

IFRA-Check:

**Evaluation
of printing quality
on the basis of worldwide
valid standards**



Instructions

Thank You

For your interest in using the IFRA-Check tool to submit your newspaper to a continuous printing quality control and thus securing high-quality newspaper printing for both your own and suppliers' purposes.

In order to be able to evaluate nearly all printing processes as well as a large number of the materials used in newspaper printing, we offer you the possibility to arrange your specific technical production environment within one of the following four different production categories. The categories are defined based on technical criteria. They are oriented towards the different printing processes and materials used in modern newspaper printing. The objective is to permit the participation of every newspaper printer, no matter which technical production process he applies.

You decide in favour of one of the following categories when inputting your data:

Category 1	Coldset-offset printing on newsprint
Category 2	Heatset-offset printing or UV ¹ -cured offset printing on newsprint
Category 3	Heatset-offset printing or UV-cured offset printing on SC ² or LWC paper ³
Category 4	Extra category for newspaper printing on tinted paper or for printing processes outside offset (e.g. flexo or ink-jet)

Target values or evaluation methods differ in part for the various categories due to the different process techniques. For this reason, in the following "Comments on the Evaluation Processes" it is indicated in each case for which of the categories the evaluation process applies.

Kindly check at the appropriate time that you have all the necessary materials and information. If anything is missing, please inform us immediately! Also do not hesitate to contact us if you have any queries or require further information.

You can download the test forms to be reproduced for the competition, these instructions as well as additional material from www.ifra.com/qualitycheck.

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¹ UV stands for ultra-violet curing.

² SC stands for super-calendered, familiar mainly from gravure printing.

³ LWC stands for Light Weight Coated paper.

Introduction

The IFRA Cuboid test element

The "IFRA Cuboid" digital test element is available as a PDF in CMYK. This print target does not require color separation.



The IFRA Cuboid is a test element. Its square shape recalls that of a cube. It is 45 mm wide and therefore corresponds to the standard column width. The above figure shows the original size. Colors are not to be taken as references.

The IFRA Cuboid is a single-column color filler ad that may be enlarged to scale. It may not be reduced in size under any circumstances for printing, as that would make it impossible to measure the printed sample correctly! Please process this test element in the same way as a supplied color ad. It is intended for printing as part of a newspaper page.

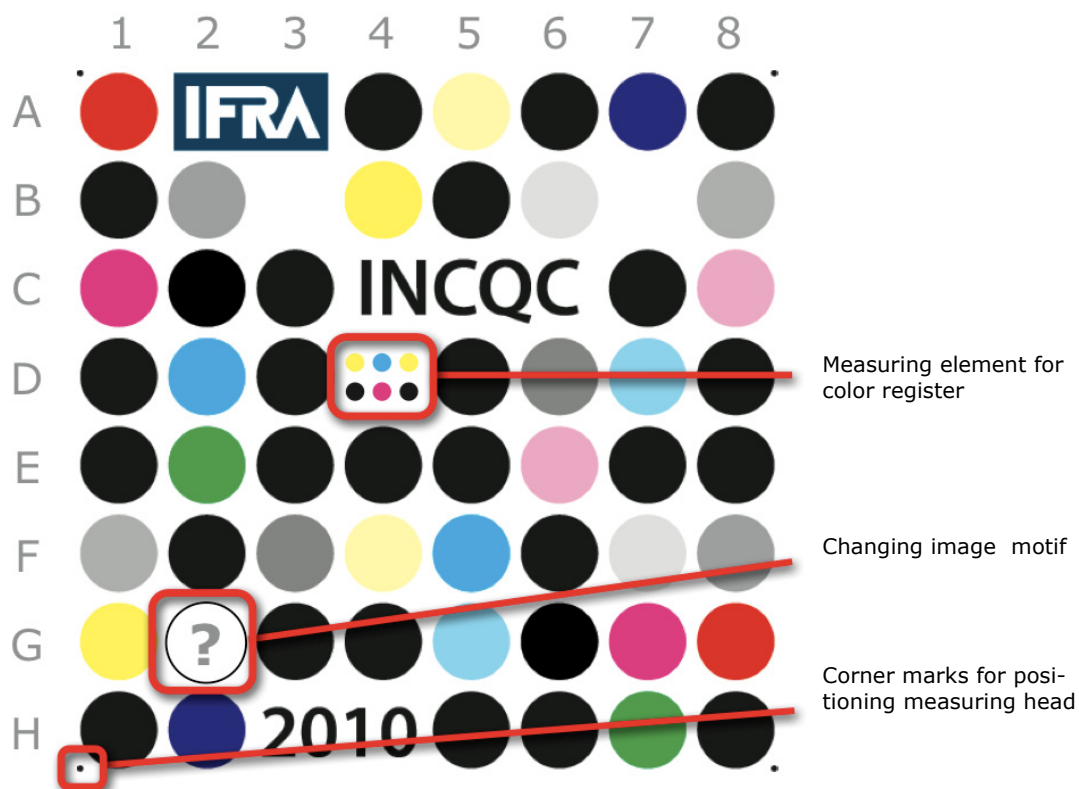
The IFRA Cuboid is 45 mm wide, and therefore in line with the standard column width of many newspapers. You have two possibilities to position the test element on a newspaper page:

- You position the IFRA Cuboid *in the original size* on any page of the newspaper title you have selected to evaluate. In this case, use the file "Cuboid_Non_Scaleable.pdf". The file includes the color register measuring element.
- You *enlarge the IFRA Cuboid* up to a maximum 15 cm wide to suit your desired scale – e.g. two columns wide. In such a case, use the file "Cuboid_Scaleable.pdf". Position the IFRA Cuboid on a newspaper page. Then position the color register measuring element (file name "Register.eps"), unscaled, in patch D4 in the middle of the IFRA Cuboid.

The color register measuring element may not be scaled under any circumstances, neither downwards nor upwards! To do so would make the printed sample unsuitable for evaluation and cause you to lose the achievable points for color register.



The color register measuring element (Register.eps) positioned at the centre of the IFRA Cuboid may not be scaled under any circumstances. Figure enlarged, see above figure for original size.

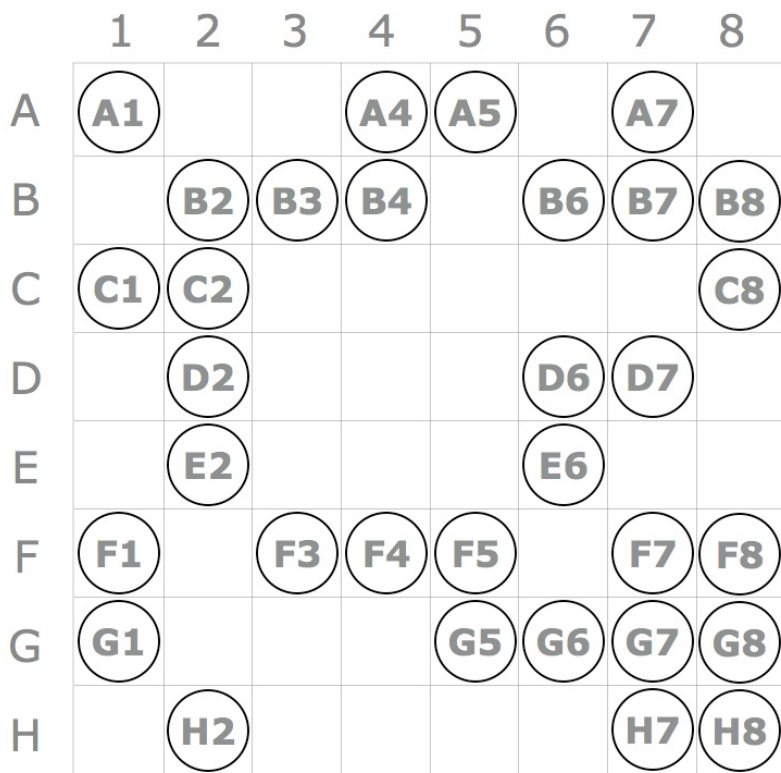


The different elements of the IFRA Cuboid. Some of the color dots are color-measured as part of the competition. The figure does not show the original size, colors are not to be taken as references.

N.B.!

- The file "Cuboid_Scaleable.pdf" may be enlarged up to a maximum width of 15 cm. It **may not be reduced in size**, as that would make it impossible to measure the printed sample.
- The color register measuring element "Register.eps" must be reproduced **in the original size**. Under no circumstances may it be scaled – either upwards or downwards.
- **Avoid positioning test elements in the fold**, as that can adversely affect the evaluation of the printed samples due to set-off and soiling.

The color patches of the IFRA Cuboid taken for color measurement are highlighted in the following figure and their CMYK composition explained in the Table below.



The marked color positions are measured in the competition.

	1	2	3	4	5	6	7	8
A	C 0%			C 0%	C 0%		C 100%	
	M 100%			M 0%	M 0%		M 100%	
	Y 100%			Y 0%	Y 40%		Y 0%	
	K 0%			K 100%	K 0%		K 0%	
B		C 0%	C 0%	C 0%		C 10%	C 0%	C 30%
		M 0%	M 0%	M 0%		M 8%	M 0%	M 24%
		Y 0%	Y 0%	Y 100%		Y 8%	Y 0%	Y 24%
		K 40%	K 0%	K 0%		K 0%	K 0%	K 0%
C	C 0%	C 52%						C 0%
	M 100%	M 44%						M 40%
	Y 0%	Y 44%						Y 0%
	K 0%	K 100%						K 0%
D		C 100%				C 50%	C 40%	
		M 0%				M 42%	M 0%	
		Y 0%				Y 42%	Y 0%	
		K 0%				K 0%	K 0%	
E		C 100%				C 0%		
		M 0%				M 40%		
		Y 100%				Y 0%		
		K 0%				K 0%		
F	C 30%		C 50%	C 0%	C 100%		C 10%	C 0%
	M 24%		M 42%	M 0%	M 0%		M 8%	M 0%
	Y 24%		Y 42%	Y 40%	Y 0%		Y 8%	Y 0%
	K 0%		K 0%	K 0%	K 0%		K 0%	K 40%
G	C 0%				C 40%	C 52%	C 0%	C 0%
	M 0%				M 0%	M 44%	M 100%	M 100%
	Y 100%				Y 0%	Y 44%	Y 0%	Y 100%
	K 0%				K 0%	K 100%	K 0%	K 0%
H		C 100%					C 100%	C 0%
		M 100%					M 0%	M 0%
		Y 0%					Y 100%	Y 0%
		K 0%					K 0%	K 100%

The CMYK values of the IFRA Cuboid test element for information purposes.

Instructions

1. As a first step, decide in which size you wish to reproduce the IFRA Cuboid test element. You have the choice between:
 - a) Reproduction in the original size. This corresponds to a width of 45 mm.
 - b) Scaled enlargement up to a maximum 15 cm wide.
2. If you decide in favor of reproducing the IFRA Cuboid in the original size, download the file "**Cuboid_Non_Scaleable.pdf**" from **www. ifra.com/qualitycheck**
3. If you decide in favor of an enlarged reproduction of the IFRA Cuboid, download the file "**Cuboid_Scaleable.pdf**" and "**Register.eps**" from **www. ifra.com/qualitycheck**
4. Treat the IFRA Cuboid test element like a supplied color ad! Position the IFRA Cuboid outside of the folding area on a colored page of the selected newspaper title.
5. If you have decided in favor of enlarging the IFRA Cuboid, then additionally position the "Register.eps" register control element in the free patch D4 of the "Cuboid_Scaleable.pdf". The register control element may not be scaled upwards or downwards!
6. Print the IFRA Cuboid test element under standardized printing conditions as part of a regular issue of your newspaper. If you do not wish the test element to appear in the distributed daily issue, you can exchange the plates of any color page after a production run for the plates of the test page that includes the IFRA Cuboid.
7. Take 10 good sample copies⁴ of an issue that contains the IFRA Cuboid. When submitting the printed samples, please indicate the page on which the IFRA Cuboid test element is placed. In order to prevent a premature aging of the printed samples, they should be packaged in such way that they are protected against light and humidity. Send your package containing the sample printed copies to IFRA in mentioning the subject "IFRA CQ-Check".
8. Your evaluation report is strictly confidential. Only you will be informed of their contents and these cannot be accessed by third parties.
9. You will receive your evaluation report short term.

Explanations concerning the evaluation process

The evaluation process consists of the measured evaluation of the printed IFRA Cuboid test element. A total maximum of 180 points can be awarded for the evaluation of the printed IFRA Cuboid test elements.

The achievable points in categories 1 to 3 are constituted as follows:

⁴ "Good copies" is a frequently used technical term. It refers to the perfect printing quality of printed newspaper copies and excludes waste as well as lower quality or "just about suitable for sale" quality.

No.	Categories	No. of achievable points
1	Newsshade	30
2	Black ink	30
3.1	Mid-tone spread CMY	20
3.2	Mid-tone spread CMYK	10
4	Gray balance	30
5	Color space	30
6	Color register	30
Total max. points		180

The achievable points in category 4 are constituted as follows

No.	Categories	No. of achievable points
1	Newsshade	Info
2	Black ink	Info
3.1	Mid-tone spread CMY	20
3.2	Mid-tone spread CMYK	10
4	Gray balance	30
5	Color space	Info
6	Color register	30
Total max. points		90

Measuring procedure and measuring instruments

All color measurements are carried out using a spectrophotometer in accordance with ISO 12647-1, paragraph 5.6. That means: angle of observation 2°, light source D50, measuring geometry 45°/0° or 0°/45°, black backing. The software used calculates the CIELAB color values (L*a*b*) as well as the color density values (density status T). Dot gain is calculated by the Murray-Davies formula.

The color measurement of the IFRA Cuboid test element is done using the X-Rite automatic "Eye One iO" measuring instrument. Because each color patch is included twice in the test element and two printed samples are measured, four sets of measured data are produced. The obtained values are then averaged following a plausibility check.

Color register measurement is done using an image analysis-based measuring instrument. This instrument, a Techkon "RMS 910", is used to twice measure three printed copies per title. This produces six sets of measured data, the results of which are averaged following a plausibility check.



The X-Rite "EyeOne iO" color measuring instrument (left) and Techkon "RMS 910" color register measuring instrument (right)

Evaluation of the results

1. Newsshade (max. 30 points)

The color of the newsprint (newsshade) should be sufficiently light to permit a good contrast in print. The color cast of the paper should be low and within the permitted tolerance range. But the paper should also have sufficient opacity in order to minimize show-through.

The paper shade is measured on non-printed areas of the IFRA Cuboid (patches B3 and B7). Points are awarded based on the following criteria:

For categories 1 and 2:

<i>Color values</i>	<i>Points per month</i>
L* = 79 or higher	10
L* = less than 79	0
a* = between -1 and 1	10
a* = less than -1 or more than 1	0
b* = between 0 and 4	10
b* = less than 0 or more than 4	0
Maximum number of points	30

For category 3:

<i>Color values</i>	<i>Points per month</i>
L* = 83 or higher	10
L* = less than 83	0
a* = between -2 and 0	10
a* = less than -2 or more than 0	0
b* = between 0 and 3	10
b* = less than 0 or more than 3	0
Maximum number of points	30

For category 4 the following procedure applies:

The IFRA Cuboid is measured but no points can be awarded because the corresponding standards do not exist. However, by comparing several IFRA-Check runs, you can verify that the color of the paper that is used is largely uniform.

2. Black ink (max. 30 points)

The black ink should have a sufficiently high print density to permit good black, white and color printing results. This is especially important because news photos, due to the GCR⁵, usually have a relatively high share of black in the color separation. However, the color density may also not be too high in order to avoid overinking. Points are awarded based on the following criteria:

For category 1:

<i>Color values</i>	<i>Points per month</i>
L* = 38 or lower	10
L* = higher than 38	0
a* = between 0 and 2	10
a* = lower than 0 or higher than 2	0
b* = between 0 and 5	10
b* = lower than 0 or higher than 5	0
Maximum number of points	30

For category 2:

<i>Color values</i>	<i>Points per month</i>
L* = 37 or lower	10
L* = higher than 37	0
a* = between 0 and 2	10
a* = lower than 0 or higher than 2	0
b* = between 0 and 4	10
b* = lower than 0 or higher than 4	0
Maximum number of points	30

For category 3:

<i>Color values</i>	<i>Points per month</i>
L* = 29 or lower	10
L* = higher than 29	0
a* = between -1 and 1	10
a* = lower than -1 or higher than 1	0
b* = between 0 and 2	10
b* = lower than 0 or higher than 2	0
Maximum number of points	30

For category 4 the following procedure applies:

The IFRA Cuboid is measured but no points can be awarded because the corresponding standards do not exist. However, by comparing several IFRA-Check runs, you can verify that the color of the paper that is used is largely uniform.

⁵ GCR = Gray Component Replacement. Chromatic colors that together produce gray are replaced in favor of black.

3. Mid-tone spread

A consistent dot gain in printing is critical for good color balance. Often the so-called “mid-tone spread”, the difference in dot gain between the process inks in the mid-tones, is not sufficiently controlled despite its importance. The mid-tone spread of the CMY inks should have a small tolerance and be smaller than the mid-tone spread of all four process inks, including black.

3.1 Mid-tone spread CMY (max. 20 points)

The patches D7 and G5, C8 and E6, as well as A5 and F4 of the IFRA Cuboid will be used for the measurement of the CMY mid-tone spread.

The achievable points in **category 1** are awarded based on the deviation of the individual colors from the 26% dot gain reference curve specified by the ISO 12647-3 standard:

<i>Difference of dot gain between the CMY colors</i>	<i>Points</i>
Mid-tone spread between the CMY colors max. 6% and dot gain within the 5% tolerance (+/-) of the 26% dot gain curve	20
Mid-tone spread between the CMY colors > 6% and dot gain outside the 5% tolerance (+/-) of the 26% dot gain curve	0

The achievable points in **categories 2 to 3** are awarded based on the deviation of the individual colors from the 22% dot gain reference curve:

<i>Difference of dot gain between the CMY colors</i>	<i>Points</i>
Mid-tone spread between the CMY colors max. 6% and dot gain within the 5% tolerance (+/-) of the 22% dot gain curve	20
Mid-tone spread between the CMY colors > 6% and dot gain outside the 5% tolerance (+/-) of the 22% dot gain curve	0

The achievable points in **category 4** are awarded based on the following criteria:

<i>Difference of dot gain between the CMY colors</i>	<i>Points</i>
Mid-tone spread between the CMY colors max. 6%	20
Mid-tone spread between the CMY colors > 6%	0

3.2 Mid-tone spread CMYK (max. 10 points)

The patches D7 and G5, C8 and E6, A5 and F4, as well as B2 and F8 of the IFRA Cuboid will be used for the measurement of the CMYK mid-tone spread.

The achievable points in **category 1** are awarded based on the following criteria:

<i>Difference of dot gain between the CMYK colors</i>	<i>Points</i>
Mid-tone spread between the CMYK colors max. 8% and dot gain within the 5% tolerance (+/-) of the 26% dot gain curve	10
Mid-tone spread between the CMYK colors > 8% and dot gain outside the 5% tolerance (+/-) of the 26% dot gain curve	0

The achievable points in **categories 2 to 3** are awarded based on the following criteria:

<i>Difference of dot gain between the CMYK colors</i>	<i>Points</i>
Mid-tone spread between the CMYK colors max. 8% and dot gain within the 5% tolerance (+/-) of the 22% dot gain curve	10
Mid-tone spread between the CMYK colors > 8% and dot gain outside the 5% tolerance (+/-) of the 22% dot gain curve	0

The achievable points in **category 4** are awarded based on the following criteria:

<i>Difference of dot gain between the CMYK colors</i>	<i>Points</i>
Mid-tone spread between the CMYK colors max. 8%	10
Mid-tone spread between the CMYK colors > 8%	0

4. Gray balance

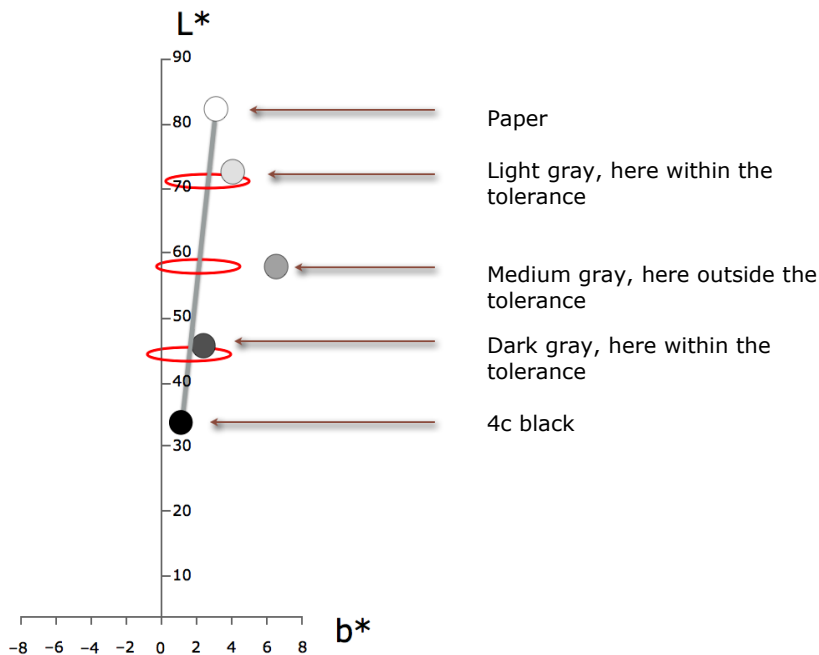
The ability to print neutral gray tones is of fundamental importance for the color reproduction process. If the gray balance is correct, the print result will be neutral and free of color casts. This is especially important for process control that, with the gray balance, has an essential control procedure at its disposal.

But what is gray? The human eye adapts to the shade of the print substrate and takes this for gray in the sense of a neutral color reference. This is why we are not aiming for an absolute gray, but will take the a^* and b^* values measured on your paper (newsshade) as the gray reference. The patches B6 and F7, B8 and F1, as well as D6 and F3 of the IFRA Cuboid will be taken for the measurement of the gray balance. The reference gray (a^* and b^*) will be calculated as follows:

The lightest and darkest measured values (color gamuts of the paper and of the 4c black) are connected via a straight line. This produces a reference gray axis in the color space that is used as an individual scale for the evaluation. Based on the individually measured brightness value L^* of bright, medium and dark grey on the IFRA Cuboid concerned in each case, the "ideal" colour values a^* and b^* are now mathematically calculated on the reference grey axis. These serve as targets (=reference) for the measured a^* and b^* values of bright, medium and dark grey. We refer to the thus-calculated colour difference as "Delta C* absolute".

Points are awarded for all categories in accordance with the following criteria:

<i>The deviation from the individual reference gray should not be higher than 3 "Delta C* absolute"</i>				<i>Points</i>
Light gray balance	Cyan 10%	Magenta 8%	Yellow 8%	10
Medium gray balance	Cyan 30%	Magenta 24%	Yellow 24%	10
Dark gray balance	Cyan 50%	Magenta 42%	Yellow 42%	10
Maximum number of points				30



The individual reference gray axis is the straight line between your newsshade and your 4c black (240% CMYK). It is not usually positioned parallel to the lightness axis L^* , but at an angle as the typical yellow cast of the newsprint is lower in the shadows. The printed CMY gray tones (light, medium, dark) are compared with the reference gray axis ("Delta C* absolute").

5. Color space (max. 30 points)

The larger the printable color space, the more colorful you can print. The color range should have a minimum size as well as a certain geometry in order to satisfy international standards. This is especially important for high-quality ad printing.

The following patches of the IFRA Cuboid test element are used for measuring the printable color space ($L^*a^*b^*$):

Color	Patches	Color	Patches	Color	Patches
Cyan	D2 / F5	Red	A1 / G8	White (paper)	B3 / B7
Magenta	C1 / G7	Green	E2 / H7	4c black	C2 / G6
Yellow	B4 / G1	Blue	A7 / H2		

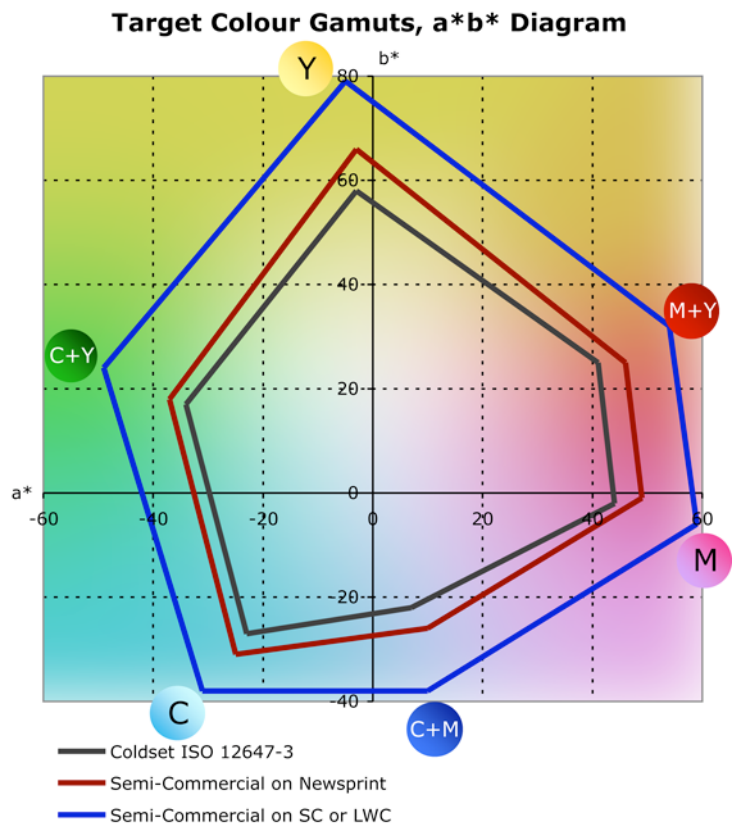
Points for categories 1, 2 and 3 are awarded based on the following criteria:

If your measured color space covers at least 85% of the reference color space concerned, 30 points per month will be awarded. If the measured volume of your color space covers less than 85% of the target color space, no points will be awarded.

Colors	Reference color value for category 1 (in accordance with ISO 12647-3)		
	L^*	a^*	b^*
Cyan	57	-23	-27
Magenta	54	44	-2
Yellow	78	-3	58
Green, Y + C	53	-34	17
Blue, C + M	41	7	-22
Red, M + Y	52	41	25
4c black, CMYK	34	1	2
White, paper color	82	0	3

Colors	Reference color value for category 2		
	L^*	a^*	b^*
Cyan	55	-25	-31
Magenta	51	49	-1
Yellow	78	-3	66
Green, Y + C	50	-37	18
Blue, C + M	35	10	-26
Red, M + Y	49	46	25
4c black, CMYK	30	1	2
White, paper color	82	0	3

Colors	Reference color value for category 3		
	L^*	a^*	b^*
Cyan	56	-31	-38
Magenta	50	59	-6
Yellow	83	-5	79
Green, Y + C	50	-49	24
Blue, C + M	33	10	-38
Red, M + Y	48	54	32
4c black, CMYK	26	0	1
White, paper color	86	-1	2



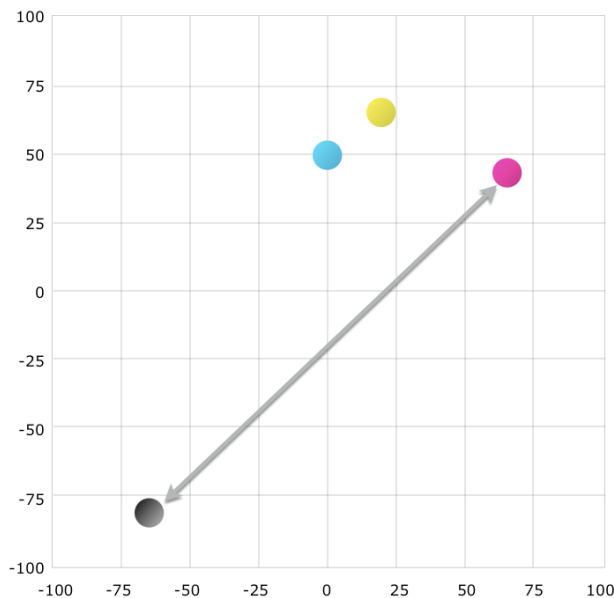
The a*/b* diagram shows the different target color spaces. The black color space corresponds to the standard coldset newspaper offset process in accordance with ISO 12647-3. With the aid of drying or UV-curing, it is possible to print a larger color space range on the same paper (red). If in addition a higher-quality paper (SC or LWC) is used, the color space is again enlarged (blue).

For category 4 the following procedure applies:

The IFRA Cuboid is measured but no points can be awarded because the corresponding standards do not exist. However, by comparing several Self-Check runs, you can verify that the color of the paper that is used is largely uniform.

6. Color register (max. 30 points)

Good color register is the basis of four-color printing. Therefore the IFRA Cuboid test element contains six small color points (patch D4) for color register measurement. Three copies will be measured per title.



For measuring the color register deviation, the largest distance between two colors of the set of colors is calculated. In this case, the greatest distance lies between magenta and black.

The assessment method applies for all categories. The greatest distance between two colors is evaluated. This distance is calculated from the circumferential and lateral register precision. Up to 30 points can be achieved. The points are awarded in accordance with the following rules:

<i>Color register deviation</i>	<i>Points</i>
Maximum 150 µm (0.15 mm)	30
300 µm (0.3 mm) or more	0
For color register deviations between 150 µm and 300 µm (0.05 and 0.3 mm), between 30 and 0 points will be awarded on a linear proportional basis.	

Last but not least. . .

This concludes our instructions. We welcome your participation in the worldwide color reproduction and printing competition of the international news publishing industry and wish you much success in the upcoming competition!

Yours sincerely,
 Your IFRA Color-Quality-Team
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