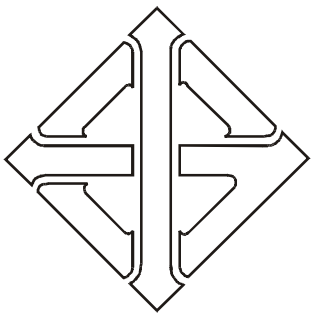

มาตรฐานผลิตภัณฑ์อุตสาหกรรม

THAI INDUSTRIAL STANDARD

มอก. 2260 เล่ม 1–2549

ISO 12647–1 : 2004

เทคโนโลยีการพิมพ์ - การควบคุมกระบวนการการผลิตในงานแยกสีฮาล์ฟโทน ปรู๊ฟ และพิมพ์

เล่ม 1 : พารามิเตอร์และวิธีการวัด

GRAPHIC TECHNOLOGY-PROCESS CONTROL FOR THE PRODUCTION OF HALF-TONE COLOUR SEPARATIONS, PROOF AND PRODUCTION PRINTS

PART 1 : PARAMETERS AND MEASUREMENT METHODS

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

กระทรวงอุตสาหกรรม

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มาตรฐานผลิตภัณฑ์อุตสาหกรรม

เทคโนโลยีการพิมพ์-การควบคุมกระบวนการการผลิตในงานแยกสีฮาล์ฟโทน ปรู๊ฟ และพิมพ์

เล่ม 1 : พารามิเตอร์และวิธีการวัด

มอก. 2260 เล่ม 1–2549

สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม
กระทรวงอุตสาหกรรม ถนนพระรามที่ 6 กรุงเทพฯ 10400
โทรศัพท์ 0 2202 3300

ประกาศในราชกิจจานุเบกษา ฉบับประกาศและงานทั่วไป เล่ม 124 ตอนพิเศษ 26ง
วันที่ 7 มีนาคม พุทธศักราช 2550

ปัจจุบันเป็นยุคที่สังคมโลกมีการแข่งขันกันทั้งในด้านเศรษฐกิจและอุตสาหกรรม มาตรฐานเทคโนโลยีการพิมพ์จึงเป็นเครื่องมือที่จำเป็นสำหรับการพัฒนากระบวนการพิมพ์เพื่อให้สามารถควบคุมปัจจัยต่าง ๆ ทางการพิมพ์ได้อย่างสม่ำเสมอและครบวงจร และเพื่อให้สามารถผลิตชิ้นงานพิมพ์ที่มีคุณภาพสม่ำเสมอ อันจะเป็นการสร้างความพึงพอใจแก่ลูกค้าและยังเป็นการเพิ่มศักยภาพการแข่งขันในตลาดโลกด้วย

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ กำหนดขึ้นโดยรับ 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 มาใช้ในระดับเหมือนกันทุกประการ (identical) โดยใช้ ISO ฉบับภาษาอังกฤษเป็นหลัก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ กำหนดขึ้นเพื่อให้ทันกับความต้องการของผู้ใช้และจักได้แปลเป็นภาษาไทยในโอกาสอันควร หากมีข้อสงสัยโปรดติดต่อสอบถามที่สำนักงานมาตรฐานผลิตภัณฑ์อุตสาหกรรม

คณะกรรมการมาตรฐานผลิตภัณฑ์อุตสาหกรรมได้พิจารณามาตรฐานนี้แล้ว เห็นสมควรเสนอรัฐมนตรีประกาศตามมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511

ประกาศกระทรวงอุตสาหกรรม

ฉบับที่ 3543 (พ.ศ. 2549)

ออกตามความในพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม

พ.ศ. 2511

เรื่อง กำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม

เทคโนโลยีการพิมพ์-การควบคุมกระบวนการ

การผลิตในงานแยกสีฮาล์ฟโทน ปรู๊ฟ และพิมพ์

เล่ม 1 : พารามิเตอร์และวิธีการวัด

อาศัยอำนาจตามความในมาตรา 15 แห่งพระราชบัญญัติมาตรฐานผลิตภัณฑ์อุตสาหกรรม พ.ศ. 2511 รัฐมนตรีว่าการกระทรวงอุตสาหกรรมออกประกาศกำหนดมาตรฐานผลิตภัณฑ์อุตสาหกรรม เทคโนโลยีการพิมพ์-การควบคุมกระบวนการการผลิตในงานแยกสีฮาล์ฟโทน ปรู๊ฟ และพิมพ์ เล่ม 1 : พารามิเตอร์และวิธีการวัด มาตรฐานเลขที่ มอก. 2260 เล่ม 1-2549 ไว้ ดังมีรายละเอียดต่อท้ายประกาศนี้

ประกาศ ณ วันที่ 10 สิงหาคม พ.ศ. 2549

สุริยะ จึงรุ่งเรืองกิจ

รัฐมนตรีว่าการกระทรวงอุตสาหกรรม

มาตรฐานผลิตภัณฑ์อุตสาหกรรม
เทคโนโลยีการพิมพ์ - การควบคุมกระบวนการการผลิตในงานแยกสีฮาล์ฟโทน ปรู๊ฟ และพิมพ์
เล่ม 1 : พารามิเตอร์และวิธีการวัด

บทนำ

ในกระบวนการพิมพ์ ความถูกต้องของการแสดงสีและน้ำหนักสี จะขึ้นอยู่กับข้อตกลงในการควบคุมคุณภาพระหว่างผู้ปฏิบัติงานแยกสี ปรู๊ฟ และช่างพิมพ์ ด้วยการสื่อสารใช้ค่าพารามิเตอร์ทางการพิมพ์ ซึ่งเป็นตัวกำหนดคุณภาพของภาพและสีบนสิ่งพิมพ์ วิธีการนี้จะช่วยให้การทำงานของขั้นตอนต่าง ๆ ตั้งแต่การแยกสี ปรู๊ฟดิจิทัล หรือปรู๊ฟจากแท่นพิมพ์สามารถผลิตงานได้เหมือนหรือใกล้เคียงกับงานพิมพ์จริงมากที่สุด โดยไม่จำเป็นต้องทำงานแบบลองผิดลองถูก

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ มีวัตถุประสงค์เพื่อกำหนดรายการและรายละเอียดของชุดพารามิเตอร์ ปฐมภูมิที่จำเป็นและมีความสำคัญต่อคุณภาพงานพิมพ์ที่ปรากฏ รวมทั้งเกี่ยวข้องกับขั้นตอนการทำงานต่าง ๆ ของกระบวนการพิมพ์ ไม่ว่าจะเป็นงานปรู๊ฟโดยตรงจากไฟล์ข้อมูลดิจิทัลหรือจากฟิล์มแยกสีฮาล์ฟโทน ขณะที่ในอนุกรมมาตรฐานเทคโนโลยีการพิมพ์ฉบับอื่น ๆ กำหนดค่าของพารามิเตอร์เหล่านี้เพื่อให้เหมาะสมกับกระบวนการเฉพาะ (ได้แก่ การพิมพ์ออฟเซต กราวัวร์ เฟล็กโซกราฟฟี และสกรีน) พบว่าบางระบบพิมพ์ พารามิเตอร์กลุ่มหนึ่งอาจมีนัยสำคัญมากกว่าพารามิเตอร์อื่น ๆ ในกรณีนี้ พารามิเตอร์ที่มีนัยสำคัญจะกำหนดไว้เพื่อบังคับใช้ ในขณะที่พารามิเตอร์อื่น ๆ จะกำหนดเพื่อเป็นทางเลือก อย่างไรก็ตามในมาตรฐานเล่มนี้จะพิจารณาพารามิเตอร์ทั้งหมด โดยให้ความสำคัญอย่างเท่าเทียมกัน

พารามิเตอร์ปฐมภูมิ หมายถึง พารามิเตอร์ที่มีผลโดยตรงต่อคุณภาพของภาพ (การมองเห็น)

พารามิเตอร์ทุติยภูมิ หมายถึง พารามิเตอร์ที่อาจมีผลทางอ้อมต่อคุณภาพของภาพ ด้วยการทำให้ค่าพารามิเตอร์ปฐมภูมิเปลี่ยนแปลงไป ตัวอย่างพารามิเตอร์ทุติยภูมิเหล่านี้ ได้แก่

- ความหนาของฟิล์มแยกสี
- การสลับด้านของฟิล์ม (อ่านออก – อ่านไม่ออก)
- การกำหนดฟิล์มเป็นเนกาทีฟ–พอสิทีฟ
- ความหยาบของผิวหน้าด้านเคลือบน้ำยา (อีมัลชัน) ของฟิล์ม
- การกำหนดเครื่องหมายรีจิสเตอร์
- ลำดับสีในการพิมพ์

ขอบข่าย

มาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ รวบรวมพารามิเตอร์ที่สามารถอธิบายถึงสภาวะการพิมพ์ของระบบพิมพ์ต่าง ๆ ตั้งแต่ขั้นตอนการแยกสี ทำแม่พิมพ์ ปรู๊ฟ พิมพ์ และขั้นตอนหลังพิมพ์ (การเคลือบผิวหน้าสิ่งพิมพ์) โดยพารามิเตอร์เหล่านี้สามารถนำไปใช้ได้ทั้งในระบบที่ยังคงใช้ฟิล์มแยกสีและที่ไม่ใช้ฟิล์มแยกสีแล้ว
รายละเอียดให้เป็นไปตามมาตรฐาน ISO 12647-1 : 2004 ข้อ 1

เอกสารอ้างอิง

รายละเอียดให้เป็นไปตามมาตรฐาน ISO 12647-1 : 2004 ข้อ 2

บทนิยาม

ความหมายของคำที่ใช้ในมาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้ ให้เป็นไปตามมาตรฐาน ISO 12647-1 : 2004 ข้อ 3 (คำแปลภาษาไทยของคำศัพท์ให้ไว้ในภาคผนวก ก)

ข้อกำหนด

ไฟล์ข้อมูลนำเข้า-ส่งออก ฟิล์มแยกสี แม่พิมพ์ การผลิตปรู๊ฟและขั้นตอนพิมพ์
รายละเอียดให้เป็นไปตามมาตรฐาน ISO 12647-1 : 2004 ข้อ 4

วิธีทดสอบ

มุมสกรีน การผลิตน้ำหนักสีบนฟิล์มแยกสีหรือไฟล์ข้อมูลภาพและบนสิ่งพิมพ์ การเกิดเม็ดสกรีนบวม ความมันวาว การวัดสเปกตรัม ค่าสี CIELAB และค่าความแตกต่างของสี
รายละเอียดให้เป็นไปตามมาตรฐาน ISO 12647-1 : 2004 ข้อ 5

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 12647-1 was prepared by Technical Committee ISO/TC 130, *Graphic technology*.

This second edition, which has been extensively revised by the introduction of digital data as input, the addition of several definitions and a general clean up, cancels and replaces the first edition (ISO 12647-1:1996).

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 printing*

— *Part 5: Screen printing*

— *Part 6: Flexographic printing*

Part 7: Processes using digital printing or reproductions made on various traditional printing processes from digital files is in preparation.

Introduction

When producing a colour reproduction, it is important that the persons responsible for colour separation, proofing and printing operations have previously agreed on a minimum set of parameters that uniquely defines the visual characteristics and other technical properties of the planned print product. Such an agreement enables the correct production of suitable separations (without recourse to “trial-and-error”) and subsequent production of analogue or digital off-press or on-press proof prints from these separations whose purpose is to simulate the visual characteristics of the finished print product as closely as possible.

It is the purpose of this part of ISO 12647 to list and explain the minimum set of primary process parameters (see below) required to uniquely define the visual characteristics and related technical properties of a proof or production print produced directly from digital data or from a set of half-tone separation films. Other parts of ISO 12647 define specific values for these parameters that are appropriate for specific processes (such as lithography, gravure, flexography, screen printing). For some processes certain parameters are more significant than others and may be specified as mandatory while the remainder are optional. However, in this part of ISO 12647, all parameters are treated equally.

Primary parameters are defined here as having a direct bearing on the visual characteristics of the image; secondary parameters are defined as those which may influence the image indirectly by changing the values of primary parameters. Secondary parameters include

— colour separation film thickness;

— image orientation (wrong-reading or right-reading);

— film polarity (negative or positive);

— roughness of the film emulsion surface;

— presence of colour marking or register marks;

— printing sequence.

Where necessary for specific process applications, secondary parameters and further related details may be specified in addition to primary parameters, but they are not included in this part of ISO 12647 except in the definitions.

During the process of colour separation for multi-colour printing, a digital data set comprising CMYK tone values ready for printing is normally produced from digital data that relate to a multi-coloured continuous-tone original. This usually consists of a photographic transparency or a reflection copy print, although any multicoloured graphic in analogue or digital form may be used as input.

The majority of printing processes covered by ISO 12647 requires continuous-tone images to be broken up into half-tone screens before they can be put on a printing forme. However, there are new processes like inkjet that do not require screening. For these processes, this part of ISO 12647 may be equally applied, with the exception of the specifications for screen width, screen angle, half-tone dot shape and, of course, film quality. It should be noted that a number of off-press proofing systems produce images without recourse to half-toning. In this case, the proof cannot be used to predict artefacts like moiré that may be caused by interferences between periodic structures of the image and half-tones used in production printing.

The process of colour separation does not provide a unique transformation of the colour values of the original into those of the production print. For every distinguishable spot of the original, the colour (characterizable by three colorimetric values, e.g. *X, Y, Z* or *L*, a*, b** or hue, saturation and lightness) has to be separated into tone values for four or more process colours. However, in most cases, the density range (and, hence, the

colour gamut) of the original is wider than that achievable in printing. As a result, the classical colour separation process requires some degree of interpretation of the original by the operator and the resultant transformation may differ from one original to another. With ICC colour management, the mentioned ambiguity is reduced to vendor-specific options for the user; within a given option set the results are reproducible. A further source of variation is the degree and manner by which the achromatic component of a colour is generated with black ink rather than by a suitable mix of the chromatic inks. Here again, a number of options exist, which may to some degree be vendor-specific.

Whatever freedom exists for the colour separation process, it is important that it take account of the values of the process parameters of the printing condition to be used for production. This is because the process steps that follow colour separation, namely output on film (if required), proofing (on- or off-press), the production of the printing forme (if required), production printing and print surface finishing, are normally carried out with a rigid set of process parameters which include

— the properties of the print substrate;

— the optical properties of solid prints of the process inks;

— the tone value increase curve.

Maintaining consistent values for the parameters at all steps in the process is important to ensure predictable reproduction. Any unforeseen variation of these values is usually to the detriment of the visual characteristics of the image.

The technical background discussed so far shows that the processes of colour separation and proofing require prior knowledge of the values of the process parameters encountered in production printing. It is virtually impossible to print all jobs with the same set of process parameters, irrespective of the type of printing press or digital printing unit, printing forme, printing ink, print substrate, or surface finishing used. Therefore, there has to be an efficient information exchange between the pre-press service provider, the proof printer and the production printer which defines the specific parameters for that job.

To facilitate the information interchange, this part of ISO 12647 defines a complete set of parameters whose values should be specified as a minimum when a pre-press job consisting of a digital file or a set of colour-separation films, both with accompanying proof print, is being ordered. Specific values for each parameter are assigned in other parts of ISO 12647; this part is only concerned with definitions, principal requirements, reporting and test methods.

Because the proof print is the principal means of communication between pre-press, print-buyer and printer, it is important that

— the proof print be made using the best achievable simulation of the intended printing condition, and

— production printing attempt to match the visual characteristics of the approved proof print.

One of the major variations between and within printing processes is between tone-value-increase curves (formerly “dot gain curves”), examples of which are shown schematically in Figure 1. One such curve, with appropriate tolerances, may be specified for every process colour, for each specific combination of print substrate type and printing process.

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

Part 1:
Parameters and measurement methods

1 Scope

This and other parts of ISO 12647 specify parameters that define printing conditions for the various processes used in the graphic arts industry. Practitioners wishing to work to common goals may use the values of the parameters specified in the exchange of data to characterize the intended printing condition and/or for the process control of printing.

This part of ISO 12647

— defines vocabulary and establishes a minimum set of process parameters that uniquely determine a printed four-colour half-tone image (which are also referenced from other parts of ISO 12647). The parameters were selected based on the following process stages “colour separation”, “making of the printing forme”, “proofing”, “production printing” and “surface finishing”. These are directly applicable to proofing and printing processes that use colour separation films as input;

— is directly applicable to proofing and printing from printing surfaces produced by filmless methods as long as direct analogies to film production systems are maintained;

— is applicable to proofing and printing 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 to line screens and, where relevant, to those that do not have regular screen angles or regular screen rulings.

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 referenced document (including any amendments) applies.

ISO 5-2, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*

ISO 5-3, *Photography — Density measurement — Part 3: Spectral conditions*

ISO 5-4, *Photography — Density measurements — Part 4: Geometric conditions for reflection density*

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

3 Terms and definitions

For the purpose of all parts of ISO 12647 the following definitions apply, they are given in alphabetical order. For convenience, some definitions are included in anticipation of their use in subsequent parts of ISO 12647.

NOTE For quantities, the preferred unit is given together with the definition. By definition, the unit of the so-called dimensionless quantities is 1.

3.1
achromatic colour
perceived colour devoid of hue, in the perceptual sense

[adapted from 845-02-26 of CIE 17.4[3]]

NOTE 1 The colour names white, grey and black are commonly used or, for transmitting objects, colourless and neutral.

NOTE 2 In printing practice, achromatic colours can be produced either by a single ink or three chromatic inks suitably balanced.

3.2
axis of a screen
one of the two directions in which the half-tone pattern shows the highest number of image elements, such as dots or lines, per length

3.3
chromatic colour
perceived colour possessing hue, in the perceptual sense

[adapted from 845-02-27 of CIE 17.4[3]]

NOTE The process inks cyan, magenta and yellow are the chromatic colour inks.

3.4
CIELAB colour difference
CIE 1976 L^*, a^*, b^* colour difference
ΔE^*_{ab}
difference between two colour stimuli defined as the Euclidean distance between the points representing them in L^*, a^*, b^* space

[adapted from 845-03-55 of CIE 17.4[3]]

NOTE The unit is 1.

3.5
CIELAB colour space
CIE 1976 L^* a^* b^* colour space
three-dimensional, approximately uniform colour space produced by plotting L^*, a^*, b^* in rectangular co-ordinates

[adapted from 845-03-56 of CIE 17.4[3]]

3.6
colorimeter
instrument for measuring colorimetric quantities, such as the tristimulus values of a colour stimulus

[845-05-18 of CIE 17.4[3]]

NOTE A tristimulus colorimeter achieves this by the analogue integration of the spectral product of object reflectance or transmittance factor, illuminant and filters which are defined by standard illuminant and the standard observer functions. A spectrocolorimeter achieves this by calculation from the spectral data.

3.7
colour-separation film
one of a set of black-and-white half-tone films for process printing that pertains to one process colour

NOTE There are usually four colour-separation films in a set.

3.8
control patch
area produced for control or measurement purposes

3.9
control strip
one-dimensional array of control patches

3.10
core density
⟨half-tone film⟩ transmittance density in the centre of an isolated opaque image element such as a half-tone dot or line

NOTE The unit is 1.

3.11
deviation tolerance
permissible difference between the **OK print** (3.26) from a production run and the reference value

3.12
film emulsion orientation
orientation of a colour separation film relative to the observer with respect to the emulsion side

NOTE Normal orientation is emulsion up, i.e. towards the observer.

3.13
fringe width
⟨isolated opaque image element⟩ average distance between the density contour lines corresponding to 10 % and 90 % of the minimum core density specified for the printing process under consideration

NOTE Fringe width is expressed in units of micrometres.

3.14
grey balance
set of tone values for cyan, magenta and yellow on the **colour-separation films** (3.7) that appears as an achromatic colour under specified viewing conditions if printed under specified printing conditions

NOTE There are two practical definitions for grey: “a colour having the same CIELAB a^* and b^* values as the print substrate” and “a colour that has the same CIELAB a^* and b^* values as a half-tone tint of similar L^* value printed with black ink”.

3.15
half-tone film
film for use with a half-tone printing process showing image elements such as dots or lines

3.16
hard-dot film
colour-separation film with half-tone dots that reproduce reliably in film duplication and production of the printing forme

3.17
ICC colour management
communication, by means of an ICC profile, of the associated data, required for unambiguous interpretation of colour content data and application of colour data conversions using this profile, as required, to produce the intended reproductions

NOTE 1 This definition is adapted from that in ISO 15076, which is under preparation.

NOTE 2 Colour content can consist of text, line art, graphics, and pictorial images, in raster or vector from, all of which can be colour managed.

NOTE 3 Colour management considers the characteristics of input and output devices in determining colour data conversions for these devices.

[adapted from ISO 15076-1]

3.18
International Color Consortium
ICC
industry body responsible for the ICC profile specification and colour management architecture

3.19
ICC profile
set of colorimetric transforms prepared in accordance with ICC.1

[Reference 4]

3.20
image orientation
orientation of text and images, designated right-reading if text appears as it is intended to be read and images are in the orientation intended for viewing by the end user and wrong-reading for the opposite

NOTE 1 The film-emulsion orientation requires specification as well: state “emulsion up” or “emulsion down”. “Emulsion up” is usually assumed if there is no film-emulsion orientation statement.

NOTE 2 A typical reference is “wrong-reading emulsion up” which is equivalent to “right-reading emulsion down”.

3.21
mid-tone spread
S
quantity defined by the equation

$$S = \max[(A_c - A_{c0}),(A_m - A_{m0}),(A_y - A_{y0})] - \min[(A_c - A_{c0}),(A_m - A_{m0}),(A_y - A_{y0})]$$

where

A_c is the measured tone value of the cyan process colour image;

A_{c0} is the specified tone value of the cyan process colour image;

A_m is the measured tone value of the magenta process colour image;

A_{m0} is the specified tone value of the magenta process colour image;

A_y is the measured tone value of the yellow process colour image;

A_{y0} is the specified tone value of the yellow process colour image.

EXAMPLE For measured values $A_c = 22$, $A_m 17$ and $A_y = 20$ and specified values $A_{c0} = 20$, $A_{m0} = 20$ and $A_{y0} = 18$):

$$S = \max[(22-20),(17-20),(20-18)] - \min[(22-20),(17-20),(20-18)] = 2-(-3) = 5$$

3.22
moiré pattern
unwanted periodic structure produced by interference between two or more two-dimensional periodic structures

3.23
negative film polarity
property of a colour separation film, whose clear and solid areas on the film correspond to solid and unprinted areas on the print, respectively

3.24
non-periodic half-tone screen
half-tone screen without a regular half-tone dot pattern

3.25
off-press proof print
print produced by a method other than press printing whose purpose is to show the results of the colour separation process in a way that closely simulates the results on a production press

NOTE Also known as artificial or pre-press proof.

3.26
OK print
OK sheet
production print (during production printing) singled out as the reference for the remaining production run

3.27
on-press proof print
print produced by press printing (production or proof press) whose purpose is to show the results of the colour separation process in a way that closely simulates the results on a production press

3.28
positive film polarity
property of a **colour separation film** (3.7), whose clear and solid areas correspond to unprinted and solid areas on the print, respectively

3.29
principal axis
axis of a screen that coincides with the direction of the longest diameter of an oblong-shaped (e.g. elliptical or diamond-shaped) half-tone dot

NOTE Circular and square shaped half-tone dots do not have a principal axis.

3.30
printing condition
set of printing details which fully describe the conditions associated with a specific printed output, usually associated with characterization data measured from an ISO 12642 or similar target

NOTE Such parameters usually include (as a minimum) printing process, print substrate type, printing ink, screen type and screen frequency, manner used to produce the printing forme, and surface finish.

3.31
printing forme
tool whose surface is prepared such that some parts transfer printing ink whereas other parts do not

3.32
print substrate
material bearing the printed image

3.33
process colours
⟨four-colour printing⟩ cyan, magenta, yellow, black

3.34
reference direction
⟨image⟩ horizontal direction as viewed by the end user

3.35
reflectance factor
R
ratio of the measured reflected flux from the specimen to the measured reflected flux from a perfect-reflecting and perfect-diffusing material located in place of the specimen

[ISO 5-4]

NOTE The unit is 1.

3.36
reflection densitometer
instrument which measures **reflectance factor density** (3.37)

3.37
reflection density
reflectance factor density
D
logarithm to base ten of the reciprocal of the **reflectance factor** (3.35)

NOTE 1 This definition for reflection density is taken from ISO 5-4.

NOTE 2 This definition for reflection factor density is taken from CIE 17.4[3].

NOTE 3 The unit is 1.

3.38
reflectometer
photometer for measuring quantities pertaining to reflection

[845-05-26 of CIE 17.4[3]]

3.39
relative density
density from which the density of a reference such as the film base, or the unprinted print substrate, has been subtracted

NOTE The unit is 1.

3.40
sampling aperture size
dimensions of the surface area of a specimen that contributes to the measurement of the reflectance or transmittance factor density, governed by the design of the instrument

3.41
screen angle
angle (for oblong-shaped half-tone dots) which the principal axis of the screen makes with the **reference direction** (3.34), or the smallest angle (for circular and square dot shapes) which an axis of the screen makes with the reference direction

NOTE Screen angle is expressed in units of degrees.

3.42
screen frequency
screen ruling
number of image elements, such as dots or lines, per unit of length in the direction which produces the highest value

NOTE Screen frequency or screen ruling is expressed in units of reciprocal centimetres.

3.43
screen width
reciprocal of **screen ruling** (3.42)

NOTE Screen width is expressed in units of micrometres.

3.44
surface finishing
process by which a print is either covered by varnish (lacquer) or laminated with a transparent polymeric film

3.45
tone value
A
⟨data file⟩ proportional printing value encoded in a data file and interpreted as defined in the file format specification

NOTE 1 Tone value is expressed in units of percent.

NOTE 2 Most files store these data as 8-bit integer values, i.e. 0 to 255. The tone value of a pixel is typically computed from the equation

$$A = 100 \times \left(\frac{V_{\mathrm{p}} - V_0}{V_{100} - V_0} \right)$$

where

V_{p} is the integer value of the pixel;

V_0 is the integer value corresponding to a tone value of 0 %;

V_{100} is the integer value corresponding to a tone value of 100 %.

3.46
tone value
A
⟨film⟩ value given in percent as calculated from one of the following equations:

for half-tone film of positive polarity, $A = 100 \times \left(\frac{1 - 10^{-(D_{\mathrm{t}} - D_0)}}{1 - 10^{-(D_{\mathrm{s}} - D_0)}} \right)$, or

half-tone film of negative polarity, $A = 100 \times \left(1 - \frac{1 - 10^{-(D_{\mathrm{t}} - D_0)}}{1 - 10^{-(D_{\mathrm{s}} - D_0)}} \right)$

where

D_0 is the transmittance density of the clear half-tone film;

D_{s} is the transmittance density of the solid;

D_{t} is the transmittance density of the half-tone.

NOTE Formerly known as the film printing dot area. “Dot area” is now a deprecated term.

3.47
tone value
A
⟨print⟩ ⟨printing forme⟩ percentage of the surface which appears to be covered by colorant of a single colour (if light scattering in the print substrate and other optical phenomena are ignored), calculated from the equation

$$A = 100 \times \left(\frac{1 - 10^{-(D_t - D_0)}}{1 - 10^{-(D_s - D_0)}} \right)$$

where

D_0 is the reflectance factor density of the unprinted print substrate, or the non-printing parts of the printing forme;

D_s is the reflectance factor density of the solid;

D_t is the reflectance factor density of the half-tone.

NOTE 1 Formerly also known as apparent, equivalent or total dot area. “Dot area” is now a deprecated term.

NOTE 2 The synonym dot area can be applied only to half-tones produced by dot patterns.

NOTE 3 This definition can be used to provide an approximation of the tone value on certain printing formes.

3.48
tone value increase
ΔA

difference between a **tone value** (3.47) on the print and the **tone value** (3.45, 3.46) on the half-tone film or in the digital data file

EXAMPLE 1 The tone value of the control strip patch on the print is 55 %, that on the film is 40 %. The tone value increase is 15 %.

EXAMPLE 2 The tone value of a flat tint produced by an application program is set to be 75 %, the corresponding tint on the print is measured at 92 %. The tone value increase is 17 %.

NOTE 1 Tone value increase is expressed in units of percent.

NOTE 2 The synonym dot gain may be applied only to half-tones produced by dot patterns.

NOTE 3 Formerly known as dot gain. “Dot gain” is now a deprecated term.

3.49
tone-value sum
sum of the **tone values** (3.46, 3.47, 3.48), at a given image spot, of all four colours

NOTE 1 Tone value sum is expressed in units of percent.

NOTE 2 Formerly known as the total dot area (TDA). “Dot area” is now a deprecated term.

NOTE 3 For most sets of colour-separation films, the maximum of the tone-value sum occurs at the position of the darkest achromatic tone of the image.

NOTE 4 The tone-value sum can be determined from the colour separation films or from the digital file.

3.50
transmission densitometer
device which measures transmittance density

3.51
transmission density
transmittance density
optical density
logarithm to base ten of the reciprocal of the transmittance factor (3.52)

NOTE 1 This definition for transmission density is taken from ISO 5-2.

NOTE 2 This definition for transmittance (optical) density is taken from CIE 17.4[3].

NOTE 3 The unit is 1.

3.52
transmittance factor
T
ratio of the luminous flux transmitted through an aperture covered by a specimen to the luminous flux through the aperture without the specimen in place

[adapted from ISO 5-2]

NOTE The unit is 1.

3.53
variation tolerance
permissible difference between the **OK print** (3.26) and that of a sample print taken at random from the production

4 Requirements

4.1 General

The following subclauses provide a number of properties and primary parameters that uniquely define the visual characteristics and other technical properties of a half-tone print product. Where appropriate, test methods and specific values are provided. The general layout and content of Clause 4 shall be repeated in the other parts of ISO 12647.

If data files or colour separation film sets are supplied for printing, they shall be accompanied by a proof print, unless there is agreement to the contrary by all parties concerned. The proof print shall simulate the intended production printing condition to a sufficient degree. This fact shall be verifiable by measuring a well-known control strip or a similar control device that is printed on the proof print along with the subject.

NOTE Information about properties and primary parameters is important to the communication about the half-tone colour printing process. In practice, many of these parameters can be assumed to have standard values, so that explicit specification of each is then unnecessary. Such values are specified in other parts of ISO 12647.

4.2 Data file, colour separation films and printing formes

4.2.1 Quality (film only)

A CMYK data file shall be output on film such that the tone value of the data equals the tone value at the corresponding position on the film; see 3.45.

Specify the minimum core density and the maximum fringe width.

NOTE Refer to the informative Annex B for assessment or measurement methods.

4.2.2 Screen frequency (film or printing forme only)

For every set of colour separation films, the screen frequency (screen ruling) shall be specified in reciprocal centimetres, cm^{-1}. If the set includes more than one screen ruling, each colour separation film or printing forme shall be specified individually or the exception to the screen ruling specified for the set shall be reported explicitly.

For non-periodic screens, i.e. those without a regular half-tone dot pattern, the size of the smallest dot and the name of the program that produced it shall be stated.

NOTE 1 Rough-print substrates require coarser screens than smoothly coated ones. Otherwise the tone-value limits become too restricted and the tone-value increase becomes excessive.

NOTE 2 For the black process colour image, the screen ruling may be substantially finer than that for the chromatic colours: for example, 80 cm^{-1} for K and 60 cm^{-1} for CMY.

NOTE 3 With computer-generated screening, the parameters “screen ruling” and “screen angle” may be varied slightly from one process colour to another.

NOTE 4 For high-quality reproductions, it is important that the addressability of a digital half-tone output device such as a plate setter or an image setter be at least 10 times higher than the screen frequency of a periodic half-tone screen. For non-periodic screens, it is important that the spot diameter of the output device not be greater than one half of the diameter of the smallest half-tone dot to be printed.

4.2.3 Screen angle (film or printing forme only)

For every colour, the screen angle shall be specified. The test method shall be as specified in 5.1, the reporting shall be as specified in A.1.

For non-periodic screens, i.e. those without a regular half-tone dot pattern, no screen angles need to be stated.

NOTE 1 A well-known screen angle convention is the following: the nominal screen separation between black, cyan and magenta is 30°, with yellow separated by 15° from cyan or black. The screen angle of the principal axis of the dominant process colour is 45°; this value refers to measurement on the films.

NOTE 2 See also Note 3 in 4.2.2.

4.2.4 Dot shape and its relationship to tone value (film or printing forme only)

The mid-tone dot shape (e.g. circular, square, elliptical) shall be specified and, in the case of screens with a principal axis, the tone values shall be specified where the half-tone dots show the first and second link-ups. The tone-value test method shall be as specified in 5.2, the reporting shall be as specified in A.2.

NOTE For a complete description, it is necessary to specify the shape of the half-tone dot structure and its dependence on tone value of the digital data file over the complete tone-value range.

4.2.5 Image size tolerance (film or printing forme only)

The maximum size difference between any two colour separation films or printing formes of one set shall be specified as a percentage of the diagonal of the image. This percentage is obtained for film by first aligning corresponding images on all four-colour separation films along the upper edge and the upper left-hand corner. Secondly, the maximum size difference at the lower right-hand corner is measured and expressed as percentage of the diagonal. For directly produced printing formes, an analogous procedure shall be applied.

4.2.6 Tone-value sum (data or film only)

The tone-value sum at the position of the darkest achromatic tone of all images shall be specified. Where useful, the tone value of the black process colour image should be specified separately. The tone-value test method shall be as specified in 5.2, the reporting shall be as specified in A.2.

4.2.7 Grey balance (data or film)

The tone values of magenta and yellow leading to a neutral grey together with a certain cyan tone value (usually 50 %) should be specified. Additional triplets of tone values that lead to a neutral grey may also be specified. The tone value test method shall be as specified in 5.2, the reporting shall be as specified in A.2.

NOTE 1 The grey balance is determined by the tone values of the cyan, magenta and yellow images, their colours and the colours of their overprints. Since these parameters are to be specified according to this part of ISO 12647, a separate specification for grey balance is not strictly necessary and can overdetermine the process specification. For practical reasons, however, this specification is useful and appreciated by the colour separator, particularly if his proofing process is not an exact match to that of the production press.

NOTE 2 A single grey balance condition is usually not sufficient to ensure an achromatic colour for all print substrates and printing inks that may be used with a given printing process.

NOTE 3 See note in 3.14.

4.3 Proof or production print

4.3.1 General

Colour-characterization data obtained by printing and measuring the basic data set of ISO 12640[5] or ISO 12642[2] contain all of the information to be specified according to 4.3.2.1; 4.3.2.3; 4.3.3; 4.3.5.

4.3.2 Visual characteristics of image components

4.3.2.1 Print substrate colour

For the unprinted print substrate, the CIELAB colour co-ordinates (L^*, a^*, b^*) and CIELAB colour difference tolerances (ΔE^*_{ab}) shall be specified. Where the print is to be surface-finished the co-ordinates L^*, a^*, b^* of the surface-finished, but unprinted, print substrate shall be specified as well. The test method shall be as specified in 5.6, the reporting shall be as specified in A.6.

4.3.2.2 Print substrate gloss

The gloss of the unprinted print substrate and a tolerance shall be specified. Where the print is to be surface-finished, the gloss of the surface-finished, but unprinted, print substrate shall be specified as well. The test method shall be as specified in 5.5, reporting shall be as specified in A.5.

4.3.2.3 Ink set colours

The CIELAB colour co-ordinates L^*, a^*, b^* and colour-difference (deviation and variation) tolerances shall be specified for a solid print of each of the four process colours on the intended print substrate. Specifying the printing ink only by stating the pertinent part of ISO 2846 shall not replace this requirement.

In addition, the colour co-ordinates of the overprints (in the printing sequence used) of cyan + magenta, cyan + yellow, magenta + yellow shall be specified. Where the print is to be surface-finished, the L^*, a^*, b^* values of the surface-finished print product shall be specified as well.

For a precise definition of ink set colours, the following eight additional colours may be specified:

— 3 two-colour overprints: black with cyan, magenta, yellow (C-K, M-K, Y-K);

— 4 three-colour overprints of process colours (C-M-Y, M-Y-K, C-M-K, C-Y-K);

— 1 four-colour overprint of all process colours (C-M-Y-K).

The test method shall be as specified in 5.6, the reporting shall be as specified in A.6.

Though density values may be practical, it should be recognized that there may be cases where densitometric and colorimetric matching to a specification lead to different results. Therefore, reflection densities should be given only as additional information together with colorimetric data. Density measurement should be carried out using a black backing in accordance with ISO 5-4, reporting should follow A.7.

4.3.2.4 Ink set gloss

The gloss, together with a tolerance, of the printed process inks should be specified. The test method shall be as specified in 5.5, the reporting shall be as specified in A.5.

4.3.3 Tone-value reproduction limits

For every process colour, the lowest tone value in the data or on the colour separation film that transfers onto the print in a uniform and consistent manner shall be specified. Likewise, the highest tone value that is useful for carrying image information shall be specified. The tone-value test method shall be as specified in 5.2, the reporting shall be as specified in A.2.

4.3.4 Tolerance for image positioning

The maximum deviation between the image centres of any two process-colour images shall be specified in micrometres or millimetres, if necessary relative to the format and mass per area of the print substrate.

NOTE Traditionally, the tolerance for image positioning was related to the screen width used for the images to be printed. However, in view of the proliferation of half-tone screen types, print substrates and formats, a single reference might not be adequate.

4.3.5 Tone-value increase

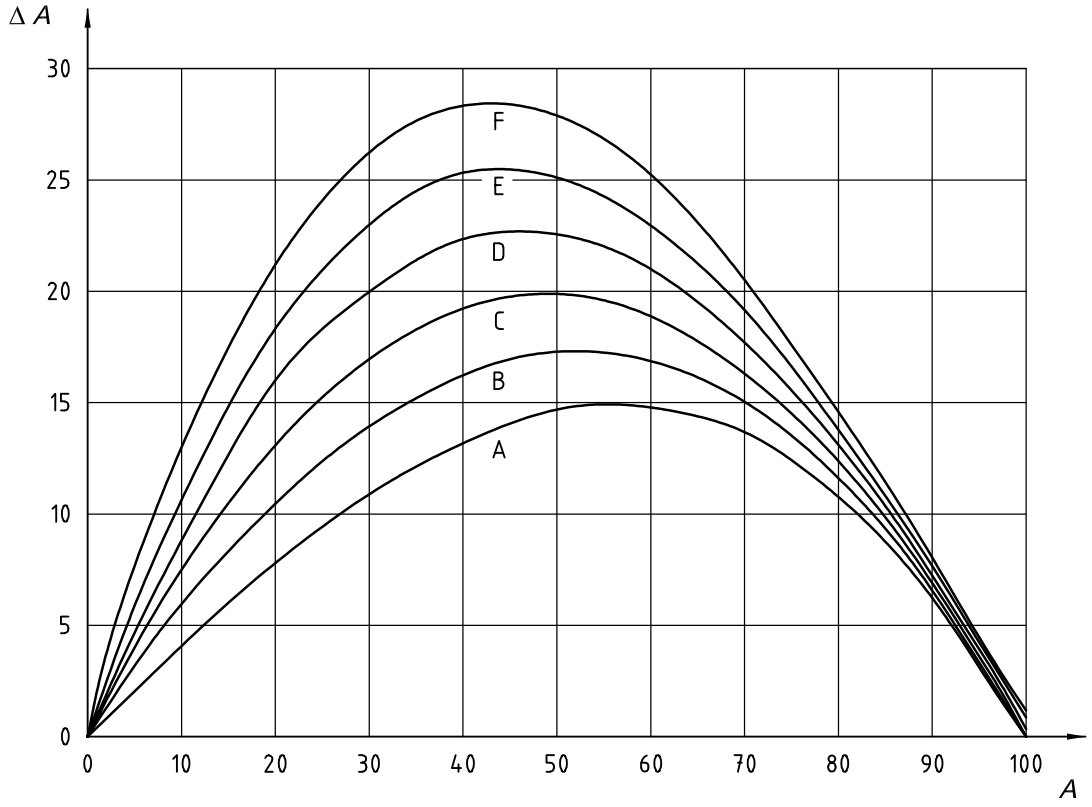
For every process colour, the tone-value increase values that best represent the printing condition shall be reported for at least one tone value on the film or data file other than 0 % or 100 %. Alternatively, the tone-value increase function may be specified using a table or a graph.

EXAMPLE 1 Figure 1 shows a family of tone-value increase curves, also known as print-characteristic curves, where the pertinent tone-value increase function may be specified by referring to one of the letters A to F. While the shape of the curves depends on the printing process, the curves in Figure 1 are typical for the offset lithographic process.

In addition, deviation and variation tolerances shall be specified. All tone values shall be relative to a multi-colour control strip. It shall be printed along with the subject during proof printing and should be printed with the subject in production printing. A control strip shall contain well-defined control patches marked with tone value designations. If the control strip is based on film, its tone values shall be accurate to plus or minus one percent.

The test method for the tone-value increase shall be as specified in 5.4, reporting shall be as specified in A.3.

NOTE For press prints on paper with periodic screens, there exists a unique correspondence between tone-value increase values determined at various screen frequencies on the same print. Therefore, for those prints, the screen frequency of the control strip need not be identical to those of the subject, but is recommended to be within one-sixth of the average nominal value of the subject screen frequency.



Key

A film or data tone value

ΔA tone value increase

NOTE Curves labelled A to F refer to six different printing conditions.

Figure 1 — Typical family of tone-value increase curves

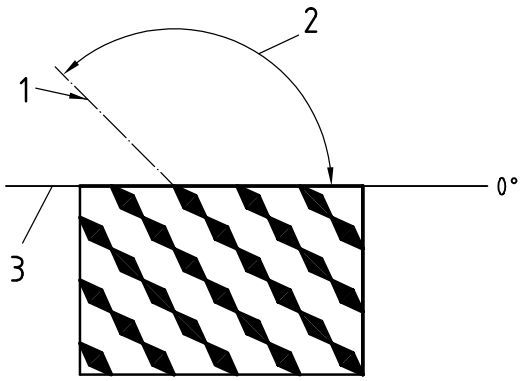
5 Test methods

5.1 Screen angles

Lay each colour-separation film to be measured on a light table and orient it as viewed by the end user; it will then be right-reading. Determine the principal axis of the screen. As shown in Figure 2, with an anticlockwise-ascending scale protractor, measure the smallest positive angle between the principal axis and the horizontal reference direction (3 o'clock direction). If there is no principal axis: of the two axes, use that which produces the smallest angle.

If no film is available, measure the angles on the print or on the printing forme. If the printing forme as viewed is wrong-reading, measure with a clockwise-ascending scale protractor with respect to the horizontal (9 o'clock direction). Report results as specified in A.1.

NOTE It is recognized that both clockwise measurements from the vertical axis of the forme and counter-clockwise measurements from the horizontal of the forme have been used for defining screen angles. In the absence of a generally accepted method, the present angle definition was selected because it yields identical values for all films, irrespective of film generation, and for all printing formes and prints.



Key

1 principal axis
2 screen angle
3 reference direction

Figure 2 — Measurement of screen angles — Angle definition for right-reading material

5.2 Tone value on a colour-separation film or of a data file

For film, using a transmission densitometer conforming to ISO 5-2, with 0°/d or d/0° geometry, determine the transmittance densities of the film base material, D_0, the solid tone, D_s, and a well-defined half-tone area, D_t. Calculate the tone value (see 3.46) for positive polarity and 3.47 for negative polarity colour-separation films. In order to assure sufficient accuracy, the sampling aperture of the instrument should have a diameter not less than 15 times the screen width; it shall be not less than 10 times the screen width. This requirement applies also by analogy to the area of non-circular sampling apertures.

For a data file, use the tone-value analysis function of an application program to determine the tone value of the half-tone in question. In the case of a digitally defined control strip, use the value given for the particular half-tone patch.

Report results as specified in A.2.

5.3 Tone value on the print

5.3.1 Reflection densitometer

Place the print on a matte, black backing in accordance with ISO 5-4. Calibrate the instrument according to the manufacturer's instructions. If settable, the so-called Yule-Nielsen factor (or equivalent) shall be set to 1,000. For chromatic process colours, select the densitometer channel which gives the highest reading for the solid and use this channel to measure the reflectance factor densities of the unprinted print substrate, D_0, a well-defined half-tone area, D_t, and a nearby solid, D_s. Measure the black process colour with the “ISO visual” spectral characteristic as specified in ISO 5-3. Calculate the tone value on the print from the definition, 3.47.

In order to assure sufficient accuracy, the sampling aperture of the instrument should have a diameter not less than 15 times the screen width; it shall be not less than 10 times the screen width. This requirement applies also by analogy to the area of non-circular sampling apertures. For non-periodic screens, the aperture should be even larger than required for periodic screens that are typically used with the print substrate in question.

Report results as specified in A.3.

NOTE 1 The tone value depends slightly on the instrument conditions, especially with the yellow process-colour image. Differences of up to 2 % might be observed in the mid-tone between wide-band instruments without polarization and narrow-band instruments with polarization. Care must be taken that all instruments, with and without polarization means, are calibrated with the appropriate procedures and certified reference materials appropriate to the instrument configuration.

NOTE 2 Image analysis instruments can also be used to determine the tone value of a half-tone print. However, most image analysis instruments only determine the geometrical (planimetric) area of a half-tone dot and do not include the so-called optical increase due to light scattering that densitometers and colorimeters include.

5.3.2 Colorimeter (tristimulus colorimeter or spectrocolorimeter)

Use a 45/0 or 0/45 geometry colorimeter for measuring the tristimulus values X, Y and Z, relative to the perfect diffuser, using the CIE 1931 2° standard observer function and illuminant D50. Measure the tristimulus values of the unprinted print substrate, a well-defined half-tone area, and a nearby solid. Calculate the tone value, A, in percent, from Equations (1) to (3):

for cyan: $$A = 100 \times (X_0 - X_t)/X_0 - X_s) \quad (1)$$

for magenta and black: $$A = 100 \times (Y_0 - Y_t)/Y_0 - Y_s) \quad (2)$$

for yellow: $$A = 100 \times (Z_0 - Z_t)/Z_0 - Z_s) \quad (3)$$

where

X_0, Y_0, Z_0 are the tristimulus values of the unprinted print substrate;

X_t, Y_t, Z_t are the tristimulus values of the half-tone;

X_s, Y_s, Z_s are the tristimulus values of the solid.

In order to assure sufficient accuracy, the sampling aperture of the instrument should have a diameter not less than 15 times the screen width; it shall be not less than 10 times the screen width. This requirement applies also by analogy to the area of non-circular sampling apertures. For non-periodic screens, the aperture should be even larger than required for periodic screens that are typically used with the print substrate in question.

NOTE The results may be a couple of percent lower than those of 5.3.1, especially for cyan. Where tone value or tone-value increase values are based on tristimulus values, it is important that this fact be clearly identified; see also A.3.

Report results as specified in A.3, stating that they were produced with the colorimetric method.

5.4 Tone value increase on the print

Calculate the quantity by deducting the tone value on the colour separation film or the data file (see 5.2) from the corresponding tone value on the print (see 5.3).

Report values as specified in A.3.

5.5 Gloss

Measure the specular gloss of the print substrate or a solid printed area of a process ink with light incident at an angle appropriate to the gloss level of the print substrate of the particular printing process in question. Details of the appropriate test methods shall be as specified in the pertinent part of ISO 12647.

Report results as specified in A.5.

5.6 Spectral measurement, computation of CIELAB colour co-ordinates and CIELAB colour differences

Carry out the measurement in accordance with ISO 13655, i.e., using a 45/0 or 0/45 geometry spectrocolorimeter with a matte, black backing according to ISO 5-4 or a matte, opaque, white backing with $L^* > 92$ and $C^* < 3$. Use illuminant D50 and the CIE 1931 2° standard observer function for computation of the tristimulus values. From the tristimulus values X, Y, Z, compute the CIELAB colour co-ordinates L^*, a^*, b^* as detailed in ISO 13655.

From two sets of colour co-ordinates (L_1*, a_1*, b_1*) and (L_2*, a_2*, b_2*), the CIELAB colour difference shall be calculated as detailed in ISO 13655.

Instead of a spectrocolorimeter, any colorimeter may be used which reports the same values well within the tolerances stated in the pertinent part of ISO 12647.

Report results as specified in A.6.

Annex A
(normative)

Reporting

A.1 Screen angles

For the colour separation films, report angles in degrees for C, M, Y and K.

EXAMPLE "The screen angles were C 15°, M 45°, K 75°, Y 0°."

If the angle cannot be expressed by a whole number, use two decimal places or report the angle in degrees and minutes.

A.2 Tone value on the colour-separation film or on a control-strip film

Report tone values in percent.

EXAMPLE "The tone value of the shadow-tone patch of the control strip is 75 %."

A.3 Tone value on the print

Together with the tone value, in percent, report the spectral response of the instrument used, the sampling aperture size and whether polarization was used. Where the tone-value calculation is based on tristimulus values, that fact shall be clearly reported.

EXAMPLE 1 (densitometer) "The tone value in the cyan 75 % patch of the control strip is 87 % as measured with a densitometer with ISO Status T spectral products (ISO 5-3), 3-mm diameter sampling aperture, without polarisation", "... with DIN narrow-band, 9-mm^2 sampling aperture, without polarisation" or "... with ISO visual spectral products, 5-mm diameter sampling aperture, with polarization".

EXAMPLE 2 (colorimeter) "The tone value in the cyan 40 % patch of the control strip is 56 % as calculated from the tristimulus value X, measured with a colorimeter of 4-mm diameter sampling aperture and D50 illuminant."

A.4 Tone-value increase on the print

Report the tone-value increase in the same manner as tone values on the print; see A.3.

A.5 Gloss

Report the gloss value and the test method.

EXAMPLE "The gloss of the unprinted paper was 45 % as measured with 75°/75° geometry following the TAPPI official test method T 480 om-85."

A.6 Colour co-ordinates and CIELAB colour differences

Report the L^*, a^* , b^* values or CIELAB colour differences and state that they refer to the spectral measurement and calculation conditions specified in ISO 13655. In addition, report the brand and model of the instrument used and the sampling aperture size. If, for additional information, conditions other than those specified in ISO 13655 have been used, such as illuminant D65, this fact shall be stated.

NOTE As colour co-ordinates are so-called dimensionless quantities, the unit is 1.

A.7 Reflectance-factor densities and relative densities

Report densities to two decimal places together with the following:

— the spectral characteristics, preferably by quoting ISO 5-3 Status E, I or T;

— the density of the unprinted print substrate;

— the sampling aperture size;

— the backing material, if not in accordance with ISO 5-4;

— whether polarization was used.

EXAMPLE 1 “The density of the cyan solid was 1,45; that of the substrate was 0,15; both measured on a black backing in accordance with ISO 5-4, with a ISO Status T spectral response, 10-mm^2 sampling aperture, without polarization.”

EXAMPLE 2 “The relative visual density of the black solid was 1,85 with regard to the substrate (visual density 0,07), both measured with the XYZ model of ZYX Company, on a black backing in accordance with ISO 5-4, 3-mm diameter sampling aperture, with polarisation.”

NOTE As optical densities are so-called dimensionless quantities, the unit is 1.

Annex B
(informative)

Determination of quality parameters of half-tone dots on a colour separation film

B.1 Microline target

A simple qualitative method for half-tone films with a base-plus-fog transmittance density of less than 0,1 is to place a control strip film with a microline target, emulsion oriented up, on a light table and to cover it with the film to be evaluated, emulsion oriented down. With a hand-held microscope of between 60- and 100-fold magnification, observe the isolated opaque half-tone dots which are found in those parts of the half-tone film, of positive or negative polarity, that appear lighter. If the microlines are distinctly visible below the half-tone dots, then the core density is too low. The fringe width can be estimated by comparing it to the width of the microlines which is stated on the microline target. The colour-separation film should be illuminated from below by light at oblique angles of incidence, a condition known as dark-field illumination. With some experience, the compliance of half-tone dots to a specified maximum fringe width can be predicted with near certainty.

B.2 Scanning microdensitometer

A quantitative method may be obtained using a scanning microdensitometer. This is an instrument in which, for instance, the illumination stage of a transmission microscope is equipped such that an aperture, with an adjustable diameter of 3 µm or less, is formed in the centre of the object plane. The film is moveable, in a controlled way, in both x and y directions of the object plane. As the film is moved, the radiation transmitted by the film is measured with a photodetector, which has been calibrated in terms of transmittance density. The wavelength range of the radiation source should be selected in view of the spectral requirement of the process steps where the film is to be used. The data may be presented graphically, either as a transmittance density profile across a half-tone dot (see Figure B.1), or by drawing contour lines that connect points of equal transmittance density (see Figure B.2).

The effects depicted in Figures B.1 and B.2 may also be observed with directly imaged printing formes; the evaluation methods described in this annex may be applied by analogy.

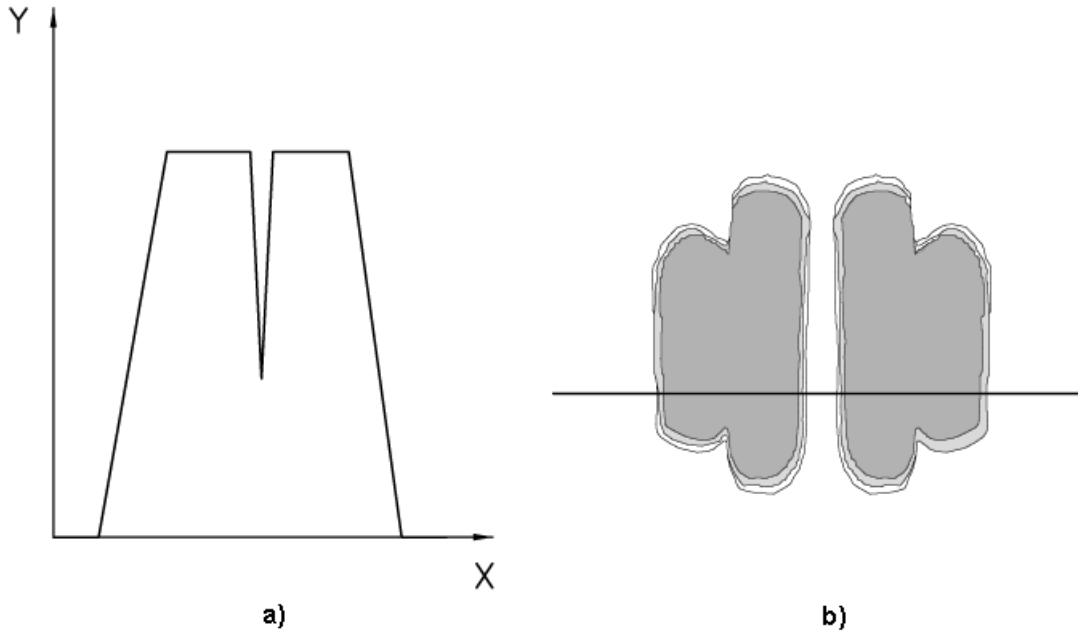


Figure B.1 — Transmittance density profile of a split half-tone dot on a colour separation film (a) and microscopic image of the same dot (b)

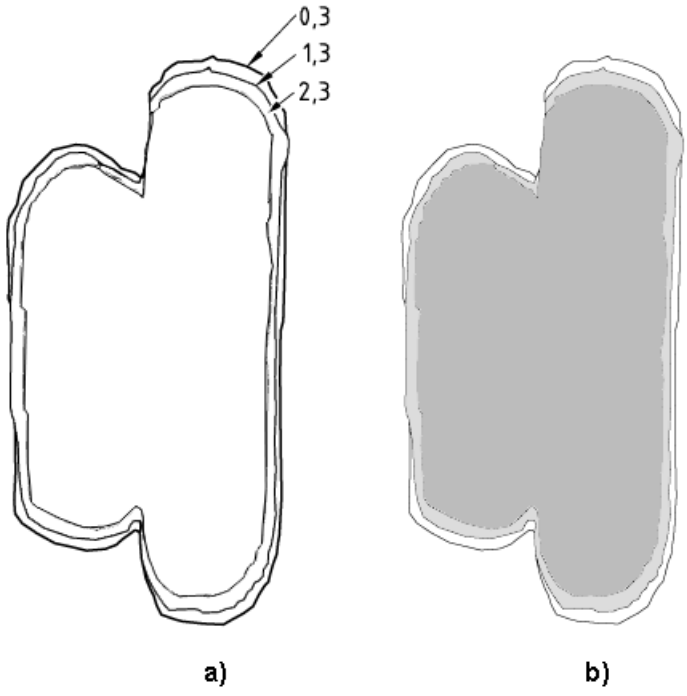


Figure B.2 — Microscopic image of the left part of the soft half-tone dot of Figure B.1 (a) and transmittance-density contour lines of that image (b)

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[3] CIE 17.4 (1987), *International Lighting Vocabulary*

[4] Specification ICC.1, *File format for color profiles* (Version 4.0.0), International Color Consortium, 1899 Preston White Drive, Reston, VA 20191, USA

[5] ISO 12640, *Graphic technology — Prepress digital data exchange — CMYK standard colour image data (CMYK/SCID)*

[6] ISO 2846 (all parts), *Graphic technology — Colour and transparency of printing ink sets for four-colour-printing*

[7] CIE 1931, *Standard Colorimetric Observer*

[8] ISO 15076-1:—[1)] , *Graphic technology — Prepress digital data exchange — International colour profile*

1) In preparation.

ภาคผนวก ก

คำแปลภาษาไทยของคำศัพท์สำหรับบทนิยามในมาตรฐานผลิตภัณฑ์อุตสาหกรรมนี้

ก.1 คำศัพท์และคำแปลของบทนิยามใน ISO 12647 - 1 : 2004 ข้อ 3 เรียงตามลำดับหัวข้อ มีดังนี้

achromatic colour (3.1)	สีอรงค์
axis of a screen (3.2)	แกนของสกรีน
chromatic colour (3.3)	สีรงค์
CIELAB colour difference (3.4)	ความแตกต่างของสีซีแล็บ
CIELAB colour space (3.5)	ปริภูมิสีซีแล็บ
colorimeter (3.6)	มาตรสี
colour-separation film (3.7)	ฟิล์มแยกสี
control patch (3.8)	แผ่นควบคุม
control strip (3.9)	แถบควบคุม
core density (3.10)	ความดำแกน
deviation tolerance (3.11)	ความเบี่ยงเบนที่ยอมรับได้
film emulsion orientation (3.12)	การหันด้านอีมัลชันของฟิล์ม
fringe width (3.13)	ความกว้างขอบเม็ดสกรีนจาง
grey balance (3.14)	สมดุลเทา
half-tone film (3.15)	ฟิล์มฮาล์ฟโทน
hard-dot film (3.16)	ฟิล์มเม็ดสกรีนตัน
ICC colour management (3.17)	การจัดการสีระบบ ไอซีซี
International Colour Consortium (3.18)	องค์กรสีนานาชาติที่รับผิดชอบด้านข้อกำหนดของโพรไฟล์ ไอซีซี และการจัดการสี
ICC profile (3.19)	โพรไฟล์ ไอซีซี
image orientation (3.20)	ทิศทางของภาพ
mid-tone spread (3.21)	ปริมาณน้ำหนักสีกลาง
moire pattern (3.22)	รูปแบบตาเสื่อหรือมัวเร
negative film polarity (3.23)	ฟิล์มเนกาทีฟ
non-periodic half-tone screen (3.24)	สกรีนฮาล์ฟโทนไม่สม่ำเสมอ
off-press proof print (3.25)	ภาพพิมพ์ปรู๊ฟที่ไม่ใช้แท่นปรู๊ฟ
OK print / OK sheet (3.26)	แผ่นพิมพ์ยอมรับ
on-press proof print (3.27)	ภาพพิมพ์ปรู๊ฟจากแท่นพิมพ์

positive film polarity (3.28)	ฟิล์มพอสิทีฟ
principal axis (3.29)	แกนสมนัยของเม็ดสกรีนฮาล์ฟโทน
printing condition (3.30)	ภาวะการพิมพ์
printing forme (3.31)	แม่พิมพ์
print substrate (3.32)	วัสดุใช้พิมพ์
process colours (3.33)	สีชุด
reference direction (3.34)	ทิศทางอ้างอิง
reflectance factor (3.35)	แฟคเตอร์การสะท้อนแสง
reflection densitometer (3.36)	มาตรความดำแบบสะท้อนแสง
reflection density (3.37) / reflectance factor density	ค่าความดำแบบสะท้อนแสง / แฟคเตอร์การสะท้อนแสง
reflectometer (3.38)	มาตรสะท้อนแสง
relative density (3.39)	ค่าความดำสัมพัทธ์
sampling aperture size (3.40)	ขนาดรูเปิดวัดค่า
screen angle (3.41)	มุมสกรีน
screen frequency / screen ruling (3.42)	จำนวนเส้นสกรีนหรือเม็ดสกรีน
screen width (3.43)	ความกว้างสกรีน
surface finishing (3.44)	การตกแต่งผิว
tone value <data file> (3.45)	ค่าน้ำหนักสีของไฟล์ข้อมูลภาพ
tone value <film> (3.46)	ค่าน้ำหนักสีของภาพบนฟิล์ม
tone value <print> <printing forme> (3.47)	ค่าน้ำหนักสีของภาพบนสิ่งพิมพ์และแม่พิมพ์
tone value increase (3.48)	การเพิ่มค่าน้ำหนักสี
tone-value sum (3.49)	ผลรวมค่าน้ำหนักสี
transmission densitometer (3.50)	มาตรความดำแบบโปร่งใส
transmission density / transmittance density (3.51) /optical density	ค่าความดำแบบโปร่งใส
transmittance factor (3.52)	แฟคเตอร์การส่องผ่านของแสง
variation tolerance (3.53)	การผันแปรที่ยอมรับได้