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

Part 4:

**Publication gravure printing**

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

*Partie 4: Processus de gravure*

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Case postale 56 • CH-1211 Geneva 20  
Tel. + 41 22 749 01 11  
Fax + 41 22 749 09 47  
E-mail [copyright@iso.org](mailto:copyright@iso.org)  
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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](http://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](http://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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 130, *Graphic technology*.

This second edition cancels and replaces the first edition (ISO 12647-4:2005), which has been technically revised with the following changes:

- deletion of film based requirements;
- changes in proof requirements;
- changes in printing conditions;
- changes in the colouration of the primary and secondary solids;
- general clean up.

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

This part of ISO 12647 lists values or sets of values of the primary process parameters specified in ISO 12647-1 and related technical properties of a gravure publication print. Where deemed useful, secondary parameters are also specified.

The purposes of this part of ISO 12647 are:

- to list and explain the minimum set of primary process parameters required to uniquely define the visual characteristics and related technical properties of a half-tone proof or production print produced from digital data;
- to give the definitions for the general terms necessary for process control;
- to describe the measurement methods and the requirements for reporting the results.

The purpose of a proof print is to simulate the visual characteristics of the finished print product as closely as possible. In order to visually simulate particular print, off-press proofing processes might require values for solid tone coloration and 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 colorant), metamerism, and transparency. Such differences are likely for those off-press proofing processes in which the print substrate, the colorants, and the technology for applying them are significantly different from gravure publication printing. In such cases, the user or the supplier should ensure that appropriate corrections are specified. Another problem area is the matching of a digital off-press proof to a double-sided print on a less-than-opaque, lightweight printing paper as used in publication gravure printing. If it is deemed necessary, for image quality reasons, to proof with colour management profiles based on measurements with substrate backing rather than black backing, there will be an unavoidable difference between proof and production prints. This fact needs to be communicated to all parties concerned.

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

## Part 4: Publication gravure printing

### 1 Scope

This part of ISO 12647 specifies a number of process parameters and their values to be applied to four-colour publication gravure printing. The parameters and values are chosen in view of the complete process covering the process stages “colour separation”, “making of the printing forme”, “proof production”, and “production printing”.

This part of ISO 12647 is applicable,

- directly, to publication gravure printing, including magazines, catalogues, and commercial materials,
- directly, to half-tone and continuous tone proofing processes that predict the colourimetric results of gravure printing, and
- by analogy, to process-colour gravure package printing.

It is not directly applicable to the specifics of the transformations necessary to relate digital input data to the data used to create the cylinder engraving data and/or the proofing process.

### 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 8254-1, *Paper and board — Measurement of specular gloss — Part 1: 75 degree gloss with a converging beam, TAPPI method*

ISO 12642-2, *Graphic technology — Input data for characterization of 4-colour process printing — Part 2: Expanded data set*

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

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 13655:2009, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

ISO 15930-4, *Graphic technology — Prepress digital data exchange using PDF — Part 4: Complete exchange of CMYK and spot colour printing data using PDF 1.4 (PDF/X-1a)*

ISO 15930-6, *Graphic technology — Prepress digital data exchange using PDF — Part 6: Complete exchange of printing data suitable for colour-managed workflows using PDF 1.4 (PDF/X-3)*

ISO 15930-7, *Graphic technology — Prepress digital data exchange using PDF — Part 7: Complete exchange of printing data (PDF/X-4) and partial exchange of printing data with external profile reference (PDF/X-4p) using PDF 1.6*

### 3 Terms and definitions

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

#### 3.1

##### **improved newsprint**

paper with, compared to ordinary newsprint, a higher smoothness, a higher brightness, and a filler content up to 20 %

#### 3.2

##### **engraving pitch**

*P*

reciprocal of average cell spacing on a gravure cylinder, evaluated from the following formula:

$$P = (a \times b)^{-1/2}$$

where

*a* is the distance between the same points on two adjacent cells in the printing direction;

*b* is the distance between adjacent circumferential tracks of the engraving stylus.

#### 3.3

##### **solid colour**

printed area that corresponds to the maximum cell volume identified for the combination of gravure engraving parameters

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## 4 Requirements

### 4.1 General

4.2 and 4.3 are based on the assumption that input for gravure printing comprises digital data that defines the data tone values (equivalent to the tone values in offset processes). The specifics of the transformations necessary to relate these data to the data used to create the cylinder engraving data and/or the proofing process are the responsibility of the organization involved and are not specified in this part of ISO 12647.

The substrate categories of gravure printing, identified by the paper principally used, defined for this part of ISO 12647, are as follows:

For Gamut Type 1

- substrate category S1 (coated paper of 70 g/m<sup>2</sup> or greater);
- substrate category S2 (lightweight coated paper);
- substrate category S3 (“combined LWC paper and SC paper”);
- NOTE CRPC 5 of ANSI.
- substrate category S4 (super-calendered paper);
- substrate category S5 (improved or enhanced newsprint);



For Gamut Type 2

- substrate category S1 (LWC plus, improved lightweight coated paper);
- substrate category S2 (LWC standard, standard lightweight coated paper);
- substrate category S3 (SC plus, improved super-calendered paper);
- substrate category S4 (SC standard, standard super-calendered paper);
- substrate category S5 (News plus, improved newsprint).

While these substrate categories of gravure printing are identified in terms of the paper principally used, they can be used on any stock for which the printer is capable of achieving the colours specified in [Tables A.1](#) or [A.2](#), see also [Figures A.1](#) and [A.2](#), and thus the associated colour gamut.

Where appropriate, the applicable clauses of ISO 12647-1 are referenced for the definition of the data and measurement conditions.

[4.2](#) and [4.3](#) are arranged according to the order set out in ISO 12647-1; they also depend on it for the general principles, the definition of the data, the measurement conditions, and the reporting style.

In the absence of any other agreements between the print provider and printer, data intended for publication gravure printing in North America shall be prepared for and proofed based upon Characterized Reference Printing Condition (CRPC) 5 of ANSI CGA/TS 21-2. For this situation, it shall be the responsibility of the gravure printer to match the appearance defined by CRPC 5 to the satisfaction of the publisher. CRPC 5 is compatible with printing condition S3, Gamut Type 1.

## 4.2 Data file and printing format

### 4.2.1 Data files

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Digital data files supplied for printing should conform to the latest edition of ISO 15930-4, ISO 15930-6, and ISO 15930-7 or to ISO 12639.

Supplied data files conforming to ISO 15930-4, ISO 15930-6, and ISO 15930-7 shall also include an identification of the intended printing condition. Where the intended printing condition is a printing condition included in the registry of characterizations maintained by the ICC, as described in ICC.1, the name used in the ICC registry can be used as the identification. If the intended printing condition is not included in the ICC registry, characterization data specified using the target defined in ISO 12642-2, or an ICC output profile derived from it, shall be included. An ICC output profile derived from the appropriate characterization data should also be included in all cases. In any situations where the rendering of the data, when printed, is intended to be other than colourimetric (as specified in ICC.1) an ICC output profile derived from the appropriate characterization data shall be included.

All continuous tone raster data (CT) shall be at a resolution that equals or exceeds 120 cm<sup>-1</sup>. If line work raster data (LW) are provided, they shall be at a resolution of three to six times that of the continuous tone data. If text is provided as CT data it should be anti-aliased.

A proof print can accompany digital data and where provided, it shall conform to the indicated printing condition.

### 4.2.2 Off-press proof from digital data

The off-press proof is a simulation of the intended gravure printing condition. It is produced directly from the data used to prepare the separations. Off-press hardcopy proofing shall be accomplished according to ISO 12647-7. The control patches provided shall, as a minimum, simulate the following patches:

- a) solid primary and secondary colours (including black);

- b) at least one half-tone control patch of each of the primary colours (including black) with tone values between 40 % and 70 %; the tone values used shall be the same for each colour;
- c) a tertiary colour control patch composed of 100 % each of the primary colours (or with magenta and yellow reduced to better approximate a grey);
- d) at least one tertiary colour patch composed of the same tone values as defined in b) (or with magenta and yellow reduced to better approximate a grey).

**4.2.3 Engraving pitch**

For four-colour work, the ranges of engraving pitch shall be

- a) 54 cm<sup>-1</sup> to 70 cm<sup>-1</sup> for yellow,
- b) 60 cm<sup>-1</sup> to 80 cm<sup>-1</sup> for cyan and for magenta, and
- c) 60 cm<sup>-1</sup> to 100 cm<sup>-1</sup> for black.

**4.2.4 Image size tolerance**

See [4.3.4](#).

**4.2.5 Tone value sum**

Unless otherwise specified, the maximum tone value sum shall be <340 %.

NOTE Smaller values can be used but this applies to a lesser extent to uncoated papers.

**4.2.6 Grey reproduction and grey balance** ISO 12647-4:2014

A single grey balance condition is usually not sufficient to ensure an achromatic colour for all print substrates and printing inks that can be used with a given printing process. Therefore the grey balance has to be determined for each printing condition separately based on a well-defined grey reproduction. See [Annex B](#) for detailed information.

**4.3 On-press proof and production print**

**4.3.1 General**

To define the appearance of a print or proof, it is necessary, as a minimum, to specify the gloss and colourimetric characteristics of the substrate and inks used for printing when the inks are printed at the appropriate concentration. These characteristics are defined in [4.3.2](#) to [4.3.5](#). A typical print substrate, such as LWC paper and SC paper, has commonly used characteristics. This does not imply that other substrates are not suitable for this application or cannot be used to reach the specified colour gamut. [Table 1](#) provides a survey of the typical print substrates (Gamut Type 1, Gamut Type 2).

**Table 1 — Standard printing conditions for typical print substrates (survey)**

| Printing Conditions<br>Gamut Type 1 | Print Substrate Description<br>(see <a href="#">Table 2</a> ) | Colorant Description<br>(Substrate Coordinates, see <a href="#">Table A.1</a> ) | Printing Conditions<br>Gamut Type 2 | Print Substrate Description<br>(see <a href="#">Table 2</a> ) | Colorant Description<br>(Substrate Coordinates, see <a href="#">Table A.2</a> ) |
|-------------------------------------|---|---|-------------------------------------|---|---|
| PC1 Gamut 1                         | PS1 Gamut 1   | CD1 Gamut 1   | PC1 Gamut 2                         | PS1 Gamut 2   | CD1 Gamut 2   |
| PC2 Gamut 1                         | PS2 Gamut 1   | CD2 Gamut 1   | PC2 Gamut 2                         | PS2 Gamut 2   | CD2 Gamut 2   |
| PC3 Gamut 1                         | PS3 Gamut 1   | CD3 Gamut 1   | PC3 Gamut 2                         | PS3 Gamut 2   | CD3 Gamut 2   |

Table 1 (continued)

| Printing Conditions<br>Gamut Type 1 | Print Substrate Description<br>(see Table 2) | Colorant Description<br>(Substrate Coordinates, see Table A.1) | Printing Conditions<br>Gamut Type 2 | Print Substrate Description<br>(see Table 2) | Colorant Description<br>(Substrate Coordinates, see Table A.2) |
|-------------------------------------|--|--|-------------------------------------|--|--|
| PC4 Gamut 1                         | PS4 Gamut 1                                  | CD4 Gamut 1  | PC4 Gamut 2                         | PS4 Gamut 2                                  | CD4 Gamut 2  |
| PC5 Gamut 1                         | PS5 Gamut 1                                  | CD5 Gamut 1  | PC5 Gamut 2                         | PS5 Gamut 2                                  | CD5 Gamut 2  |

NOTE Colourimetric characterization data, as specified in this standard, contain all the data to be specified in accordance with 4.3.2.1, 4.3.2.3, 4.3.3, and 4.3.5.

## 4.3.2 Visual characteristics of image components

### 4.3.2.1 Print substrate colour

The print substrate used for proofing should be identical to that of the production printing. If this is not possible, the properties of the print substrate shall be a close match to that of the production in terms of colour, gloss, type of surface (coated, uncoated, super-calendered, etc.) and mass per area. Table 2 provides aim values for colour as well as other attributes for the substrate categories mentioned in 4.1.

NOTE All values in Table 2 except for the  $a^*$  and  $b^*$  values of the substrate are informative only.

### 4.3.2.2 Print substrate gloss

The gloss of the print substrate used for proofing should be a close match to that of the production print substrate. If this is not possible, press proofing shall be carried out on the closest simulation selected from the substrate categories listed in 4.1.

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Table 2 — CIELAB coordinates, gloss, roughness, and tolerances for the substrate categories

| Substrate category<br>Gamut Type 1   | $L^{*a,b}$ | $a^{*a}$ | $b^{*a}$ | Gloss <sup>c</sup> | Roughness <sup>d</sup><br>µm | Mass per area<br>g/m <sup>2</sup> |
|--------------------------------------|------------|----------|----------|--------------------|------------------------------|-----------------------------------|
| S1: coated                           | 91 (88)    | 0 (0)    | -3 (-3)  | 65                 | 0,9                          | 80                                |
| S2: lightweight coated (LWC)         | 90 (87)    | 1 (0)    | 3 (2)    | 55                 | 1,1                          | 51                                |
| S3: Combined LWC-SCA                 | 90 (87)    | 0 (-1)   | 3 (2)    | —                  | —                            | —                                 |
| S4: super-calendered (SC)            | 89 (86)    | 0 (-1)   | 4 (3)    | 45                 | 1,5                          | 52                                |
| S5: improved newsprint               | 84 (83)    | 0 (-1)   | 4 (3)    | <10                | 3,5                          | 50                                |
| Tolerances                           | —          | ±2       | ±2       | ±10                | —                            | —                                 |
| Substrate category<br>Gamut Type 2   | $L^{*a,b}$ | $a^{*a}$ | $b^{*a}$ | Gloss <sup>c</sup> | Roughness <sup>d</sup><br>µm | Mass per area<br>g/m <sup>2</sup> |
| S1: LWC plus (lightweight coat.)     | 94 (93)    | 0 (0)    | 0 (-1)   | 65                 | 0,9                          | 70                                |
| S2: LWC standard (lightweight coat.) | 90 (87)    | 1 (0)    | 3 (1)    | 55                 | 1,1                          | 48                                |
| S3: SC plus (super-calendered)       | 91 (89)    | 1 (0)    | 2 (0)    | 50                 | 1,5                          | 52                                |

<sup>a</sup> Measurement in accordance with ISO 13655 (M0): D50 illuminant, 2° observer, 0/45 or 45/0 geometry, white backing. Values for black backing measurement are in brackets, informative. Gamut Type 2 substrates: substrate backing (sb) instead of white backing.

<sup>b</sup> The  $L^*$  is informative only, values are representing a minimum.

<sup>c</sup> Measurement in accordance with ISO 8254-1, TAPPI method, informative only.

<sup>d</sup> Measurement in accordance with ISO 8791-4, Parker Print-surf, clamping pressure 980 kPa, soft backing, informative only.