

Redline version  
compares third edition  
to second edition



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

**Part 2:  
Offset lithographic processes**

*Technologie graphique — Maîtrise des procédés pour la fabrication  
des séparations de couleur en ton tramé, des épreuves et des tirages  
en production —*

*Partie 2: Procédés lithographiques offset*



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This Redline version provides you with a quick and easy way to compare the main changes between this edition of the standard and its previous edition. It doesn't capture all single changes such as punctuation but highlights the modifications providing customers with the most valuable information. Therefore it is important to note that this Redline version is not the official ISO standard and that the users must consult with the clean version of the standard, which is the official standard, for implementation purposes.



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# Contents

	Page
<b>Foreword</b> .....	iv
<b>Introduction</b> .....	vi
<b>1</b> <b>Scope</b> .....	1
<b>2</b> <b>Normative references</b> .....	1
<b>3</b> <b>Terms and definitions</b> .....	2
<b>4</b> <b>Requirements</b> .....	3
4.1    General.....	3
4.2    Data files, <del>colour separation films</del> and printing formes.....	3
4.3    Proof or production print.....	6
<b>5</b> <b>Test methods — Tone value and tone-value increase of a print</b> .....	24
<del><b>6.5</b>    <b>Reporting of printing conditions</b></del> <b>Measurement methods</b> .....	24
5.1    Computation of densities, CIELAB colour coordinates and CIELAB colour differences.....	24
5.2    Control strip.....	24
<del><b>Annex A</b> (informative) <b>Methods for establishing the colour of a standard ink on the paper types</b></del> .....	<del>26</del>
<del><b>Annex B</b> (informative) <b>Dependence of the tone value increase of press print on screen frequency</b></del> .....	<del>28</del>
<b>Annex CA</b> (informative) <b>Grey reproduction and grey balance</b> .....	30
<b>Annex B</b> (informative) <b>Handling differences in paper colour</b> .....	34
<b>Bibliography</b> .....	36

## 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~~ 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 ~~rules given in~~ editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

~~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 ~~part of document~~ ISO 12647 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

~~ISO 12647-2 was prepared by Technical Committee~~ The committee responsible for this document is ISO/TC 130, *Graphic Technology*.

This ~~second~~ ~~third~~ edition cancels and replaces the ~~first~~ ~~second~~ edition (ISO 12647-2:1996), which has been extensively revised. The revisions include the following:

- a) ~~introduction of digital data as input~~ deletion of film-based requirements;
- b) ~~reduction of the tone value increase by roughly 3 %~~ changes in proof requirements;
- c) changes in printing conditions;
- d) changes in the colouration of the primary and secondary solids (Table 2);
- e) introduction of ~~an additional measurement condition with a specified white backing~~ new tone value increase curves;
- f) general clean-up.

~~In view of the misconceptions about the use of density and grey balance values, it was decided to move this information to an informative annex.~~

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 ~~and letterpress~~ on newsprint
- Part 4: Publication gravure ~~process~~ 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

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## Introduction

~~Part 1 of ISO 12647 serves to provide definitions, the general principles, the general order of the material to be covered in the subsequent parts 2 to 6, the definition of the data, the measurement conditions and the reporting style.~~

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 half-tone offset lithographic print. Primary parameters ~~include the screening parameters~~ constitute a general printing condition and are defined here as the substrate description, the colorant description, the screening description, the tone value increase, the colours of the solids and the print substrate. ~~Conformance to the specified values in proof and production printing assure~~ and the ink sequence. Since the printing ink to be used in this International Standard is to conform to ISO 2846-1, ~~in principle, a good visual match between specimens produced. Exceptions from this general observation are discussed in the following paragraph~~ it is in general not necessary to name it as a primary process parameter.

Conformance to the specified values in proof and production printing ensures, in principle, a good visual match between specimens produced. A visual and in part measurement-wise “proof-to-print match” is essential for globally consistent printing and publishing workflows in general. A press proof print might be necessary when using specific printing conditions that use different types of surface finishing.

~~The purpose of a proof print is to simulate the visual characteristics of the finished print product as closely as possible. As the printing and publishing world has accepted former editions of this International Standard, it has struggled to implement the different paper types. The paper type specifications by means of tristimulus values, originally defined as a guideline for press proof prints, have been wrongly interpreted as an exclusive prerequisite for papers to be “in conformance with ISO 12647-2. In order to visually match a particular print, off press proofing processes often require values for solid tone coloration and tone value increase that 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 offset press printing. In such cases the user or the supplier needs to ensure that appropriate corrections are specified.”~~ In addition, it has become evident that the paper types defined by this International Standard reflect market papers poorly. Therefore, some industry groups, while using the general principles of this International Standard, have established additional printing conditions with different paper specifications.

When revising this International Standard a new paper categorization was established. This was necessary since there is no agreed upon method to predict the printing behaviour based on colorimetric readings of the unprinted print substrate. When the visual printing characteristics of typical printed papers were analysed, different sets of colorant descriptions were identified. A closer look revealed that these sets corresponded to the surface (CIE whiteness, gloss, and coating) and mass per area characteristics (opacity).

A print is therefore in conformance with this International Standard when:

- the colorimetric aims of the process colours, defined by the general printing conditions and using typical means of inking, are achievable;
- by agreement between all parties, an additional printing condition is established and aim values for this printing condition are clearly communicated, for example by exchanging a characterization.

~~Another problem area is the matching of a digital off press proof on an opaque substrate to a double-sided print on a less than opaque, lightweight printing paper as used in heat set web printing. If the proof is made with colour management profiles based on measurements with white backing, there will be an unavoidable difference between proof and production prints, placed on a black backing in accordance with the specifications of this part of~~ This International Standard addresses typical industrial printing under feasible economical constraints. The tolerance values have therefore been chosen to provide a reasonable balance between customer expectations (meaning small variations),

technical production limits and production costs. ~~ISO 12647. The possible occurrence of such differences needs to be well communicated, in advance, to the parties concerned.~~ Assuming agreements between all parties concerned, tolerances might be tightened especially when primary or secondary process parameters (e.g. paper) can be fixed in the planning stage.

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

## Part 2: Offset lithographic processes

### 1 Scope

This part of ISO 12647 specifies a number of process parameters and their values to be applied when ~~preparing colour separations~~ producing colour separations, printing formes and print production for four-colour ~~offset printing or when producing four colour prints by one of the following methods: heat-set web, sheet-fed or continuous forms process printing, or proofing for one of these processes, or offset proofing for half-tone gravure~~ and web-fed offset printing presses excluding coldset offset lithography on newsprint.

The parameters and values are chosen in view of the ~~complete~~ typical process covering the process stages “colour separation”, “~~film setting~~ proof production”, “making of the printing forme”, “~~proof production~~”, “OK print” and “production printing” and “surface finishing” on all kinds of commercially available production substrates.

This part of ISO 12647 is:

- is directly applicable to ~~proofing press proof prints and printing processes that use colour separation films~~ printing formes as input;
- ~~directly applicable to proofing and printing from printing formes produced by filmless methods as long as direct analogies to film production systems are maintained;~~
- is applicable to ~~proofing press proof prints~~ and printing processes with more than four process colours as long as direct analogies to four-colour printing are maintained, such as for data and screening, for print substrates and printing parameters;
- is applicable by ~~analogy to line screens and non-periodic screens.~~ to printing on cardboard material for packaging;
- is applicable for all kinds of drying methods such as heat-set, infrared, and ultraviolet;
- provides references for quality assurance and quality management.

This part of ISO 12647 is not applicable to processes other than offset such as printing directly from digital data where there is no intermediate image carrier, or where the image carrier can be refreshed for each impression and thus each impression can be different in content.

### 2 Normative references

The following referenced documents ~~are indispensable for the application of this document~~, 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 ~~reference~~ referenced document (including any amendments) applies.

ISO 5-3:1995/2846-1, ~~Photography — Density measurements~~ Graphic technology — Colour and transparency of printing ink sets for four-colour printing — Part 3: Spectral conditions 1: Sheet-fed and heat-set web offset lithographic printing

ISO 8254-1:1999, Paper and board — Measurement of specular gloss — Part 1: 75° degree gloss with a converging beam, TAPPI method

ISO 8254-2, Paper and board — Measurement of specular gloss — Part 2: 75 degree gloss with a parallel beam, DIN method [alternative to ASTM D7163]

ISO 12642:1996/TS 10128, Graphic technology — ~~Prepress digital data exchange — Input data for characterization of 4 colour process printing~~ Methods of adjustment of the colour reproduction of a printing system to match a set of characterization data

ISO 11475, Paper and board — Determination of CIE whiteness, D65/10 degrees (outdoor daylight)

ISO 12647-1:2004, 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, Graphic technology — Spectral measurement and colorimetric computation for graphic arts images

ASTM D7163, Standard Test Method for Specular Gloss of Printed Matter [alternative to ISO 8254-2]

### 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**  
~~positive acting plate~~ **area coverage**  
(offset printing) offset printing plate for use with positive polarity film ratio of the area covered with ink to the entire area in an ink zone

**3.2**  
~~negative acting plate~~ **calibration**  
(offset printing) offset printing plate for use with negative polarity film adjustment based on a comparison between a standard and a unit under test

~~3.3~~  
~~four colour continuous forms printing~~  
offset process performed on small width web fed presses for use with personalized mailings

**3.4**  
~~commercial/speciality printing~~  
general purpose sheet fed and non magazine heat set web offset printing

~~3.5.3.3~~  
~~heat set web printing~~ **characterization data**  
lithographic offset printing on web type print substrates with printing ink that requires heat for drying set of tone values and associated colorimetric values that fully describe a given printing process

~~3.6.3.4~~  
**tone value**  
(printing forme) percentage of surface area that appears to be receptive to is covered by printing ink

Note 1 to entry: With some plate types, the tone value thus defined is smaller than the percentage of surface area that is visibly distinct from the background.

Note 2 to entry: Formerly known as the film printing dot area. "Dot area" is now a deprecated term.

## 4 Requirements

### 4.1 General

The following subclauses are arranged in accordance with the order set out in Digital data files delivered for printing should be accompanied by a digital proof ISO 12647-1, they also depend on this part for the general principles, the definition of the data, the measurement conditions and the reporting style print, a press proof print, or an OK print from a previous print run.

**NOTE** Press proof prints are test prints of the data files on a printing press which may serve as a reference for subsequent printing. While most proofs are digital proofs, for colour- or content-critical work there is a need for press proof prints with the same setup as the production print.

### 4.2 Data files, colour separation films and printing formes

#### 4.2.1 General Data delivery

Data delivered for printing shall be in the colour formats CMYK or three-component. In all cases, digital data files or colour separation film sets delivered for printing should be accompanied by a proof and should be exchanged using PDF/X [6][7] print that simulates the intended printing condition and that conforms to data formats 4.3. This fact shall be verifiable by measuring a well-specified control strip or a similar control device that is printed on the proof print along with the subject.

The intended printing condition shall be indicated. In case of PDF/X the mechanisms provided by the specified data format shall be used. In case of other data formats a printing condition description, a characterization data set [3][4] or an International Colour Consortium (ICC) output profile [5] shall be communicated.

In the case of digital data, the intended printing condition shall be indicated. Where the latter is included in the registry of characterizations maintained by the ICC and the digital data is CMYK, the name used in the ICC registry is usually 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 colorimetrically by colorimetric descriptions using an ICC input profile or another mechanism and an ICC CMYK output profile shall be included. The rendering intent to be used with the output profile for each data element shall be communicated.

If the characterization data or ICC output profile provided conflicts with the printing conditions defined in this part of ISO 12647 one of the methods defined in ISO/TS 10128 shall be used for data adjustment prior to print production. The aims for process control should be taken from characterization data, if agreed between all parties. Where this is done, densitometric tone values are not usually available and colorimetric tone values should be used. Further information on the relationship between colorimetric and densitometric tone values can be found in ISO/TS 10128.

**NOTE 1** A printing condition is defined here as a print substrate description, a colorant description, a screening description, an ink set and a printing sequence.

**NOTE 2** Quality control of the content of a print job prior to final production checks is recommended since PDF/X conformance does not necessarily ensure a suitable image resolution or other production dependent criteria.

**NOTE 3** Additional spot colours are allowed but this part of ISO 12647 does not make provisions for tolerances.

#### 4.2.2 Film or printing Printing forme quality

In order to permit the reproduction of at least 100 tone value steps, the resolution of the image setter or plate setter should be set accordingly selected to ensure that at least 150 tone value steps are reproduced.

**EXAMPLE 1** If, for a screen employing single half-tone cell modulation, the intended nominal screen ruling is 7080 cm<sup>-1</sup>, the resolution of the image setter or the plate setter should not be smaller than 700 less than 1 000 cm<sup>-1</sup> (1 800 dpi). For a screen with super-cell technology, it is possible to set the resolution to a smaller value.

Unless otherwise specified, the core density of colour separation films shall be at least 2,5 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. Both 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.

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 are not expected to exceed 0,10. Note further that 0,05 represents the lowest commonly found value for ISO type 1 printing density. For half-tone films with clear film densities outside 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 on colour separation films, 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; for the measurement of core density, an ISO type 2 printing instrument is applicable.

The fringe width of a colour separation film shall not be greater than one fortieth of the screen width.

A half-tone dot that is produced by several exposures of a focal spot shall be fully rendered and not be split up into distinct parts. This requirement also applies to direct platemaking.

Other than for the clear film density requirement, the colour separation film quality shall be evaluated according to the informative Annex B of ISO 12647-1:2004.

#### 4.2.3 Screen frequency (film or printing for periodic screens)

For four-colour work, the screen ruling frequency (screen frequency) ruling for periodic screens should be within the range from 48 cm<sup>-1</sup> to 80 cm<sup>-1</sup>. Preferred nominal screen rulings are

Preferred nominal screen frequencies are:

- a) 48 cm<sup>-1</sup> to 80 cm<sup>-1</sup> for web offset periodical printing, coated paper; and
- b) 48 cm<sup>-1</sup> to 70 cm<sup>-1</sup> for continuous forms process printing on coated paper, 52 cm<sup>-1</sup> for uncoated paper;
- c) 60 cm<sup>-1</sup> and higher for commercial/speciality printing.

NOTE 1 Outside of the range 48 cm<sup>-1</sup> to 80 cm<sup>-1</sup>, the general principles specified in ISO 12647-1 remain valid but specific values might differ.

NOTE 2 With computer generated screening, the "screen frequency" The screen frequency is often varied slightly from one process colour to another in order to minimize moiré patterns. For example, there might be a difference of 3 cm<sup>-1</sup> up to 6 cm<sup>-1</sup> or 4 cm<sup>-1</sup> of the nominal screen frequency between the colours C, M, Y.

NOTE 3 For the black or yellow colour half-tone, a screen ruling frequency is sometimes used which is substantially finer than the nominal screen ruling of the remaining colours, for example, 84 cm<sup>-1</sup> versus 60 cm<sup>-1</sup>.

NOTE 4 Screen frequencies are often required or given in lpi (lines per inch). To convert between screens per cm and lines per inch a conversion factor of 2,54 should be used.

EXAMPLE The requirement 4.2.3 given in lpi will read as follows (rounded to commonly used integral numbers): for four-colour work, the screen frequency (screen ruling) for periodic screens should be within the range from 120 lpi to 200 lpi. Preferred nominal screen frequencies are a) 120 lpi to 200 lpi for coated paper; and b) 120 lpi to 175 lpi for uncoated paper.