

Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols

The European Standard EN ISO/IEC 15416:2001 has the status of a British Standard

ICS 35.040; 01.080.50

National foreword

This British Standard is the official English language version of EN ISO/IEC 15416:2001. It is identical with ISO/IEC 15416:2000. It supersedes BS EN 1635:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee IST/34, Automatic identification and data capture techniques, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN ISO/IEC title page, the EN ISO/IEC foreword page, the ISO/IEC title page, pages ii to vi, pages 1 to 34, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

This British Standard, having been prepared under the direction of the DISC Board, was published under the authority of the Standards Policy and Strategy Committee on 15 March 2002

Amendments issued since publication

Amd. No.	Date	Comments
13861 Corr. No. 1	19 April 2002	EN ISO/IEC title page and foreword corrected

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ISBN 0 580 39107 8

English version

Information technology - Automatic identification and data
capture techniques - Bar code print quality test specification -
Linear symbols (ISO/IEC 15416:2000)

Technologies de l'information - Techniques d'identification
automatique et de capture des données - Spécifications
pour essai de qualité d'impression des codes à barres -
Symboles linéaires (ISO/IEC 15416:2000)

Informationstechnik - Verfahren der automatischen
Identifikation und Datenerfassung - Testspezifikationen für
Strichcodedruckqualität, Lineare Symbole (ISO/IEC
15416:2000)

This European Standard was approved by CEN on 20 October 2001.

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CORRECTED 2002-03-27

Foreword

The text of the International Standard from Technical Committee ISO/IEC/JTC 1 "Information technology" of the International Organization for Standardization (ISO) has been taken over as a European Standard by Technical Committee CEN/TC 225 "Bar coding", the secretariat of which is held by NEN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by June 2002, and conflicting national standards shall be withdrawn at the latest by June 2002.

This document supersedes EN 1635:1997.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Endorsement notice

The text of the International Standard ISO/IEC 15416:2000 has been approved by CEN as a European Standard without any modifications.

INTERNATIONAL STANDARD

ISO/IEC
15416

First edition
2000-08-15

Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols

*Technologies de l'information — Techniques d'identification automatique et
de capture des données — Spécifications pour essai de qualité
d'impression des codes à barres — Symboles linéaires*



Reference number
ISO/IEC 15416:2000(E)

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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. 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 International Standard may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

International Standard ISO/IEC 15416 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

Annexes A and B form a normative part of this International Standard. Annexes C to J are for information only.

Introduction

The technology of bar coding is based on the recognition of patterns encoded in bars and spaces of defined dimensions according to rules defining the translation of characters into such patterns, known as the symbology specification.

The bar code symbol must be produced in such a way as to be reliably decoded at the point of use, if it is to fulfil its basic objective as a machine readable data carrier.

Manufacturers of bar code equipment and the producers and users of bar code symbols therefore require publicly available standard test specifications for the objective assessment of the quality of bar code symbols, to which they can refer when developing equipment and application standards or determining the quality of the symbols. Such test specifications form the basis for the development of measuring equipment for process control and quality assurance purposes during symbol production as well as afterwards.

The performance of measuring equipment is the subject of a separate International Standard, ISO/IEC 15426.

This International Standard is intended to be substantially equivalent in technical content to EN 1635 and ANSI standards X3.182 - 1990 and ANSI/UCC5 on which it has been based. It should be read in conjunction with the symbology specification applicable to the bar code symbol being tested, which provides symbology-specific detail necessary for its application.

There are currently many methods of assessing bar code quality at different stages of symbol production. The methodology provided in this specification is not intended as a replacement for any current process control methods but gives essential additional quality information. This methodology provides a basis for grading the quality of bar code symbols in relation to their expected performance when read and therefore gives symbol producers and their trading partners a universally standardized means for communicating about the quality of bar code symbols after they have been printed. It also provides symbol producers with information enabling them to adjust their production process.

Alternative methods of quality assessment may be agreed between parties or as part of an application specification.

Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols

1 Scope

This International Standard

- specifies the methodology for the measurement of specific attributes of bar code symbols;
- defines a method for evaluating these measurements and deriving an overall assessment of symbol quality;
- gives information on possible causes of deviation from optimum grades to assist users in taking appropriate corrective action.

This International Standard applies to those symbologies for which a reference decode algorithm has been defined, and which are intended to be read using linear scanning methods, but its methodology can be applied partially or wholly to other symbologies.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 7724-2:1984, *Paints and varnishes — Colorimetry — Part 2: Colour measurement*.

EN 1556:1998, *Bar coding — Terminology*.

3 Terms and definitions

For the purposes of this International Standard, the terms and definitions given in EN 1556 and the following apply.

3.1

bar

A dark element corresponding to a region of a scan reflectance profile below the global threshold.

3.2

bar reflectance

The lowest reflectance value of an individual bar element in the scan reflectance profile of that element.

3.3

decodability

The proportion of the available margin (between the ideal dimension of an element or combination of elements and the relevant reference threshold) that has not been consumed by the element or combination of elements, calculated for the element or combination of elements deviating most from its ideal dimension.

3.4

decode

Determination of the information encoded in a bar code symbol.

3.5

edge contrast

The difference between bar reflectance and space reflectance of two adjacent elements.

3.6

element reflectance non-uniformity

The reflectance difference between the highest peak and the lowest valley in the scan reflectance profile of an individual element or quiet zone.

3.7

global threshold

The reflectance level midway between the maximum and minimum reflectance values in a scan reflectance profile used for the initial identification of elements.

3.8

gloss

The propensity of a surface to reflect a proportion of incident light in a specular manner.

3.9

inspection band

The band (usually from 10 % to 90 % of the height of a bar code symbol) across which measurements are taken (see Figure 2).

3.10

measuring aperture

A circular opening which governs the effective sample area of the symbol, and the diameter of which at 1:1 magnification is equal to that of the sample area.

3.11

modulation

The ratio of minimum edge contrast to symbol contrast.

3.12

(n, k) symbology

A class of bar code symbologies in which each symbol character is n modules in width and is composed of k bar and space pairs.

3.13

peak

A point of higher reflectance in a scan reflectance profile with points of lower reflectance on either side.

3.14

sample area

The effective area of the symbol within the field of view of the measurement device.

3.15

scan reflectance profile

Plot of variations in reflectance with linear distance along a scan path.

3.16**scan path**

The line along which the centre of the sample area traverses the symbol, including quiet zones.

3.17**space**

A light element corresponding to a region of a scan reflectance profile above the global threshold.

3.18**space reflectance**

The highest reflectance value of an individual space element or quiet zone in the scan reflectance profile of that element or quiet zone.

3.19**two-width symbology**

A bar code symbology in which symbol characters consist only of narrow and wide elements the widths of which are in a constant ratio to each other.

3.20**valley**

A point of lower reflectance in a scan reflectance profile with points of higher reflectance on either side.

3.21**vertical redundancy**

The property of a bar code symbol whereby there exist multiple possible scan paths as a result of the symbol being significantly higher than the height of a single scan line.

4 Symbols and abbreviated terms

4.1 Abbreviations

EC: Edge contrast

EC_{min}: Minimum value of EC

ERN: Element reflectance non-uniformity

ERN_{max}: Maximum value of ERN

GT: Global threshold

MOD: Modulation

PCS: Print contrast signal

RT: Reference threshold

SC: Symbol contrast

SRD: Static reflectance difference

4.2 Symbols

A: Average achieved width of element or element combinations of a particular type

e: Width of widest narrow element

E: Width of narrowest wide element

e_j : j^{th} edge to similar edge measurement, counting from leading edge of symbol character

K: Smallest absolute difference between a measurement and a reference threshold

k: number of element pairs in a symbol character in a (n, k) symbology

M: Width of element showing greatest deviation from A

m: Number of modules in a symbol character

N: Average achieved wide to narrow ratio

n: number of modules in a symbol character in a (n, k) symbology

R_b : Bar reflectance

R_D : Dark reflectance

R_L : Light reflectance

R_s : Space reflectance

$R_{\max}$: Maximum reflectance

$R_{\min}$: Minimum reflectance

RT_j : Reference threshold between measurements j and (j+1) modules wide

S: Total width of a character

V: Decodability value

V_C : Decodability value for a symbol character

X: Nominal narrow element dimension

Z: Average achieved narrow element dimension

5 Measurement methodology

5.1 General requirements

The measurement methodology defined in this standard is designed to maximize the consistency of both reflectivity and bar and space width measurements of bar code symbols on various substrates. This methodology is also intended to correlate with conditions encountered in bar code scanning hardware.

Measurements shall be made with a single light wavelength and a measurement aperture of a diameter defined by the application specification or determined in accordance with 5.2.1 and 5.2.2.

Whenever possible, measurements shall be made on the bar code symbol in its final configuration, i.e. the configuration in which it is intended to be scanned. If this is impossible, refer to annex D for the method to be used for measuring reflectance for non-opaque substrates.

The sampling method should be based on a statistically valid sample size within the lot or batch being tested. A minimum grade for acceptability shall be established prior to quality control inspection. In the absence of a