INTERNATIONAL STANDARD

ISO 12647-3

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Graphic technology — Process control for the manufacture of half-tone colour separations, proofs and production prints —

Part 3:
Coldset offset lithography and letterpress on newsprint

Technologie graphique — Contrôle du processus de confection de sélections couleurs tramées, d'épreuves et de tirages —

Partie 3: Impression offset sans sécheur et typographique sur papier journal

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Contents

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 12647-3 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

ISO 12647 consists of the following parts, under the general title *Graphic technology — Process control for the manufacture of half-tone colour separations, proofs and production prints*:

— *Part 1: Parameters and measurement methods*

— *Part 2: Offset lithographic processes*

— *Part 3: Coldset offset lithography and letterpress on newsprint*

— *Part 4: Gravure printing*

— *Part 5: Screen printing*

Annex A of this part of ISO 12647 is for information only.

Introduction

When producing a half-tone colour reproduction it is important that the colour separator, proofer and printer have previously specified a minimum set of parameters that uniquely define the visual characteristics and other technical properties of the planned print product. Such an agreement enables the correct production of suitable separations (without recourse to trial-and-error") and subsequent production of off-press or on-press proof prints from these separations whose purpose is to simulate the visual characteristics of the finished print product as closely as possible.

For more information on the technical background refer to ISO 12647-1.

It is the purpose of this part of ISO 12647 to list and explain the minimum set of process parameters required to uniquely define the visual characteristics and related technical properties of a half-tone proof or production print produced by coldset offset or letterpress on newsprint, or half-tone proof designed to simulate this, from a set of half-tone separation films.

It is a further purpose of this part of ISO 12647 to list values or sets of values of the primary parameters specified in ISO 12647-1 and related technical properties of a half-tone newspaper print or proof produced from a set of half-tone colour separation films. Where deemed useful, secondary parameters are also recommended for specification.

Since non-periodic screening and direct-to-plate techniques are common practice with newspaper printing, information on some of the pertinent parameters has been included.

Graphic technology — Process control for the manufacture of half-tone colour separations, proofs and production prints —

Part 3:
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1 Scope

This part of ISO 12647 specifies printing conditions for newspaper single- or four-colour printing and proofing. The values of the parameters specified may be used in the exchange of data to characterize the intended printing condition and/or for the process control of printing by practitioners wishing to work to common goals.

This part of ISO 12647

— specifies a number of process parameters and their values that shall be applied when preparing half-tone separations for newspaper single- or four-colour proof and production printing. The parameters and values are chosen in view of the process stages “colour separation”, “making of the printing forme”, “proofing” and “production printing”;

— is applicable to coldset offset and letterpress proof and production printing and off-press proof printing processes on newsprint, or that simulate newsprint, and that use colour separation films as an analogue optical information storage medium rather than storage in digital form in an electronic storage medium;

— is applicable by analogy to press printing from printing surfaces produced by direct imaging methods and the corresponding proof printing processes;

— is not applicable to line screens and non-periodic screens although certain parameters given can be applied by analogy. In particular, the tone values increases specified apply directly because they refer to control patches which contain periodic screen half-tones;

— is not applicable to flexo proof and production printing although a number of parameters can be applied by analogy.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 12647. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 12647 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5-3:1995, *Photography — Density measurements — Part 3: Spectral conditions.*

ISO 5-4:1995, *Photography — Density measurements — Part 4: Geometric conditions for reflection density.*

ISO 2846-2:—[1)], *Graphic technology — Colour and transparency of ink sets for four-colour-printing — Part 2: Newspaper printing.*

1) To be published.

ISO 12647-1:1996, *Graphic technology — Process control for the manufacture of half-tone colour separations, proof and production prints — Part 1: Parameters and measurement methods*.

ISO 12642:1996, *Graphic technology — Prepress digital data exchange — Input data for characterization of 4-colour process printing*.

3 Terms and definitions

For the purposes of this part of ISO 12647, the terms and definitions given in ISO 12647-1 and the following apply.

3.1
coldset offset
method of offset lithographic printing where the inks set ("dry") primarily by absorption into the print substrate

3.2
non-periodic (half-tone) screen
half-tone screen without a regular screen angle and without a constant screen ruling

NOTE Sometimes referred to as stochastic, frequency modulated or random screens.

4 Requirements

The following subclauses are arranged according to the order set out in ISO 12647-1. They also depend on it for the definition of the parameters and test methods.

4.1 Colour separation films

4.1.1 Quality

Unless otherwise specified, the core density shall be at least 2,5 for offset and 3,5 for letterpress above the transmission density of the clear film (film base plus fog). The transmission density in the centre of a clear half-tone dot shall not be more than 0,1 above the corresponding value of a large clear area. The transmission density of the clear film shall not be higher than 0,15.

The fringe width shall not be greater than one-fortieth of the screen width; the half-tone dot shall not be split up in distinct parts.

The colour separation film quality shall be evaluated according to annex B of ISO 12647-1. Measurements shall be made with a (UV) transmission densitometer whose spectral products conform to ISO type 1 printing density as defined in ISO 5-3; for the evaluation of core properties, type 2 printing density may be used.

NOTE 1 The clear film density requirement is based on the understanding

— that the density range of the clear areas of all films that are to be exposed on to an offset plate, for consistent work, should not exceed 0,10;

— that 0,05 represents the lowest commonly found value for ISO type 1 printing density.In order to minimise the impact of the use of half-tone films with clear film densities above this range, agreements between the supplier of colour separations and the recipient are required. Contacting or duplicating can also be used to bring half-tone films with dissimilar clear film densities into agreement.

NOTE 2 As a practical guide, a core density of 2,5 above the clear film density will normally be achieved if the density of large solid areas is more than 3,5 above the clear film density.

NOTE 3 If a user wishes to use a blue filter for transmission density measurements, as is the case for type 2 printing density, it is necessary to determine, for the particular film type and processing conditions, the correlation between densities obtained with the blue filter and those obtained with an ISO type 1 printing density instrument.

NOTE 4 With non-periodic screens, a fringe width of not more than 4 µm is reported to give reliable results.

4.1.2 Screen ruling

For four-colour work, the screen ruling (screen frequency) should be (34 ± 2) cm^{-1} or (40 ± 2) cm^{-1} for offset and (28 ± 2) cm^{-1} or (34 ± 2) cm^{-1} for letterpress.

NOTE 1 With computer-generated screening, the parameters screen ruling and screen angle may be varied slightly in conjunction, from one process colour to another, in order to minimise moiré patterns.

NOTE 2 Higher screen rulings for offset can be successfully used with proper adjustments.

NOTE 3 With non-periodic screens, reliable results are obtained if the minimum dimension of the image elements is in the range of 25 µm to 40 µm.

4.1.3 Screen angle

For half-tone dots without a principal axis, the nominal difference between the screen angles for cyan, magenta and black shall be 30°, with the screen angle of yellow separated at 15° from another colour. The screen angle of the dominant colour should be 45°, this value refers to the film.

For half-tone dots with a principal axis, the nominal difference between screen angles for cyan, magenta and black shall be 60°, with the screen angle of yellow at 0°. The screen angle of the dominant colour should be 45° or 135°, these values refer to the film.

NOTE The dominant colour contains most of the image information compared to the other colours. In most cases the dominant colour will be either black (K) or magenta (M), depending on the amount of GCR/UCR used in creating the separation.

4.1.4 Dot shape and its relationship to tone value

For images that are to be transmitted by facsimile "circular" as distinct from elliptical half-tone dots should be used.

For other images elliptical half-tone dots may be used where the first linkup occurs between the tone values (on film) of 35 % and 45 %, ideally 40 %. The tone value where the second linkup occurs shall be not more than 20 % above that of the first.

4.1.5 Image size tolerance

For a set of colour separation films in common environmental equilibrium, the lengths of the diagonals shall not differ by more than 0,02 %, measured from common image elements.

NOTE This tolerance includes imagesetter repeatability and film stability.

4.1.6 Tone value sum

Unless otherwise specified, the tone value sum should not exceed 240 % and shall not exceed 260 %. Where the maximum tone value sum approaches this limit the tone value of black should be at least 85 %.

NOTE 1 To achieve acceptable shadow densities, GCR or UCR should be used.

NOTE 2 Any colour which is reproduced using all three chromatic process inks, may be thought of as having a neutral component. This is defined by the lowest tone value and its grey balance equivalents of the other two inks. It is possible to replace all or some of the neutral component by black ink. GCR (Grey Component Replacement) and UCR (Under Colour Removal) are two techniques for achieving this. UCR is limited to near-neutral colours only, whereas GCR generally provides no such limit.

4.1.7 Grey balance

Grey balance, unless otherwise specified, should be given by the following tone value combinations, expressed as dot area on the colour separation film:

	Cyan	Magenta	Yellow
Quarter tone	25 %	18 %	18 %
Mid tone	50 %	40 %	40 %
Three quarter tone	75 %	64 %	64 %

4.2 Print

4.2.1 Visual characteristics of image components

4.2.1.1 Print substrate colour

The production print substrate shall conform to the L^*, a^*, b^* values specified in table 1 within the tolerances specified in table 2.

The print substrate used for proofing should be identical to that used for production with respect to the defined values. When the production substrate cannot be used for proofing, the values of table 1 shall be taken as the reference. The deviations of the L^*, a^*, b^* values of the proofing print substrate from those of the actual production or reference print substrate shall not exceed the tolerances specified in table 2.

Table 1 — CIELAB L^*, a^*, b^* values, gloss and brightness of typical newsprint

	L^* [a]	a^* [a]	b^* [a]	**Gloss** [b]	**Brightness** [c]
Unit	1	1	1	%	%
	80	0	4	< 5	60

a Measurement according to 5.6 of ISO 12647-1, that is 2° observer, illuminant D_{50}, 45°/0° or 0°/45° geometry, black backing

b Measurement according to the TAPPI official test method, "Specular gloss of paper and paperboard at 75 degrees", T 480 om-85

c Reflectance factor at 460 nm, informative only

Table 2 — Tolerances for the colour of the print substrate

Unit: 1

	ΔL^*	Δa^*	Δb^*
Proofing should be within	2	2	2
Production should be within	2	1	1
Production shall be within	3	2	2

4.2.1.2 Print substrate gloss

The print substrate gloss should be as given in table 1.

4.2.1.3 Ink set colours

The CIELAB colour co-ordinates L^*, a^*, b^* of the process colour solids on the proof shall agree with the aim values specified in table 3 within the appropriate deviation tolerances specified in table 4. The colour co-ordinates of the two-colour overprints without black ink should be as given in table 3.

The deviation of the process colour solids of the production print is restricted by the condition that the colour differences between proof and OK print shall not exceed the appropriate deviation tolerances specified in table 4.

The variability of the process colour solids in production is restricted by the following condition. For at least 68 % of the prints, the colour differences from the OK print shall not exceed, and should not exceed one half of, the appropriate variation tolerances specified in table 4.

Table 3 — CIELAB L^*, a^*, b^* aim values of ink colours on newsprint or on equivalent proofing print substrates

Unit:1

	L^*[a]	a^*[a]	b^*[a]
Cyan	57	–23	–27
Magenta	53	48	0
Yellow	79	–5	60
Black	40	1	4
Cyan + Yellow	53	–34	18
Cyan + Magenta	41	7	–22
Magenta + Yellow	52	41	25

a Measurement according to 5.6 of ISO 12647-1, that is 2° observer, illuminant D_{50}, 45°/0° or 0°/45° geometry, black backing

NOTE 1 As this part of ISO 12647 is equally applicable to both offset and letterpress proof and production printing, the question arises as whether it is possible to print the same *L**, *a**, *b** values in both processes. It is noted that the offset process allows for higher chroma values than the letterpress process. However, in order to achieve the same optical result on all newspapers, irrespective of the printing process, identical *L**, *a**, *b** values for both processes are specified here.

NOTE 2 The secondary colours red, green, blue can vary depending on conditions that include the mechanics of the press, the surface characteristics of the print substrate, and the rheological and transparency properties of the inks. Thus, conformance of the primaries C, M, Y to specifications is not sufficient for the conformance of the secondaries to the values given in table 3.

NOTE 3 The values in table 3 relate to printing with ink sets according to ISO 2846-2, they were derived from press runs in the field.

NOTE 4 The distribution of ΔE_{ab} values is not gaussian but skewed. For reasons of consistency, the variation tolerance is defined here as the upper limit for 68 % of the production copies. This is in analogy with a gaussian distribution where 68 % are within plus or minus one standard deviation of the mean.

NOTE 5 As a secondary reference, reflection densities for the process colours as measured with four different densitometer types are provided in table A.1 of the informative annex A.

Table 4 — CIELAB ΔE^*_{ab} tolerances for the primary process colour solids

Unit: 1

	K	C	M	Y
Deviation tolerance [a]	5	5	8	7
Variation tolerance [a]	3	3	5	4
Not more than 60 % of the total deviation or variation shall be attributable to either ΔL^* or ΔH^*				

a Deviation and variation are defined in ISO 12647-1

4.2.1.4 Ink set gloss

No requirement.

4.2.2 Tone value reproduction limits

Half-tone dot patterns within the following tone value limits (on the film) shall transfer onto the print in a consistent and uniform manner:

— 3 % to 85 % for offset

— 5 % to 85 % for letterpress

No significant image parts shall rely on tone values outside of the above ranges on the colour separation film.

NOTE The range 3 % to 90 % is reported to be achievable also by non-periodic screens if the minimum dimension of the image elements is in the range 25 µm to 40 µm.

4.2.3 Tolerance for image positioning

The maximum deviation between the image centres of any two separations shall be less than 0,3 mm and should be less than 0,15 mm.

4.2.4 Tone value increase

4.2.4.1 Aim values

The tone value increase for the production run shall be as specified in table 5 within the tolerances specified in table 6. The tone value increase for proofing should be identical to that used for production. The test method shall be as specified in clause 5.

Table 5 — Tone value increase values for production printing for chromatic colours as measured at a tone value on film of 40 % or 50 %

Screen ruling	34 cm^{-1}	40 cm^{-1}
Unit	%	%
Coldset web offset printing [a] [b]		
Negative-acting plates, contact exposed	30	33
Positive-acting plates, contact exposed	24	27
Positive-acting plates, camera-exposed	20	23
Letterpress	23	–

a As black is normally printed to a higher ink film thickness than the chromatic colour inks, the tone value increase for black may be 2 % higher than for chromatic colours.

b Directly exposed plates may not experience the tone value change normally associated with the contact exposure of a film on to a plate. Therefore, both positive-acting and negative-acting plates so exposed are expected to have a tone value increase of 27 % for 34 cm^{-1} and 30 % for 40 cm^{-1}

NOTE 1 In general it is assumed that the tone value (termed “ink value” in ISO 12642) of the digital data is reproduced identically on the film produced by an image setter. Final films should reproduce those tone values.

NOTE 2 For non-periodic screens the values of tables 5 and 6 also apply since they refer to measurements in a control strip with a periodic half-tone screen, see clause 5. For the purpose of colour separation, however, it is important to use tone value increase data that refers to measurements in non-periodic half-tones. For non-periodic screens with a spot diameter in the range from 25 µm to 40 µm it is reported that a tone value increase of 43 % at 50 % tone value on film is typical for the offset process with negative-acting plates.

4.2.4.2 Tolerances and mid-tone spread

The deviation of the tone value increase of a proof or an OK print from the pertinent aim value specified in 4.2.4.1 shall not exceed the deviation tolerance specified in table 6. The mid-tone spread (variation of tone values/dot gains) of proof or production prints shall not exceed the values given in table 6. The test method shall be as specified in clause 5.

During production printing, the tone value increase shall agree to that of the OK print within the pertinent variation tolerance specified in table 6.

Table 6 — Tone value tolerances and maximum mid-tone spread for proof and production printing
The values refer to control strips with 34 cm^{-1} screen ruling

Unit: percent

	Proofing deviation	Production	
		Deviation	Variation
Control patch 40 or 50	4	5	5
Control patch 75 or 80	3	4	3
	Proofing	**Production**	
Mid-tone spread	5	6	

4.3 Additional requirements for single-colour reproduction and printing

4.3.1 Screen ruling

A screen ruling of (28 ± 2) cm^{-1} or (34 ± 2) cm^{-1} shall be used.

4.3.2 Half-tone reflection copy

The minimum tone value on half-tone reflection copy used for producing films or plates shall be as shown in table 7.

Table 7 — Minimum tone values

Screen ruling	34 cm^{-1}	28 cm^{-1}
Offset	6 %	6 %
Letterpress	8 %	10 %

5 Test method: Tone value and tone value increase of a print

Refer to 5.3 and 5.4 of ISO 12647-1 and note the following additional requirements:

A multi-colour control strip shall be printed along with the subject. It shall contain well-defined control patches with accurate tone value designations. The shape of its half-tone dot should be circular, the screen ruling shall be in the range from 34 cm^{-1} to 40 cm^{-1}. The core density shall be not less than 3,5 above the density of the clear film (film base plus fog) and the fringe width shall not be greater than 4 µm.

The effective measurement aperture diameter of the densitometer on the print should be at least 4,5 mm and shall be at least 3,0 mm.

NOTE 1 If a moderate chain dot shape is used, the tone value increase may be slightly (up to 1 %) higher caused by the different dot shape used.

NOTE 2 For non-periodic screens it is reported that reliable results are obtained using the same control strip and the same aim values and tolerances as with periodic half-tone screens.