# Revision of ISO 12647-3

Ifra Special Report 2.37

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# Preface

In 1998, for the first time a worldwide ISO standard for colour offset newspaper printing with process colours was approved. This standard came just in time, as four-colour printing spread like wildfire through the newspaper industry in the 1990s. Already before the standard came into force, there was a major demand for the specifications of the ISO TC 130 Committee that were then applied in a number of standardisation projects at newspapers worldwide. Also the "International Newspaper Color Quality Club" competition, organised jointly by Ifra, NAA and PANPA, made use early on of the specifications of the newspaper printing standard (ISO 12647-3) as the yardstick by which to judge printing quality.

Therefore it was possible to gain a wealth of practical experience with the application of the standard in the newspaper sector since the mid-1990s. This experience was taken into account in 2003 when the question arose as to whether, and if so how, the newspaper printing standard should be revised. ISO standards are reviewed every five years, when it is decided whether a revision is necessary. In this way, a revision of ISO 12647-3 came about. Based on the practical applications and feedback from the markets, it very soon became evident that the unambiguousness and clarity of the newspaper printing standard from the year 1998 could be improved. Advertising customers and other data suppliers want to prepare a single digital file for standardised newspaper printing that they can then make available to all newspapers. Customers have little interest in dot gain differences, for example. They expect the individual newspaper houses to compensate for such technical differences.

The revision of ISO 12647-3 took due account of such demands. In addition, greater attention was paid to modern technical workflow conditions, such as digital ad supply and CTP. The reproduction process and printing process were described more comprehensively than was the case seven years before. Here also, findings from practical application and applied research were taken into account. For example, the results of the Ifra "Newsshade 2003" research project were incorporated into the specifications of the new ISO 12647-3:2004. Newsshade 2003 investigated the average colour or shade of standard newsprint from all over the world.

At the beginning of 2005, the revised newspaper printing standard has reached the status of a "Draft International Standard" (DIS). This means that already all comments and objections from the representatives of the countries participating in the Technical Committee (TC 130) have been incorporated and that now the standard as a whole is ready to be submitted for approval. It also means that there can be no more changes; the standardisation associations with voting rights can only vote "yes" or "no". Accordingly, failure of the standard is highly unlikely, as any queries and objections were settled already during the process. The new standard has been published and can be obtained from the various national standardisation associations. In Germany, this can be from the internet site of the Beuth Verlag (a daughter company of the DIN organisation). Go to www.beuth.de and search for "ISO/DIS12647-3".

For these reasons, a number of associations, including the German ones, decided already last year to make the guidelines of ISO 12647-3:2004 the basis for practical standardisation. With a view to supporting this changeover, Ifra, among other things, has published a series of articles in its monthly "newspaper techniques" magazine under the heading " What does the new newspaper printing standard bring?". We summarise this series of articles in this Special Report. We supplement this with an overview in tabular overview under the title " A quick reference guide to standardised newspaper printing". This was in response to several approaches to us requesting such a quick reference guide. It was compiled last year with the assistance of a small working group drawn from Ifra members. This quick reference guide does not replace practical training, but can complement it and help realise the conditions of standardised newspaper printing in operating practice.

Finally, we wish to point out that standard ICC colour profiles based on the new newspaper printing standard have been available since mid-2004 to all interested parties for downloading free of charge from the Ifra web site (www.ifra.com). These profiles were tested under regular operating conditions at newspapers before they were released. Many thousands of downloads confirm the high level of interest in the industry and advertising sector.

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**Imprint**

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# 1 What does the new ISO standard for newspaper printing bring?

ISO 12647-3, the international newspaper printing standard, was released in 1998. The revised version of this standard is now nearly ready. The German associations, bvdm and ZMG, are aiming to switch to the new standard by mid-2004. Ifra is supporting the preparations for this and is already testing new standard colour profiles. A joint event held at Ifra headquarters on 17 March will inform about the changes. Therefore it is high time to take a close look at the revised ISO 12647-3. bvdm and Ifra will give an in-depth introduction to this topic in a series of articles.

### Why standardise?

For a long time, there were only a few standards in the graphics industry. In the 19th century it was still commonplace to have different type heights for hot-metal composition. It was not possible to exchange type between printing plants. This situation meant that it was even necessary to build customised printing presses. However, these costs were willingly accepted in the hope of keeping competitors at bay. That this is so illustrated by the fact that the question "to standardise or not?" is always answered in the light of business interests, and not on the basis of purely technical considerations.

Do newspaper printing plants want to distinguish themselves by printing quality or do they want to satisfy customer demands by guaranteeing a minimum standard of quality? The question will be decided by the market development.

In the past 15 years, there has been a dramatic increase in colour printing in the newspaper industry. Up to 2001, when the economic crisis began, ink manufacturers reported double-digit annual growth rates in their sales of colour inks. The main reason for the investments in printing presses in recent years was to increase colour capacity. The trend towards new investments is driven by the objective of being able to print full colour on all pages. At the same time, the use of spot colours is clearly declining. Many newspapers have totally switched from using spot colour to process colour printing. Colour in newspapers is no longer anything special. Instead, it has become a fundamental feature of newspaper printing. Colour has entered all parts of the newspaper. Even the classified ad columns contain colour ads and the editorial desks make extensive use of colour.

### The market has changed

A significant development of the advertising market was accompanied by the now almost total development of digitisation. The role of the once so influential reproduction studios changed considerably. Whereas in the analogue world, advertising customers were prepared to spend money on customised colour separations, films and proofs to allow optimal adaptation to individual printing conditions, this is no longer the case. Instead, advertising customers expect that a digital file of the ad can be supplied to all papers and then printed everywhere in the same quality.

At the same time, advertising agencies take over the task of digital ad reproduction; reproduction studios are frequently no longer included in the process. Individual large customers, for example, car manufacturers, build up international databases with product information and images from which worldwide subsidiaries and agents can access to design their own ads. This leads to increased efficiency and cost savings for advertising customers.

On the down side, this development causes specialised printing skills or even specific newspaper printing skills to be lost. This makes it even less likely that advertising customers can be expected to cater to the individual printing specifications of individual houses.

In addition, as a conse-quence of a drop in profits, the agencies are less able to afford printing know-how. Instead, they tend towards specialising in planning multimedia advertising campaigns. Therefore, there remains less scope for designated newspaper specialists.

These developments have led to increased pressure to standardise. Such is undoubtedly felt more in publications printing than in the commercial sector, where it is easier for the customer and the printer to reach agreement due to the fact that there is less time pressure and a greater freedom of design.

Non-standardised newspaper printing has become almost inconceivable and would, in the medium term, split the market as a whole into three parts. One third of all newspaper houses would be able to gain a reputation as high-quality printers, a second third would be regarded by advertising customers as offering average quality, and the final third would slip through the customers' quality filter. All in all, no one would trust the newspaper industry to reliably supply consistent quality. Such a situation would be damaging to the advertising business.

Since the mid-1990s, standardisation initiates have been formed in a number of countries where this trend has been recognised. Ifra alone is participating directly in such projects in Germany, the Netherlands, Spain, the United States, South America and India. All the aforementioned initiatives are modelled along the lines of the ISO 12647-3 international newspaper printing standard. Why does it have to be an international standard? The European Union is a common market that is facing expansion in every respect. Advertising customers act at an international level. The applied printing techniques are comparable almost everywhere. This is all the more the case in the wake of the latest wave of new investments in newspaper presses.

The ISO 12647-3 newspaper standard has been existence for six years. It was taken over, unchanged, as a German DIN standard in 2000. Every five years, ISO standards are examined for possible revision. Accordingly, last year the opportunity arose to introduce improvements, take into account new technical developments and react to changed market needs. For this reason, the ISO Technical Committee 130 (TC 130), which is responsible for developing graphic standards, decided to revise ISO 12647-3. A draft version is now available that has already been coordinated with

many of the national delegates attached to the TC 130 and is ready for approval at the next meeting of the Technical Committee in St. Gallen, Switzerland, that is scheduled for the spring. We have summarised the present draft ISO 12647-3 in the form of a table (see table on page 50).

### What are the benefits of the new standard?

The description of the colour space was adapted to better match reality. For this purpose, it was possible to use an extended database consisting of measured data from Europe, the United States and Japan. The most important aspect here was the correction of the target magenta value.

Today's basis for newspaper production is largely digital. Ads, editorial pages, texts and images from news agencies reach the newspaper in digital form. Digital photography has become an established feature of editorial work. The new draft version takes account of this development by making greater allowance for digital data as the starting point for production. The same applies for computer-to-plate, a technique that only six years ago began to gain a foothold in the newspaper area but today is largely standard in Europe.

Also included in the new draft are more exact and extended definitions of the screening system, grey balance in newspaper printing, the printable colour space, dot gain and solid densities. Listed in annex are electronically available characterising data for describing colour newspaper printing, which it is planned to make available via the internet. No such reliable data was available six years ago.

We shall deal in detail with the aforementioned changes in the later articles of this series. Perhaps the most important change in the new newspaper standard is that, generally speaking, only one specification applies for all parameters without exception. A single screen ruling is specified, one dot shape, one set of screen angles, one type of colour separation (namely grey component replacement, GCR), etc. This not only gives the standard clarity but also reflects the described market requirements only which demand that exactly only one data set must be produced for newspaper printing.

This is best illustrated on the basis of the specifications of the ISO draft for dot gain. The dot gain of a printing process depends on many process steps and technical conditions. At the same time, it is one of the most important parameters for printing quality. The standard released in 1998 contained nine specifications for dot gain: the values for offset printing from conventional negative plates were 30 percent and 33 percent, for offset printing from conventional positive plates 24 percent and 27 percent, for offset printing from camera-exposed positive plates 20 percent and 23 percent, for offset printing from CTP plates 27 percent and 30 percent, and finally for newspaper letterpress printing 23 percent. Dot gain – depending on technical process concerned – was defined very differently.

The new draft standard takes a fundamentally different approach here. A uniform total dot gain of 26 percent or 30 percent is specified for offset newspaper printing – independent of the technical production process concerned. Therefore, there is a clear definition in this question also for the data supplier.

### Customer-oriented approach

It is now up to the newspaper printer, with the aid of process-internal calibration, to obtain this value. This is a very customer-oriented way of thinking and as such can only benefit business. Then again, it is the success of the digitised working method that has enabled such an orientation. It is now simpler to adapt data to suit the required specifications.

The previous nine dot gain values will be replaced by two specifications in the future: 26 percent and 30 percent. Why not have only one dot gain curve?

Indeed, the objective was to define a single specification for dot gain. But the standardisation committee had to acknowledge that production conditions differ greatly in Europe and America.

One example is the different levels of market penetration of computer-to-plate technology. Already in widespread use in the European newspaper industry, CTP is still only in the process of gaining a foothold in the United States. That is just one aspect. The fact is that the average dot gain – on a global basis – differs from one region to another. But that does not affect efforts aimed at agreeing one process-independent specification.

Therefore the general expectation is that individual countries, when adopting the international ISO standard, will each define one specification in relation to dot gain. For Europe, this is most likely to be the 26 percent curve. This can be stated already with a high degree of certainty in the case of Germany.

Standardisation means improving conditions for all market participants. Standardising newspaper printing means improved communication with customers, lowering the costs of dealing with complaints, making newspaper advertising more attractive and therefore improving the market conditions for newspapers in their competition with other media. The draft version of ISO 12647-3:2004 is fully in line with this strategy. It is worthwhile to get ready for the new standard.

**Overview: Revision of the newspaper printing standard**
**Project ISO 12647-3:2004**
Status: 27 January 2004
The final release of the revised newspaper printing standard is expected for the end of 2004. Minor changes are possible. We accept no responsibility for the accuracy and finality of the values included in this table.

| **Parameters** | **Specifications** | | |
|---|---|---|---|
| The standard applies for the following printing and proofing processes | coldset offset printing on standard newsprint<br>coldset offset proofing on standard newsprint<br>newspaper proofing by special proofing processes<br>(e.g. ink jet) | | |
| **Original copy** | | | |
| Original copy must be supplied as | sets of digital data | | |
| Data format | PDF/X (ISO 15930) | | |
| Colour-binding proof | must contain a control element to allow verification of the suitability of the proof for newspaper printing by means of measurement | | |
| Min. tonal value of a paper original (monochrome printing) | 5% | | |
| **Colour separation** | | | |
| Total ink coverage | should not exceed 240%, max. 260% | | |
| Max. black (K) | min. 85% | | |
| Colour reproduction | Grey Component Replacement (GCR) | | |
| **Screen** | | | |
| Type of screen | | | |
| dot shape | elliptical | | |
| first dot link-up | At 40% ; +/- 5% | | |
| second dot link-up | not more than 20% above the 1st dot link-up | | |
| Screen ruling | 40 lines/cm ; +/- 2 lines/cm (100 lpi ; +/- 0.8 lpi) | | |
| Screen angles | | | |
| Cyan | 15° | | |
| Magenta | 75° | | |
| Yellow | 0° | | |
| Black (K) | 135° | | |
| Smallest dot with use of FM screening | 40 µm | | |
| **Films for platemaking** | | | |
| Imager resolution | Recommended : | 500 lines/cm (1270 dpi) | |
| | At least | 472 lines/cm (1200 dpi) | |
| Film density (above fog density) | At least | 3.5[1] | |
| Fog density of film | max- 0.15 | | |
| Permitted variation tolerance of fog density | max. 0.10 | | |
| Permitted register inexactness of colour-separated films | max. 0.02% of the image size (diagonal) | | |
| Max. edge effect for AM screen | 6 µm | | |
| Max. edge effect for FM screen | 4 µm | | |
| **Printing plates** | | | |
| Max. tonal variation across the plate | +/- 2% (plus device-dependent measuring imprecision) | | |
| Permitted register fault for a set of plates | max. 0.02% of the image size (diagonal) | | |
| **Newsprint** | **L*** | **a*** | **b*** |
| Colour of newsprint | | | |
| Black measuring background[2] , normative | 82.0 | 0.0 | 3.0 |
| White measuring background[3], informative | 85.2 | 0.9 | 5.2 |
| Tolerances colour of newsprint | | | |
| Proofing | 3 | 2 | 2 |
| Target tolerance in production printing | 3 | 1 | 1 |
| Max. Tolerance in production printing | 4 | 2 | 2 |
| Variance within a print run | 2 | 2 | 2 |
| **Printing inks[3] (black background, normative)** | **L*** | **a*** | **b*** |
| Cyan (C) | 57.0 | – 23.0 | – 27.0 |
| Magenta (M) | 54.0 | 44.0 | – 2.0 |
| Yellow (Y) | 78.0 | – 3.0 | 58.0 |
| Black (K) | 36.0 | 1.0 | 4.0 |
| C + Y | 53.0 | – 34.0 | 17.0 |
| C + M | 41.0 | 7.0 | – 22.0 |
| M + Y | 52.0 | 41.0 | 25.0 |
| C + M + Y | 40.0 | 0.0 | 1.0 |
| $C_{54\,\%} + M_{44\,\%} + Y_{44\,\%} + K_{100\,\%}$ | 34.0 | 1.0 | 2.0 |

| **Tolerances in colour printing**[4] | | **Deviation ΔE** | **Variation ΔE** |
|---|---|---|---|
| Cyan (C) | normative | 5 | 4 |
| Magenta (M) | normative | 5 | 4 |
| Yellow (Y) | normative | 5 | 5 |
| Black (K) | normative | 5 | 4 |
| C + Y | for information | 8 | 7 |
| C + M | for information | 8 | 7 |
| M + Y | for information | 8 | 7 |

| **Printing inks**[3] **(white background, for information)** | **L*** | **a*** | **b*** |
|---|---|---|---|
| Cyan (C) | 58.7 | – 24.7 | – 26.9 |
| Magenta (M) | 55.8 | 47.2 | – 0.8 |
| Yellow (Y) | 80.9 | – 1.4 | 61.8 |
| Black (N) | 36.5 | 1.3 | 4.5 |
| C + Y | 54.4 | – 35.2 | 18.3 |
| C + M | 41.8 | 7.1 | – 22.2 |
| M + Y | 53.7 | 44.6 | 27.2 |
| C + M + Y | 40.6 | 0.1 | 1.5 |
| $C_{54\,\%} + M_{44\,\%} + J_{44\,\%} + N_{100\,\%}$ | 34.4 | 0.9 | 2.3 |

Colour characterisation data in accordance with ISO 12642 (IT8.7/3) are published on the internet; for information.

| **Printing** | |
|---|---|
| Printing sequence | CMYK or KCMY |
| Tonal range | 3% to 90% |
| Register fault | should not exceed 0.15 mm; max. 0.30 mm |

| **Total dot gain**[5] | **For the 26% curve (%)** | **For the 30% curve (%)** |
|---|---|---|
| Input tonal value 10% | 11.1 | 14.1 |
| Input tonal value 20% | 19.0 | 23.4 |
| Input tonal value 30% | 24.0 | 28.5 |
| Input tonal value 40% | 26.1 | 30.5 |
| Input tonal value 50% | 26.0 | 29.5 |
| Input tonal value 60% | 23.9 | 26.1 |
| Input tonal value 70% | 19.8 | 21.0 |
| Input tonal value 80% | 14.3 | 15.2 |
| Input tonal value 90% | 7.6 | 7.8 |

| | |
|---|---|
| Dot gain with FM screen in tonal patch 50% | 43 |

| **Tolerances for max. dot gain** | **Proofing** | **Production printing** |
|---|---|---|
| Deviation in 40% or 50% tonal patch | 4% | 5% |
| Deviation in 75% or 80% tonal patch | 3% | 4% |
| Variance in 40 % or 50% tonal patch | – | 5% |
| Variance in 75% or 80% tonal patch | – | 3% |
| Midtone spread | 5% | 6% |

| **Grey balance, for information** | **Cyan** | **Magenta** | **Yellow** |
|---|---|---|---|
| The stated CMY combined prints should produce a neutral grey in each case. | 10% | 8% | 8 % |
| The reference grey is determined by the paper and darkest black (240%). | 20% | 16% | 16% |
| | 30% | 24% | 24% |
| | 40% | 33% | 33% |
| | 50% | 42% | 42% |
| | 60% | 52% | 54% |
| Recommended composition for a grey balance control element, for information | 30% | 24% | 24% |

| **Densities**[2]**, for information** | **Status E, with pol.filter** | **Status T, without pol. filter** |
|---|---|---|
| Cyan (C) | 0.90 | 0.90 |
| Magenta (M) | 0.90 | 0.90 |
| Yellow (Y) | 0.90 | 0.85 |
| Black(K) | 1.10 | 1.05 |
| Paper | 0.00 | C = 0.23 ; M = 0.24 ; Y = 0.27 ; K = 0.22 |

1) According to the standard, the density at the centre of the halftone dot is 2.5. It is practicable to meaasure the film density on a larger patch. If this solid density of the film reaches or exceeds 3.5, it can be stated that the density at the centre of the halftone dot is at least 2.5.
2) Inks according to ISO 2846-2, measuring conditions : 45°/0° or 0°/45°, D50/2°, black backing.
3) Inks according to ISO 2846-2, black background, see ISO/WD 13655.
4) Inks according to ISO 2846-2, measuring conditions: 45°/0° ou 0°/45°, D50/2°, black backing min. 68% of all production copies should lie within the /M variation tolerances.
5) Max. dot gain = tonal difference between the digital file and the printed result.
6) Black backing in accordance with ISO 5-4.

# 2 Tonal value curve: World outside U.S. will use 26 percent curve

In this second article on the new ISO 12647-3 standard, which is scheduled to come into force in Germany on 1 July 2004, we focus on the new tonal value curve. As explained in the article published in the last issue of newspaper techniques, it is especially the tone value increase that is changed in the new ISO standard.

Whereas in the old standard the tone value increase was defined in a highly process-dependent way, in the new standard it is the finished result on the paper that counts. The steps to be taken to achieve this curve are less strictly regulated, it is only considered important that the objective should be reached. This becomes possible through elimination of the film.

In 1994, when work began on the old standard, and even in 1998 when the final version was published, film was still the most common transport medium between advertising customer or publishing house and printing plant. It was widespread practice for agencies to send their ad to each newspaper on film. Therefore the film was the medium of reference. The old ISO standard clearly specified the form in which the film had to be supplied: if the file contained a 50 percent solid, then the film also had to contain a solid of exactly 50 percent, measured by means of a densitometer. In addition, the minimum density for the shadow areas was defined.

### Out with the old ...

In this way, it was simple to judge whether the film was ISO-conform or not. The further process was also exactly described in the old standard. If negative plates were used, the tone value increase at 40 percent or 50 percent should be 33 percent. In the case of positive plates, tone value increase should not exceed 27 percent. In practice, this leads to problems because, strictly speaking, the repro studio would not only have to clarify which newspaper requires positive or negative films, but also process and separate the ad differently for the two aforementioned processes. Understandably, few agencies were able or willing to do this.

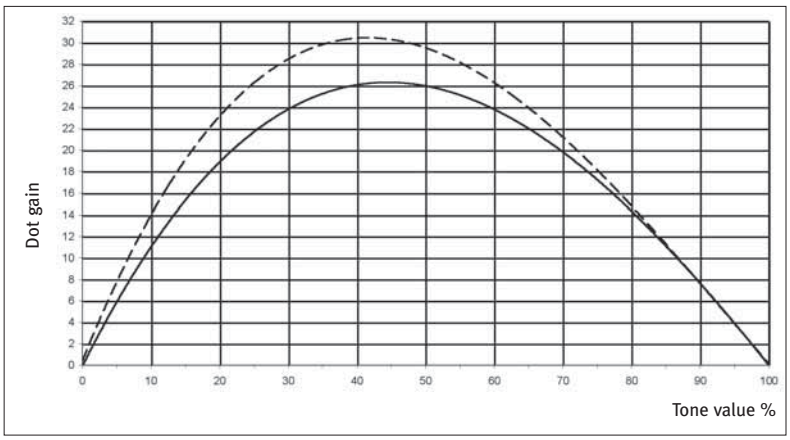



Fig. 1: The tone value increase curve for 26 percent. The 30 percent curve applies only for the United States.

Another aspect makes any attempt to specify reference values for each individual process step appear less than desirable: no two films are exactly alike, and this principle applies also with regard to plates. In tests conducted by Ifra in the 1980s and 1990s, it emerged that, depending on the type of plate concerned, tone value increase can vary by up to 3-4 percent. Anyone who believes that everything is better today with CTP will also be disappointed. Whereas CTP silver and thermal plates reveal a nearly linear behaviour (50 percent from the file produce 50 percent on the plate), photopolymer plate have a tone value increase (50 percent from the file produce, for example, 61 percent on the plate). But a look at the behaviour in print reveals yet another different result.

After linearisation has been realised on the plate (50 percent from the file produces 50 percent on the plate), it is then certainly possible that the photopolymer plate prints more “openly“ than the thermal or silver plate. In addition, the different inks behave differently with one type of plate than with the next.

Lastly, there are differences in the press construction (e.g. blanket to blanket or blanket to steel cylinder) that influence tone value increase decisively. Moreover, no standard plate measuring method exists. Different manufacturers‘ measuring instruments produce varying results with different plates. The difference here can be as great as 5 percent, depending, for example, on the inking of the carrier and substrate coating.

Conclusion: Due to the large number of process components and their different effect on tone value increase, it is unwise to attempt any standardisation of the individual process steps. Consequently, it is recommended to focus on the final result.

On paper, the establishment of halftone values by densitometric measurement in accordance with Jule-Nielsen is relatively identical from one measuring instrument to another and therefore better suited for checking.

### ... in with the new

Although for each process step described in the new standard it is indicated which reference values or limits should not be exceeded under normal circumstances, e.g. tone value increase in platemaking, the final tone value increase curve on the paper is repeatedly pointed out. This curve has highest priority and “adequate means“ should be applied to obtain this curve. But more about that later.

Also new is that now a complete curve was given and not, as in the old standard, just a reference value in each case stating the maximum tone value increase at 40 or 50 percent. It is therefore specified what value a data information of 10 percent should produce on the paper.

In the course of our standardisation projects, we have found that different tone value increase curves from one printing house to another are common. The chart above shows 10 different printing locations belonging to one (!) publishing group with 10 different tone value increases.

Frequently the tone value increase is not even checked. Usually the film is measured, the platemaking is checked every 3–6 months, or there is a plate measuring instrument available for CTP plates and measured in print – if at all – are only the colour densities. This was, and unfortunately continues to be, regular practice at many operations. Under these conditions, how should a colour, composed of corresponding CMYK shares, have a similar or identical appearance in printing house 1 or printing house 2?

As mentioned already in the previous article, besides the 26 percent curve, the standard includes a second curve with 30 percent. Strictly speaking, according to the standard, the data sender and receiver must agree on which curve to use. It was not possible to include a more concrete formulation into the standard itself and consequently this requires a more precise interpretation: in practice, the most likely outcome will be that worldwide, with the exception of the United States, the 26 percent curve will be used. Due to the older presses and the still only small number of installed CTP systems, American publishers are not willing to agree to the 26 percent curve. A 30 percent curve is more in line with common practice there and was additionally incorporated into the standard.

In Germany, with effect from 1 July 2004, only one curve shall apply, namely the 26 percent curve. All leading associations, such as bvdm, FOGRA, ZMG and Ifra, have agreed on this and publicly highlighted their commitment at an information event on 17 March 2004.

### But why 26 percent

Why not 0 percent, 22 percent, 28 percent, 30 percent or 33 percent? As is so often the case in standardisation projects, the result is based on compromises. Some associations, e.g. Ifra, wanted a relatively low tone value increase, others a higher one. Also during the QUIZ project there were repeated discussions between the smaller newspapers working with CTP that managed well with 22 percent and the larger newspapers that still use film and were more inclined towards working with 28 percent or 30 percent respectively. This was reflected also in the discussions within the ISO. Several countries wanted 22 percent, others 30 percent. Therefore it was decided to go half-way and agree on 26 percent, with an exception for the United States of 30 percent.

Why was it not agreed to switch to 0 percent tone value increase, i.e. balance the tone value increase of the print, e.g. by means of a corresponding calibration curve in the RIP? It did not prove possible to achieve a majority approval for this proposal in the ISO, nor does it not correspond to the general rules in the graphics industry and the other ISO printing process standards. It would undoubtedly be difficult to explain to an agency that the tone value increase on coated paper in sheet-fed offset should be 16 percent and 0 percent in newspaper printing.

The standard includes the tolerance and midtone spread as further definitions in connection with tone value increase. The deviation and variation tolerance, at 5 percent, is set rather high and it is comparatively simple to observe this tolerance. The midtone spread has shown itself to be one of the most problematical criteria in the standard in the past. The deviation of the colours cyan, magenta and yellow may not exceed 6 percent in the midtone. Therefore, when the curves of these colours are generated, they should not be more than 6 percent apart. It can occur that a different tone value increase is experienced between the first and final colour due to the press construction and lowering ink trapping. This must be balanced by suitable measures, e.g. different rubber blankets.

But how is this 26 tone value increase curve to be achieved? Unfortunately, this is a rather time-consuming process that also involves a lot of measurements, but can be done with the assistance of the RIP software. Therefore the objective now is no longer 50 percent = 50 percent on the film or of plate, but 50 percent from the file should become 76 percent on the paper.

In order to realise a corresponding adaptation, it is first necessary to measure the current parameters of the process chain. Do the individual process steps correspond to ISO recommendations? How high is the tone value increase in the platemaking process? How high is the tone value increase on my CTP plate in its uncalibrated state?

In this case, users should carry out a “linearisation“ of the plate with the aid of the RIP. It is better, also in film-based production, to measure the tone values on the plate and input them into the RIP. Taking this linearisation, several printing tests are then carried out. “Several“ means different printing towers on different days. Instead of test printing, corresponding halftone wedges can be printed for a defined period on several pages. These prints are then used to determine the press characteristics. By averaging the measured values, a typical tone value increase curve for the used press should emerge.

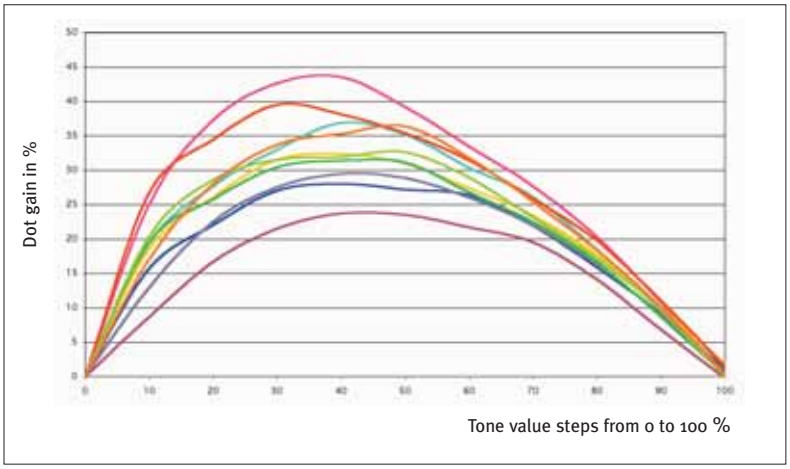



Fig. 2: Ten newspapers, 10 tone value increase curves. Each line represents the average tone value curve of a newspaper. The range is between 24 and 43 percent tone value increase. No consistent printed result can be expected.

If the tone value increase curve in the midtone range shows, for example, only 22 percent instead of 26 percent, the curve must be raised by 4 percent in the RIP. In the Harlequin RIP, which is in widespread use at newspapers, this is possible by a combination of film or plate curve and two printing curves. One curve corresponds to the "intended press," therefore the originally planned "ideal press," in this case the 26 percent ideal curve from the ISO standard and the "actual press," therefore the actually available press with the curve established under real conditions.

After input of the values, it should be possible to closely approximate the ideal curve in print. Constant monitoring of the tone value increase with the aid of control elements should help continually improve the curve precision.

To ensure that agencies and other customers are in a position to simply prepare printing data for the newspaper industry, the ISO standard also includes so-called characterisation data. This characterisation data is based on test prints with a tone value increase of 26 percent. There is a set of data also for 30 percent. Ifra has produced an ICC profile on the basis of this characterisation data. This standard ICC profile for the entire newspaper industry can be used by the agencies to prepare data for the newspaper. Therefore it is sufficient for an agency to prepare only one file. This makes it as simple as possible for the advertising customer.

In the final instance, standardisation always serves to simplify processes. The new standard reduces the workload for newspaper operations. The data is consistent and must not be adapted in a time-consuming process. This should help ensure that the newspaper continues to be attractive as an advertising carrier for the advertising agencies.

For more information on the standard, see the Ifra web site at www.ifra.com or e-mail Ifra's Consulting Manager Uwe Junglas at junglas@ifra.com.

# 3 Solid tinting, colour density and colour balance

Colour has become a firmly established feature in newspapers. In recent years, investments have been directed towards newspaper presses with full four-colour printing capacities. This enables advertising customers and the editorial desks to use colour effects or images on all pages in the vast majority of newspapers. Limitations on positioning due to press configurations are increasingly a thing of the past. At the same time, there is a trend towards using process colours to produce spot colours.

But full four-colour newspaper printing also means new challenges, as the colour quality of newspapers must be able to compete with printing processes and electronic media, which can produce a much broader colour range. Customers also demand the desired colour is reached as far as possible and, in the case of nationwide ads, is consistent in all newspapers.

The only way to achieve this is to introduce standardisation at all companies involved. By working with standardisation, newspaper houses aim to obtain a common colour space. This does not mean losses in quality, but instead the possibility to create means of safe colour transmissions via colour management.

During the frequently lengthy course undergone by images in the digital process chain – beginning with image recording by scanner or digital camera, followed by image treatment on the monitor screen and output on the digital proofing system, concluding with preparation for the printing process – colour distortions inevitably occur, e.g. due to the different colour display and different colour ranges of the input and output systems used. Based on the colour space defined by the standardisation specifications, characterising tables and colour profiles and therefore calculation algorithms can be developed to guarantee correct colour reproduction in accordance with the possibilities of newspaper printing. Especially with colour ads, working consistently by standardised methods and using a colour management system will bring positive results.

Standardisation does not mean making everything exactly the same, but creates the possibility, by means of defined interfaces, to communicate on the outside with the customers and internally between the various individual production steps.

## Solid tinting/primary and secondary colours

ISO 12647-3 contains the process specifications for newspaper printing. For example, it states which target colour spaces should be achieved with the process colours (see Tab. 1). ISO 2846-2 exists for the process colours themselves. It defines the colour characteristics for newsinks. ISO 2846-2 is a standard for ink manufacturers and is intended to ensure that similar colours are obtained in cases where sets of process inks of different origin are printed with the regular ink layer thickness on a similar substrate. Tab. 2 shows CIELAB colour values and tolerances of the substrate to be used.

A comparison of the primary colours of the new and old ISO 12647-3 shows:

> Cyan remains unchanged.
> Magenta is less saturated. Reason: in practice, the primary colour space was not achieved; in contrast, the secondary colour spaces were achieved. After correction, the specified primary colour space is once again in line with practice.
> Yellow is also somewhat less saturated. Reason: the new colour space is a compromise between the more reddish European yellow obtained to date and the colder U.S. yellow.
> With black, due account of the changes in practice was taken and lightness reduced by $\Delta L^* = 4$.

The process does not allow target values to be reached exactly. For this reason, tolerance windows are provided for the individual parameters in production printing that must be observed. Thus $\Delta E^*ab$ tolerances are given for the primary colour target colour spaces (Tab. 1). These are:

| | CIELAB-Colour values | | | | | | ΔE*ab-tolerance | |
|---|---|---|---|---|---|---|---|---|
| | L* | | a* | | b* | | | |
| | black background | white[1] background | black background | white[1] background | black background | white[1] background | deviation | fluctuation |
| Cyan (C) | 57.0 | 59.7 | -23.0 | 24.7 | -27.0 | -26.9 | 5 | 4 |
| Magenta (M) | 54.0 | 55.8 | 44.0 | 47.2 | -2.0 | 0.8 | 5 | 4 |
| Yellow (Y) | 78.0 | 80.9 | -3.0 | -1.4 | 58.0 | 61.8 | 5 | 5 |
| Black (K) | 36.0 | 36.5 | 1.0 | 1.3 | 4.0 | 4.5 | 5 | 4 |
| C+Y | 53.0 | 54.4 | -34.0 | -35.2 | 17.0 | 18.3 | 8 | 7 |
| C+M | 41.0 | 41.8 | 7.0 | 7.1 | -22.0 | -22.2 | 8 | 7 |
| M+Y | 52.0 | 53.7 | 41.0 | 44.6 | 25.0 | 27.2 | 8 | 7 |
| C+M+Y | 40.0 | 40.6 | 0.0 | 0.1 | 1.0 | 1.5 | – | – |
| Four Colour Black K=100%, C=52%, M=44%, Y=44% | 34.0 | 34.4 | 1.0 | 1.1 | 2.0 | 2.3 | – | – |
| | Using colour measurement in accordance with 5.6 the ISO 12647-1: D50/2°, 45°/0° or 0°/45°; Black background: ISO 5-4; White background: ISO/WD 13655 [1] for information purposes only | | | | | | No more than 60 % of total deviation or fluctuation should be due to $\Delta L^*$ or $\Delta H^*ab$. | |

Table 1: CIELAB target colour spaces and tolerances in newspaper printing.

| | L* | | a* | | b* | |
|---|---|---|---|---|---|---|
| | black backgrnd | white[1] backgrnd | black backgrnd | white[1] backgrnd | black backgrnd | white[1] backgrnd |
| Paper | 82.0 | 85.2 | 0.0 | 0.9 | 3.0 | 5.2 |
| **Tolerances** | ΔL* | | Δa* | | Δb* | |
| Proofing should be in | 3 | | 2 | | 2 | |
| Production should be in | 3 | | 1 | | 1 | |
| Production should be in | 4 | | 2 | | 2 | |
| Fluctuation tolerance in a production | 2 | | 2 | | 2 | |

Measurement with colour measuring instrument in accordance with 5.6 of ISO 12647-1: D50/2°, 45°/0° or 0°/45°; Black background: ISO 5-4; white background: ISO/WD 13655; [1] for information purposes only

Table 2: CIELAB colour values and tolerances for the standard substrate.

> the deviation tolerance that represents the permissible deviation of the OK sheet from the original copy, and
> the fluctuation tolerance that defines the permissible fluctuation around the OK sheet. The fluctuation tolerance should be considered a simple standard deviation, i. e. 68.3 percent of the production copies must observe the fluctuation tolerance. The remainder of the production run may exceed the tolerance value.

Compared to the old standard, the tolerance values were put on a realistic footing. It should be noted that the stated deviation and fluctuation tolerances for the primary colours in newspaper printing are identical to those in commercial offset (ISO 12647-2). Although this may seem surprising at first glance, it is due to the fact that the more limited colour range in newspaper printing means that fluctuations in ink layer thickness have a less serious effect. We will return to this later on.

In contrast, the target colour spaces for the secondary colours (Tab. 1) are unchanged. But their achievement depends, for example, on the press, the substrate, print sequence as well as the rheological properties of the ink. For this reason, the fact that primary colour spaces may match the standard does not automatically guarantee a match of the secondary colours. For purposes of information, deviation and fluctuation tolerances are given also for the secondary colours.

A new feature is the colour space of the combined printing of the three chromatic primary colours (C + M + Y), as it is sometimes demanded in prepress programs. Likewise new is four colour black. This is the darkest reproducible colour in newspaper printing where all four process inks are used and the recommended maximum total tone value of 240 percent is applied.

## Black or white measuring background?

Until now, the process standard only listed colour spaces measured on a defined black background. The reason for the black background is to eliminate the possible influence of reverse side printing on the measurement in the case of non-opaque substrates. In practice, however, independent of this recommendation for the production of characterisation data, or profiles respectively, and for proof production, a white background was used to avoid undesired side-effects such as blackening or a green hue in the yellow etc. This contradiction of the old standard specification is resolved by including values calculated on a defined white background in addition to those calculated on a black background. The black background is now used only for process control in the production run, with a white background applied for all other process steps, such as characterisation data/profiles, proof matching, etc.

## Colour density and colour space fluctuations

The process control in solid tinting is based on colour measurement. After Part 1 of ISO 12647, which defines the parameters and measuring methods for process control, it is possible to give density values for information purposes. At the same time it is pointed out that there may be cases where the densitometric and colorimetric resetting of the standard specifications lead to different results. This means that the newspaper houses must check whether, when achieving the target values for the solids, the optical densities contained for information purposes in ISO 12647-3 are also reached (Tab. 3). If the density values deviate from the standard recommendations, the individual newspaper house should apply the actually established density values.

For the informative optical densities, compared to ISO 12647-3 from the year 1998, the following should be noted: although the colour space for cyan has not changed, printing tests show that the originally stated optical density was too low. The cyan density was raised to correspond to practice and in general all density values rounded off. For the chromatic primary colours, this produces an optical density of 0.9 and for black 1.1.

The listed optical densities can be suitable for the individual newspaper house, but must not. In such a case, the numerical value that is obtained when the target colour spaces is reached under concrete conditions must be set as the target colour space for the colour density. The optical density is dependent on various factors, but it represents a gauge for the applied ink layer thickness for a fixed ink/substrate combination. Because the ink layer thickness cannot be kept constant during the printing process, the bvdm/FOGRA newspaper standard has recommended a permissible density tolerance for the production run of ± 0.1 since the late 1980s. Ink layer thick-ness fluctuations affect both the optical density and colour space of the primary colours, therefore the appearance of the various colours.

If a density tolerance of ± 0.1 (corresponding to about 10 percent of the absolute density value) is applied, the individual fluctuation tolerances of the soli ds will be ion

| | Optical density solid in relation to paper white |
|---|---|
| Cyan (C) | 0.9 |
| Magenta (M) | 0.9 |
| Yellow (Y) | 0.9 |
| Black (K) | 1.1 |

Measured with densitometer status E and polarisation filter, black background

Table 3: Recommended solid densities (in relation to paper white) on the substrate corresponding to Table 2.

the region of 2 to 3 ΔE*ab units. That would be a welcome development from the aspect of colorimetrics and the aim to produce within limits that are as narrow as possible, as colour differences are perceived as follows:

> ΔE*ab = 1 to 3 under favourable conditions, barely visible,
> ΔE*ab = 3 to 6, featuring a small to medium difference,
> ΔE*ab above 6, major difference.

But with low ΔE*ab values of 2 or 3, the permissible fluctuations would be within the range of measuring precision of the colour measuring instruments. A series of colouring tests was carried out for the purpose to establish, by visual evaluation, which colouring differences are acceptable. Thus it came about that the fluctuation tolerances for solids shown in Table 1 were fixed which, as stated above, correspond to those in commercial offset. But the fluctuation tolerances of ΔE*ab 4 and 5 respectively now correspond to a relatively large density fluctuation, namely ca. 18 percent. For newspaper printing plants, this means an orientation towards a density tolerance of ± 0.1, or ca. 10 percent of the absolute density value to be on the safe side in a production run.

## Colour balance/grey balance

In four-colour newspaper printing, the colours are achieved by overprinting certain tone values of the chromatic inks and black. The resulting data produces the desired colour in standardised printing, i.e. a colour planned as grey at the prepress stage will appear as grey.

In this (normal) case, the grey balance of the reproduction is considered to be reached. But if the ratio of the cyan, magenta and yellow tone values at the time of any subsequent transmission step are not maintained, the colour balance is disturbed and an off-colour hue will be experienced.

| Cyan | Magenta | Yellow |
|---|---|---|
| 10 % | 8 % | 8 % |
| 20 % | 16 % | 16 % |
| 30 % | 24 % | 24 % |
| 40 % | 33 % | 33 % |
| 50 % | 42 % | 42 % |
| 60 % | 52 % | 52 % |

Table 4: Recommended cyan, magenta and yellow tone values for grey balance.

According to Part 1 of the ISO 12647 series, a grey balance should be defined. At the same time, it is pointed out that the grey balance, as described above, is produced by the reproduction and its definition can overrule the process description, as any deviations of the newsprint or inks from the standardisation specifications render the recommended grey balance invalid.

At ISO level, there was no unanimity when revising the newspaper standard with regard to specifying a grey balance. As a compromise, as with the optical density, informative values are now given for the grey balance (Table 4).

Interested newspaper houses can use these C-M-Y tone value combinations as orientation aids, e.g. to produce their own test patches. Especially small newspapers in the Scandinavian countries work with grey balance patches to check their production runs.

To maintain the grey balance in printing, for production fluctuations within the permissible tolerance windows there is a special “tie-in” specification (mid-tone spread). This states that, between the chromatic process colours C, M, Y in the mid-tone, no difference greater than 6 percent in tone value increase or 0.07 optical density units may occur. As long as the chromatic colours vary together, the colour deviations stay with acceptable limits.

# 4 Screen definition and colour separation

ISO 12647-3, the international newspaper printing standard, was issued in 1998. The revised version of this standard is now nearing completion. The German bdvm and ZMG associations aim to have realised the changeover to the new standard by mid-year. Ifra is supporting the preparatory work for this change and is testing new standard colour profiles. A joint event will be held at Ifra on 8 June to inform about the changes. bdvm and Ifra are introducing this topic in a series of articles.

If it were possible to print grey tones, the world would be a different place. Unfortunately, we can only print black (or colour). In order to simulate all the required intermediate tones between the white of the paper and black of the solid, printers have always used a trick that fools the viewer into thinking that he sees intermediate tones. Fortunately, the human eye can barely distinguish between fine lines or dots printed alongside one another. Therefore, viewed at a suitable distance of about 35 centimetres, printed screens are perceived as grey tones.

But because every attempted deception has its limits, there are ongoing efforts to refine screen technology in printing and eliminate shortcomings. As a result, the topic of "screening" repeatedly causes waves in the industry every six years or so. Discussions in the newspaper sector currently focus on "second-generation" hybrid and frequency-modulated screens.

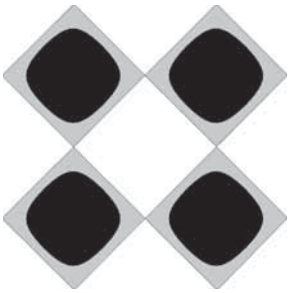
Independent of these special screens that must always be specially acquired, the ISO newspaper printing standard defines parameters for a standard screening process that can be used by everyone.

## Dot shape

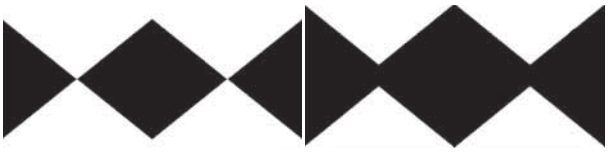
Why choose a chain dot and not the simple round dot that is preset in most RIPs as a standard feature? At a 50 percent screen value, a round dot has a four-sided dot link-up with the adjacent dots; as the round dot becomes a square-shaped dot whose corners come into contact with the adjacent dots at 50 percent.

The four-sided dot link-up results in a jump in the dot percentage, thereby causing disturbances in gradations such as occur in skin tones. To reduce the negative effect of the dot link-up, a chain dot is used with only two-sided dot link-ups; the first at approximately 40 percent and the second at approximately 60 percent.

| The revised ISO 12647-3 version defines the following specifications: | | |
|---|---|---|
| Dot shape | moderate chain screen ("elliptical" dot shape) | |
| First dot link-up | 40 percent (± 5 percent) | |
| Second dot link-up | 20 percent above the first dot link-up | |
| Screen frequency | 40 lines/cm (100 lines per inch) | |
| Screen angle | Cyan | 15° |
| | Magenta | 75° |
| | Yellow | 0° |
| | Black (K) | 135° |
| FM screen | smallest dot = 40 µm | |



Left: Four-sided dot link-up in a round dot shape.



A moderate chain screen with the 1st dot link-up at 42.5 percent, 2nd dot link-up at 57.5 percent.

Such a dot shape can be selected in every RIP. In the case of the Harlequin RIP that is in widespread use, it is recommended to select the "Elliptical P" dot.

## Screen ruling

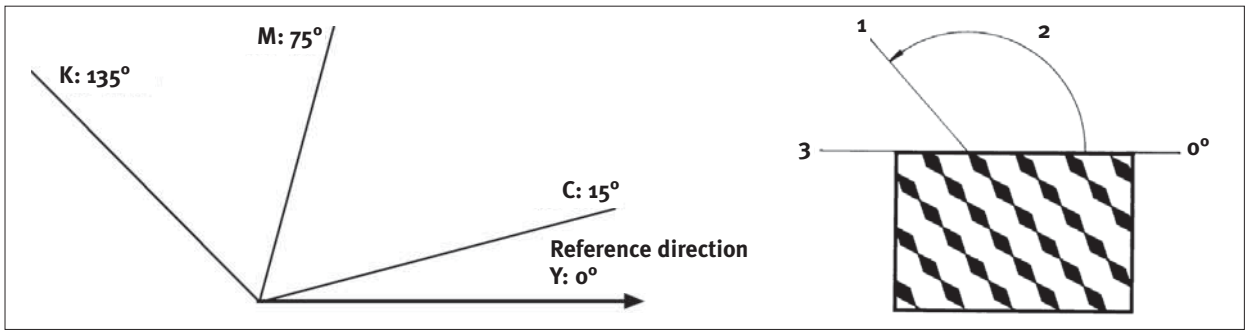
The new ISO standard lists only one screen frequency, namely 40 lines per centimetre (or 100 lines per inch). A tolerance of ± 2 lines/cm is permitted. This screen ruling can be easily printed by all of today's newspaper presses, now that the letterpress process is no longer used. The distinction between monochrome images (34 lines/cm) and colour images (40 lines/cm), still occasionally encountered, is obsolete. If it is possible to print colour images with a 40 screen, then it is certainly possible with monochrome images.

## Screen angle

This topic regrettably continues to cause confusion. For this reason, it is to be welcomed that a graphic in the new ISO standard now helps to clarify the situation.

Theoretically, the screen angle is calculated setting out from the mathematical 'x' axis in a clockwise direction. Unfortunately, this is still not common practice in the graphics industry. ISO 12647-3 sets out to clarify the situation.

Screen angles must be measured on the printed finished product. Some RIP settings call for an "inverted" way of thinking when programming the angle, as they set out from the wrong-reading exposed negative film. The differences in screen angles between the colours should be 60° to largely avoid moiré. That is the case also for the colours cyan, magenta and black (K). But because the circle does not permit a 60° interval for all four colours, the least visible colour (yellow) is put at an interval of no more than 15° from cyan on the 0° axis. The dominating colour is put at 135°, as this is the least perceptible angle to the eye. In newspaper printing, where maximum achromatic composi-




Example for a screen angle in newspaper printing (ISO 12647-3: 2004) Explanation (right): 1 = centerline, 2 = screen angle, 3 = reference direction (ISO 12647-1: 1996).

tion is applied, black is dominant in the vast majority of cases.

Why should the screen angle be 60° and not 30° as sometimes claimed? A 30° interval would be used in the case of a round dot with no defined centerline. For example, with a round dot, a 0° and 90° angle would be identical. The situation is different with a chain dot, as this has a defined centerline. A graphic from ISO 12647-1 clearly illustrates this.

It is very important to correctly set the screen angle in the RIP, as most RIPs are supplied with a preset 45° for all colours. If this is not taken into account and the angle settings checked, the outcome will be highly visible moiré effects in the printed images.

## Colour separation

Colour separation, i. e. the way in which a colour file is prepared for printing in CMYK, is dependent on the requirements of the printing process concerned and therefore differs also for commercial offset, gravure, or newspaper printing. All these parameters are taken into account already when producing a colour profile. Consequently, if a good standard profile is used, it is no longer necessary to worry about this aspect every time.

ISO 12647-3: 2004 also defines the decisive benchmark values for the colour separation:

> Total inking: should not exceed 240 percent; max. 260 percent
> Maximum black (K): 100 percent; min. 85 percent
> Composition of colour separation: GCR (grey component replacement).

## Total inking

No printing process in the world allows the overprinting of cyan, magenta, yellow and black with 100 percent inking, which would correspond to a total inking of 400 percent. Due to the nature of the materials concerned (ink and paper) as well as the method of drying (only absorption in the case of newspaper printing), the total inking is limited in every case. This is especially true of newspaper printing, where the ink does not genuinely dry but only "absorbs," that is it partially penetrates into the paper.

Excessive inking – frequently observed in supplied ads – usually causes losses in quality that may only become apparent in the mailroom when the products are rolled-up. But set-off and smearing can occur due to the web lead in the press and in folder. Therefore it is essential to limit the total inking. Standard profiles for newspaper printing do not exceed 240 percent. That means that no part of the image – not even the darkest – has more inking than 240 percent.

## Maximum black

Why is the maximum black important? A "long" black that is used for image definition throughout the tonal gradation, from the highlights to the shadows, helps stabilise the printing process. Especially black – if possible with a maximum 100 percent – should be present in the darkest part of an image. Only the difference to the total inking of 240 percent should be filled by the chromatic colours cyan, magenta and yellow. This reduces the share of chromatic colours contained in the image, which helps the printer to print without colour cast.

## Grey component replacement

Grey component replacement (GCR) is a decisive means of reducing colour fluctuations in printing. What is this? Every overprinting of three chromatic colours (cyan, ma-

Left: Black separation of an image without GCR. Right: with GCR.

genta, yellow) includes a share of grey. The size of this share is determined by the same shares of each chromatic colour.

For example, if 40 percent cyan, 50 percent magenta and 20 percent yellow are overprinted in one place, the grey share of this colour is 20 percent each of cyan, magenta and yellow. Taken together, these colour percentages produce a grey impression. Instead of the 20 percent of each chromatic colour, black could also be printed. The advantage here – provided that this is applied throughout the image – would be that printing could be done with a lot less colour ink without changing the colour impression.

This effect is utilised with grey component replacement in the colour separation. The decisive point is that the increased use of black and reduced use of chromatic colours produces the identical colour impression, while at the same time verifiably reducing the colour fluctuations.

Ifra Special Report 2.16 (1996) evidenced this situation. It even proved possible in most cases to reduce colour fluctuations and colour tone changes in print by 50 percent. An interesting side effect of GCR is savings of colour inks and therefore production costs.

GCR images are best recognised from the black separation. If black defines the entire image from the highlights to the shadow areas, then this is a GCR-separated image. As opposed to this, if the skin tones in the black separation are without tone separation, then this is not a GCR image.

Screening and colour separation are important steps in the reproduction process. Both depend greatly on the conditions of newspaper printing. The screen settings must be done centrally in the Raster Image Processor (RIP). The standard settings are in most cases unsuitable for newspaper printing. Colour separation parameters are carried out at the time of production of the colour profile. Using the standard profile automatically activates the programmed settings.

# 5 How to introduce the new standard

The new ISO Standard 12647-3: 2004 is nearing completion. After the articles published in recent issues of newspaper techniques explained the purpose and most important parameters of this standard, this article will give a concrete recommendation for the necessary preparatory steps.

Before implementation of the standard can be started, it should be ensured that all necessary measuring instruments and conditions for measurement are in place. A densitometer should be available at every control desk in the printing plant. Although the density specifications in the standard are not binding, the density measurement gives the printer basic information about inking. In addition to density, the densitometer should have the capacity to measure dot gain. That is the case with the majority of modern densitometers, but not with older models.

The printing plant should also have a colour spectrometer to ensure the correct colour gamut can be checked. This usually means printers must be trained to learn the significance of Lab values. A hand-held instrument is recommended here that can be used as a stand-alone device or connected to a computer (e. g. EyeOne or Spectrolino from Gretag-Macbeth). Combined densitometers and spectrometers have now also become available (X-Rite 500 series, Techkon DMS, Viptronic Spectrodens). The colour spectrometer can be used also to produce profiles for the proofer or for special printing conditions, e.g. with improved paper. If it is intended to do this frequently, table-top devices for automatic measurements are recommended.

Where film is still used, a transmission densitometer is obligatory. This is already available in most printing plants. Moreover, a measuring instrument is necessary for plate measurement. This is recommended for CTP users and also for film users to check the plates after exposure.

After it has been ensured that all measuring equipment is on hand, it is then possible to begin to standardise the film (if still used) – plate – print production process. For this purpose it is recommended to take a five-step approach involving a total of three test prints:

> Record existing situation (test print 1)
> Adapt to standard
> Record the dot gain of the press (test print 2)
> Adapt to standard in the RIP
> Final test print (test print 3)

Before setting out on a journey, it is always recommendable to establish one's present position. If this was not done in the past, it is time to do so now.

Without measurements, it is impossible to know what you are doing. The objective here is to record the existing "in-house standard," if there is one. What tonal values are produced on film and plate? Which colour values are obtained? What tonal value curve is on the paper? If possible all towers should be checked with several test prints and included in the recording process. If sufficient knowledge is available in-house, test print 1 can be omitted.

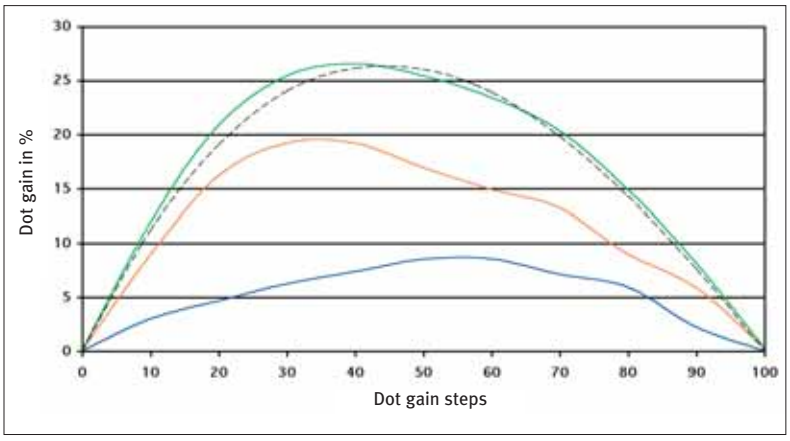
### Adapting to the standard

This is where the work starts. Do all printing towers behave identically? Is the different dot gain between individual colours sufficiently close together (midtone spread)? Can using different ink, different rubber blankets or water additives bring the printing process closer to the specifications of the standard? Of course, all these points are quickly listed in theory, but in practice it represents a protracted adaptation process. Several test prints may be required. For a defined period, it may be useful to print control elements with the newspaper, e. g. in the form of small promotional ads to manage without test prints.

The objective should be to approximate the standard as closely as possible with the available mechanical (e. g. rubber blanket, contact pressure, print sequence) and chemical means (e. g. ink, water additives). In doing so, the main focus should be on the following parameters (in order of priority): paper shade, colour values of the primary and secondary colours, dot gain, grey balance, densities.

### Recording dot gain of the press

After the existing status has been recorded and all necessary measures taken, it is then time to establish the dot gain of the press. For this purpose, it is recommended to set out from a calibrated status. As described already in the previous articles, the main emphasis in the new standard in relation to the dot gain curve is to ensure that the correct finished result is obtained on the paper. This means that the former slogan: 50 percent from the file produces 50 percent on film or plate no longer applies. Instead, the principle is now: 50 percent from the file produces 76 percent on paper. All process steps must be directed towards reaching this objective. In order to ensure that this objective can be reached and controlled, the dot gain of the press must be determined under linearised initial conditions.




Example of an adaptation: To ensure ideal dot gain curve (green, ISO ideal curve black, broken) in print, the newspaper in this example had to expose CTP plates with a dot gain of about 8 percent (blue curve). The dot gain of the press (orange curve) in this press/material configuration is only 19 percent. The drop in the press characteristic curve from 40 percent is compensated by a higher dot gain on the plate.

A reference output medium must then be selected. That can be film, but also the plate. The latter is recommended. Set the RIP to the ISO standard specifications (elliptical dot, angled, 40 lines per cm). Produce plates with a linear result for the following test prints. With the Harlequin RIP, the Calibration Manager provides valuable assistance here. Firstly, an uncalibrated plate (CTP) is exposed, or an uncalibrated film, and a plate copied with optimal setting in the printing-down frame. The uncalibrated plate is measured and the measured values input into the RIP. A calibrated plate can then be output. Now 50 percent from the file should be 50 percent on the plate. The plates exposed with this setting are used for the test prints (several should be used or, ideally, several production prints with corresponding control elements) and the test prints evaluated. Only in rare cases will the press produce absolutely correct dot gain. But the operator has an indication of the dot gain of his press with the used material configuration (plate, ink, rubber blanket). Next comes fine-tuning of the dot gain in the RIP.

### Adapting the standard in the RIP

The Harlequin RIP is a good example to describe this adaptation. The process is similar, in some cases even simpler, with other RIP manufacturers. It is possible to input adapting curves for the printing press in the calibration manager. Harlequin distinguishes here between the "intended press" and the "actual press".

The "intended press" corresponds to an ideal newspaper press. Therefore if a press has a dot gain curve of exactly 26 percent, as recommended by the ISO standard (30 percent for the U.S.A.), it is only necessary to input this one ideal curve. But because the press is undoubtedly not exactly in line with the reference curve, it is necessary to "explain" to the RIP the situation of the actual press and input an additional curve. Thus the ISO curve and the measured curve from test print 2 should be input to the calibration manager. It is theoretically possible to input a different curve for each colour. However, this should be done only if there are insurmountable deviations in all printing towers.

After both curves are input, the relationship between the two curves must be defined to the RIP in the "Setup manager". The ISO curve must be selected as "intended press" and the own curve as "actual press". The RIP now overlays a total of three curves: the calibration curve for the plate (or film), the ideal curve of the virtual ISO press and the curve of the actual press.

### Final test print for checking

A test print run should then be done to check the settings. The main objective here is to establish whether the dot gain in print matches the ideal curve.

The intermediate result, such as tonal value on the plate and on the film, should be documented, as the adaptation via the three curves means linear results are no longer obtained on the film and on the plates. Therefore 50 percent is no longer 50 percent on the plate, perhaps 48 percent or 54 percent, but on the printed paper it should be 76 percent, which corresponds to the standard. These "uneven" values on the plate represent the new reference to be observed within the production plates. To carry out a new calibration, it is possible at all times to output linearised plates via the calibration manager, in which case it is only possible to use the test file from the Harlequin RIP or deselect the two press curves and then send test files from application programs.

After changeover, quality and calibration should be checked continuously. It should be kept in mind that, e. g., using a different ink can cause a difference of up to 5 percent. If it is necessary to change material configuration, all changes should be observed, documented, and the process adapted correspondingly. The consequence can be, e. g., if a different plate manufacturer is used, a different RIP configuration must be selected.

Since 1 May, Ifra has made available a new ICC profile for 26 percent (in addition to a profile with 30 percent for the U.S.A. only) on the Ifra web site (www.ifra.com). This profile should be used by the agencies, and for news photos. The names of the profiles are: ISOnewspaper26_b4.icc (for the U.S: ISOnewspaper30_b4.icc).

# Appendix: Quick reference guide to standardised newspaper printing in accordance with ISO 12647-3

Ifra prepared this quick reference guide to standardised newspaper printing and agreed it with the participants in a round table meeting held on 29 January 2004. The following experts participated:

> Michael Adloff, Unternehmensgruppe Vignold, Ratingen
> Thorsten Bastian, Axel Springer Verlag AG, Hamburg
> Walter Fleck, Bundesverband Druck und Medien e.V., Wiesbaden
> Oliver Graf, MAN Roland Druckmaschinen AG, Augsburg
> Volker Hotop, Frankfurter Sozietätss-Druckerei GmbH, Frankfurt
> Werner Scherpf, Koenig & Bauer AG, Würzburg
> Manfred Werfel, Ifra, Darmstadt

The following chapters have been arranged in accordance with the sequence of work processes in newspaper production. A special page was reserved for each individual production step, so that the quick reference guide can be easily copied and distributed to the various departments concerned.

All comments in the following refer exclusively to the coldset offset newspaper production process. Letterpress and flexo printing are not covered. The background to these comments is provided by the specifications of ISO 12647-3 in the draft version of ISO DIS[1)] 12647-3:2004.

Alternative methods of plate production are described (conventional production and CTP). We recommend that you focus exclusively on the chapters that apply to your production. (No liability is accepted for information contained in this document).

[1)] DIS = Draft International Standard. This document has been published already and is available from the various national standardisation bodies, e. g. in Germany from www.beuth.de.

## 1 Taking over of ad data and proof prints

| Objectives | Proofing methods | Proofing frequency |
|---|---|---|
| Recommended is PDF/X in accordance with ISO 15930 as transfer data format.<br>Check of digital ads for sufficiency.<br>All used fonts and images must be integrated into the ad file. If this is not the case, the data supplier must be contacted immediately. | Automatic proofing is possible via a suitable "preflight" software. Automatic or manual replacement of missing fonts is possible only after consultation with the data supplier. | After every supply of digital data. |
| Check of digital ads for typographic suitability for newspaper printing.<br>Lines must have a minimum thickness of 0.5 point. Reverse type on a colour background should be semi-bold and at least 7 point large. Negative lines on a colour background should have a minimum weight of 0.7 point. | Automatic line weight correction is possible with suitable "preflight" software. Type size correction is only manually possible. | After every supply of digital data. |
| Check of supplied CMYK colour data for suitability of use in newspapers.<br>Resolution should be greater/equal to the factor 1.5 of the screen ruling in print. Factor 2 is optimal.<br>*Example: min. 150 dpi with 40 L/cm screen (=100 lpi), optimal: 200 dpi.*<br>Total CMYK dot percentage should not exceed 240 %.<br>According to ISO 12647-3, max. black should be at least 85 %. In practice, 95 % can be recommended and achieved. | Check of supplied data sets using suitable "preflight" software; if possible, incl. automatic correction. | Automatic after every supply of digital colour data. |
| Adaptation of supplied colour data (unknown CMYK, RGB, LAB) to newspaper printing conditions by means of standard ICC print profile in accordance with ISO 12647-3.<br>The standard colour profile is called:<br>ISOnewspaper26v4.icc<br>(status: July 2004) | After consultation with the data supplier, correction of the supplied data is possible.<br>Automatic colour space conversion of supplied data sets by means of suitable "preflight" and/or image workflow software. Depending on the used software, correction of the total CMYK (target 240 %) dot percentage can also be automated.<br>Manual conversion in Photoshop (from version 6) is also possible. | After every supply of digital colour data. |
| Avoidance of multiple, loss-inducing compression of colour data (e. g. by JPEG). | Check before storing colour data. For reasons of quality, multiple compression should be avoided as far as possible. This can be done by converting already early on to a loss-free data format (e. g. TIFF). | At the time of image processing. |
| Check of hard copy proofs for their suitability for newspaper printing. | Check of one of the control elements printed on the proof. Colorimetric measurement and comparison of the measured data with the colour specifications of ISO 12647-3.<br>Recommendation: UGRA/FOGRA media wedge in the latest version. | After every supply of hard copy proofs. |

## 2 Digital editorial image data

| Objectives | Proofing methods | Proofing frequency |
|---|---|---|
| Check of supplied image data for suitability for use in newspapers.<br>Resolution should be greater/equal to the factor 1.5 of the screen ruling in print.<br>*Example: min. 150 dpi with 40 L/cm screen (= 100 lpi), optimal: 200 dpi.* | Automatic check of supplied data sets by means of suitable software; if possible, incl. automatic correction (automatic image reproduction). | Automatic after every supply of digital image data. |
| RGB data with embedded profile should be opened with the colour space that is defined in the profile (therefore do not convert into a different RGB!). | Automatic display of the attached profile when opening the image in Photoshop. | After every supply of digital colour data. |
| Conversion of RGB data of unknown origin (without source profile) to a company-wide uniform RGB colour space. Recommended in this case is the use of "Adobe98-RGB". | Automatic conversion possible with suitable software.<br>Automatic conversion when opening the image in Photoshop. | After every supply of digital colour data. |
| Digital image processing and image optimisation.<br>*Important parameters:*<br>*Grey balance (neutral tones)*<br>*Skin tones*<br>*Colour intensity (saturation)*<br>*Contrast*<br>*Tonal range*<br>*Detail reproduction* | Automatic image processing and image optimisation possible with suitable software.<br>Alternative: manual image processing and image optimisation in Photoshop.<br>The general principle applies: controlled corrections! | Automatic after every supply of digital colour data. |
| Digital "sharpening" of images for newspaper printing. Sufficient sharpness should be guaranteed (slight oversharpness on the monitor screen, view motif in 50% size display) in order to produce a good effect in print.<br>In general, sharpness depends on the motif, resolution and size concerned. | Automatic sharpening of the image as required is possible using suitable software.<br>Manual sharpening in Photoshop with "unsharp masking" function.<br>*The following rules apply:*<br>*"Pixel-Radius" always 1,*<br>*"Threshold" as low as possible (image-dependent),*<br>*"Strength" as high as possible (image-dependent).* | Automatic after every supply of digital colour data. |
| Colour separation of supplied colour data (usually in RGB) by means of standard-ICC print profile (ISOnewspaper26v4.icc, status July 2004).<br>*Total CMYK dot percentage should not exceed 240 %.*<br>*Max. black should be at least 85 %.*<br>*Use of strong GCR.*<br>In cases where the above standard profile is used, these parameters are applied already. | Automatic colour space conversion of supplied data sets using suitable image workflow software.<br>Manual conversion in Photoshop (recommended from version 6) is also possible. | After every supply of digital colour data. |
| Avoidance of multiple, loss-inducing compression of colour data (e. g. by JPEG). | Check before storing colour data. For reasons of quality, multiple compression should be avoided as far as possible. This can be done by converting already early on to a loss-free data format (e. g. TIFF). | At image processing. |

## 3 Scanners, monitors, digital proofing systems

| Objectives | Proofing methods | Proofing frequency |
|---|---|---|
| Characterisation of the colour scanners for purposes of optimal colour reproduction. | Production of scanner profiles by means of suitable characterisation aids (batch-calibrated IT8.7/1 and IT8.7/2 targets plus corresponding software); new production, if required. | Quarterly. |
| Resolution should be greater/equal to the factor 1.5 of the screen ruling in print. Factor 2 is optimal.<br>*Example: min. 150 dpi with 40 L/cm screen (= 100 lpi), optimal: 200 dpi.* | Check the correct setting in the scanner software. | When scanning image data. |
| Important to note at the time of colour separation (either by means of scanning or reproduction software): total CMYK dot percentage should be limited to 240 %.<br>*Max. black should be greater/equal to 85 %.*<br>*Strong GCR is recommended.*<br>In cases where the standard profile (ISOnewspaper26v4.icc, status July 2004) is used, these parameters are applied already. | Check the corresponding settings in your scanning or reproduction software, or select the corresponding correct standard ICC colour printing profile respectively.<br>*Check the correct installation and selection of the colour profiles for scanner, monitor and print (if colour management is used).* | Daily before production start-up or shift start respectively. |
| Calibration and characterisation (monitor profile) of the colour monitors at image-processing workplaces in accordance with the following values:<br>*White dot 5000 Kelvin (D50)*<br>*Gamma 1,8*<br>*Luminance ≥ 70 Cd/m²*<br><br>Reduction of ambient light, prevention of reflections. | Check the calibration and monitor profile by means of suitable calibration aids (colorimeter/spectrophotometer plus corresponding software); if necessary, re-calibration and production of a new monitor profile.<br><br>*N.B.: the name of the monitor profile must always include the date of creation.* | Monthly. |
| Calibration of the proof printer in order to ensure consistent colour reproduction. | Use of suitable calibration aids (system-dependent, plus spectrophotometer plus corresponding software); regular check of calibration or re-calibration respectively. | Monthly; or more often, depending on proofing device technology |
| Characterisation of the proof printer to ensure the correct simulation of the colour printing result. | Production of proofing instrument profiles using suitable characterisation aids (IT8.7/3 output testform plus spectrophotometer plus corresponding software); if necessary, new production after a certain time. | Half-yearly; or more often, depending on proofing instrument technology |
| Check of register precision of Copy-Dot scanners for re-digitising colour separation films. Misregister between the colour separations (film or plate) of a page should be less than/equal to 0.02 % of the page diagonals. | Proof from the final page films or plates respectively that contain re-digitised elements (ads). | Monthly. |

## 4 Colour separation and image processing in general

The colour separation of data sets can be done at a single workstation (e.g. with Photoshop) or centrally controlled in a server (automatic editorial image workflow). In each case, the following guideline values should be observed.

| Objectives | Proofing methods | Frequency of proofing |
|---|---|---|
| The total CMYK dot percent should be limited to max. 240 %. | Select corresponding standard newspaper printing profile in accordance with ISO 12647-3 (ISOnewspaper26v4.icc, status July 2004) or check the corresponding settings in your software.[2)] | Daily before production start-up. |
| The maximum value for black (K) in the 4c composition should be at least 85 %. | Select corresponding standard newspaper printing profile in accordance with ISO 12647-3 (ISOnewspaper26v4.icc, status July 2004) or check the corresponding settings in your software.[2)] | Daily before production start-up. |
| Recommended is the application of strong GCR, in which black starts at cyan = 20 %. | Select corresponding standard newspaper printing profile in accordance with ISO 12647-3 (ISOnewspaper26v4.icc, status July 2004) or check the corresponding settings in your software.[2)] | Daily before production start-up. |
| Sufficient sharpness for reproduced halftone image data. | Check the corresponding settings in the software. Because sharpness depends on the image, resolution and size concerned, it is possible here only to give general tips for standard settings.<br>*Example Photoshop settings:*<br>*"Pixel-Radius" always 1,*<br>*"Threshold" as low as possible (image-dependent),*<br>*"Strength" as high as possible (image-dependent).* | Daily before production start-up and during production of ready-to-print image data. |
| Ad data format: ISO 12647-3 recommends PDF/X.<br>The data format must be agreed between the sender and receiver. PDF/X was developed especially for the transfer of data for printing. | Production and checking via suitable proofing software: see Ifra Special Report 2.36 as well as other background information and Freeware on the production and proofing of files under www.pdfx.info.<br>Automatic proofing of PDF/X files is possible with suitable preflight software. | Before sending and after receiving ad data. |

[2)] Always use the current standard newspaper printing profile. This can be downloaded free of charge from ifra.com.

## 5 Screening of data sets

The type of screening of halftone data is specified in the RIP (Raster Image Processor) uniformly for the entire newspaper production.

| Objectives | Proofing methods | Frequency of proofing |
|---|---|---|
| Screen type: moderate chain dot (depending on the software concerned, also described as "elliptical dot"). Two dot link-ups at ca. 40 % and 60 % on film or directly exposed plate (CTP). | Optical check of the corresponding screen setting on the basis of the first-exposed screen film/plate (magnifier, tube microscope) in the three-quarter tone range. | Weekly |
| Alternative screen type: frequency-modulated screen with min. spot-sizes of 40µm. | Optical check of the corresponding screen on the basis of the first-exposed screen film/plate (magnifier, tube microscope) in the three-quarter tone range. | Weekly |
| Alternative screen types: hybrid screen with spot sizes between 25µm and 40µm, other screen types with special-shaped dots; strongly manufacturer-dependent. | Optical check of the corresponding screen on the basis of the first-exposed screen film/plate (magnifier, tube microscope) in the three-quarter tone range. | Weekly |
| Imager resolution for moderate chain dot screen and 40 lines/cm: 1270 dpi. | Check the corresponding RIP setting. | Weekly |
| Screen frequency for moderate chain dot screen: 40 lines per centimeter, corresponding to 100 lpi. | Check the corresponding RIP setting. Check the first-exposed screen film/plate (dot counter). | Weekly |
| Screen angle for moderate chain dot screen:<br>Yellow 0°<br>Cyan 15°<br>Magenta 75°<br>Black (K) 135°<br>Measured on the printed product. | Check the corresponding RIP setting.<br>Check the first-exposed screen film/plate (screen angle measuring instrument). | Weekly |

## 6 Film exposure

If you expose directly to plate (CTP), proceed to chapter 8.

| Objectives | Proofing methods | Frequency of proofing |
|---|---|---|
| Film misregister between the colour separations of a page should be less than/equal to 0.02 % of the page diagonals. | Tube microscope, magnifier. Using register pins, position punched page films over one another on a light table. Register marks from hairlines may not differ from one another by more than one line weight. | Random samples during production |
| Black density of the exposed film greater than/equal to 3.5 (in many cases, a density greater than 4 is obtained with modern Hard-Dot films). | Transmitted light densitometer, zeroise on unexposed film, measure a solid. | Daily before production start-up |
| Fog density of the unexposed film less than/equal to 0.15 | Transmitted light densitometer, zeroise on light source, measure on unexposed but developed film. | Daily before production start-up |
| Dot gain at film exposure is controlled in the RIP (Raster Image Processor).<br>The degree of dot gain at the time of film exposure can differ from one case to another. The objective is to obtain a total dot gain of 26 % in all colours (CMYK). (Total dot gain = tonal value difference between file and printed result)<br>Once the required dot gain for film exposure has been defined, it should be achieved in narrow tolerances in daily production. The aim should be to obtain a consistent and reproducible tonal transfer from the data set to the film with a tolerance of ±1% at 40 % or 50 % nominal tonal value. | Transmitted light densitometer, zeroise on unexposed film, measure a stepped wedge (e. g. tonal values 2 % / 4 % / 6 % / 8 % / 10 % / 20 % / 30 % / 40 % / 50 % / 60 % / 70 % / 80 % / 90 % / 95 % / 100 %) | Daily before production start-up |

## 7 Conventional platemaking

If you expose directly to plate (CTP), proceed to chapter 8.

| Objectives | Proofing methods | Frequency of proofing |
|---|---|---|
| The plate must be burned-out and developed in such a way as to make it suitable for use in long production runs (the target is 150,000 to 200,000 impressions). | Also recommended is the use of the UGRA/FOGRA plate test wedge 1982: depending on the product concerned, a specific step of the halftone wedge must still be completely exposed. The next step may no longer be completely exposed. | Daily before production start-up |
| The tonal range on the plate should be at least 3 % – 90 %. | Measure a stepped wedge (e. g. tonal values 3 % / 6 % / 8 % / 10 % / 20 % / 30 % / 40 % / 50 % / 60 % / 70 % / 80 % / 90 % / 95 % / 100 %) using a suitable measuring instrument.[3] Such measuring instruments can be:<br>· Densitometers or spectrophotometers suitable for plate measurement<br>· So-called Dotmeters (CCD measuring devices)<br>· Also possible: optical check with the aid of a tube microscope | Daily before production start-up |
| Dot gain at platemaking is controlled by the light strength in the platemaking system.<br>The degree of dot gain at the time of film exposure can differ from one case to another. The objective is to obtain a total dot gain of 26 % in all colours (CMYK). (Total dot gain = tonal value difference between file and printed result)<br>Once the required dot gain for plate exposure has been defined, it should be achieved in narrow tolerances in daily production. The aim should be to obtain a consistent and reproducible tonal transfer from the data set to the film with a tolerance of ± 1 % at 40 % or 50 % nominal tonal value. | Measure a stepped wedge (e. g. tonal values 3 % / 6 % / 8 % / 10 % / 20 % / 30 % / 40 % / 50 % / 60 % / 70 % / 80 % / 90 % / 95 % / 100 %) using a suitable measuring instrument.[3] Such measuring instruments can be:<br>· Densitometers or spectrophotometers suitable for plate measurement<br>· So-called Dotmeters (CCD measuring devices)<br>· It is also possible to use the UGRA/ FOGRA plate test wedge 1982: The 10 µm or 12 µm microrings should be copied both positively and negatively. | Daily before production start-up |

[3] N.B.: Depending on the measuring instrument and plate technology, the measured tonal values on the plate cannot be considered absolute values. It is essential to calibrate the total production line in such a way that a total dot gain of 26 % is achieved in print. If this is the case, the values on the plate should be recorded and taken as reference values for purposes of process control.

## 8 Direct plate imaging, Computer-to-Plate (CTP)

| Objectives | Proofing methods | Frequency of proofing |
|---|---|---|
| The plate must be burned-out and developed in such a way as to make it suitable for use in long production runs (the target is 150,000 to 200,000 impressions). | Also recommended is the use of the UGRA/FOGRA plate test wedge 1982: depending on the product concerned, a specific step of the halftone wedge must still be completely exposed. The next step may no longer be completely exposed. This test is suitable only for negative-working plates. These are mainly CTP photopolymer plates. | Daily before production start-up |
| Check the laser energy of the CTP imagers. | Recommended is the optical evaluation of digital chessboard fields. Corresponding control elements are offered by CTP system suppliers (e. g. Agfa DigiControl). | Random samples during production |
| The tonal range on the plate should be at least 3 % – 90 %. | Measure a stepped wedge (e. g. tonal values 3 % / 6 % / 8 % / 10 % / 20 % / 30 % / 40 % / 50 % / 60 % / 70 % / 80 % / 90 % / 95 % / 100 %) using a suitable measuring instrument.[4] Such measuring instruments can be:<br>· Densitometers or spectrophotometers suitable for plate measurement<br>· So-called Dotmeters (CCD measuring devices)<br>· Also possible: optical check with the aid of a tube microscope | Daily before production start-up |
| Dot gain in CTP production is controlled in the RIP (Raster Image Processor).<br>The degree of dot gain in CTP can differ from one case to another. The objective is to obtain a total dot gain of 26% in all colours (CMYK). (Total dot gain = tonal value difference between file and printed result)<br>Once the required dot gain for direct plate exposure has been defined, it should be achieved in narrow tolerances in daily production. The aim should be to obtain a consistent and reproducible tonal transfer from the data set to the CTP plate with a tolerance of ± 2 % at 40 % or 50 % nominal tonal value. | Measure a stepped wedge (e. g. tonal values 3 % / 6 % / 8 % / 10 % / 20 % / 30 % / 40 % / 50 % / 60 % / 70 % / 80 % / 90 % / 95 % / 100 %) using a suitable measuring instrument.[4] Such measuring instruments can be:<br>· Densitometers or spectrophotometers suitable for plate measurement<br>· So-called Dotmeters (CCD measuring devices)<br>· Also possible is the use of the UGRA/ FOGRA plate test wedge 1982: the 10 µm or 12 µm microrings should be copied both positively and negatively. | Daily before production start-up |

[4] N.B.: Depending on the measuring instrument and plate technology, the measured tonal values on the plate cannot be considered absolute values. It is essential to calibrate the total production line in such a way that a total dot gain of 26 % is achieved in print. If this is the case, the values on the plate should be recorded and taken as reference values for purposes of process control.

## 9 Offset printing

Grey balance control combined with a reference density measurement has proved to be an effective means of colour control on the press. In recent times, closed loop control systems are being developed and offered for newspaper printing that also use the grey balance or even measure directly in the image. Automatic colour register control has long been in use and recommended.

<table>
<tr><th>Objectives</th><th>Proofing methods</th><th>Frequency of proofing</th></tr>
<tr><td>Misregister in print should be less than or equal to 0.15 mm. Max. permissible is 0.30 mm.</td><td>Tube microscope with integrated scale, measure a register mark or similarly suitable element.</td><td>Daily during production (random samples)</td></tr>
<tr><td>Retain grey balance in print.<br>Grey balance control with:<br>Cyan 30 %<br>Magenta 24 %<br>Yellow 24 %<br>(percentages in the data set/on film)</td><td>Use suitable control elements that are printed along with the product. Recommended is a grey balance print control strip.<br>The visual control must be done under standard light conditions (D50).</td><td>Daily during printing (random samples)</td></tr>
<tr><td>Solids from CMYK via paper density in accordance with DIN E with polarisation filter on a black background[5)]<br>Cyan 0.90 ± 0.1<br>Magenta 0.90 ± 0.1<br>Yellow 0.90 ± 0.1<br>Black (K) 1.10 ± 0.1</td><td>Reflected light densitometer, measure suitable print control elements (densities of cyan and black). The remaining colour densities automatically become evident from the calculation of the grey balance. Density measurement in accordance with DIN E, black background, above paper density – zeroise on newsprint.</td><td>Daily during printing (random samples)</td></tr>
<tr><td>Colour values paper<br>L* 82 ± 3<br>a* 0 ± 2<br>b* 3 ± 2</td><td>Spectrophotometer, measure paper samples, 10 measurements with black background, calculation of the average values.</td><td>Random samples at the time of paper supply</td></tr>
<tr><td>Colour values process colours
<table>
<tr><th>Colours</th><th>L*</th><th>a*</th><th>b*</th><th>Deviation Δ E</th><th>Variation Δ E</th></tr>
<tr><td>Cyan</td><td>57</td><td>–23</td><td>–27</td><td>5</td><td>4</td></tr>
<tr><td>Magenta</td><td>54</td><td>44</td><td>–2</td><td>5</td><td>4</td></tr>
<tr><td>Yellow</td><td>78</td><td>–3</td><td>58</td><td>5</td><td>4</td></tr>
<tr><td>Black (K)</td><td>36</td><td>1</td><td>4</td><td>5</td><td>5</td></tr>
<tr><td>C+Y</td><td>53</td><td>–34</td><td>17</td><td>8</td><td>7</td></tr>
<tr><td>C+M</td><td>41</td><td>7</td><td>–22</td><td>8</td><td>7</td></tr>
<tr><td>M+Y</td><td>52</td><td>41</td><td>25</td><td>8</td><td>7</td></tr>
<tr><td>CMY</td><td>40</td><td>0</td><td>1</td><td>–</td><td>–</td></tr>
<tr><td>CMYK</td><td>34</td><td>1</td><td>2</td><td>–</td><td>–</td></tr>
</table></td><td>Spectrophotometer, measure on densities of primary colours C + M + Y + K and secondary colours R + G+ B.<br>Measuring conditions in accordance with ISO 12647-3: geometry 45°/0°, 2° viewer, D50 illuminant, with polarisation filter, black measuring background.</td><td>Weekly during printing (random samples)</td></tr>
<tr><td>Total dot gain in print run: 26 % (at 40 % or 50 % nominal tonal value)<br>Dot gain tolerances in the print run:<br>Deviation 5 %<br>Variation 5 %<br>Fluctuation range between CMYK:<br>mid-tone spread 6 %</td><td>Reflected light densitometer, measure suitable print control elements (40 % or 50 % patches in each case of C + M + Y + K).</td><td>Weekly during printing (random samples)</td></tr>
</table>

[5)] This information is intended solely as an aid to obtain the required colour values in print. If necessary, densities can and should be adjusted to ensure that they lead to the desired colour values in the result.

# Other Ifra Special Reports dealing with:

## 2 Pre-Press

(as of June 2005)

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2.18 Colour Management Systems

2.19 Faster press photos with digital cameras

2.20 Vorarlberger Nachrichten – a case study
Reaching the Ifra Colour Quality Club Standards

2.21 FM Screening

2.23 Soft proofing of full newspaper pages

2.24 Computer to plate, an economic solution for newspapers

2.25 Newspaper Intranets

2.26.1 Data Management in Newspapers – A Challenge for the Newspaper Management, Part I, Applications

2.27 Computer-to-Plate submitted to cross-examination

2.30 Introduction and Implementation of Page Planning Systems

2.31 Integrated Publishing Systems

2.32 Automated process control in CTP production – a feasibility study

2.33 XML for newspapers

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