

# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 15339-2.2

ISO/TC 130

Secretariat: SAC

Voting begins on:  
2013-09-30

Voting terminates on:  
2013-12-30

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## Graphic technology — Printing from digital data across multiple technologies —

### Part 2: Characterized reference printing conditions

*Titre manque —*

*Partie 2: Conditions d'impression de référence caractérisées*

ICS: 35.240.30;37.100.99

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Reference number  
ISO/DIS 15339-2.2:2013(E)

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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 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 15339-2 was prepared by Technical Committee ISO/TC 130, *Graphic technology*,

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

- *Part 1: Principles*
- *Part 2: Characterized reference printing conditions - 2013*

## Introduction

ISO 15339 is based on the premise that in the printing and publishing industry, electronic data is the intermediary for content storage and exchange throughout production including copy preparation, job assembly, proofing, and process 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 a variety of tools in place to both define the relationship of digital data to printed color 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 color characterization data, which is the relationship between CMYK input data and color measured on the printed sheet. Where such a set of color characterization data is used as a reference it is referred to as a characterized reference printing condition (CRPC).

ISO 15339-1 describes the principals involved in developing and working with CRPCs.

This part of ISO 15339 defines a set of CRPCs associated with the initial publication of ISO 15339. It is the intent of ISO TC130 that if changes in, or additions to, these data sets are needed in the future, they will be documented in added parts of ISO 15339 so that changes in the data sets are possible without losing traceability to earlier data sets

Not all printing processes that can achieve the same colour gamut are subject to the same limitations. Offset, gravure, flexography, electrophotographic, ink-jet, etc., each have limitations that may have to be considered in the final data preparation for printing. These typically include limitations of total ink coverage, minimum and maximum printable dot sizes, etc. Should general guidance be needed, additional parts of ISO 15339 can be prepared to assist in the communication or standardization of the handling of such limitations.

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# Graphic technology — Printing from digital data across multiple technologies — Part 2: Characterized reference printing conditions

## 1 Scope

This Part of ISO 15339 specifies 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. Their use is described in ISO 15339-1

## 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 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 15339-1, *Graphic technology — Printing from digital data across multiple technologies — Part 1: Principles*

ISO 28178, *Graphic technology -- Exchange format for colour and process control data using XML or ASCII text*

CGATS TR015:2013, *Graphic technology — Methodology for Establishing Printing Aims Based on a Shared Near-neutral Gray-scale*

## 3 Terms and definitions

For the purposes of this document, the terms and definitions of ISO 15339-1 apply.

## 4 Requirements

As defined in ISO 15339-1, unless otherwise agreed between sender and receiver, the characterized reference printing condition used for data preparation and data exchange shall be one of the data sets defined in this or other parts of ISO 15339.

The characterization data associated with the characterized reference printing conditions identified in this part of ISO 15339 are normative and are included as data files ISO 15339-2-CRPC1.txt through ISO 15339-2-CRPC7.txt. Although a normative part of this International Standard, they may be freely used and distributed provided that the header of all distributed files shall indicate that they are part of ISO 15339-2

The characterized reference printing conditions included in these tables have been selected to be near the middle of both the general class of printing that is expected to make use of each characterized reference printing condition and the color of the substrates used. It is expected that adjustments for substrate color (see ISO 15339-1) will allow each characterized reference printing condition to meet a wide variety of needs and be independent of the actual "printing" process to be used.

To provide a consistent relationship between the substrate corrected neutral scales of the various data sets created for this part of ISO 15339, the CMY triplets defined by Equation 1 are mapped to the substrate corrected neutral scale of all data sets.

$$M = Y = 0.7470C - 4.100 \times 10^{-4} C^2 + 2.940 \times 10^{-5} C^3 \quad 1$$

The tone reproduction curves used are based on the procedures defined in CGATS TR015 and are dependant on the reflectance of the substrate and of the the black and 3-color solids.

The data shown in Tables 1 to 3 are taken from the CRPC data files and are shown in these tables and figures for information. The CIELAB a\*-b\* projection of the color characterization data of each of these characterized reference printing conditions is shown in Figure 1.

All colorimetry is defined to be ISO 13655 M1 with white backing.

NOTE 1 To facilitate the use of the correction of colorimetric data for variations in substrate color as described in ISO 15339-1 the header of each file contains both the reference white point and the minimum CIE X, CIE Y, and CIE Z values of the data set.

The substrate, single color solids, and two-color overprints that are the aims for the characterization data set are as shown in Table 1 and Table 2.

The colorimetrically computed mid-tone TVI for each of the single color scales of each of the characterized reference printing conditions is listed in Table 3 for information. More extensive TVI curves can be computed directly from the CRPC data if desired. Annex A shows the computed densitometric TVI and provides the computations used to derive both densitometric and colorimetric TVI.

NOTE 2 A spreadsheet, which will extract process control data from a CRPC data set, do substrate correction computations, and derive both densitometric and colorimetric TVI curves is available at <http://www.npes.org/Programs/StandardsWorkroom/ToolsBestPractices.aspx>

Table 4 lists typical use conditions, and a convenient name, for each of these characterized reference printing conditions. These characterized reference printing conditions have been selected to be near the middle of both the general class of printing that is expected to make use of each characterized reference printing condition and the color of the substrates used. It is expected that adjustments for substrate color (see ISO 15339-1) will allow each characterized reference printing condition to meet a wide variety of needs and be independent of the "printing" process to be used.



Table 1 — Characterized reference printing conditions – Primary color aims (informative)

CRPC	Substrate color			Printed solid colors											
				Cyan			Magenta			Yellow			Black		
	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*	L*	a*	b*
1	85	1	5	59	-24	-26	56	48	0	80	-2	60	37	1	4
2	87	0	3	57	-28	-34	52	58	-2	82	-2	72	30	1	2
3	96	1	-4	60	-26	-44	56	61	-2	89	-3	76	32	1	1
4	89	0	3	55	-36	-38	47	66	-3	83	-3	83	23	1	2
5	92	0	0	57	-37	-44	48	71	-4	87	-4	88	19	0	1
6	95	1	-4	56	-37	-50	48	75	-4	89	-4	93	16	0	0
7	97	1	-4	54	-42	-54	47	79	-10	90	-4	103	14	0	0

Table 2 — Characterized reference printing conditions –Two-color overprint aims (informative)

CRPC	Red			Green			Blue		
	L*	a*	b*	L*	a*	b*	L*	a*	b*
1	54	44	25	55	-35	17	42	7	-22
2	51	55	32	51	-44	19	36	9	-32
3	54	56	28	54	-43	15	38	10	-31
4	46	62	39	49	-54	24	28	14	-39
5	48	65	45	51	-62	26	27	17	-44
6	47	68	48	50	-66	26	25	20	-46
7	47	75	54	50	-72	29	20	26	-53

Table 3 — Colorimetric TVI (informative)

CRPC	Colorimetric TVI @ 50% input TV			
	C	M	Y	K
1	24.3	26.1	26.1	26.2
2	17.3	19.2	19.2	22.0
3	16.8	19.1	19.0	22.1
4	15.9	19.1	19.0	22.1
5	15.0	16.0	16.0	19.1
6	13.4	16.0	16.0	19.0
7	11.6	16.1	16.1	19.1