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Graphic technology – Process control for the production of half- tone colour separations, proofs and production prints – Part 6: Flexographic printing (ISO 12647-6:2012, IDT)

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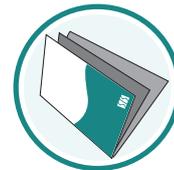
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Denna standard ersätter SS-ISO 12647-6:2006, utgåva 1

The International Standard ISO 12647-6:2012 has the status of a Swedish Standard. This document contains the official English version of ISO 12647-6:2012.

This standard supersedes the SS-ISO 12647-6:2006, edition 1

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Denna standard är framtagen av kommittén för Grafisk teknik, SIS/TK 434.

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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 2.

The main task of technical committees is to prepare International Standards. 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.

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.

ISO 12647-6 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This second edition cancels and replaces the first edition (ISO 12647-6:2006), which has been technically revised. This revision of this part of ISO 12647 has changed the intent of the document 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.

ISO 12647 consists of the following parts, under the general title *Graphic technology — Process control for the production 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 on newsprint*
- *Part 4: Publication gravure printing*
- *Part 5: Screen printing*
- *Part 6: Flexographic printing*
- *Part 7: Proofing processes working directly from digital data*
- *Part 8: Validation print processes working directly from digital data*

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 part of ISO 12647 differs from that concept because flexographic printing has changed significantly since ISO 12647 was initially conceived.

This edition of this part of ISO 12647 differs from the earlier edition by not defining specific printing condition aims but instead requires 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 part of ISO 12647 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 and 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 provider and receiver. In order to visually simulate a particular printed product, off-press proofing processes might require values for various process control aims (e.g. solid tone colouration, tone value increase) which are different from those of the printing process they are meant to simulate. This is caused by differences in phenomena such as gloss, light scatter (within the print substrate or the colourant), ink trap or overprint efficiency, metamerism and transparency. Such differences are likely for those off-press proofing processes in which the print substrate, the colourants and the technology for applying them are significantly different from flexographic printing. In such cases the user or the supplier needs to ensure that appropriate corrections are specified.

Although this market uses colour proofing on electronic displays, and it was the intent of the authors to reference the requirements for such proofing techniques, ISO/TC 130 has not yet defined a standard in this area that can be referenced. It is hoped that such work will progress and be available in the near future.

In addition, work has started on ISO 17972, *Graphic technology — Colour data exchange format*. ISO 17972-4 will include exchange specifications for spot colour characterization data to facilitate the communication of spot colour data.

Graphic technology — Process control for the production of half-tone colour separations, proofs and production prints — Part 6: Flexographic printing

1 Scope

This part of ISO 12647 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 part of ISO 12647 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 referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the reference document (including any amendments) applies.

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

ISO 2846-5, *Graphic technology — Colour and transparency of printing ink sets for four-colour printing — Part 5: Flexographic printing*

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 half-tone colour separations, proof and production prints — Part 7: Proofing processes working directly from digital data*

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

ISO 15930 (all parts), *Graphic technology — Prepress digital data exchange using PDF*

3 Terms and definitions

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

3.1

printing forme for flexography

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

[SOURCE: SOURCE: ISO 2834-2:2007, definition 3.3]

3.2

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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3.3

receiver

organization that receives the file, or to whom a digital data file is delivered, in the context of this part of ISO 12647 usually a prepress company, printer or converter

3.4

replacement colour

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

3.5

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-copy proof unless there is agreement between all parties concerned 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. 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. The use of soft-copy proofs requires agreement between sender and receiver.

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 provider and receiver may include additional details (such as image distortion) not covered in detail in this International Standard.

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 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-copy 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 replacement 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 data are other than CMYK, the data shall be defined colourimetrically using an ICC destination profile that shall be included; the rendering intent to be used with the output profile shall be communicated.

The file format used for data exchange shall be PDF/X in accordance with ISO 15930 (all parts).

NOTE 1 Communication of spot colours as part of digital data exchange is not yet fully defined. See [Annex A](#).

NOTE 2 [Annex B](#) provides a printing curve for use in those situations where colour-managed systems for data input and preparation are either not available or not appropriate.

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.

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 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. Both measurements shall be made with a (UV) transmission densitometer whose spectral products conform to ISO 5 Type 1 printing density as defined in ISO 5-3.

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

In the case of digital plate making process based on laser ablative mask, both the mask and the stain level shall be controlled. The mask shall have an ISO 5 Type 1 printing density of 4,0 or above. The stain level (amount of mask not removed by the laser) shall not be higher than 0,07. Stain level is the transmission density difference between an area where the mask was totally removed (using adhesive tape or solvent) and a solid area (where the mask was removed by the exclusive means of the laser).

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 onto the same plate need to be within an ISO 5 Type 1 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 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 4,0 above the clear film density will normally be achieved if the density of large solid areas is more than 4,0 above the clear film density.

NOTE 3 Other than for the clear film density requirement, the colour separation film quality can be evaluated according to the informative [Annex D](#).

4.2.5.2 Printing forme 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](#). Verification of the accuracy of these values shall be based on agreement between provider and receiver concerning the measurement system to be used, including any relevant settings and conditions, for measuring dot area on the printing forme. This requires that the control patches be exposed independent of the image content.

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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 control patches, measured on the printing forme, shall be within tone value tolerance shown in [Table 1](#). Verification of the accuracy of these values shall be based on agreement between provider and receiver concerning the measurement system to be used, including any relevant settings and conditions, for measuring dot area on the printing forme.

NOTE 1 Because the tone value measured on the printing forme does not necessarily represent the tone value that will be 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.

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 2 Because the exposed area of a flexographic printing forme is not necessarily representative of the tone value that will be 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.

NOTE 3 The minimum physical dot printable (min dot) is dependent upon, among other things, the screen ruling, printing forme technology and anilox roller being used and requires agreement between the provider and receiver of the printing formes.

4.2.5.3 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 %.

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. 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.

4.3.2 Halftoning parameters

4.3.2.1 General

The manufacturers of raster image processors generally recommend specific screen angles and output resolution for an imaging device in order to provide the smoothest screening. Agreement shall be reached between provider and receiver concerning the particular screening parameters to use.

4.3.2.2 Screen frequency

Agreement shall be reached between the provider and the receiver.

4.3.2.3 Screen angle

Where screen angle is critical, agreement shall be reached between the provider and the receiver.

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 for yellow separated by 15° from another colour. No colour should align with engraving pattern on the anilox roller.

NOTE Typically ceramic anilox rollers are engraved at 60° and mechanically engraved rollers are engraved at 45°. The provider needs to communicate with the receiver in order to avoid conflict with the actual anilox engraving angle.

4.3.2.4 Dot shape and its relationship to tone value

Round dots are recommended since they provide the best process consistency for a given resolution, and the best available resolution for process consistency. When delivering printing formes, agreement shall be reached between provider and receiver.

4.3.2.5 Tone value sum

The tone value sum shall be equal to or less than 320 % for four colours unless there is prior agreement between provider and receiver.

NOTE The tone value sum requirement is intended for general guidance as a maximal limit only. The actual limitations on tone value sum are a function of, among other things, the type of ink used (solvent, water-based, UV cured, etc.), the substrate, dryer configurations, and inline converting processes. Press trials provide the appropriate tone value sum for a particular process.

4.3.2.6 Tone value reproduction limits

The receiver shall convey to the provider of films, files or printing formes the physical size of minimum stable printable dot that can be supported by the printing system to be used. The upper and lower tone value limits of half-tone dot patterns which shall transfer to the print substrate in a consistent and uniform manner shall be agreed between the provider and the receiver.

NOTE Press trials provide the appropriate minimum stable printable dot. The actual minimum stable printed dot is, among other things, a function of machine configuration, plate type, printed substrate, type of ink and speed.

4.3.3 Reference substrates

Identification of the substrate to be used for printing, and its colour and gloss, shall be conveyed from the printer to the provider of films, printing formes or data.

Substrate colour typically should fall within the ranges tabulated in [Table 2](#).

Table 2 — Recommended print substrate colour range

L*	a*	b*
> 88	-3 to +3	-5 to +5

Where the substrate colour falls within the range shown in [Table 2](#), the characterization data set provided in accordance with [4.2.4](#) may be modified using the backing correction method outlined in ISO 13655. Where the substrate colour falls outside of the range shown in [Table 2](#) the characterization data set provided shall be modified using the backing correction method outlined in ISO 13655. Where the substrate is transparent, the method described in ISO 13655 for the correction of measurements