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Third edition

Information technology — Automatic identification and data capture techniques — Bar code verifier conformance specification —

Part 2: Two-dimensional symbols

Technologies de l'information — Techniques automatiques d'identification et de capture des données — Spécifications de conformité des vérificateurs de codes à barres —

Partie 2: Symboles bi-dimensionnels

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Foreword

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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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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html. In the IEC, see www.iec.ch/understanding-standards.

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 15426-2:2015), which has been technically revised.

The main changes are as follows:

— tolerances for certain parameters have been clarified;

— fixed pattern damage test symbol for Aztec code has been added.

A list of all parts in the ISO/IEC 15426 series can be found on the ISO and IEC websites.

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.

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 linear symbols, on the one hand, and two-dimensional symbols on the other; the latter may in turn be subdivided into «multi-row bar codes» sometimes referred to as “stacked bar codes”, and “two-dimensional matrix codes”.

Multi-row bar codes 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 row of the symbol has the characteristics of a linear bar code symbol and may be read by linear symbol scanning techniques.

Two-dimensional matrix symbols are usually rectangular arrangements of modules 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.

Unless the context requires otherwise, the term “symbol” in this document may refer to either type of symbology.

The symbol, as a machine-readable data carrier, 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. Standard methodologies have been developed for measuring and assessing the quality of symbols for process control and quality assurance purposes during symbol production as well as afterwards.

Manufacturers of bar code equipment, the producers of bar code symbols and the users of bar code technology require publicly available standard conformance specifications for measuring equipment applying these methodologies, to ensure the accuracy and consistency of performance of this equipment.

This document is intended to be similar in technical content (mutatis mutandis) to the linear bar code verifier conformance standard, ISO/IEC 15426-1, 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.

Information technology — Automatic identification and data capture techniques — Bar code verifier conformance specification —

Part 2: Two-dimensional symbols

1 Scope

This document specifies the test methods for representative samples of the equipment and the minimum accuracy criteria applicable to verifiers using the methodologies of ISO/IEC 15415 for multi-row bar code symbols and two-dimensional matrix symbologies. This document also specifies reference calibration standards for verifier conformance.

NOTE ISO/IEC 15426-1 applies to verifiers for linear bar code symbols.

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 15415, *Information technology — Automatic identification and data capture techniques — Bar code symbol print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Automatic identification and data capture techniques — Bar code print quality test specification — Linear 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 15415, ISO/IEC 19762 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/

3.1
primary reference test symbol
bar code symbol intended for the testing of the accuracy of bar code verifiers and manufactured to close tolerances, much higher than bar code verifiers to be tested, by methods traceable to national standards

4 Symbols

R_b Bar reflectance, as defined in ISO/IEC 15416

R_{max} Maximum reflectance, as defined in ISO/IEC 15416

R_{min} Minimum reflectance, as defined in ISO/IEC 15416

R_s Space reflectance, as defined in ISO/IEC 15416

5 Conformance

The instrument shall be considered to conform with this document if it performs the functions defined in 6.3 and if the results of measurements of primary reference test symbols carried out in accordance with Clause 8 demonstrate that the arithmetic means of the ten measurements (for multi-row bar code symbols) or five measurements (for two-dimensional matrix symbols) of individual reported parameters are within the tolerances shown in Table 1.

Table 1 — Tolerances for measured parameter values

Parameter	Symbology type	Tolerance
R_{max} and/or R_s	Both	±5 % reflectance
R_{min} and/or R_b	Both	±3 % reflectance
Unused error correction (UEC)	Both	±0 (see A.3.3)
Decodability	Multi-row	±0,08
Defects	Multi-row	±0,08
Codeword yield	Multi-row	±0,08
Grid nonuniformity	Matrix	±0,06
Axial nonuniformity	Matrix	±0,02
Contrast uniformity (modulation)	Matrix	±0,08 for the contrast uniformity value described in A.3.2
Fixed pattern damage	Matrix	Within calibrated grade boundaries
NOTE The tolerances are additional to any tolerances stated by the supplier of the primary reference test symbols.		

6 Functional requirements

6.1 General requirements

The general requirement of a two-dimensional symbol verifier is that it shall provide assessments of the quality of a bar code symbol which are accurate and consistent, both in relation to measurements of a specific symbol made with the same instrument over a period of time and in relation to measurements of a specific symbol made by different instruments. Such consistency is essential to enable valid comparisons to be made of assessments of a symbol verified at two different times or on two different instruments.

6.2 Reflectance calibration

Verifiers shall have means of calibration and adjustment where necessary of reflectance values against reference reflectance calibration samples. Two calibration points should be used, one as near the high reflectance end of the range and the other as near the low reflectance end of the range as possible.

ISO/IEC 15415 defines the reference reflectance material against which these samples shall be calibrated.

6.3 Mandatory functions

6.3.1 Verifiers for multi-row bar code symbols

A verifier for multi-row bar code symbols applying the methodology defined in ISO/IEC 15415 shall be capable of:

— collecting reflectance measurements from points along multiple scan paths across a bar code symbol;

— establishing scan reflectance profiles from these measurements;

— analysing the scan reflectance profiles;

— reporting individual scan reflectance profile parameter grades and profile grades;

— reporting the codeword yield value and grade;

— reporting the unused error correction value and grade;

— determining and reporting an overall symbol grade;

— reporting the decoded data.

6.3.2 Verifiers for two-dimensional matrix symbols

A verifier for two-dimensional matrix symbols applying the methodology defined in ISO/IEC 15415 shall be capable of:

— collecting reflectance measurements from a sample area framing the test symbol and its quiet zones, extending for certain symbol sizes 20X (where X is the specified width of the narrow elements in a bar code symbol or the specified width of a single element in a two dimensional symbol) beyond the quiet zones (see Clause 10);

— establishing a reference grey-scale image and a binarized image as described in ISO/IEC 15415;

— decoding these images in accordance with the applicable reference decode algorithm;

— reporting individual values and grades for each of the parameters listed in ISO/IEC 15415;

— determining and reporting an overall symbol grade;

— reporting the decoded data.

The method of reporting is not specified but may be by means of, for example, a display screen in the instrument, a printed report or an electronic communication with another device such as a computer.

6.4 Optional functions

Users of verifiers have differing requirements for the amount of detail reported by the instrument, and a verifier may therefore perform additional functions, for example:

— reporting of number of scan reflectance profiles or images on which the overall symbol grade is based;

— reporting of symbology verified;

— reporting all decoded symbol characters or codewords;

— print-out or display of all or, at the user's option, selected scan reflectance profiles or images.

7 General constructional and operational requirements

7.1 Installation, operation and maintenance

The manufacturer shall specify in documentation provided for or available to the installer, user and maintainer of the equipment the conditions for installation, operation and maintenance of the equipment. These documents shall indicate the recommended extent and frequency of maintenance, if any. When equipment which is the subject of this document is installed, operated and maintained in accordance with the above conditions, it shall be capable of operating as specified.

7.2 Power supply

The manufacturer shall indicate the minimum and maximum parameters of the power supply at which the device is able to operate in accordance with its specifications. The accuracy of the bar code verifier shall not be adversely affected by fluctuations in supply voltage and frequency within the range specified by the manufacturer.

In the case of battery-powered equipment, the instrument shall either give a warning signal to the operator or shall cease to operate when approaching the battery power limit at which the reliable performance of the instrument can no longer be guaranteed. For equipment powered by rechargeable batteries, the manufacturer shall indicate the requirements for recharging the batteries.

7.3 Temperature

7.3.1 Operating temperature range

The manufacturer shall state the range of temperatures in degrees Celsius within which the equipment will operate.

7.3.2 Storage temperature range

The manufacturer shall state the range of temperatures in degrees Celsius which the equipment (including removable batteries) is capable of withstanding during storage and transportation, without loss of performance.

7.4 Humidity

The manufacturer shall state the range of values of relative humidity (RH) of the air within which the equipment will operate and whether the environment is condensing or non-condensing.

7.5 Ambient light immunity

The characteristics of ambient light vary very widely and should be taken into consideration. Some examples of typical light sources which may be the cause of problems: are high-efficiency fluorescent lighting, sodium vapour lamps, mercury vapour lamps, red neon lights and direct sunlight.

The manufacturer shall state the recommended ambient light conditions under which the equipment is intended to be used.

