
**Graphic technology — Colour and
transparency of printing ink sets for
four-colour-printing —**

**Part 4:
Screen printing**

iTeh STANDARD PREVIEW

*Technologie graphique — Couleur et transparence des gammes d'encre
d'impression en quadrichromie*

Partie 4: Sérigraphie

ISO 2846-4:2000

<https://standards.itih.ai/catalog/standards/sist/3cb49680-fb0c-4c16-ac6e-f53055643f93/iso-2846-4-2000>



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Printed in Switzerland

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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.

Attention is drawn to the possibility that some of the elements of this part of ISO 2846 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 2846-4 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

ISO 2846 consists of the following parts, under the general title *Graphic technology — Colour and transparency of printing ink sets for four-colour-printing*:

- Part 1: Sheet-fed and heat-set web offset lithographic printing
- Part 2: Coldset offset lithographic printing
- Part 3: Publication gravure printing
- Part 4: Screen printing
- Part 5: Flexographic printing

Annex A forms a normative part of this part of ISO 2846. Annexes B, C and D are for information only.

Introduction

The demand for the screen printing process to become more consistent and predictable has required a means of standardizing the product to ensure the easy flow of business between the various parties involved in its production. An essential component in this process are the colorimetric characteristics of the ink set.

If a set of standard four-colour process inks suitable for screen printing is to be produced it is necessary to specify a number of parameters. It is the purpose of this part of ISO 2846 to describe those parameters which affect the colorimetric characteristics in such a manner that a standard set of inks can be supplied by any ink manufacturer to any printer who can then supply prints to a Print Buyer with confidence in the colour of the work produced.

This part of ISO 2846 will allow screen printers to obtain different sets of inks which will produce a similar colour when printed on the same substrate (paper, board, plastic or fabric etc.). In addition, it will allow colour separations for screen printing to be based on known colour standards. The colorimetric characteristics specified may only be obtained when the inks are printed on the reference substrate. However, similarity of two inks on a reference substrate will ensure similarity on another substrate.

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Graphic technology — Colour and transparency of printing ink sets for four-colour-printing —

Part 4: Screen printing

1 Scope

This part of ISO 2846 specifies the colour and transparency to be produced by a process colour ink set, including extender, intended for four-colour screen printing when printed under specified screen printing conditions. It also describes the test method to ensure conformance. This part of ISO 2846 is applicable to screen inks for conventional drying and for radiation curing.

This part of ISO 2846 does not specify pigments (or spectral reflectance) in order not to preclude developments which may enable different pigment combinations to be used advantageously while still achieving the colorimetric requirements specified in this part of ISO 2846.

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2 Normative references

ISO 2846-4:2000

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 2846. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 2846 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 535:1991, *Paper and board — Determination of water absorptiveness — Cobb method.*

ISO 536:1995, *Paper and board — Determination of grammage.*

ISO 2144:1997, *Paper, board and pulps — Determination of residue (ash) on ignition at 900 °C.*

ISO 6588:1981, *Paper, board and pulps — Determination of pH of aqueous extracts.*

ISO 8254-1:1995, *Paper and board — Measurement of specular gloss — Part 1: 75° gloss with a converging beam, TAPPI method.*

ISO 8791-4:1992, *Paper and board — Determination of roughness/smoothness (air leak methods) — Part 4: Print-surf method.*

ISO 13655:1996, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images.*

3 Terms and definitions

For the purposes of this part of ISO 2846, the following terms and definitions apply.

**3.1
extension**

addition of a transparent material (colorant-free ink) to the ink to reduce the pigment concentration without significantly influencing the rheological properties of the ink

**3.2
press-ready ink**

ink that has all necessary components and is at press viscosity

**3.3
transparency**

ability of an ink film to transmit and absorb light without scattering

NOTE It is generally expressed as some measure of the unwanted scattering.

4 Test method

4.1 Principle

Each ink shall be printed on the reference substrate described in annex A at a range of colorations obtained by varying the extension of the press-ready ink. The colours which result shall be measured colorimetrically and the colour difference between the sample and the pertinent value in Table 1 shall be plotted versus the percentage of press-ready ink. If one or more samples conform to the values and tolerances specified, and the ink, except black, also meets the transparency criteria, that ink complies to this part of ISO 2846.

Transparency T shall be evaluated by printing or applying each of the chromatic process inks on a black substrate at a range of ink extensions. The CIELAB colour difference ΔE^*_{ab} shall be determined for each sample, between the overprinted and unprinted black. The linear regression coefficient (slope of the regression line) between the percentage by mass of press-ready ink in each of the extended ink samples being tested and colour difference shall be calculated from a plot of ΔE^*_{ab} versus percentage press-ready ink over a range of extensions. An ink conforms to this requirement if the transparency T which is the reciprocal of the regression coefficient is negative or greater than the value specified. For further details, see annex D.

4.2 Test print preparation

4.2.1 Prints for colorimetric evaluation

For each ink to be evaluated, prepare an extension series with 50 %, 60 %, 70 %, 80 %, 90 % and 100 % of press-ready ink using extender diluted to press viscosity. Apply the series of extended inks to the reference substrate specified in annex A with a method that produces an even ink film thickness. Examples are printing with a flat-bed screen press or coating applicator. The wet ink film thickness used for the extension series shall be approximately equal.

The method chosen shall produce a curve that shows a pronounced minimum or a data point which is in conformance with Table 1 when ΔE^*_{ab} is plotted versus percentage of press-ready ink. If the extension series does not produce such a curve, produce another series of specimens with different ink film thicknesses. Produce a higher ink film thickness if the colour difference decreases with increasing percentage of press-ready ink. Produce a lower ink film thickness if the colour difference decreases with decreasing percentage of press-ready ink.

See annex D for further information.

4.2.2 Prints for transparency evaluation

Test prints for transparency evaluation shall be produced by printing or applying the inks to be tested over black. The black shall have a lightness (L^*) less than six when determined in accordance with ISO 13655.

One appropriate substrate is the contrast card¹⁾.

Prior to applying the chromatic ink the CIELAB-values of the black substrate are measured.

The ink to be tested shall then be applied on the substrate such that a range of samples is achieved, each with a different percentage of press-ready ink.

4.2.3 Drying of test prints

Prior to colour measurement all samples shall be thoroughly dried using a method simulating the production printing conditions.

4.3 Colour measurement procedure

Test prints shall be measured in accordance with ISO 13655, except that a substrate backing consisting of at least three sheets of the unprinted reference substrate in accordance with annex A shall be used.

NOTE The samples are measured spectrally, with a 0°/45° or 45°/0° geometry instrument. Calculation of CIELAB values and colour differences is performed in accordance with ISO 13655 using tristimulus values which are computed from the spectral data using the CIE 1931 (2°) standard colorimetric observer data together with CIE illuminant D₅₀.

5 Colour and transparency

5.1 Conformance

For an ink to conform to this part of ISO 2846, it shall meet the specification for colour given in 5.2 at some percentage of press-ready ink and the specification for transparency specified in 5.3.

5.2 Colorimetric values

To meet the specification for colour, an ink shall produce a colour that falls within the colour difference tolerances from the specified colorimetric values given in Table 1, when printed as specified in 4.2.1 at some percentage of press-ready ink.

NOTE 1 The aim values and tolerances given in Table 1 are consistent with those for offset printing, as defined in ISO 2846-1, and may therefore only be strictly applicable to screen printing inks based on similar pigments. For some applications screen printing inks may need to be based on different pigments and while in such circumstances the aim values are the same, the tolerances may need to be larger.

NOTE 2 Unlike some other parts of ISO 2846, this part does not specify limits for concentration or ink film thickness within which to meet the specified colour and tolerances, as such requirements are not applicable to the screen printing process.

NOTE 3 Typical spectral data for inks conforming to this part of ISO 2846 are provided in annex B. Reference spectral data for 8°/diffuse or diffuse/8° (specular included) geometry are also included in annex B.

NOTE 4 Data for CIELAB values calculated from the CIE 1931 (2°) standard colorimetric observer, together with CIE standard illuminant D₆₅, are included in annex C for both geometries. CIELAB data for 8°/diffuse or diffuse/8° (specular included) geometry and illuminant D₅₀ are also included in that annex.

1) Leneta paper or card (No. 105C) which can be purchased from Leneta Corp. Mahwah, N.J., USA. Leneta paper or card is the trade name of a product supplied by Leneta Corporation. This information is given for the convenience of the users of this part of ISO 2846 and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Table 1 — Colorimetric values for 0°/45° and 45°/0° geometry, illuminant D₅₀, 2° observer

Ink	CIELAB values ^a			Tolerances			
	<i>L</i> [*]	<i>a</i> [*]	<i>b</i> [*]	ΔE^*_{ab}	ΔL^*	Δa^*	Δb^*
Yellow	91,0	- 5,1	95,0	6,0	—	—	—
Magenta	50,0	76,0	- 3,0	7,0	—	—	—
Cyan	57,0	- 39,2	- 46,0	5,0	—	—	—
Black	18,0	0,8	- 0,56	—	+ 0,0 ^b - 18,0	± 1,5	± 3,0

^a See 4.3.

^b This means that for black there is no symmetrical tolerance for *L*^{*} but an upper limit.

5.3 Transparency characteristics

To meet the specification for transparency, an ink shall produce a value greater than that specified in Table 2 when determined in accordance with the principles and test methods outlined in clause 4.

Table 2 — Transparency requirements

Ink	Transparency, <i>T</i>
Yellow	4,0
Magenta	6,0
Cyan	5,0

For highly transparent inks, the slope of the regression line may be zero or negative. In such a situation the transparency value *T* is considered to be approaching infinity and therefore meets the specification.

NOTE For further information concerning transparency evaluation using instruments with different geometry, see clause D.2.

Annex A (normative)

Reference substrate

For the purposes of this part of ISO 2846, a light-fast gloss coated wood-free paper free of optical brightener shall be used, the characteristics of which shall be as follows:

Colour

CIELAB values: $L^* = 95,5 \pm 2,0$

$a^* = -0,4 \pm 1,0$

$b^* = 4,7 \pm 1,5$

Method: ISO 13655 (except for substrate backing use at least three sheets of unprinted reference substrate)

Water absorptiveness

Specification: 2 g/m² to 5 g/m² after 10 s

Method: ISO 535

Gloss

Specification: 70 % to 80 %

Method: ISO 8254-1

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Mass per area

Specification: (150 ± 3) g/m²

Method: ISO 536

Ash content

Specification: 20 % to 30 %

Method: ISO 2144

pH

Specification: 8 to 10

Method: ISO 6588

Roughness

Specification: (1,0 ± 0,1) µm at a pressure of 1 N/mm²

Method: ISO 8791-4

NOTE In practice there has been only one supplier of this material and this has become the de facto standard. This material is the gloss-coated wood-free paper Phoenix Imperial APCO II/II from Scheufelen, D-73250 Lenningen, Germany. This information is given for the convenience of the users of this part of ISO 2846 and does not constitute an endorsement by ISO of the product named. Equivalent products may be used if they can be shown to lead to the same results.