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Graphic technology — Printing from digital data across multiple technologies —

Part 1: **Principles**

Technologie graphique — Impression à partir de données numériques via des technologies multiples —

Partie 1: Principes

Reference number
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Contents

Page

Foreword ..... **iv**
Introduction ..... **v**
1 Scope **1**
2 Normative references **1**
3 Terms and definitions **1**
4 Requirements **2**
4.1 Principles and assumptions 2
4.2 Data encoding 2
4.3 Data preparation 3
4.4 Characterized reference printing conditions and colour characterization data 3
4.5 Use selection criteria for choice of characterized reference printing condition 3
4.6 Adjustment of data for substrate colour differences 4
4.7 Alternate printing reference 4
4.8 Colour profiles 4
5 Process control **5**
5.1 General 5
5.2 Printing to intended gamut 5
5.3 Determine colour characterization 6
5.4 Maintain running characteristics of the printing device 6
5.4.1 Tools and procedures 6
5.4.2 Tolerances 7
5.5 Job content specific adjustments 7
Annex A (normative) **Correction of colorimetric data for variation in substrate colour** **8**
Annex B (informative) **Tolerancing schema** **10**
Annex C (informative) **Process independent workflow** **14**
Bibliography **15**

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Foreword

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

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

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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/PAS 15339 consists of the following parts, under the general title *Graphic technology — Printing from digital data across multiple technologies*:

— *Part 1: Principles* [Publicly Available Specification]

— *Part 2: Characterized reference printing conditions, CRPC1–CRPC7* [Publicly Available Specification]

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Introduction

ISO/PAS 15339 is based on the premise that in the printing and publishing industries, electronic data are the intermediary for content storage and exchange throughout production including copy preparation, job assembly, proofing, and process colour printing. It further assumes that data preparation can be largely process independent and that choice of the printing process or processes to be used for final production will be based primarily on run length requirements and substrates to be used. There are various tools in place to both define the relationship of digital data to printed colour for specific instances of printing and to manipulate data such that similar results can be obtained between and among different printing processes (ISO/TS 10128). These specific instances of printing are typically described by colour characterization data, which is the relationship between CMYK input data and colour measured on the printed sheet. Where such a set of colour characterization data are used as a reference, it is referred to as a characterized reference printing condition (CRPC).

When producing printed colour reproductions it is important that the organizations responsible for material preparation, colour separation, proofing, and printing all working to a common set of parameters that uniquely define the intended visual characteristics of the final printed product. Such an agreement enables the correct production of suitable input data and subsequent production of proofs from these data. The purpose of a proof is to simulate the visual characteristics of the finished print product as closely as possible prior to production printing.

There is a unique relationship between ink, substrate, and printing process that limits the maximum chroma of the solids of the printing colorants and therefore limits the range of colours (colour gamut) that can be achieved for particular combinations. While special inks can be used, the commonly available ink pigments are used across all traditional ink processes. While toner and ink-jet systems have different colorant constraints than traditional ink processes, they tend to mimic traditional ink process aims and they will be treated as a variation of traditional ink processes. The achievable chroma range (gamuts) of ink-on-paper characterized reference printing conditions can generally be bracketed between cold-set printing on newsprint on the small end and by printing on gloss coated stocks (by a variety of processes) on the large end. Between these limits there is significant overlap of process/substrate combinations. The number of intermediate characterized reference printing conditions that are logical to define between smallest and largest is in part a function of the tolerances to which printing is expected to conform to the intended characterized reference printing condition. However, the intermediate characterized reference printing conditions also need to represent common widely used printing and that was the determining factor for the selection of the characterized reference printing conditions listed in ISO/PAS 15339-2. In addition, a characterized reference printing condition 7 is included to represent a possible exchange space for large gamut processes that exceed the colour gamut of characterized reference printing condition 6 and therefore need a larger reference gamut.

The data sets defined in ISO/PAS 15339-2 are those associated with the initial publication of ISO 15339. It is the intent of ISO/TC 130 that if changes in, or additions to, these data sets are needed in the future they will be documented in added parts of ISO/PAS 15339 so that changes in the data sets, or addition of data sets, are possible without losing traceability to earlier data sets.

A colour characterization data set is required for each characterized reference printing condition specified. Because the intent of ISO/PAS 15339 is that the data sets provided can be used as the reference for any printing process, they might not be aligned with the typical TVI and trapping associated with any specific printing process. The values selected need to represent a compromise between all potential processes to be used – in effect virtual printing on a virtual printing system.

It is important to realize that digital data can be encoded as already separated CMYK or can consist of un-separated data (typically in an RGB colour space) with supplementary information (ICC colour profiles, etc.) defining the colour intended on the printed sheet. Such unseparated data plus the associated supplementary data are sometimes referred to as “virtual CMYK” data. All data are to be encoded according to one of the PDF/X specifications (ISO 15930- series) to allow the necessary metadata which identifies the intended characterized reference printing condition to be included.

The colour of the printing substrate is a critical component of the colour appearance of a printed image (it behaves like a 5th colour). With the current widespread use of optical brightening agents (OBA)

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substrate colour is defined in terms of its apparent reflectance under D50 illumination (see ISO 3664). For halftone images the colour of the substrate contributes mostly in the area not covered by ink. ISO 13655 provides a reasonably effective method to adjust tristimulus data of measured halftone areas for moderate changes in substrate colour. ISO/PAS 15339 is based on the assumption that the colour characterization data can be adjusted (fine-tuned) for the range of normal substrate colours expected and that different characterized reference printing conditions are not required for moderate differences in substrate colour.

Although density, tone value increase, grey balance, etc. are individually important tools for the printing and publishing industry, in ISO/PAS 15339 they are assumed to be part of process control and not printing definition. They need to be considered in developing reference colour characterization data sets and need to be used where applicable as part of local site ongoing process control.

Modern characterization data and profile evaluation tools allow identification of the colour of the solids, the colour and tone values of the single colour scales, and the CMY values associated with the neutral (achromatic) tone scale. Using the values derived from the colour characterization data, rather than any a priori values, is the recommended input for process control aims used to control a printing process intended to conform to a particular characterized reference printing condition.

Annex C provides a description of the process independent workflow that is the basis for the concepts embodied in ISO/PAS 15339.

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Graphic technology — Printing from digital data across multiple technologies —

Part 1: Principles

1 Scope

This part of ISO/PAS 15339 establishes principles for the use of colour characterization data as the definition of the intended relationship between input data and printed colour for copy preparation, job assembly, proofing, and graphic arts production printing. Additional parts of ISO/PAS 15339 specify a limited number of characterized reference printing conditions that span the expected range of colour gamuts used for the production of printed material from digital data, regardless of printing process used. The procedure to be used to adjust colour characterization data for the normally expected range of substrate colour is specified.

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/TS 10128, *Graphic technology — Methods of adjustment of the colour reproduction of a printing system to match a set of characterization data*

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

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

ISO 15076-1, *Image technology colour management — Architecture, profile format and data structure — Part 1: Based on ICC.1:2010*

ISO 15930 (all parts), *Graphic technology — Prepress digital data exchange using PDF*

3 Terms and definitions

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

3.1
colour characterization data
tabulation of data that represents the relationship between device code values (e.g. CMYK) and the colour (CIELAB) produced on the printed sheet by those values in a specific printing process

3.2
colour profile
set of transforms, encoded according the rules of ISO 15076-1, that convert data between (to and from) device space and profile connection space

Note 1 to entry: The transforms contained within a colour profile can include manipulation of gamut compression/expansion, tone reproduction, colour separation, black printer creation, printing limitations (e.g. total area coverage), etc.

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