International Standard

ISO/IEC 15415

Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols

Techniques automatiques d'identification et de capture des données — Spécification de test de qualité d'impression des symboles de code à barres — Symboles bidimensionnels

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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.

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 document 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 or www.iec.ch/members_experts/refdocs).

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

This third edition cancels and replaces the second edition (ISO/IEC 15415:2011) which has been technically revised.

The main changes are as follows:

— a continuous (or decimal) grading has been introduced;

— a more optimal threshold calculation has been introduced;

— a more stable symbol contrast calculation has been introduced;

— a definition of grading for print growth has been added;

— modulation and reflectance margin have been combined into a single measurement.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html and www.iec.ch/national-committees.

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Introduction

The technology of bar coding is based on the recognition of patterns encoded, in bars and spaces or in a matrix of modules of defined dimensions, according to rules defining the translation of characters into such patterns, known as the symbology specification. Symbology specifications may be categorised into those for linear symbols, on the one hand, and two-dimensional symbols on the other; the latter may in turn be subdivided into "multi-row bar code symbols" sometimes referred to as "stacked bar code symbols", and "two-dimensional matrix symbols". In addition, there is a hybrid group of symbologies known as "composite symbologies"; these symbols consist of two components carrying a single message or related data, one of which is usually a linear symbol and the other a two-dimensional symbol positioned in a defined relationship with the linear symbol.

Multi-row bar code symbols are constructed graphically as a series of rows of symbol characters, representing data and overhead components, placed in a defined vertical arrangement to form a (normally) rectangular symbol, which contains a single data message. Each symbol character has the characteristics of a linear bar code symbol character and each row has those of a linear bar code symbol; each row, therefore, may be read by linear symbol scanning techniques, but the data from all the rows in the symbol must be read before the message can be transferred to the application software.

Two-dimensional matrix symbols are normally square or rectangular arrangements of dark and light modules, the centres of which are placed at the intersections of a grid of two (sometimes more) axes; the coordinates of each module need to be known in order to determine its significance, and the symbol must therefore be analysed two-dimensionally before it can be decoded. Some matrix codes are comprised of unconnected dots, in which the individual modules do not directly touch their neighbours but are separated from them by a clear space.

Unless explicitly specified otherwise, the term "symbol" in this document refers to either type of symbology.

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, a process known as verification, to which they can refer when developing equipment and application specifications 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 for the verification of symbols, also known as verifiers, is covered in ISO/IEC 15426-1 and ISO/IEC 15426-2.

The methodology described in this document is intended to achieve comparable results to the linear bar code symbol quality standard ISO/IEC 15416, the general principles of which this document has followed. It should be read in conjunction with the symbology specification applicable to the bar code symbol being tested, which provides symbology-specific details necessary for its application. Two-dimensional multi-row bar code symbols are verified according to the ISO/IEC 15416 methodology, with the modifications described in Clause 6; different parameters and methodologies are applicable to two-dimensional matrix symbols. The procedures described in this document must necessarily be augmented by the reference decode algorithm and other measurement details within the applicable symbology specification, and they may also be altered or overridden as appropriate by governing symbology or application specifications.

The method of quality assessment described in this document is most applicable to reading environments wherein printed and otherwise marked symbols are read predominantly by diffuse reflection. For direct part mark applications, in which symbols and substrates may be glossy, specular, low contrast, etc., a modified and extended version of the methodology defined in this document has been defined in ISO/IEC 29158 and

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provides for lighting arrangements and enhanced algorithms which more closely match reading equipment commonly used in DPM applications.

NOTE The Bibliography provides official and industry standards containing symbology specifications, among other references, to which this document applies. However, the Bibliography does not provide an exhaustive list of symbology specifications.

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Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols

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1 Scope

This document

— specifies two methodologies for the measurement of specific attributes of two-dimensional bar code symbols – one of which applies to multi-row bar code symbologies and the other to two-dimensional matrix symbologies;

— specifies methods for evaluating and grading 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 document applies to two-dimensional symbologies for which a reference decode algorithm has been defined, however the methodologies in this document can be applied partially or wholly to other similar symbologies.

NOTE While this document can be applied to direct part marks, better correlation between measurement results and scanning performance can be obtained with ISO/IEC 29158 in combination with this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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/IEC 15416, *Information technology – Automatic identification and data capture techniques — Bar code print quality test specification — Linear symbols*

ISO/IEC 15426-2, *Information technology — Automatic identification and data capture techniques — Bar code verifier conformance specification — Part 2: Two-dimensional symbols*

ISO/IEC 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 19762, ISO/IEC 15416 and the following apply.

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

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