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Information technology — Automatic identification and data capture techniques — Bar code master test specifications

Technologies de l'information — Techniques automatiques d'identification et de capture des données — Spécifications pour essai de base des codes à barres

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ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national 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 and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC 15421 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

This second edition cancels and replaces the first edition (ISO/IEC 15421:2000), which has been technically revised.

Introduction

The technology of bar coding is based on the recognition of patterns encoded in bars and spaces of specified dimensions. A wide variety of methods exists by which these bar and space patterns can be reproduced as a physical image. Conventional printing processes such as offset lithography, photogravure, letterpress, screen process, hot foil stamping and flexography require one or more intermediate image carriers, for example artwork, photographic film, printing plates or cylinders, screens or dies.

The term bar code master refers to the first physical image of the complete bar code symbol from which the other image carriers can be produced. Some processes directly create an image carrier without generating a master that would be covered by this International Standard. In order to make allowances for variability of the production processes, and to ensure the correct encoding of the data to be represented, certain procedures need to be performed during the preparation of the bar code master.

This International Standard does not define the procedures but states the requirements for a bar code master.

Information technology — Automatic identification and data capture techniques — Bar code master test specifications

1 Scope

This International Standard specifies the requirements and test methods for physical and related attributes of a bar code master. It covers all forms of bar code master, irrespective of the mode of origination of the initial image, intended for reproduction by conventional printing processes. This International Standard does not cover processes in which there is no master, such as computer to plate (CTP).

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 5-3, *Photography and graphic technology — Density measurements — Part 3: Spectral conditions*

ISO 18911, *Imaging materials — Processed safety photographic films — Storage practices*

ISO/IEC 19762-1, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 1: General terms relating to AIDC*

ISO/IEC 19762-2, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary — Part 2: Optically readable media (ORM)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762-1, ISO/IEC 19762-2 and the following apply.

3.1
achieved bar width difference
average difference in width between specified and actual dimensions, for all bars within the symbol

3.2
bar edge
junction between a bar and space in a bar code symbol

3.3
bar edge conformance
accuracy with which a bar edge or part of a bar edge is located, relative to its specified location

3.4
bar edge contour
line joining all bar/space transitions at all points along the height of a bar

3.5
bar edge gradient
rate of change in optical density at a bar edge per unit distance, measured from the optical density profile

3.6
base density
lowest optical density of the bar code master material

3.7
negative image
image where the bars are of low optical density and the spaces are of high optical density

3.8
nominal bar width
⟨EAN/UPC symbols⟩ reference bar width defined by the symbology specification at a magnification of 1,0, with which other bar widths included in the symbology specification are compared or related

3.9
optical density profile
continuous plot of the optical density of the image of a bar code master, constructed from measurements of optical density made at micrometric intervals of distance, along a line which passes at a right angle through all of the bars of the symbol

NOTE See Annex A.

3.10
polarity
negative or positive property of an image

3.11
positive image
image where the bars are of high optical density and the spaces are of low optical density

3.12
specified bar width
⟨EAN/UPC symbols⟩ nominal bar width modified by a magnification factor and bar width adjustment, if applicable, i.e. (NOMINAL multiplied by MAGNIFICATION) ± BAR WIDTH ADJUSTMENT

3.13
specified bar width
⟨non-EAN/UPC symbols⟩ X-dimension multiplied by the ratio or number of modules, as appropriate, modified by bar width adjustment if applicable, i.e. (X multiplied by RATIO) ± BAR WIDTH ADJUSTMENT, or (X multiplied by NO. OF MODULES) ± BAR WIDTH ADJUSTMENT

4 Symbols

D optical density, as defined in ISO 5-3

5 Physical requirements

5.1 Material

A bar code master shall be produced on material which conforms to the following physical requirements.

5.1.1 Dimensional stability

The finished bar code master shall be such that dimensional variations due to changes in ambient conditions do not exceed:

— 0,01 per cent per 1 % change in relative humidity (RH);

— 0,01 per cent per 1 °C change in temperature.

Dimensional stability requirements shall be satisfied within the temperature range of 0 °C to 60 °C and the relative humidity range of 10 % to 70 %.

Samples shall be measured as specified in 6.1 and at the specified temperature and relative humidity.

5.1.2 Archival properties

For optimum life, a bar code master (produced on photographic film) shall be properly stored and used in controlled conditions which are in accordance with ISO 18911.

5.2 Physical requirements controlled by the manufacturing process

5.2.1 Target bar width

When measured according to the methods described in Clause 6, the width of each element of the bar code master shall equal the target width for that element, subject to the tolerances defined in 5.3.

5.2.2 Bar width adjustment

Bar width adjustment shall be applied uniformly and symmetrically to every bar throughout the symbol.

NOTE In consequence, where bar width increase is applied, the widths of spaces will also be reduced by an equal amount, and vice versa.

5.3 Tolerances

The achieved bar widths measured according to the methods of Clause 6 shall be compared with the target bar widths of the symbology.

5.3.1 Tolerance A - all symbologies

The achieved bar width difference of a symbol shall be < ± 0,008 mm.

The achieved bar width difference of the symbol shall be determined by the method specified in 6.1.2.

5.3.2 Tolerance B - two width symbologies

The achieved width of individual bars and spaces in a symbol shall be subject to Tolerance B.

Tolerance B equals ±4 % times the nominal X-dimension of the symbol for symbols with X-dimension less than 0,5 mm.

See Figure 1.

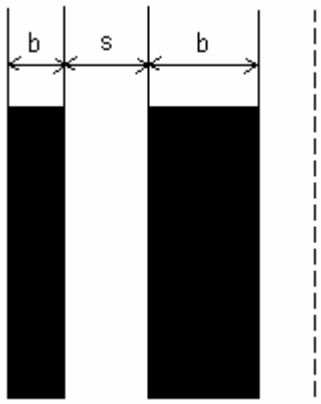

Figure 1 — Measurements for ratio-based symbologies

For ratio-based symbologies, bar and space widths are individually subject to Tolerance B. Cumulative widths of successive combinations of bars and spaces are also subject to Tolerance B.

5.3.3 Tolerance C - (n,k) symbologies

The achieved widths of individual bars and spaces in a symbol or any consecutive bar and space combination within a character shall be subject to Tolerance C.

Tolerance C equals ±4 % times the nominal X-dimension of the symbol for symbols with X-dimension less than 0,33 mm.

See Figure 2.

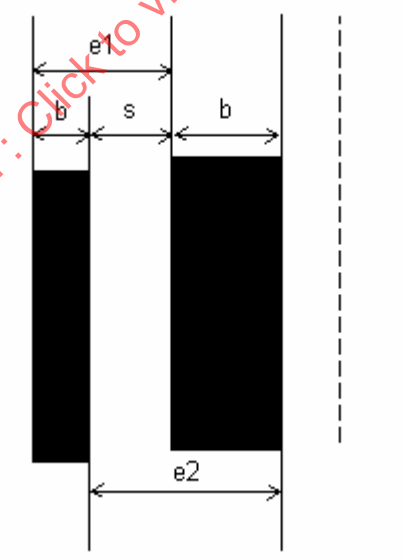

Figure 2 — Measurements for (n, k) symbologies

For (n, k) symbologies, bar and space widths are subject to Tolerance C. The cumulative widths of successive combinations of bars and spaces are also subject to Tolerance C.

5.3.4 Tolerance D - all symbologies

The overall achieved width of a character shall be subject to Tolerance D.

Tolerance D equals ± 0,013 mm

See Figure 3.

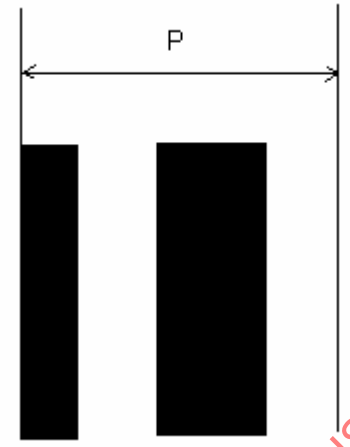

Figure 3 — Symbol character pitch measurement (all symbologies)

For all symbologies, the symbol character pitch P is subject to Tolerance D.

5.4 Bar edge characteristics

5.4.1 Bar edge uniformity

The bar edge contour should be straight, typically ± 0,002 mm.

5.4.2 Bar edge gradient

The slope of the line joining intersections on the density profile plot at the specified densities of Table 1 ii) and iii), shall be not less than that specified in Table 1 iv).

See Figure 2.

5.5 Defects

There shall be no spots in low density areas or voids in high density areas which, regardless of shape, would include a circle of 0,010 mm diameter.

5.6 Quiet zones

The quiet zones for symbols shall be at least the minimum specified by the symbology specification. To avoid quiet zone errors the tolerance of the printing and manufacturing process of the final product shall be compensated for by adding to the minimum quiet zone width

NOTE In order to ensure that the minimum quiet zones are respected when printing or positioning the symbol (e.g. to compensate for print growth or to allow registration of the bar code symbol position relative to other graphics or label edges), adjustment of the position of any graphical mark on the bar code master adjacent to the quiet zone boundary may be required.

5.7 Corner marks

When the bar code master is supplied as a discrete component, corner marks shall be applied to indicate the minimum area required for the bar code symbol, including quiet zones. This area shall not be encroached on by other design detail.

5.8 Optical densities

5.8.1 Minimum density, D_{min}

The optical density values of low density areas shall not exceed that given in Table 1 v).

5.8.2 Maximum density, D_{max}

The optical density values of high density areas shall not be less than that given in Table 1 vi).

5.9 Orientation

The orientation of a film-based bar code master shall be specified as 'emulsion up' or 'emulsion down'.

5.10 Polarity

The polarity of a bar code master shall be specified as positive or negative.

5.11 Encodation

For a bar code master, the image shall be composed by a method which ensures that the encodation rules of the symbology specification are followed.

Where an application specification requires that data be modified before encodation in the bar code master, the logical rules defined by the application specification shall be implemented for this procedure.

5.12 Human readable interpretation

The human readable interpretation of the data encoded in the bar code master shall conform to the requirements of the symbology or application specification to which it is manufactured.

Table 1 — Reference density values

PARAMETER			OPTICAL DENSITIES	
			TRANSMISSION	REFLECTION
i)	Density threshold level at which bar edge position is determined[a]		0,50	0,40
ii)	Density levels for defining bar edge gradient[a]	MIN	0,10	0,10
iii)		MAX	2,90	1,65
iv)	Minimum edge gradient		0,50*D* per micron	0,29*D* per micron
v)	Maximum value of D_{min}[b]		0,10	0,15
vi)	Minimum value of D_{max}[b]		3,0	1,80

[a] These density values are above base density.
[b] These density values include base density.