/–4,6	–1,7/–2,7/–2,0	–1,5/–2,8/–2,6
Green (C+Y)	–1,0/1,7/–0,3	–2,6/2,6/–1,9	–1,3/1,2/–0,8	–1,0/1,6/–1,3
Blue (C+M)	–0,4/–0,3/0,7	–1,4/–0,8/0,8	–0,8/–0,5/0,6	–0,5/–0,2/0,3

Tab. 3: CIELAB color values for solid tones of the primary and secondary colors for sheetfed, web and continuous forms offset printing on 5 paper types [7]. To achieve target values for measuring on black backing (during print run), with white backing color values (off-press proof, on-press proof) as a starting point, please add the differences indicated in the lower part of the table.

	L*	***a****	***b****	***L****	***a****	***b****
	white backing			black backing		
Black (K)	36,5	1,3	4,5	36,0	1,0	4,0
Cyan (C)	58,7	–24,7	–26,9	57,0	–23,0	–27,0
Magenta (M)	55,8	47,2	–0,8	54,0	44,0	–2,0
Yellow (Y)	80,9	–1,4	61,8	78,0	–3,0	58,0
Red (M+Y)	53,7	44,6	27,2	52,0	41,0	25,0
Green (C+Y)	54,4	–35,2	18,3	53,0	–34,0	17,0
Blue (C+M)	41,8	7,1	–22,2	41,0	7,0	–22,0
C+M+Y	40,6	0,1	1,5	40,0	0,0	1,0
Paper shade	85,2	0,9	5,2	82,0	0,0	3,0

Tab. 4: CIELAB color values for solid tones of the primary and secondary colors for newspaper printin [8]

Paper type[1]	LWC			SC			MF			HWC		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
Black (K)	19	0	1	20	0	1	25	0	1	20	–1	2
	20	0	1	21	0	1	26	1	2	20	–1	1
Cyan (C)	48	–23	–37	44	–21	–36	45	–18	–33	46	–23	–48
	50	–23	–38	46	–21	–35	46	–18	–33	47	–24	–48
Magenta (M)	45	69	–4	45	64	–4	48	59	–2	49	68	–11
	46	71	–4	46	66	–3	49	61	–2	50	70	–9
Yellow (Y)	81	7	91	78	9	87	77	10	84	85	7	94
	83	7	93	80	9	89	79	11	86	85	8	96
Red (Y+M)[2]	43	68	50	42	64	44	46	61	39	46	67	51
	44	70	51	44	66	45	46	62	39	47	69	53
Green (Y+C)[2]	40	–41	31	39	–36	25	36	–31	20	38	–45	24
	41	–42	32	40	–37	26	37	–32	21	39	–45	25
Blue (M+C)[2]	18	20	–42	20	13	–38	24	5	–35	21	20	–48
	19	21	–42	21	14	–38	25	7	–34	21	20	–48
Y+M+C	14	5	3	15	0	–1	20	–3	–1	16	0	0
	14	5	3	15	0	–1	20	–3	–1	16	1	1
Paper shade	89	0	2	88	–1	4	86	–1	3	92	0	–1
	91	0	3	90	0	4	89	1	5	93	0	0

Tab. 5: CIELAB color values for solid tones of the primary and secondary colors for gravure printing [9]
Upper line: color values for black backing, lower line: color values for white backing
[1] LWC: light weight coated, SC: super calandered, MF: machine finished (improved newsprint)
HWC: brighter white, higher weight paper (improved LWC)
[2] Color sequence: Yellow-Magenta-Cyan-Black (YMCK)

	Gamut class (solid colors)								
	1			2[2]			3		
	*L**	*a**	*b**	*L**	*a**	*b**	*L**	*a**	*b**
Black (K)	24	0	0	18	0	0	8	0	0
Cyan (C)	59	–35	–43	52	–33	–51	46	–32	–54
Magenta (M)	51	70	–15	47	74	–5	42	79	10
Yellow (Y)	90	–11	66	89	–9	83	88	–7	100
Red[1] (Y+M)	50	59	42	47	67	50	44	66	47
Green[1] (Y+C)	55	–68	32	49	–65	30	43	–62	28
Blue[1] (C+M)	28	27	–41	21	26	–40	16	29	–39

Tab. 6: CIELAB color values for solid tones of the primary and secondary colors for screen printing [10]
[1] Color sequence Yellow, Cyan, Magenta [2] According approximately to offset paper type 1

B.4 Four and more component color data (CMYK and spot colors)

A proof print or press proof should be supplied that is tailored to the anticipated printing condition – see fig. 1 and table 1. During data delivery the ICC output profile (reference print profile) used for proof printer setting or separation should also be supplied.

B.4.1 General points relating to CMYK separations of the supplied data

The maximum value of the tone value sum (C+M+Y+K) should not exceed the values laid down in point B.2.5. The tone value range should comply with the specifications of the particular standard of the ISO 12647 series.

This also applies to the tone value range laid down in the image data set. The tone values of an image should not lie outside the tone value range determined for the particular printing process.

Additional information (e.g. job ticket info): state which characterisation data (source data) and which color build up (tone value sum, UCR, GCR, black gradation) or black primary (beginning and end of the tone value range) parameters the ICC output profile for the output printing condition used for the separation of the color data is based on. Trapping information should be provided.

B.4.2 Digital off-press proofing

An Ugra/Fogra CMYK-TIFF media wedge (see appendix C.1) must be placed on the proof print. Its color values must correspond to the target values of the relevant part of the ISO 12647 series of standards [6] to [11] that are contained in its instructions for use, e.g. for paper types 1, 3 and 4 of offset printing. In the event of deviations from the target values the following shall apply:

The mean of all CIELAB color differences of the color patches should be less than 4, a maximum value of 10 should not be exceeded. For the CMYK primaries there should be a maximum color difference of less than 5 from the respective target values, for the color of the substrate the maximum difference should be less than 3. See appendix C.2 for the measurement conditions. These tolerances apply for offset printing according to ISO 12647-2 [7]. For tolerances of other printing processes see appropriate part of ISO 12647.

The bottom line of the proof print should includes the file name and date and, in addition, which characterisation data (source data) and which color build up (tone value sum, UCR, GCR, black gradation) or black primary (beginning and end of the tone value range) parameters the ICC output profile for the output printing condition used for the separation of the color data is based on.

B.4.3 Analogue off-press/on-press proof

There must be a print control strip on the sheet that allows the measurements of the solid colors and tone value increase of the CMYK and spot colors to be checked.

The press proof substrate must of the same type or gamut class as specified by the relevant part of ISO 12647 [6] to [11] as the substrate it is planned to use for the print run.

The tone value increases must lie within the tolerances and guidelines for the maximum spread in the mid tones for the values laid down for analogue off-press/on-press proofs in the appropriate part of the ISO 12647 standard [6] to [11]. The solid colors of the on-press proof must correspond to that of the relevant part of the ISO 12647 series of standards [6] to [11]. For the offset printing process appropriate process color solid standards from the Altona Test Suite application package [26] can be used. The matching should then be carried out either visually or colorimetrically, for black densitometric measurement is preferable.

The bottom line of the analogue off-press/on-press proof should contain the file name and the output date as well as name of the source and reference print profile used for producing the forme for the analogue off-press/on-press proof.

Examples

- See section B.3.2.

B.5 Guidelines for the supply of films for offset reproduction

B.5.1 Film orientation

Positive plate: wrong reading positive film
Negative plate: wrong reading negative film
(viewed from the emulsion side in each case)

B.5.2 Color identification	Yellow: Y Magenta: M Cyan: C Black: K Spot colors should be named.
B.5.3 Film composition	▸ 0.1 mm, dimensionally stable, neutral tint, without creases, scratches and spots. ▸ Masking work on the reverse of the film (carrier side). ▸ Blank film density: if possible < 0.10; In any event < 0.15; Difference on one side ≤ 0.10
B.5.4 Halftone dot	▸ Core density at least 2.5 above blank film. The requirement is usually met, if the solid density is 3.5 above the blank film density. ▸ Side width (gradient) of the halftone dot not exceeding 4 µm.
B.5.5 Difference in the exposure from color to color	< 0,02 %, in relation to the diagonal of the type area (also applies for CtP plates).
B.5.6 Tone value transfer	Tone value film = tone value data set

B.6 On-press proof, further specifications (see also B.3.2, B.4.3)

B.6.1 Inks and solid colors	Inks corresponding to ISO 2846-1. The solids should match the process color solid standards or comply with table 3 ff.
B.6.2 Control strip	60/cm screen, circular dot Control patches for mid tones, shadows and solids for the primaries and spot colors over the full width of the format. Slur/doubling and exposure control must be possible. (e.g.: Fogra print control strip)

B.6.3 Plate exposure (conventional)

Positive plates	60/cm screen	10 µm to 12 µm
	80/cm screen	10 µm
	Non-periodic screen	8 µm
	54/cm screen (continuous)	12 µm
Negative plates (60/cm)	Resolution up to 7 µm	8 µm to 10 µm
	Resolution > 7 µm to 9 µm	10 µm to 12 µm
	Resolution > 9 µm to 11 µm	12 µm to 15 µm

B.6.4 Tone value increase in control strip	Example: tone value increase commercial offset, see table 7.
B.6.5 Printable tone value range	See B.2.4
B.6.6 Color sequence	KCMY or CMKY (offset printing)
B.6.7 Corrections	Image correction marks in accordance with DIN 16549, substantial corrections require a new press proof.
B.6.8 Offline finishing	The print run also requires a finished on-press proof.

Tone value film/data	Tone value increase A: 13 %	B: 16 %	C: 19 %	D: 22 %	E: 25 %	F: 28 %
0	0,0	0,0	0,0	0,0	0,0	0,0
5	2,0	3,0	3,9	4,8	5,7	6,7
10	4,0	5,6	7,3	8,9	10,6	12,3
15	5,9	8,1	10,3	12,5	14,7	17,0
20	7,6	10,2	12,8	15,5	18,1	20,8
25	9,3	12,1	15,0	17,9	20,8	23,8
30	10,7	13,7	16,7	19,8	22,8	25,9
35	12,0	15,0	18,1	21,1	24,2	27,3
40	13,0	16,0	19,0	22,0	25,0	28,0
45	13,8	16,7	19,5	22,4	25,2	28,0
50	14,3	17,0	19,6	22,3	24,9	27,5
55	14,6	17,0	19,4	21,7	24,1	26,4
60	14,5	16,6	18,7	20,8	22,8	24,8
65	14,1	15,9	17,7	19,4	21,1	22,7
70	13,4	14,9	16,3	17,6	19,0	20,3
75	12,3	13,4	14,5	15,5	16,5	17,5
80	10,7	11,5	12,3	13,0	13,7	14,4
85	8,7	9,3	9,8	10,2	10,7	11,0
90	6,3	6,6	6,9	7,1	7,3	7,5
95	3,4	3,5	3,6	3,7	3,8	3,8
100	0,0	0,0	0,0	0,0	0,0	0,0
PT 1 and 2	☐ CMY	☐ K	■ CMY	■ K		
PT 3		☐ CMY	☐ K	■ CMY	■ K	
PT 4 and 5			☐ CMY	☐ K	■ CMY	■ K

Tab. 7: Tone value increase for commercial offset printing (print characteristics A to F, across the whole tone value range), measured at 60/cm (150 lpi) in control patches with circular dots.
PT = Paper type, ☐ = Positive plate, ■ = Negative plate

B.6.9 Image orientation

In accordance with imposition layout as far as possible

B.6.10 Image register

Register deviations should not exceed half the screen ruling (e.g. at 60/cm, 83 µm).

B.7 Print run

B.7.1 Control devices

Control strips must be used for jobs for which it is necessary to be able to demonstrate the quality. As a rule, for jobs where there is a contract copy (digital off-press proof, on-press proof), a specification for the print run exists. It should be possible to subsequently check the forme production by means of an exposure control strip on the film or a digital control device intended for this purpose; this can be done outside the printable area.

B.7.2 Quantities

The tone value increases must match the tolerances set for the print run for the values in the relevant part of the ISO 12647 series of standards [6] to [11].

The solid colors is based on the contract off-press/on-press proof. If these are not uniformly colored, it is based on the color value indications in the relevant part of the ISO 12647 series of standards or, in the case of the offset print process and gravure in accordance with the process color solid standard in question. The matching is then carried out either visually or colorimetrically, densitometry is preferable for the black. Example:

- Offset printing, newspaper printing, screen printing, values for CMY tone value increases and CMYKRGB solids each in accordance with B.3.2.

C Appendix

C.1 Control devices

C.1.1 Digital off-press proofs

An Ugra/Fogra CMYK-TIFF media wedge [15] must be positioned on any proof print that is intended to serve as a contract proof. This control block (Fig. 4) is supplied as a data set and comprises 33 single color and multicolor patches. There is also a chromatic gray wedge, a true gray wedge, as well as an unprinted patch. If a proof is to serve as a contract proof for a printing condition then the CIELAB color values of the patches of the Ugra/Fogra CMYK-TIFF media wedge must match those of a reference print produced under standardised conditions that correspond to those of the planned print run. Ideally the match should be colorimetrically checked and target values for major reference printing conditions are contained in the instructions for the use of the media wedge. The CMYK-TIFF version is particularly suitable for proof print control because this data format can be used with ICC-based color management systems without any restriction.

C.1.2 Analogue off-press and on-press proofs

In accordance with ISO 13656 [16] and ISO 12647-1 [6], a control strip for an on-press proof must, as a minimum, allow the following control patches to be measured: halftone patches in the mid tone and in the three quarter tone with, if possible, circular halftone dots, as well as CMYKRGB solids. The control strip should be mounted at right angles to the direction of printing across the full width of the format. It should preferably be positioned in the centre of the printing or alternatively at the end or beginning of the printing. The same is true for analogue off-press proofs but the control strip does need to extend across the full width of the format so long as it can be guaranteed that there is the possibility of checking each delivered image in the case of combined formes.

Examples:

- Offset, film: Ugra offset test wedge 1982 [17]
  and Fogra DKL print control strip [18].
  Offset, filmless: Ugra/Fogra digital plate wedge [19],
  Ugra/Fogra digital print control strip (PCS) [13].
- Newspaper printing, film: Ugra offset test wedge 1982 [17],
  Ugra/Fogra-DKL-Z [20].
  Newspaper printing, filmless: Ugra/Fogra digital plate wedge [19],
  Ugra/Fogra digital DKL-Z [20].
- Screen printing: print control strip with circular dot screen, control patches with quarter, mid, three quarter and solid tone, screen ruling 30/cm.
  Example: Fogra screen printing print control strips DKL-S1 [21] and DKL-S2.

C.1.3 Print run

In accordance with ISO 13656 [16] and ISO 12647-1 [6], a control strip for the print run must, as a minimum, allow the following control patches to be measured: mid tone and three quarter tone halftone patches with circular dots if possible as well as CMYKRGB solids. The control strip should be mounted at right angles to the direction of printing. It should preferably be placed at the centre of printing but alternatively at the end or beginning of printing.

Example

- See section C.1.2

C.1.4 Forme making

Filmless: Ugra/Fogra digital plate wedge [19].
From film: Ugra offset test wedge 1982 [17].

C.2 Matching and measurement conditions

C.2.1 Matching

Matching processes and other critical matches must be carried out under very strong lighting of 2000 lx ± 500 lx because it is only then that small differences become apparent. The illuminant must correspond to D50 (5000 K). The specimens must be placed on a matte white backing and surrounded by a matte gray surface with a color density of 0.7 (in relation to ideal white) whose width must be at least 1/3 of the diameter of the specimen, masks should be made from board if necessary. To make the comparison easier, the specimens should be placed edge to edge.

C.2.2 Measurement conditions

In order to be able to exchange the results of the color measurements meaningfully, uniform measurement conditions must apply. These are clearly defined as follows for the printing industry by the ISO 13655 [22] standard:

- Measurement geometry 0/45 or 45/0
- Colorimetric standard observer for 2° (independently of the measurement patch size)
- Illuminant D50 (5000 K)
- CIELAB color system, values for the three quantities *L*, a*, b** should be given.
- Matte, white backing beneath the specimen (Note: different from ISO 13655). For the process control of the print run, matte black backing beneath the specimen with a color density of c. 1.5.
- No polarisation filter
- The Color difference should be calculated using the CIELAB difference formula in accordance with ISO 13655 [22].

C.2.3 Density measurement

The densitometric measurement of the C, M, Y, K primaries should be carried out in accordance with the instructions of ISO 13656 [16]. This means that for the Y color channel a narrow bandwidth evaluation is carried out compared with the American "Status T" guidelines; the Y solid color density is therefore nearly as high as that of the C and the M. Spot colors are measured with the color channel that gives the highest color density. It is essential to use polarisation when making the measurements, with measurements on printing formes and possibly the characterisation of proof printing devices being exceptions. The following also applies:

- Matte, white backing beneath the specimen (note: different from ISO 13655). For process control during the print run matte, black backing beneath the specimen with a color density of about 1.5.

Fig. 4a: Ugra/Fogra media wedge CMYK (available as TIFF and EPS Version, see glossary)

Fig. 4b: Ugra/Fogra media wedge CIELAB (available as TIFF, EPS and PDF Version, see glossary)

C.3 Tools for Application in Prepress and Print

C.3.1 Altona Test Suite – Structure and Application at a Glance

Altona Test Suite is a joint project of German Printing and Media Industries Federation (bvdm) Wiesbaden, European Color Initiative (ECI), EMPA/Ugra St. Gall, Switzerland and Fogra Graphic Technology Research Association Munich, Germany. The comprehensive Altona Test Suite Application Kit (12 printing conditions) contains a total of 16 reference prints, 25 test suite files, seven color specimens (process color solids), all characterisation data, ICC Profiles and the documentation.

The Altona Test Suite comprises three PDF files each designed for specific purposes. The carefully manufactured reference prints in the Altona Test Suite Application Kit [26] have been produced according to standard printing conditions as defined in the international standard ISO 12647-2. This part of the standard is currently under revision by ISO in order to reflect stateof-the-art printing. The latest values are already included in the Altona Test Suite Application Kit. Other printing conditions are represented in the respective part of ISO 12647, e.g. ISO 12647-3 for newspaper printing.

C.3.1.1 Altona Measure

Altona Measure (fig. 5 upper right) contains test elements for setting up and checking output systems such as proofers or conventional or digital printing systems based on colorimetric and densitometric measurements. The file is a common PDF 1.3 file as it is not limited to be used for one single printing condition only.

C.3.1.2 Altona Visual

Altona Visual (fig. 6 lower right) is a PDF/X-3 file focusing on visual testing of the PDF/X-3 applicability. As PDF/X-3 allows a color-managed workflow, this page comprises not only CMYK and spot color elements, but also several components containing device independent colors such as CIELAB and ICC based RGB. In conjunction with the reference prints, Altona Visual allows visually checking and adjustment of color accuracy of press simulation on a proofing system. Note: All natural CMYK images (21 to 25) have been created in Adobe Photoshop based on the same set of RGB images using “Convert to Profile” with ECI-RGB as source color space and the respective output intent profile of the PDF/X-3 file as destination color space and the rendering intent “Perceptual”. Hence the CMYK values are individually adjusted in accordance with the respective printing conditions, the total ink coverage e.g. in the newspaper version is lower than the ink coverage of the offset version for coated stock.

C.3.1.3 Altona Technical

Altona Technical (without figure) addresses overprinting and font formats from a technical perspective. The elements of Altona Visual which test correct overprinting obviously cannot cover all possible combinations of elements set to overprint. Altona Technical therefore contains 864 carefully structured patches for a thorough evaluation of whether a PostScript RIP is able to correctly deal with overprinting. In addition, this page holds text, coded in all relevant font formats (Type 0 CID, Type 1, Type 2 CID, Type 3, TrueType).

C.3.1.4 Sources

Altona Test Suite – Application Kit: www.altonatestsuite.com
Altona Test Suite – 1.2 Online Version: www.eci.org

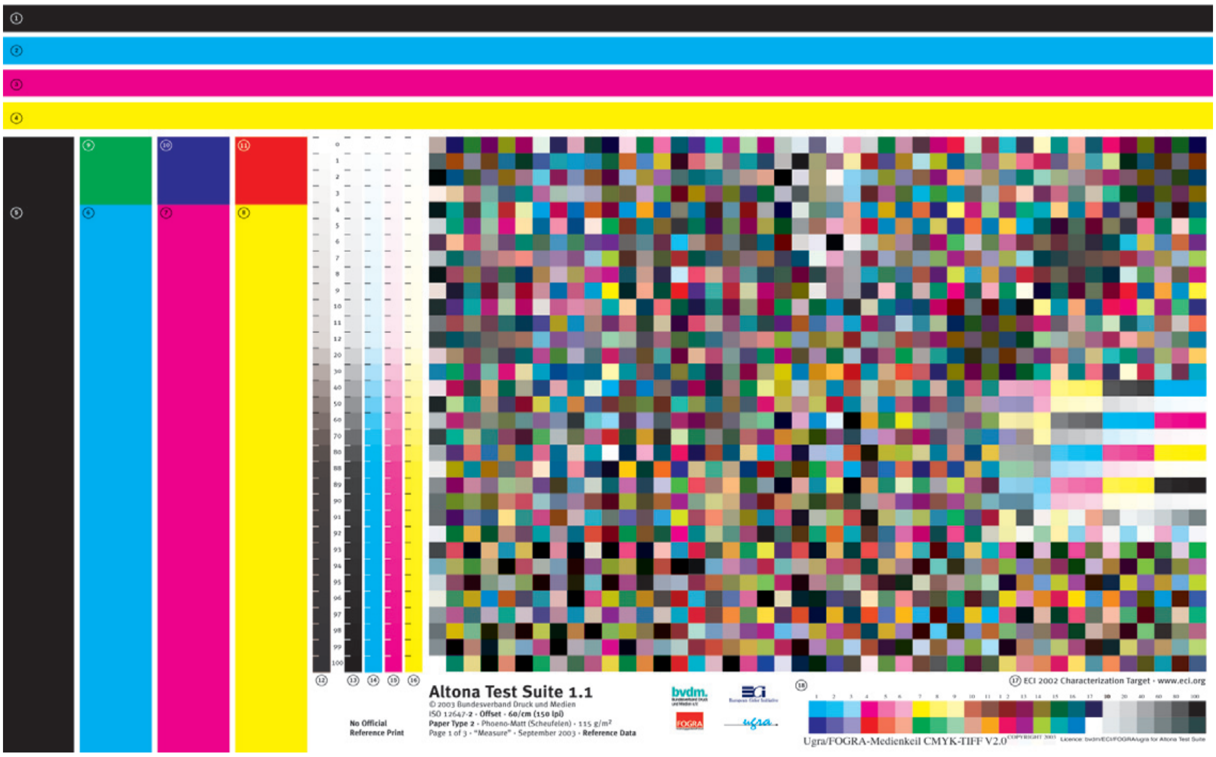


Fig. 5: Altona Test Suite “Measure” with testchart ECI 2002 (DIN 16614 [25], subset of ISO 12642-2 [5]).

Fig. 6: Altona Test Suite “Visual”

C.3.2 ECI/bvdm Gray Control Strip for Gray Balance Control

C.3.2.1 ECI/bvdm Gray Control Strip - Introduction

The aim of process control at press side is to quickly achieve the desired color results. When the more important press parameters, such as standardised plate production, dot gain, paper and ink have been determined, then it won’t take very long to balance the inking for the best possible outcome.

The ECI/bvdm Gray Control Strip has been developed for printers as an aid to help balance the press process in the best way possible by utilising a standardised proof. That’s why the ECI/bvdm Gray Control Strip is based on the same color characterisation data that are used in industry standard ICC profiles (for example, the ECI profiles) and the Ugra/Fogra CMYK Media Wedge in prepress. ECI offset profiles are based on color characterisation data from Fogra.

Gray balance patches that allow a quick and convenient visual control are good aids for accurate inking. That’s why the “ECI/bvdm Gray Control Strip” relies on this one simple rule: “Chromatic gray (CMY) has to look exactly like true gray (K)”.

The aim is therefore, to match the ECI/bvdm Gray Control Strip chromatic gray patches to the true gray patches by controlled inking. That is, the technical tone consisting of defined cyan, magenta and yellow (chromatic gray) values is compared to a tone value that consists of pure black (true gray). By “balancing out” the colors at the press, two patches that consist of two different sets of values ideally end up looking the same.

C.3.2.2 ECI/bvdm Gray Control Strip Versions and elements

The ECI/bvdm Gray Control Strip is available in three different layouts. Depending on intended purpose and available space they can either be applied singularly or in combination.

The Basic “S” Version

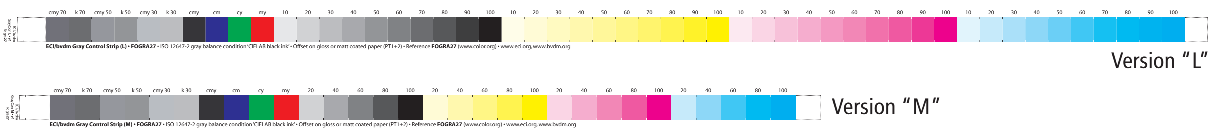
The ECI/bvdm Gray Control Strip “S” version consists of three true gray / chromatic gray pairs. The true gray patches are arranged in 70 %, 50 % and 30 % tone values of the black ink. The tone values for cyan, magenta and yellow in the respective chromatic gray patches were determined from absolute colorimetric color conversions of CIELAB values (of the respective black ink value).

Fig.7: The Basic ECI /bvdm Gray Control Strip “S” Version

Two items are to be noted. Firstly, the CIELAB value of the true gray patches originate from the corresponding characterisations file. Secondly, when determining the chromatic gray patches the black generation setting was “none” (without black ink). The control element is 36 × 8 mm. Each patch is 6 × 6 mm. The identification line of the wedge allows you to verify the utilised printing conditions. In this respect it is recommended to show the Identification line on the printing forme.

The Expanded Versions “L” and “M”

The ECI/bvdm Gray Control Strip versions “L” and “M” are based on the basic “S” version and contain additional patches for the measurement of other process parameters.



Version “L”

Version “M”

Fig. 8: Expanded versions “L” and “M” with their density values above each patch, identification lines below and an abbreviated version on the left side of the wedge.

Layout „L“

The “L” layout is 291 mm wide and has a height of 10 mm, whereas each patch (with exception of the last patch) is 5.5 mm wide. When necessary, patch density values and the identification line below may be cut off so that its height may be reduced to 6 mm. This layout consists of 51 control patches in all, which may be grouped as follows:

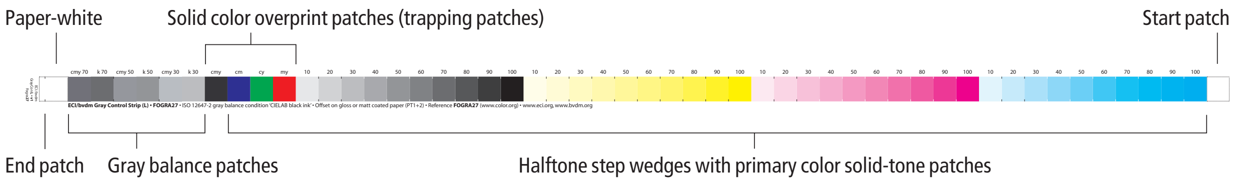


Fig. 9: ECI /bvdm Gray Control Strip patches divided into groups

Start and end patch, required for positioning hand-held scanning devices in front of the first measurable patch and for their phase out after the last patch.

Paper-white patch used as a reference value for densitometers and to determine the paper color coordinate.

Three gray balance patch pairs, consisting each of one chromatic gray and one true gray patch for visual gray balance control. The true gray patches are laid out in the tone values of 70 %, 50 % and 30 %. The chromatic gray patches are created from out of the primary colors cyan, magenta and yellow so that each printing condition indicated in the ECI/ bvdm Gray Control Strip identification line can ideally be visually matched to the true gray patches.

Solid color overprint patches (trapping patches), for the visual and technical evaluation of secondary colors (M + Y, C + Y, C + M), also for the tertiary color black (C + M + Y). This allows the detection of ink trapping problems.

Halftone step wedges in the four primary colors: black, yellow, magenta and cyan. Each halftone step wedge contains the tone values from 10 % to 100 % in 10 % increments. It serves for the visual (by way of inking standards) and technical control of solid color inking and to determine characteristic curves of printing. Since it is often very hard to distinguish between neighboring control patches, small white or black guide lines that border each patch and that have no affect on the automatic measurement of scanning devices were added to aid the positioning of the sensing head.

C.3.2.3

Sources

ECI/bvdm Gray Control Strip (free download):
www.eci.org
www.bvdm.org

C.4 Glossary

Absolute colorimetric

Form of color transformation, in which color values within the displayable part of the source color space are transferred into corresponding values in the target color space so that the white of the source color space is simulated (if it is darker than the white of the target color space).

Used in proof printing and soft proofing. See Rendering Intent, relative colorimetric, fig. 11.

Characterisation table [4], [5]

Table that for the purposes of profile generation compares color and data set values.

- Comparing either the measured color values of an original to the data set values received from its input or
- Dataset values to color values measured on its printed output or on the screen.

Characterisation tables that comply with ISO 12641 [23] (previously ANSI IT8.7/1) for input and ISO 12642-1 [4], ISO 12642-2 [5], (previously ANSI IT8.7/3 and ANSI IT8.7/4) for printed output are particularly important.

A dozen profiles may, for example, be derived from one characterisation table but differ from each other in relation to the black composition, the profile tool producer and other details. Therefore for the precise characterisation of an intended print output it is sensible for the output profile to be available.

CIE

Abbreviation standing for Commission Internationale d'Éclairage (international lighting committee), based in Vienna, that – in conjunction with the ISO and the IEC – is responsible for international standards in the field of lighting technology and color measurement.

CIELAB color difference ΔE^*_{ab}

Distance between two color locations in the three dimensional CIELAB color space calculated using the following formula:

$$\Delta E^*_{ab} = \sqrt{\Delta L^{*2} + \Delta a^{*2} + \Delta b^{*2}}$$

The values of ΔL^*, Δa^*, Δb^* are, in each case, the difference between the actual and target values. They correspond to the distances on the three axes of the projected color location. The quantities ΔE^*_{ab}, ΔL^*, Δa^*, Δb^* are pure numbers and so the unit is 1 and not for example ΔE. A color difference of 1 corresponds on average to a difference that is just visible between two sufficiently large, uniform color patches.

CIELAB color space

Approximately evenly spaced in terms of perception, three dimensional color space that is defined by plotting the L^*, a^*, b^* co-ordinates at right angles to each other, see fig. 10.

CIELAB was originally developed for evaluating color differences not as a color space.

CIELAB L^*, a^*, b^* color values

L^*, a^*, b^* color values calculated from the standard color values. Under ISO 13655 [22] only CIELAB color values are given in the printing industry.
Unit: 1.

The CIELUV system offers certain advantages with self-illuminated elements, for example monitors. However, in order to ensure the comparability of measured values, CIELUV should remain restricted to these few applications.

CIELCH system

A different way of displaying the CIELAB color space in which the Cartesian coordinates a^* and b^* are replaced by the distance of the chromaticity, known as C^*, from the L^* axis and the chromatic tone angle h (cylinder coordinates).

CMM, Color Matching Module

A color matching module is a software package based on mathematical methods for the conversion of color image data from one color space into a second one whilst using one or more ICC profiles. Several ICC profiles are normally linked together to form a single profile before the color conversion takes place. This saves time and increases the accuracy of the transformation. A color management module can be a component of an operating system or an application program. All significant applications in the field of color management employ a color management module. In the Microsoft Windows 98, ME 2000 and XP operating systems the module is referred to as the ICM – Integrated Color Management, whilst in the Apple Macintosh operating system it is known as ColorSync (Apple).

CMYK composite

File format in which the tone values of the component colors required for printing are already determined (the so-called separation has already taken place), but the division into individual files or separations has not yet been carried out.

Color density D

Term in printing technology for the reflection density. The negative Log to the base 10 of the reflection factor R in accordance with the formula:
$D = -\lg R$
Unit: 1

For measurements of chromatic printed specimens narrow bandwidth spectral curves are used in the densitometer, the black is measured with a broad bandwidth. The color density increases with increasing ink layer thickness up to a saturation point. Color densities are expressed as decimals. There are no color density units, since color densities are pure numbers, as, for example, is the number π.

Color location

The location of a color in the color space defined by three color values.

Color management

Methods for maintaining or for the controlled adjustment of color information in workflow from original to print. The term encompasses calibration and checking.

Color measurement device

Device for the measurement of colorimetric quantities, such as color values.

Color space

The color space is the three dimensional (spatial) display of the color values determined by means of color measurement.

Color temperature

The temperature of a radiant black body in degrees Kelvin (K) with the same color value proportions as the radiant body to be defined in this way.

Color values

The co-ordinates of a color such as L^*, a^*, b^* or X, Y, Z, determined from the standard color values.
Unit: 1

Control strip

One dimensional arrangement of control patches.

Crossmedia publishing

Digital information stored once and used multiple times for different media or print conditions.

Densitometer

Measurement device for the determination of color density of reflection copy or the transmission density of transmitted light copy.

This can either be carried out by using a traditional densitometer fitted with color filters and, ideally, with polarisation filters too, or by using a spectrophotometer with an additional densitometer. In Europe devices with narrow bandwith spectral characteristics with polarisation filters are preferred for yellow; see ISO 13656 [16]. If no polarisation is used, wet and dry ink films display a density difference.

Dot shapes

Elliptical dots (beaded or chain structure), circular dots (round over the whole tone value scale) and square dots (that display a chequer-board pattern primarily in the mid tone range).

Circular dots are stipulated because of the comparability of print control. Unlike elliptical dot screens, square and circular dot screens have no preferred direction.

dpi – dots per inch

US unit used for the resolution of scanners and output devices. To convert dpi values into the official cm^{-1} unit, divide by 2.54.

ECI – European Color Initiative

Expert group concerned with the device independent processing of color data in digital publication systems. Participants are customers, agencies, prepress houses, printers, associations, research institutes, technical colleges and systems suppliers (www.eci.org).

It was founded in 1996 at the instigation of the Bauer, Burda, Gruner + Jahr and Springer publishing houses

CIELAB color gamut

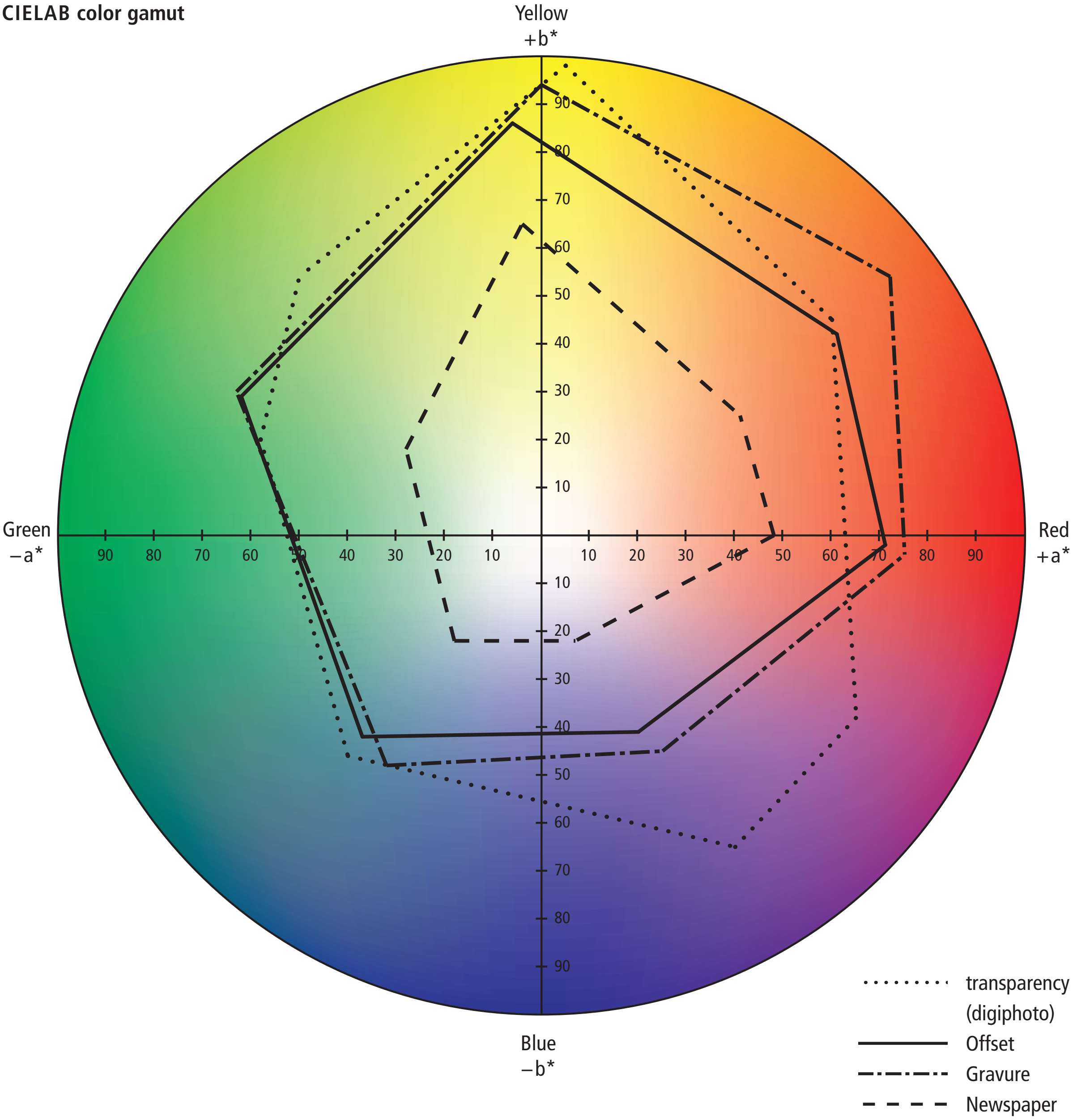


Fig. 10: Presentation of color gamuts: different printing processes (single print samples) and an original copy (transparency).
The color gamuts outline practical examples. With different combinations of papers and inks the color values are necessarily changing.

in Hamburg. The original focus was on ICC-based color management, the gravure printing process, advertisement production but today it also deals with data exchange standards (eg. PDF/X-3), process standardisation (eg. gravure, offset).

ECI-RGB

Colorimetrically defined RGB color space with expanded gamut, which is linked to CIEXYZ by a profile laid down by the ECI (www.eci.org).

ECI-RGB is a recommendation of the European Color Initiative for a working color space in the field of prepress and data exchange.

EPS – Encapsulated PostScript

Specific format of PostScript used for the (encapsulated) transport of finished page components in another file.

European color scale

C, M, Y offset ink set that fulfills the conditions of the now withdrawn European scale standard DIN 16539: 1971.

This standard only fixed the color locations of the primaries and the secondaries on a special proofing paper. Replaced by ISO 2846-1. The other sections of ISO 2846 deal with the inks for the remaining printing processes. The color locations to be achieved on production papers and the tone value increases are laid down in the ISO 12647 series of standards.

Euroscale

Non-binding, widely distributed and, in the final analysis, false name for offset ink set based on the colors of the former European color scale, DIN 16539: 1971. In the broad sense (primarily in the USA and referred to as Euroscale), used as an all-inclusive term for European offset printing with positive plate and 60/cm screen.

Filmsetter

Device that outputs a data set on film.

Gamut

The maximum extent of a color space that can be used by an original, a process or an output device.

Gray balance

Set of cyan, magenta and yellow tone values on the film separations from which a print produced in accordance with specified printing conditions results in an achromatic color under specified observation conditions.

ICC

The International Color Consortium (ICC) was founded in Munich in 1993 at the instigation of Fogra, the German graphic technology research association in response to the many parallel efforts of the different manufacturers to establish their own, closed color management system in the market. The manufacturers of the most important operating systems for the publishing industry (Apple, Microsoft, Sun and Silicon Graphics) started a practical initiative to establish a uniform color profile format that is directly supported as a standard on all systems. By closely linking the color profile structure to the color adjustment functions of the PostScript page description language it was ensured that the many color printing systems with modern PostScript RIPs that were already on the market were immediately supported by the ICC standard. Adobe Systems and some suppliers of application programs were also founder members of the ICC.

The ICC today has more than 60 members around the world, including the leading operating system manufacturers and many established suppliers of application programs as well as peripheral devices in the publishing industry. Today, most applications support the ICC standard. When the ICC mechanisms are consistently supported the result is a universally usable chain of colorimetrically defined data across all computer systems.

Further information about the work of the ICC and the specifications of ICC profiles can be obtained from the www.color.org web site.

ICC profile

File based on a characterisation table (see entry) and further specifications containing calculation instructions for a CMM for the conversion between device or process-related (e.g. CMYK) and colorimetric color data (e.g. CIELAB) and vice versa.

A distinction is drawn between input and output profiles. Scanner and digital camera profiles allow conversion between the CIELAB data of the copy and the RGB data generated from it. A monitor profile provides the link between the device specific RGB data of the monitor and the CIE color data generated from it. The output profile of a printing condition (reference print profile) allows the conversion between CMYK data and the corresponding CIELAB data of the print that is produced.

Source profile refers to the profile delivered with the data that describes the nature of the data and its relationship to an absolute color space. During output for proofing purposes the so-called target profile describes the monitor or proof printer and the reference print profile the printing condition to be simulated.

Illuminance

Quantity of light per unit area in Lux.
Unit: lx
1 lx = 1 lm/m² (lm = lumen)

Illuminant

Radiation with a particular spectral distribution in a wavelength region in which it can influence the color of an object.

The illuminant can also be described by means of a color temperature. For example D50 when applied to an illuminant corresponds to daylight with a color temperature of 5000 kelvin.

ISO

International Organization for Standardization is based in Geneva. ISO standards are valid for worldwide application and available at ISO and at the national standards institutions: in USA by ANSI, in the UK by BSI, in Germany by DIN, in France by AFNOR, in Japan by JISC, in Brazil by ABNT in Austria by ONV and in Switzerland by SNV etc. Standards for the Graphic Arts Industry are developed by ISO Technical Committee 130 Graphic Technology with contributions of technical experts from all over the world (www.iso.ch).

Lightness *L**

Sensation whereby a color appears brighter or darker, i.e. gives off more or less light compared with another.

The change in lightness is characterised as ΔL^*

Lpi – lines per inch

Unit of screen ruling in the USA.
lpi values can be converted into the official cm^{-1} unit by dividing by 2.54.

Luminance

Measurement of the quantity of light that passes through a given cross sectional area in a given direction and with a given solid angle.
Unit: cd/m^2

Matching

Critical comparison of two images.

Matching copy, OK sheet

Printed copy chosen from the print run as a reference for the rest of the run.

Media neutral data basis

Output neutral storage of digital data.

Micrometer

1 micrometer = 1 µm = 0.001 mm
The term mu and the symbol µ are now obsolete.

Non-periodic screen

Screen without a fixed value for the screen angle and ruling. A non-periodic screen is characterised by the program used to generate it and the smallest dot size that occurs.

Off-press proof

Print not produced on a press for the purposes of displaying the results of the color separation process in a way that closely reproduces the results on a production press.

The English term "proof" applies to both an on-press proofs and off-press proofs.

An idealised off-press proof, whose gamut and print characteristic curves have not been specifically tailored to a particular printing process contrasts with a so-called process-related off-press proof that serves as a true to color simulation of the production run.

On-press proof

Print produced by a press for the purpose of depicting the results of the color separation in a way that closely reproduces the results on a production press.

The purpose of an on-press proof is to show the anticipated results of the production run as accurately as possible at a specific stage of the correction or after its completion. The standardised on-press proof delivered with the reproduction (films) serves as evidence that the depiction of the image it provides is, to a large extent, what is to be anticipated during the production run under standardised conditions, irrespective of the press on which the proof was made. The evidence is provided by values of an original control strip printed with it and by observance of the other conditions for a standardised on-press proof. Instead of an on-press proof an off-press proof can be supplied as a substitute for an on-press proof.

OPI – open press interface

Prepress process that saves storage space by using a low resolution screen version in place of the higher resolution image that is held on the server. During output the low resolution image is replaced by the higher resolution image.

PDF

A platform independent page description format for documents from Adobe with the capacity to embed raster images that is mainly used for the transport of data between systems.

PDF/X (PDF/X-3)

The PDF-based PDF/X series of standards has been developed by the ISO. The ISO 15930-3: 2002 standard based on PDF 1.3 and the forthcoming ISO 15930-6: 2003 standard based on PDF 1.4 are recommended for media neutral data generation and transfer. The other sections of the standard cover media specific or incomplete data transfer.

PDF/X-3 supports both color management-based and classic workflows for all printed products and printing processes. PDF/X-3 ensures the correct, print media specific, checking and finishing of a PDF file.

Perceptual

Term for the perception-related or "photographic" type of transformation in ICC profiles. Also see "Rendering Intent".

Form of color transformation in which the color values within the displayable portion of the source color space are converted in a perception-based way to the (usually smaller) gamut of the target color space, so that the white of the source color space becomes the white of the target color space. See also fig. 11.

Pixel

Smallest image element resolved by a scanner or output device (film or platesetter, digital press, monitor).

Pixel display

Storage intensive form of coding in which the luminance of each pixel and each colour is stored.

It can refer to data generated by an input device (e.g. scanner) or data generated by a RIP (bitmap) for the output device. TIFF, TIFF/IT are typical pixel data formats.

Polarisation filter

Filter that only allows light oscillating in the same plane to pass. Densitometers fitted with polarisation filters deliver virtually identical color density values for wet and dry prints, which are higher than for devices without polarisation filters.

PostScript

Vector-based page description language and programming language from Adobe.

Primary color

In multicolor halftone printing, the color generated by a single colorant. In normal cases, the colors C, M, Y and K, which are also known as process colors. In special cases others are used, for example the replacement of M by orange.

Print run

The production run for the printed product.

Profile

See ICC profile.

Proof

See "On-press proof" and "Off-press proof".

Publishing

Term covering the array of working stages involved in the production of publications, from the layout and arrangement of the contents to the output.

Reference print profile

See ICC profile.

Reference printing condition

Standardised, generally known printing condition in which the measured values match the stipulated target values.

Example: Offset printing with a screen ruling of 60/cm and positive plate on 115 g/m² illustration printing paper and inks in accordance with ISO 2846-1.

Relative colorimetric

Type of color transformation in which the color values within the displayable part of the source color space are transferred into corresponding values in the target color space, so that the white of the source color space becomes the white of the target color space.

Used in off-press proofing on original paper. See Rendering Intent, fig. 11.

Rendering Intent

Rendering Intents terms defining the desired rendering of images and graphics on an output device or output process. Rendering intent is closely linked to gamut mapping, see fig. 11.

Absolute colorimetric rendering intent

Absolute colorimetric rendering intent is used for the exact and checkable rendering of color values. Rendering intents are used in the simulation (off-press proof) of an output process on a different output device or in the output of defined color values during printing.

Relative colorimetric rendering intent

Relative colorimetric rendering intent is used for the exact and media-related rendering of color values. Rendering intents are used in the partial simulation of an output process on another output device based on the white of the output medium.

Perceptual –
Perception related rendering

Perceptual rendering intent is used for the harmonious rendering of color values in printing taking into account the different gamuts of original and print. The rendering intent is primarily used for the color separation of images.

Saturation –
Saturation rendering intent

Saturation rendering intent is used for chromatic-oriented rendering of the color values of the original in print, in order to maintain the saturation of the color values of the original. The rendering intent is primarily used for the color separation of graphics and graphs (business graphics).

Resolution

In the case of an input scanner, this is the number of lines read per unit length, in the case of an output device it is the number of controllable writing lines per unit length.
Unit: cm^{-1},
in the USA also dpi (l/cm, lpi).

RGB data

Form of data that breaks down the color information into red, green and blue components.

RIP – Raster Image Processor

Program or device for the calculation of the bitmap to be written by the output device.

Screen angle

In elliptically shaped halftone dots the angle between the preferred direction of the screen and the reference direction. With circular or square halftone dots the smallest angle made by one of the two axes of the screen and the reference direction.

As in mathematics, the angle is measured in an anticlockwise direction. For right reading images the starting point for measuring the angle is the 3 o'clock direction. Unit: degree.

Screen ruling

Number of printed image elements such as halftone dots and lines per unit length in the direction for which the value is highest.
Unit: cm^{-1} or lines/cm

Source profile

See ICC profile.

Absolute colorimetric
All displayable colors are exactly rendered colorimetrically, non displayable colors are replaced by the closest displayable color.

Relative colorimetric
Likewise an exact colorimetric conversion but based on the paper white. A neutral white from the original is depicted by the paper white.

Saturation
Colors are highly saturated and brilliantly displayed, at the cost of color fidelity.

Perceptual (photographic)
Perception-based adjustment of the original gamut to the output gamut.
- The neutral white is depicted by the paper white.
- The furthest non-displayable colors are projected on to the periphery of the color body and all the colors lying in between are compressed together to a greater or lesser extent with the displayable colors.

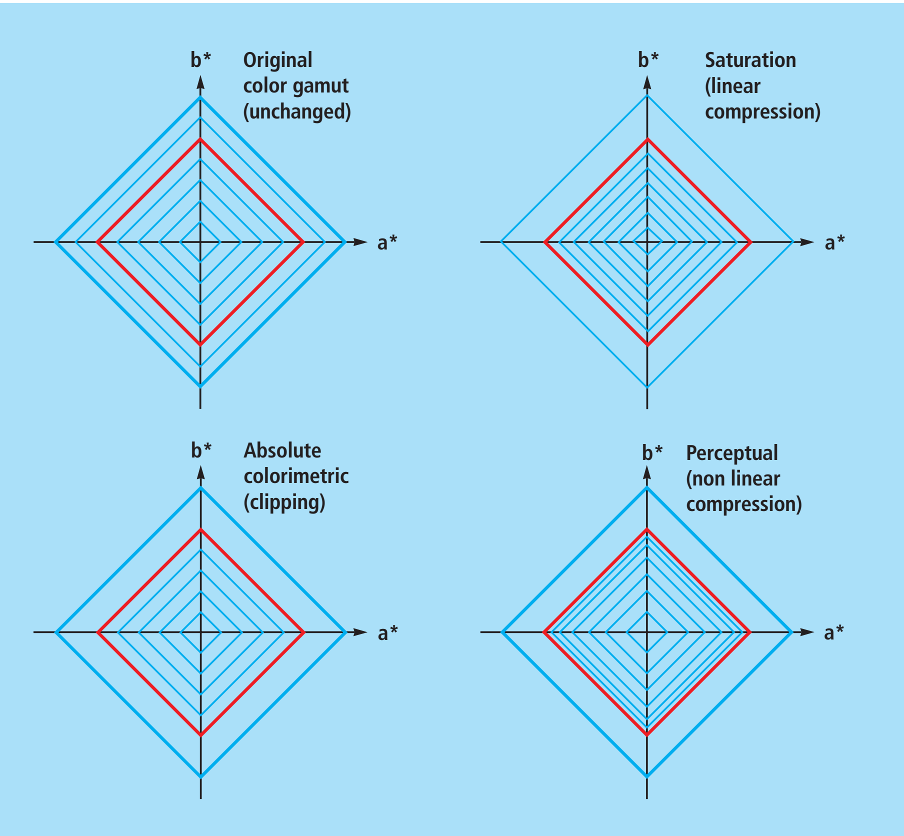


Fig. 11: Models for color gamut mapping (rendering intents of ICC profiles): For reproduction of input color gamut in the output color gamut of the appropriate printing process two models apply first: clipping and compression. With both concepts sufficient results are only achievable with certain specific images. A compromise is the nonlinear compression.

Spreading in the mid tone *S*

Difference between the highest and lowest tone values measured for the C, M, Y at the same point on the print.
Unit: %

Target profile

See ICC profile.

TIFF – Tagged Image File Format

Pixel format managed by Adobe.

TIFF/IT

Special TIFF format that complies with ISO 12639.

Tone range

The tone value range of a data set or film that can be transferred to the print.

Tone value (in photography, proofing and printing) *A*

Percentage of the surface that appears covered by a colorant of a single color (when light scattering in the substrate and other optical processes are disregarded), calculated in accordance with the Murray-Davies formula.
Unit: %.

Previously also known as the "equivalent dot percentage. The advantage of this definition is that also makes sense when the measured tone is not screened, as in, for example, digital proofs.

Tone value (on film) A_F

In a positive film, the percentage of the surface covered. In a negative film the difference between the percentage covered and 100 %. The covered area is determined in accordance with the Murray-Davies formula.
Unit: %

Tone value increase ΔA

Difference between the tone value of the print, A, and the corresponding tone value of the film, A_F:
$\Delta A = A - A_F$
Unit: %

If no film is available the comparison is made with the corresponding value of the CMYK data set. (The value is usually stated for 40 %).

Tone value sum (Dot percentage sum)

Sum of the tone values for all four color separation films of a set.
Unit: %

For most color sets the highest tone sums lies at the darkest point of the gray axis of the image.

Ugra/Fogra CIELAB media wedge (see fig. 4b)

In media neutral data preparation, the image data should be held in three component form in the process chain for as long as possible and not prepared for a particular printing condition. To do this, a control aid is useful that allows the color transformation properties of a color management system or a profile to be checked for color fidelity and gamut. During output of the data in CMYK, as for example in nearly all proof printers, the Ugra/Fogra CMYK media wedge will also always be required. The Ugra/Fogra CIELAB media wedge supplements the Ugra/Fogra CMYK media wedge in certain applications but does not replace it.

The color patches of the Ugra/Fogra CIELAB media wedge are laid out in CIELAB. The control block, 4b, is supplied as a data set and comprises three lines of color patches covering all the chromatic tints of the CIELAB color circle at an angular separation of 22.5°. There is also a true gray wedge and an unprinted patch. The top line, known as "I" for "ideal" contains the CIELAB values in the data set that correspond to an almost ideal gamut. The middle line corresponds to gamut that can usually be achieved in offset and gravure printing on good papers and is therefore labeled "R" for "real". The lowest line contains values that correspond to the gamut for newspaper printing, and is labeled "M" for "minimal". When working with CIELAB data, the Ugra/Fogra CIELAB media wedge allows the gamut mapping performed by the ICC profile being used to be followed. -TIFF, -EPS, and -PDF versions are supplied by Fogra and the instructions for use define the CIELAB values that are programmed in.

In future, in a process chain based on media neutral data preparation, the Ugra/Fogra CIELAB media wedge will be required for regular checking of the entire workflow, the color management system, as well as the checking of the gamut and the color fidelity.

Ugra/Fogra CMYK media wedge (see fig. 4a)

This digital device has been developed by Fogra in conjunction with the expert committees of Bundesverband Druck und Medien e.V. from 1996 onwards. A CMYK version initially played the primary role, since this workflow will still be used for some time. It contains color patches from strategically selected points of the well-known ISO 12642-1 (previously IT8.7/3) color chart. Since application programs and their color management do not currently always work with EPS files, both an EPS version and a TIFF version are provided, and a PDF version is also available. The major application is the control of digital proofs. It can, however, also be used to observe the consequences of image processing in CMYK mode and other prepress work.

The layout of the versions is identical, comprising two lines of 6 mm × 6 mm color patches separated into two groups – see fig. 4a. The columns are numbered. Columns 1 to 9 consist of 100 %, 70 % and 40 % tone values of the cyan, magenta and yellow primaries, as well as the blue red and green secondaries. Columns 10 to 17 cover critical mixed colors that are important for the assessment of the color transformation by means of color management and the quality of an off-press proof. It also includes the substrate color. The following columns are labeled with the tone values of the gray patches. In the top line the gray patches are produced using black (true gray) with tone values of 10 %, 20 %, 40 %, 60 % and 80 %. In the bottom line the patches are made up from cyan, magenta and yellow (chromatic gray) in accordance with the guidelines of the ISO 12642 standard. The advantage of off-press proof control using the CMYK-TIFF media wedge is that its CIELAB values are defined as soon as the ISO 12642 characterisation table for the printing condition to be simulated is known. If the media wedge is introduced into workflows with three channel color data such as ECI-RGB or CIELAB, it first needs to be changed into the desired color format by means of color management using the "perceptual" photographic type of transformation. The CIELAB media wedge is not intended for this application.

Ugra/Fogra digital plate wedge

Digital control device for filmless platemaking.

Ugra/Fogra digital print control strip DKL

Digital control device for checking on-press proofs and the print run.

Vector display

Form of coding that requires relatively little storage space in which the lines are displayed by means of angled lengths (vectors) for which only the end point is stored. Examples: PostScript, EPS; see "Pixel display".

C.5 Internet Sources

Bundesverband
Druck und Medien e.V. (bvdm), German printing and media industries federation, Wiesbaden, www.bvdm.org

CIE International Commission on Illumination, Vienna, www.cie.co.at,

CIE Division 8, www.colour.org

DIN Deutsches Institut für Normung e.V, German Institute for Standardisation, Berlin, Cologne, www.din.de, www.beuth.de

ECI European Color Initiative, www.eci.org

ERA European Rotogravure Association e.V., Munich, www.era.eu.org

Fogra
Forschungsgesellschaft Druck e.V., Graphic Technology Research Association, Munich
www.fogra.org

GRACoL
US-specific non-standardised print production guidelines for print buyers and service providers (commercial offset)
www.gracol.com

ICC International Color Consortium, www.color.org

IFRA, Darmstadt, www.ifra.com

ISO International Organization for Standardization, Geneva, www.iso.ch

SNAP
US-specific, non-standardised print production guidelines for newspaper printing
www.gain.org

SWOP
US-specific, non-standardised print production guidelines for heatset web offset printing
www.swop.org

ugra
Swiss Centre of Competence for Media and Printing Technology, www.ugra.ch

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www.iso.org

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25 Test suite files,
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11 ICC profiles, documentation
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Altona Test Suite – Application Kit

Now with additional printing conditions for newspaper and gravure (Update 2005)

16 Reference Prints, 7 Color Specimens (Process Color Solids), 25 Test Suite Files, Characterisation Data, ICC Profiles, Documentation

Application Kit for comprehensive check of digital proof and workflow including PDF/X-3 compliance

ATS Update 2005 comprises a printed documentation and CD-ROM. The CD-ROM includes the Altona Test Suite files “measure” and “visual” for five additional standard printing conditions (newspaper, gravure publication printing) and the characterisation data and profiles for these standard printing conditions. Reference prints for these five additional standard printing conditions are not supplied.

A revised version of all 14 existing Altona Test Suite files “measure” and “visual” for offset and continuous printing are also provided on the update CD-ROM.

12 Reference Prints Offset

Measure / Page 1, Offset 60/cm – Paper Type 1 to 5
Visual / Page 2, Offset 60/cm – Paper Type 1 to 5
2 × Technical / Page 3, Offset 60/cm – Paper Type 2

4 Reference Prints Continuous

Measure / Page 1, Visual / Page 2
Continuous 60/cm – Paper Type 2
Continuous 54/cm – Paper Type 4

7 Color Specimens Offset – Continuous

Offset 60/cm – Paper Type 1 to 5
Continuous 60/cm – Paper Type 2
Continuous 54/cm – Paper Type 4

CD ROM with

25 Test Suite Files (Measure, Visual, Technical)
11 Characterisation Data Files
11 ICC Profile Files
132 p. Documentation (German/English) 2004
52 p. Documentation (German/English) 2005

More information and ordering:
www.altonatestsuite.com