TECHNICAL SPECIFICATION

ISO/TS 15311-1

Graphic technology — Requirements for printed matter for commercial and industrial production —

Part 1:
Measurement methods and reporting schema

Technologie graphique — Exigences pour les imprimés pour les productions industrielle et commerciale —

Partie 1: Méthodes de mesure et schémas de rapport

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO/TS 15311-1:2016
https://standards.iteh.ai/catalog/standards/sist/84e5385e-06ab-4905-96a7-
f87ba106f0c6/iso-ts-15311-1-2016

Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

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

ISO/TS 15311 consists of the following parts, under the general title *Graphic technology — Requirements for printed matter for commercial and industrial production:*

— *Part 1: Measurement methods and reporting schema*

The following parts are under preparation:

— *Part 2: Commercial production printing*

Introduction

When producing a colour reproduction, it is important that the persons responsible for data creation, colour separation, proofing and printing operations have previously agreed a minimum set of parameters that define the visual characteristics and other technical properties of the planned print product. This part of ISO/TS 15311 identifies a number of metrics that can be applied to printed sheets and that can be used as the basis for such communication. The range of metrics is large and it is not intended that all of these metrics are to be applied to any given printed product and for any given application, the range of metrics is to be carefully selected, for example based on subsequent parts of ISO/TS 15311.

The metrics described by this part of ISO/TS 15311 can be applied to any type of print. They are likely to most often be applied to digitally printed prints.

When selecting the set of metrics, only those metrics that have a clear specification and that correlate well with human perception are included in this part of ISO/TS 15311. Since this is an area of significant research activity, new metrics are expected to emerge and existing metrics to be revised in the next few years. For this reason, we anticipate the need to revise this part of ISO/TS 15311 within a very short time scale as new metrics are tested and found to be reliable.

Additional tests to those specified in this this part of ISO/TS 15311, for example visual assessment of smoothness, images and other elements may be required when assessing print quality.

As with any parameter that is used as part of a product specification, it is important for readers to understand clearly what the metric means. For this reason, a reporting schema is to be followed when reporting measurements in conformance with this part of ISO/TS 15311.

Graphic technology — Requirements for printed matter for commercial and industrial production —

Part 1:
Measurement methods and reporting schema

1 Scope

This part of ISO/TS 15311 defines print metrics, measurement methods and reporting requirements for printed sheets that are suitable for all classes of printed products.

Guidance as to which of these metrics to apply to any given category of product along with acceptable conformance criteria is provided in subsequent parts of ISO/TS 15311.

Although this part of ISO/TS 15311 is expected to be used primarily to measure prints from digital printing systems, the metrics are general and can be applied to other kinds of print.

2 Normative references

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

ISO 2813, *Paints and varnishes — Determination of specular gloss of non-metallic paint films at 20 degrees, 60 degrees and 85 degrees*

ISO 8254-2, *Paper and board — Measurement of specular gloss — Part 2: 75 degree gloss with a parallel beam, DIN method*

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

ISO 12647-8:2012, *Graphic technology — Process control for the production of half-tone colour separations, proof and production prints — Part 8: Validation print processes working directly from digital data*

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

ISO 18924, *Imaging materials — Test method for Arrhenius-type predictions*

ISO 18930, *Imaging materials — Pictorial colour reflection prints — Methods for evaluating image stability under outdoor conditions*

ISO 18937:2014, *Imaging materials — Photographic reflection prints — Methods for measuring indoor light stability*

ISO/IEC TS 24790:2012, *Information technology — Office equipment — Measurement of image quality attributes for hardcopy output — Monochrome text and graphic images*

ISO/IEC TS 29112, *Information technology — Office equipment — Test charts and methods for measuring monochrome printer resolution*

3   Terms and definitions

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

3.1
achromatic colour
perceived colour of low chroma, in the perceptual sense

Note 1 to entry: The colour names "white", "grey" and "black" are commonly used for objects that reflect light. For objects that transmit light, the words "colourless" and "neutral" are used.

Note 2 to entry: In printing practice, achromatic colours can be produced either by a single black ink or three chromatic (and one achromatic) inks suitably balanced.

Note 3 to entry: Colours with low chroma are also called near neutral colours.

3.2
banding
appearance of one dimensional bands within an area that should be homogeneous

Note 1 to entry: This is also known as streakiness, while the artefacts are called streaks, bands, or stripes.

Note 2 to entry: Adapted from ISO 24790.

3.3
CIEDE2000 colour difference
total colour difference as defined in ISO/CIE 11664-6:2014 (CIE S 014-6/E:2013)

Note 1 to entry: The unit is ΔE00. The default weights for lightness, chroma and hue are (1:1:1).

3.4
colour deviation
difference between the colour aim value and the mean of a set of colour measurements

3.5
colour variation
colour difference from the mean of a set of colour measurements

Note 1 to entry: Colour variation is also known as colour fluctuation and may be reported as the mean or 95 percentile.

3.6
digital print
print where the image is printed directly from the digital domain

Note 1 to entry: Digital printing is a process for text and image reproduction with a colour marker on a medium using a marking device, on which the marking information is generated from digital data directly to the medium. It differs from traditional ink-based printing on which the marking information is generated from a form produced offline prior to imaging on the medium.

Note 2 to entry: Adapted from ISO 18913.

3.7
permanence
ability to remain chemically and physically stable over long periods of time

[SOURCE: ISO 18913:2012, 3.134]

3.8
image quality
impression of the overall merit or excellence of an image, as perceived by an observer neither associated with the act of photography, nor closely involved with the subject matter depicted

Note 1 to entry: The purpose of defining image quality in terms of third-party (uninvolved) observers is to eliminate sources of variability that arise from more idiosyncratic aspects of image perception and pertain to attributes outside the control of imaging system designers.

3.9
printing condition
set of primary process parameters which describe the conditions associated with a specific printed output, associated with spectral, colorimetric and/or densitometric aim values

Note 1 to entry: Such parameters usually include (as a minimum) printing process, paper category, printing ink, screening and printing sequence. The aim values typically comprise the colorant description and tone value increase aims.

Note 2 to entry: For the purposes of colour management, a printing condition is fully characterized by giving the relationship between the CMYK digital input values (as stipulated in ISO 12642-2) and the corresponding measured colorimetric values.

Note 3 to entry: Based on a given set of characterization data according to 3.9, Note 2 entry and a definition of achromatic perception, a grey condition might be extracted.

3.10
tone value
proportional printing value encoded in a data file and interpreted as defined in the file format specification

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

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 %.

Note 1 to entry: Tone value is expressed in units of percent.

Note 2 to entry: 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 formula.

4 Requirements

4.1 General

The following subclauses provide a number of metrics that define attributes of printed sheets and requirements for reporting them.

In many cases, the existing standards use CIE ΔE_ab rather than CIEDE2000. Although these are not interchangeable quantities, ΔE_ab has been superseded by CIEDE2000 in ISO/TC 130 standards. For this reason, CIEDE2000 shall be used to report colour difference metrics in this part of ISO/TS 15311.

Similarly, printing density is seldom used to measure colour and where the referenced standards specify printing density, approximately equivalent CIELAB colour measurements shall be used.

4.2   Single or multiple sheet assessment

Unless otherwise specified, metrics shall be assumed to apply to the assessment of a single sheet.

In many cases, it is useful to be able to report metrics for a set of sheets; for example, the set of sheets produced in a single print run or the set of sheets to be delivered as part of an order for print. In these cases, it is important to be able to indicate the likely variation across the entire set of sheets.

Sheets should be selected randomly with no replacement.

Samples should be selected with the following provisos:

a)   sheets should be selected throughout the entire press run;

b)   sheets should not be selected synchronous to any press event, e.g. at each roll change or after every blanket wash.

In cases where metrics are reported for a set of sheets, the report shall indicate the following: the total number of sheets in the set to be assessed, the number of sheets measured and, unless random selection with no replacement is used, the sampling method used to select the sheets shall be indicated.

4.2.1   Total number of sheets

The total number of sheets in the set of sheets assessed shall be reported (when metrics are reported). Details of the printing system used to create the sheets should also be reported.

4.2.2   Number of sheets measured

As a general rule, the higher the number of sheets measured from the set, the lower the uncertainty in the metric will be. Where there is a large number of sheets in the set, it may be impractical to measure a high percentage of these sheets and so the uncertainty (likely spread of values) may be high. Table 1 provides guidelines for the suggested number of sheets to be assessed for different sizes of sets of sheets to ensure that the metric being reported is somewhat representative of the entire set of sheets.

Table 1 — Guidelines for the number of sheets to be assessed

Total number of sheets in set	Suggested number of sheets to be measured
50	12
100	13
1 000 and greater	15

Table 1 provides typical sampling strategies used in the industry today. Users should be aware that where these values are used, the average value for the total set of sheets may vary substantially from the average measured for the sample set. Annex A provides details of how the likely difference between these two values varies with the sample size and provides a method for finding the sampling rate needed to reduce the uncertainty to a required level.

4.2.3   Reporting

When multiple sheets are assessed, the total number of sheets and the number of samples shall be reported as shown in the example below.

EXAMPLE 1   Sheets assessed: 13 (500).

When multiple sheets are assessed, the mean and standard deviation for each metric shall be reported as shown below except when reporting colour difference metrics.

EXAMPLE 2   Average line width: 0,12 mm, σ = 0,01 mm.

When reporting colour difference metrics for a single colour measured on multiple sheets, both the colour deviation and colour variation should be reported.

EXAMPLE 3   Colour deviation 3,2 DE_{00}, colour variation 0,8 DE_{00}.

Where the spread of colour difference values is reported, the average colour difference and the 95 percentile (and not the standard deviation) should be used.

EXAMPLE 4   Average colour difference: 2,8 DE_{00}, 95 percentile: 4,2 DE_{00}.

NOTE   Standard deviation is not an appropriate measure for colour difference as this assumes a normal distribution, whereas colour differences generally have a chi-squared (k = 3) distribution. The 95 percentile provides a more reliable estimate of the spread of values.

4.3   Print quality measures

4.3.1   Overview

Image quality metrics or attributes are aspects, dimensions or components of overall perceived print image quality.

The visual attributes specified in this part of ISO/TS 15311, to be used by the remaining parts of ISO/TS 15311, are defined in the following clauses.

4.3.2   Colour, tone reproduction and gloss

4.3.2.1   General

Colour accuracy describes the visual closeness between a defined reference and a reproduction. It is important to distinguish two concepts: absolute and media relative colour accuracy.

Absolute colour accuracy is usually required for side-by-side viewing, whereas media relative colour accuracy is usually more desirable for sequential viewing where the prints being compared are never viewed together.

When selecting a suitable metric, it is important to know which kind of comparison is expected and when reporting colour metrics, the colour accuracy method and the intended evaluation method should be indicated.

4.3.2.2   Print substrate

In some cases, it may be desirable to indicate the substrate that is used when reporting other attributes. For example, the colour accuracy achieved for a particular reference printing condition usually depends on the substrate. This is only likely to be useful for cases where isotropic (paper-like) substrates are used.

When such substrate attributes are included they shall be reported as shown in Table 2.