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Information technology — Automatic identification and data capture techniques — Code 39 bar code symbology specification

Technologies de l'information — Techniques d'identification automatique et de capture des données — Spécifications des symbologies des codes à barres, code 39

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Foreword

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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.

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ISO/IEC 16388 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 16388:1999), which has been technically revised.

Introduction

The technology of bar coding is based on the recognition of patterns encoded in bars and spaces of defined dimensions. There are numerous methods of encoding information in bar code form, known as symbologies. Code 39 is one such symbology. The rules defining the translation of characters into bar and space patterns and other essential features are known as the symbology specification.

In the past, symbology specifications were developed and published by a number of organizations, resulting in certain instances in conflicting requirements for certain symbologies.

Manufacturers of bar code equipment and users of bar code technology require publicly available standard symbology specifications to which they can refer when developing equipment and application standards.

Information technology — Automatic identification and data capture techniques — Code 39 bar code symbology specification

1 Scope

This International Standard specifies the requirements for the bar code symbology known as Code 39; it specifies Code 39 symbology characteristics, data character encodation, dimensions, tolerances, decoding algorithms and parameters to be defined by applications. It specifies the Symbology Identifier prefix strings for Code 39 symbols.

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/IEC 646, *Information technology — ISO 7-bit coded character set for information interchange*

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

ISO/IEC 15424, *Information technology — Automatic identification and data capture techniques — Data Carrier Identifiers (including Symbology Identifiers)*

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 and ISO/IEC 19762-2 apply.

4 Requirements

4.1 Symbology characteristics

The characteristics of Code 39 are as follows.

a) Encodable character set:

   1) full alphanumeric A to Z and 0 to 9 (ASCII characters 65 to 90 and 48 to 57 inclusive, in accordance with ISO 646).

2) special characters: space $ % + - . / (ASCII characters 32, 36, 37, 43, 45, 46 and 47, respectively, in accordance with ISO 646).

3) start/stop character.

b) Code type: discrete.

c) Elements per symbol character: 9, of which 3 wide and 6 narrow, comprising 5 bars and 4 spaces.

d) Character self-checking: yes.

e) Data string length encodable: variable.

f) Bidirectionally decodable: yes.

g) Symbol check character: one, optional (see Annex A).

h) Symbol character density: 13 to 16 modules per symbol character, inclusive of minimum intercharacter gap, depending on wide/narrow ratio.

i) Non-data overhead: equivalent to 2 symbol characters.

4.2 Symbol structure

As illustrated in Figure 1, Code 39 symbols shall comprise

a) leading quiet zone;

b) start character;

c) one or more symbol characters representing data (including symbol check character, if present);

d) stop character;

e) trailing quiet zone.

A space, the intercharacter gap, shall separate characters within the symbol.

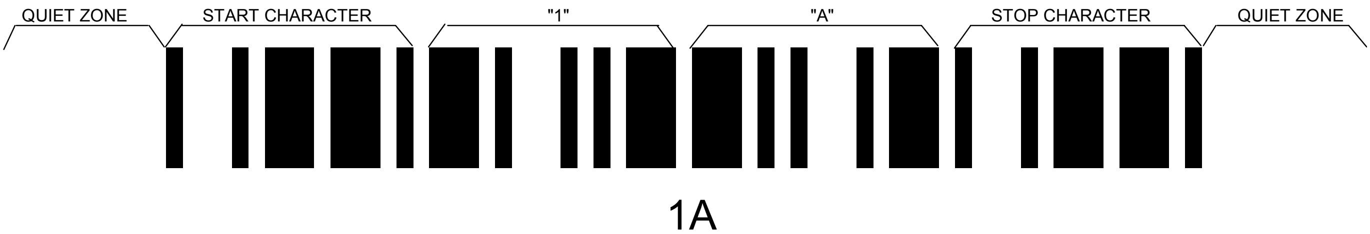

Figure 1 — Code 39 symbol

4.3 Character encodation

4.3.1 Symbol character structure

Each symbol character comprises nine elements (five bars and four spaces) of which six are always narrow (either three narrow bars and three narrow spaces, or five narrow bars and one narrow space) and three are always wide (one wide space and two wide bars when there are three narrow bars, or three wide spaces when there are five narrow bars). This parity feature enables character self-checking to be carried out.

4.3.2 Symbol character assignments

Table 1 defines all the Code 39 character assignments.

Table 1 — Code 39 character assignments

Char.	Encodation Pattern	B	S	B	S	B	S	B	S	B	ASCII value
0		0	0	0	1	1	0	1	0	0	48
1		1	0	0	1	0	0	0	0	1	49
2		0	0	1	1	0	0	0	0	1	50
3		1	0	1	1	0	0	0	0	0	51
4		0	0	0	1	1	0	0	0	1	52
5		1	0	0	1	1	0	0	0	0	53
6		0	0	1	1	1	0	0	0	0	54
7		0	0	0	1	0	0	1	0	1	55
8		1	0	0	1	0	0	1	0	0	56
9		0	0	1	1	0	0	1	0	0	57
A		1	0	0	0	0	1	0	0	1	65
B		0	0	1	0	0	1	0	0	1	66
C		1	0	1	0	0	1	0	0	0	67
D		0	0	0	0	1	1	0	0	1	68
E		1	0	0	0	1	1	0	0	0	69
F		0	0	1	0	1	1	0	0	0	70
G		0	0	0	0	0	1	1	0	1	71
H		1	0	0	0	0	1	1	0	0	72
I		0	0	1	0	0	1	1	0	0	73
J		0	0	0	0	1	1	1	0	0	74
K		1	0	0	0	0	0	0	1	1	75
L		0	0	1	0	0	0	0	1	1	76
M		1	0	1	0	0	0	0	1	0	77
N		0	0	0	0	1	0	0	1	1	78
O		1	0	0	0	1	0	0	1	0	79
P		0	0	1	0	1	0	0	1	0	80
Q		0	0	0	0	0	0	1	1	1	81
R		1	0	0	0	0	0	1	1	0	82
S		0	0	1	0	0	0	1	1	0	83

Char.	Encodation Pattern		B	S	B	S	B	S	B	S	B	ASCII value
T			0	0	0	0	1	0	1	1	0	84
U			1	1	0	0	0	0	0	0	1	85
V			0	1	1	0	0	0	0	0	1	86
W			1	1	1	0	0	0	0	0	0	87
X			0	1	0	0	1	0	0	0	1	88
Y			1	1	0	0	1	0	0	0	0	89
Z			0	1	1	0	1	0	0	0	0	90
hyphen			0	1	0	0	0	0	1	0	1	45
period			1	1	0	0	0	0	1	0	0	46
space			0	1	1	0	0	0	1	0	0	32
$			0	1	0	1	0	1	0	0	0	36
/			0	1	0	1	0	0	0	1	0	47
+			0	1	0	0	0	1	0	1	0	43
%			0	0	0	1	0	1	0	1	0	37
S/S or *			0	1	0	0	1	0	1	0	0	none

NOTE 1 S/S denotes the start and stop character, usually graphically represented as *

NOTE 2 In the columns headed B and S, 0 represents a narrow element and 1 a wide element.

4.3.3 Start and stop characters

The Code 39 start and stop character is usually depicted in human-readable form by a * (asterisk). This character shall not form part of the data encoded elsewhere in the symbol and shall not be transmitted by the decoder.

The start character shall be positioned at the normal left end of the data symbol characters, separated from the first bar of the leading data character by an intercharacter gap. The stop character shall be positioned at the normal right end of the data symbol characters (including symbol check character if present), separated from the final bar of the trailing data character by an intercharacter gap.

4.3.4 Optional symbol check character

Annex A defines the symbol check character position and calculation.

4.4 Dimensions

Code 39 symbology shall use the following nominal dimensions.

a) Width of narrow element (*X*): the *X* dimension of Code 39 symbols should be defined by the application specification having due regard to the availability of equipment for the production and reading of symbols and complying with the general requirements of the application. See 4.7.1.

b) Wide/narrow ratio (*N*): 2,0 : 1 to 3,0 : 1.

c) Width of intercharacter gap (*I*):

1) minimum: equal to *X*;

2) maximum:

for $X < 0{,}287$ mm: $5{,}3X$;

for $X \geq 0{,}287$ mm: 1,52 mm or $3X$, whichever is greater.

d) Minimum width of quiet zone: $10X$.

e) Recommended minimum bar code height for manual scanning: 5,0 mm or 15 % of symbol width excluding quiet zones, whichever is greater.

NOTE The width, *W* (in millimetres), of a Code 39 symbol, including quiet zones, can be calculated from the following expression:

$$W = (C + 2)(3N + 6)X + (C + 1)I + 2Q$$

where

W is the symbol width;

C is the number of data characters (including symbol check character if used);

N is the wide/narrow ratio;

X is the width of a narrow element in millimetres;

I is the width of the intercharacter gap in millimetres;

Q is the width of the quiet zone in millimetres.

4.5 Reference decode algorithm

Bar code reading systems are designed to read imperfect symbols to the extent that practical algorithms permit. This section describes the reference decode algorithm used in the computation of the decodability value described in ISO/IEC 15416.

a) Confirm presence of a leading quiet zone.

b) For each symbol character (including start and stop characters):

1) Measure the total width of 5 bars and 4 spaces; call this *S*.

2) Compute a threshold value, $T = S / 8$.

3) Compare each element width for that character with the value *T*. If element width is greater than *T*, assume element is wide; if not, assume element is narrow.

4) Determine if pattern of wide and narrow elements matches a valid character from the allowable set.

c) The first symbol character read must be a start/stop character, from which the scan direction can be deduced.

d) Continue character reading until a valid start/stop character is encountered.

e) Confirm presence of a trailing quiet zone.