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

Part 6:

Flexographic printing

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

Partie 6: Processus flexographique

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This third edition cancels and replaces the second edition (ISO 12647-6:2012), which has been technically revised. It also incorporates the Amendment ISO 12647-6:2012/Amd 1:2015.

The main changes compared to the previous edition are as follows:

- the intent of the document has been changed from a process control definition to a specification of the way to exchange the information necessary to define the printing characteristics of the desired product. To do this, it has built on colour management technology and the exchange of colour characterization data.

A list of all parts in the ISO 12647 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Historically, the ISO 12647 series of International Standards established the process control parameters and their aim values and tolerances for the most important professional printing processes of the graphic arts industry. The initial concept was that the groundwork for the series was laid down in ISO 12647-1. This document differs from that concept because flexographic printing has changed significantly since the ISO 12647 series was initially conceived.

This current edition differs from the earlier edition by not defining specific printing condition aims, but instead requiring that a specific reference printing condition (characterization data set) be specified. Flexographic printing differs from other printing procedures by using a variety of printing machine architectures, ink sequence, ink types, anilox rollers, substrate types, etc. Each of these involve different printing condition and process control aims. This document requires that the colour of the printed product match a characterization data set or a printing condition agreed upon by the provider and the receiver. It specifies minimum requirements and tolerances to be communicated and produced.

The purpose of a proof is to simulate the visual characteristics of the finished printed product as closely as possible, which often becomes a contractual agreement between the provider and the receiver. ISO 12647-7 defines a process where colour characterization data are used to produce a contract proof.

Defined output intent should be a smooth data set, it is recommended to use an industry accepted Reference characterization data set. The use of a data set from an old flexographic press results in a lumpy characterization data, and consequently problematic transforms. The goal for most packaging is to render all print to a similar appearance, typically the same aim reference characterization data set is used for flexographic, offset, gravure, and digital printing.

This market also uses colour proofing on electronic displays. The International Standards for colour proofing on electronic displays are ISO 14861 and ISO 12646.

Spot colour management is defined in this document to utilize spectral data in an XML schema defined by ISO 17972-4. ISO 17972-4 includes exchange specifications for spot colour characterization data to facilitate the communication of spot colour data.

There are many cases in this document where the provider and the receiver communicate. Modern flexography has the capability to align with most other printing aims, however there are some conditions based on substrate, applications, printing forme technology where aligning to providers aims cannot be met. [Table 5](#) list all attributes that should be discussed for these exceptions.

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

Part 6: Flexographic printing

1 Scope

This document specifies the requirements for the exchange of data and information necessary for the definition of the aims for four-colour flexographic printing of packaging and publication materials, including newsprint. It is based on the use of colour characterization data to define the colourimetric printing aims and includes appropriate assignment of responsibility for and recommended tolerances on critical parameters of the flexographic printing process.

This document is directly applicable to:

- publication flexographic printing including magazines, catalogues and commercial materials and packaging flexographic printing including labels, boxes, and flexible packages;
- half-tone and continuous tone proofing processes that predict the colourimetric results of flexographic printing.

Guidance is also provided concerning the definition of spot colours used in flexographic printing.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5-3, *Photography and graphic technology — Density measurements — Part 3: Spectral conditions*

ISO 2813, *Paints and varnishes — Determination of gloss value at 20°, 60° and 85°*

ISO/TS 10128, *Graphic technology — Methods of adjustment of the colour reproduction of a printing system to match a set of characterization data*

ISO 12647-7, *Graphic technology — Process control for the production of halftone colour separations, proof and production prints — Part 7: Proofing processes working directly from digital data*

ISO 13468-1, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 1: Single-beam instrument*

ISO 13468-2, *Plastics — Determination of the total luminous transmittance of transparent materials — Part 2: Double-beam instrument*

ISO 13655, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

ISO 14782, *Plastics — Determination of haze for transparent materials*

ISO 17223, *Plastics — Determination of yellowness index and change in yellowness index*

ISO 17972-1, *Graphic technology — Colour data exchange format — Part 1: Relationship to CxF3 (CxF/X)*

ISO 17972-4, *Graphic technology — Colour data exchange format (CxF/X) — Part 4: Spot colour characterisation data (CxF/X-4)*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online Browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

3.1 fringe width

size of fuzzy area to the outside of an imaged halftone dot

3.2 printing forme

cylinder or sleeve covered with a relief type rubber or photopolymer plate for application of printing ink to print substrate

[SOURCE: ISO 2834-2:2007, 3.3, modified — The original term was "printing forme for flexography".]

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3.3 provider

organization that prepares the data for printing, distributor of a digital data file, designer, consumer products company or trade shop

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3.4 receiver

organization that receives the file, or to whom a digital data file is delivered,

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Note 1 to entry: In the context of this document, usually a prepress company, printer or converter.

3.5 replacement colour

spot colour (3.7) used, with altered separations, in place of a process colour

3.6 screen ruling

number of image elements, such as dots or lines, per unit of length in the direction which produces the highest value

3.7 spot colour

non-process colour that is used in addition to, or in place of, a process colour and is normally applied with a single impression

Note 1 to entry: When associated with a corporate product identity, a spot colour is also known as brand colour.

4 Requirements

4.1 General

In all cases, digital data files, colour separation film sets or printing formes delivered for printing shall be accompanied by a contract proof or a soft proof unless there is an agreement between all parties concerned that soft proof may be used or that no proof is required. If delivered, the contract proof shall

simulate the intended printing condition including finishing and shall conform to ISO 12647-7, using a defined control bar per ISO 12647-7. This fact shall be verifiable by measuring a well-specified control strip or a similar control target suitable for measured verification that is printed on the proof print along with the subject.

NOTE Where intermediate proofs are needed to simulate the printed product without finishing applied, these are typically prepared by the printer.

4.2 Material input requirements

4.2.1 General

Input for flexographic printing may be either film, digital data or printing formes. It should be noted that the use of film or printing formes as the interchange format between the provider and the receiver should include additional details (such as image distortion) not covered in detail in this document.

4.2.2 Distortion correction

There is currently no agreement as to a single formula for image distortion. Therefore, the computation to be used shall be agreed upon between the provider and the receiver.

4.2.3 Proof requirements

All input for flexographic printing (film, digital data or printing formes) shall be accompanied by a proof prepared in accordance with ISO 12647-7 unless there is prior agreement that a proof is not required, or that an agreed upon soft proof will be used.

4.2.4 Digital data files

Data delivered for printing shall be in the colour formats of CMYK, CMYK plus spot colours, or CMYK with spot colour as replacement for CMYK colours. The actual data delivered may be either final format data or three-component colour data sets with associated colour profiles to allow the data to be converted to the final data format. The intended printing condition shall be defined with sufficient data to allow at least one of the three methods described in ISO/TS 10128 to be applied for establishing the printing aims. Where the intended printing condition is included in the registry of characterizations maintained by the ICC, and the digital data are CMYK, the name used in the ICC registry may be used for identification in lieu of including an ICC output profile. If the intended printing condition is not included in said registry, an ICC output profile shall be included.

If the process colorants are other than CMYK, the data shall be defined colourimetrically using an ICC destination profile that shall be referenced, along with spectral data defined in ISO 17972-4; the rendering intent to be used with the output profile shall be communicated.

The colour gamut of the aim reference printing conditions should be aligned to the intended press gamut. Where the aim data set cannot be achieved by the printing system, it is the receiver's responsibility to communicate and agree on resolution with the provider of the file.

The file format used for data exchange shall be PDF/X and should be in accordance with ISO 15930-7. The ISO 15930 series provides many versions of PDF, for global continuity PDF/X-4 for blind transfer delivers files containing fonts, images, and colour requirements and should be used.

Spot colours measurement data (for example Brand colours) shall be communicated between the provider and the receiver and should be communicated as CxF/X-4, CxF X-4a or CxF X-4b as defined ISO 17972-4 or ISO 17972-1 with spectral reflectance data. It may be embedded in the PDF/X document output intents as mixing hints as specified in ISO 32000-2, by prior agreement between the provider and the receiver.

The ICC profile should include tables that provide smooth transforms. One method to inspect the smoothness of a profile is to use a test image with colour vignettes for primary and secondary colours, as well as images with smooth contours.

NOTE Communication of spot colours as part of digital data exchange is defined by a number of International Standards. See [Annex A](#).

The ISO 15930 series defines many versions of PDF which may be used by prior agreement between the document designer and printer.

4.2.5 Film/printing forme requirements

4.2.5.1 Colour separations

In order to permit the reproduction of at least 100 tone value steps, the resolution of the image setter or printing forme setter should be set to the appropriate resolution for the screen ruling required for the printing application.

The fringe width shall not be greater than one fortieth of the screen ruling.

4.2.5.2 Printing forme digital (laser ablative mask or thermal imaging layer)

In the case of digital plate making processes based on laser ablative mask, the mask material and plate sensitivity varies substantially from manufacturer to manufacturer. It is therefore not possible to provide a recommendation that would apply to all plate types. Users shall follow the recommendations for ablation and plate exposure specified by the manufacturer.

4.2.5.3 Film

When film is provided, the matte negative colour separation film shall have a core density of 4,0 or above. The transmission density in the centre of a clear half-tone dot shall not be higher 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. Both measurements shall be made with transmission densitometer whose spectral products conform to printing density as defined in ISO 5-3.

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 onto the same plate need to be within a printing density range of 0,10. Experience has proved that 0,05 represents the lowest commonly found value for ISO 5 Type 1 printing density. For 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 may also be used to bring half-tone films with dissimilar clear film densities into agreement.

As a practical guide, a core density of 4,0 above the clear film density should be achieved if the density of large solid areas is more than 4,0 above the clear film density.

NOTE 1 Other than for the clear film density requirement, the colour separation film quality can be evaluated according to [Annex C](#).

NOTE 2 This tolerance includes image or printing forme setter repeatability and material stability.

4.2.5.4 Printing forme verification for delivery

Flexographic printing formes, whether prepared by the provider or the receiver, shall be created with both an uncompensated and a compensated set of control patches representing the tonal steps of at least the minimum dot size, and tonal values of 10 %, 30 %, 50 %, 70 %, and a solid.

For the uncompensated set of patches, the tone values measured on the printing forme shall be within the tolerances shown in [Table 1](#). This requires that the control patches be exposed independent of the image content.

For the compensated set of patches, the data in the file associated with these patches shall be the tone values necessary to produce the indicated value when printed on the substrate. These tone patches, measured on the printing forme, shall be within tone value tolerance shown in [Table 1](#).

There is no standard method for measuring halftone dot area on the printed forme and there should be significant differences between measurement devices. A measurement method shall be agreed between the provider and the receiver.

Table 1 — Tone value tolerances for printing forme delivery

Tone value range	Screen rulings equal to or below 48 cm ⁻¹	Screen rulings above 48 cm ⁻¹
Tone values below or equal to 10 %	±1	±2
Tone values above 10 %	±2	±3

NOTE 1 Because the tone value measured on the printing forme does not necessarily represent the tone value achieved on the printed sheet, a common calibration process is to expose a digital scale representing the full tonal scale and use this to calibrate the relationship between tone value measured on the printing forme and tone value achieved on the printed sheet.

NOTE 2 Because the exposed area of a flexographic printing forme is not necessarily representative of the tone value is achieved after processing of the printing forme, a common calibration process is to expose a digital scale representing the full tonal scale and use this to calibrate the relationship between exposed tone value and tone value achieved on the processed printing forme.

The minimum physical dot printable (min dot) is dependent upon, among other things, the screen ruling, printing forme technology and anilox roller being used. It requires agreement between the provider and the receiver of the printing formes.

4.2.5.5 Image size tolerance (film or printing forme)

For a set of colour separation films or printing formes in common environmental equilibrium, the lengths of the diagonals shall not differ by more than 0,02 %. Modern flexographic plate mounting systems do not have the capability to measure diagonals. Verification on these devices should be maintained to be within one row of dots both vertical and horizontal.

NOTE This tolerance includes image or printing forme setter repeatability and material stability.

4.3 Printing aims

4.3.1 General

The flexographic printing process as practiced today is largely based on the use of reference characterization data and colour management profiles to define the printing aims for the single and two-colour tone scales and the associated overprint colours. The printer is free to use the appropriate combination of anilox rollers, printing formes, inks, sleeves and electronic data manipulation (for example using the principles of ISO/TS 10128) to achieve final printed images that colourimetrically match the provided characterization data adjusted, if necessary to match the substrate colour as described in [4.3.3](#). The primary responsibility of the printer is to provide a consistent reproducible printing process.

However, there are some parameters that need to be controlled and some general aims that should be used as guidance for printing. These are addressed in the following clauses.