

INTERNATIONAL  
STANDARD

ISO/IEC  
24728

First edition  
2006-06-01

---

---

**Information technology — Automatic  
identification and data capture  
techniques — MicroPDF417 bar code  
symbology specification**

*Technologies de l'information — Techniques d'identification  
automatique et de capture des données — Spécifications pour la  
symbologie de code à barres MicroPDF417*

---

---

---

Reference number  
ISO/IEC 24728:2006(E)



© ISO/IEC 2006

**PDF disclaimer**

This PDF file may contain embedded typefaces. In accordance with Adobe's licensing policy, this file may be printed or viewed but shall not be edited unless the typefaces which are embedded are licensed to and installed on the computer performing the editing. In downloading this file, parties accept therein the responsibility of not infringing Adobe's licensing policy. The ISO Central Secretariat accepts no liability in this area.

Adobe is a trademark of Adobe Systems Incorporated.

Details of the software products used to create this PDF file can be found in the General Info relative to the file; the PDF-creation parameters were optimized for printing. Every care has been taken to ensure that the file is suitable for use by ISO member bodies. In the unlikely event that a problem relating to it is found, please inform the Central Secretariat at the address given below.

© ISO/IEC 2006

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

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](mailto:copyright@iso.org)  
Web [www.iso.org](http://www.iso.org)

Published in Switzerland

## Contents

	Page
<b>Foreword.....</b>	<b>vi</b>
<b>Introduction .....</b>	<b>vii</b>
<b>1 Scope .....</b>	<b>1</b>
<b>2 Normative references .....</b>	<b>1</b>
<b>3 Terms and definitions .....</b>	<b>2</b>
<b>4 Symbols, operations and abbreviated terms.....</b>	<b>4</b>
<b>4.1 Symbols .....</b>	<b>4</b>
<b>4.2 Mathematical operations.....</b>	<b>5</b>
<b>4.3 Abbreviated terms .....</b>	<b>5</b>
<b>5 Requirements .....</b>	<b>5</b>
<b>5.1 Symbology characteristics .....</b>	<b>5</b>
<b>5.1.1 Basic characteristics .....</b>	<b>5</b>
<b>5.1.2 Summary of additional features .....</b>	<b>6</b>
<b>5.2 Symbol structure .....</b>	<b>7</b>
<b>5.2.1 MicroPDF417 symbol parameters .....</b>	<b>7</b>
<b>5.2.2 Row and column combinations.....</b>	<b>9</b>
<b>5.2.3 Row parameters .....</b>	<b>10</b>
<b>5.2.4 Codeword sequence.....</b>	<b>10</b>
<b>5.2.5 MicroPDF417 Row Address Patterns.....</b>	<b>12</b>
<b>5.3 Basic encodation .....</b>	<b>14</b>
<b>5.3.1 Symbol character structure .....</b>	<b>14</b>
<b>5.3.2 Start and Stop Patterns .....</b>	<b>15</b>
<b>5.4 High level (data) encodation.....</b>	<b>15</b>
<b>5.4.1 Function codewords.....</b>	<b>15</b>
<b>5.4.2 Text Compaction mode .....</b>	<b>21</b>
<b>5.4.3 Byte Compaction mode.....</b>	<b>25</b>
<b>5.4.4 Numeric Compaction mode .....</b>	<b>27</b>
<b>5.4.5 Advice to select the appropriate compaction mode .....</b>	<b>28</b>
<b>5.4.6 Treatment of MicroPDF417 reserved codewords .....</b>	<b>29</b>
<b>5.5 Extended Channel Interpretation .....</b>	<b>29</b>
<b>5.5.1 Encoding the ECI assignment number.....</b>	<b>30</b>
<b>5.5.2 Pre-assigned and default Extended Channel Interpretations .....</b>	<b>31</b>
<b>5.5.3 Encoding ECI sequences within compaction modes .....</b>	<b>31</b>
<b>5.5.4 Post-decode protocol .....</b>	<b>33</b>
<b>5.6 Determining the codeword sequence.....</b>	<b>33</b>
<b>5.7 Error detection and correction .....</b>	<b>34</b>
<b>5.7.1 Number of error correction codewords .....</b>	<b>34</b>
<b>5.7.2 Error correction capacity .....</b>	<b>34</b>
<b>5.7.3 Defining the error correction codewords .....</b>	<b>35</b>
<b>5.8 Dimensions.....</b>	<b>35</b>
<b>5.8.1 Minimum width of a module (<math>X</math>) .....</b>	<b>35</b>
<b>5.8.2 Row height (<math>Y</math>) .....</b>	<b>35</b>
<b>5.8.3 Quiet zones.....</b>	<b>35</b>
<b>5.9 Defining the symbol format .....</b>	<b>35</b>
<b>5.9.1 Defining the aspect ratio of the module .....</b>	<b>36</b>
<b>5.9.2 Defining the symbol matrix of rows and columns .....</b>	<b>36</b>
<b>5.10 Generating the error correction codewords .....</b>	<b>37</b>
<b>5.11 Low level encodation .....</b>	<b>39</b>
<b>5.11.1 Clusters.....</b>	<b>40</b>

5.11.2 Determining the symbol matrix .....	40
5.11.3 Determining the values of the Row Address Patterns .....	40
5.11.4 Row encoding.....	46
5.12 Printing Row Address Patterns .....	46
5.13 Structured Append.....	47
5.13.1 Compaction modes and Structured Append.....	47
5.13.2 ECIs and Structured Append .....	47
5.14 User guidelines .....	47
5.14.1 Human readable interpretation.....	47
5.14.2 Autodiscrimination capability.....	47
5.14.3 User-defined application parameters.....	48
5.14.4 MicroPDF417 symbol quality .....	48
5.14.5 Separation of multiple symbols.....	49
5.15 Reference decode algorithm.....	49
5.16 Error detection and error correction procedure .....	49
5.17 Transmitted data .....	49
5.17.1 Transmitted data in the basic (default) interpretation.....	49
5.17.2 Transmission protocol for Extended Channel Interpretation (ECI) .....	49
5.17.3 Transmitted data for Structured Append.....	51
5.17.4 Transmission of reserved codewords using the ECI protocol.....	51
5.17.5 Symbology identifier.....	51
5.17.6 Transmission using older protocols .....	51
<b>Annex A (normative) Encoding/decoding table of PDF417 symbol character bar-space sequences.....</b>	<b>52</b>
<b>Annex B (normative) The default character set for Byte Compaction mode .....</b>	<b>67</b>
<b>Annex C (normative) Byte Compaction mode encoding algorithm .....</b>	<b>68</b>
<b>Annex D (normative) Numeric Compaction mode encoding algorithm.....</b>	<b>70</b>
<b>Annex E (normative) Error correction .....</b>	<b>72</b>
<b>Annex F (normative) Tables of coefficients for calculating MicroPDF417 error correction codewords .....</b>	<b>73</b>
<b>Annex G (normative) Text Compaction mode encoding algorithm.....</b>	<b>77</b>
<b>Annex H (normative) Structured Append MicroPDF417 symbols .....</b>	<b>78</b>
H.1 Structured Append overview .....	78
H.2 Structured Append syntax .....	78
H.3 High level encoding considerations .....	81
H.4 Encodation example .....	81
H.5 Structured Append and the Extended Channel Interpretation protocol .....	82
H.6 Structured Append data transmission.....	83
<b>Annex I (normative) Testing MicroPDF417 symbol quality .....</b>	<b>86</b>
I.1 Overview of methodology .....	86
I.2 Test scans for scan reflectance profile .....	86
<b>Annex J (normative) Reference decode algorithm for MicroPDF417.....</b>	<b>88</b>
J.1 Phase 1: Initialization.....	88
J.2 Phase 2: Filling the matrix.....	89
J.3 Phase 3: Interpretation .....	90
J.4 Reference line-decode algorithm .....	91
<b>Annex K (normative) Error correction procedures .....</b>	<b>95</b>
<b>Annex L (normative) Symbology identifier .....</b>	<b>97</b>
<b>Annex M (normative) Transmission protocol for decoders conforming with original PDF417 standards .....</b>	<b>98</b>
M.1 Basic Channel Mode .....	98
M.2 GLI encoded symbols .....	98
M.3 Structured Append symbols .....	100
M.4 Transmission of reserved codewords using the original PDF417 protocol .....	101

<b>M.5</b>	<b>Achieving compatibility between old and new PDF417 equipment .....</b>	<b>101</b>
<b>Annex N</b> (informative) <b>Algorithm to minimise the number of codewords.....</b>	<b>104</b>	
<b>Annex O</b> (informative) <b>Guidelines to determine the symbol matrix .....</b>	<b>106</b>	
<b>Annex P</b> (informative) <b>Calculating the coefficients for generating the error correction codewords — worked example .....</b>	<b>107</b>	
<b>Annex Q</b> (informative) <b>Generating the error correction codewords — worked example .....</b>	<b>109</b>	
<b>Annex R</b> (informative) <b>Division circuit procedure for generating error correction codewords.....</b>	<b>112</b>	
<b>Annex S</b> (informative) <b>Additional guidelines for the use of MicroPDF417 .....</b>	<b>113</b>	
<b>S.1</b>	<b>Autodiscrimination compatibility.....</b>	<b>113</b>
<b>S.2</b>	<b>Pixel-based printing .....</b>	<b>113</b>
<b>Bibliography .....</b>	<b>115</b>	

## 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 24728 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic Identification and data capture techniques*.

This International Standard contains many provisions which are identical with those of ISO/IEC 15438.

## Introduction

MicroPDF417 is a multi-row symbology, derived from and closely based on PDF417. MicroPDF417 is designed for applications with a need for improved area efficiency but without the requirement for PDF417's maximum data capacity. A limited set of symbol sizes is available, together with a fixed level of error correction for each symbol size. Module dimensions are user-specified to enable symbol production and reading by a wide variety of techniques.

Since MicroPDF417's data character encodation, its error correction method, and many of its other symbol characteristics are, and are intended to remain, identical to those of PDF417, descriptions of these characteristics are quoted verbatim from the PDF417 symbology specification (ISO/IEC 15438) wherever appropriate, or with the appropriate modifications. For ease of cross-reference, this International Standard follows a similar document structure, with minor differences in clause/subclause numbering, to ISO/IEC 15438.

# Information technology — Automatic identification and data capture techniques — MicroPDF417 bar code symbology specification

## 1 Scope

This International Standard specifies the requirements for the bar code symbology known as MicroPDF417. It specifies the MicroPDF417 symbology characteristics, data character encodation, symbol formats, dimensions, error correction rules, decoding algorithm, and a number of application parameters.

## 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 646:1991, *Information technology — ISO 7-bit coded character set for information interchange*

ISO/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*

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

ISO/IEC 15417, *Information technology — Automatic identification and data capture techniques — Bar code symbology specification — Code 128*

ISO/IEC 15418, *Information technology — EAN/UCC Application Identifiers and Fact Data Identifiers and Maintenance*

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

ISO/IEC 24723, *Information technology — Automatic identification and data capture techniques — EAN.UCC Composite bar code symbology specification*

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)*

AIM Inc. International Technical Standard: ITS/04-001, *Extended Channel Interpretations — Part 1: Identification Schemes and Protocols*<sup>1</sup>

GS1 General Specification<sup>2</sup>

<sup>1</sup> Published by AIM Global, 125 Warrendale-Bayne Road, Suite 100, Warrendale, PA 15086, USA.

<sup>2</sup> Published by GS1, Blue Tower, Avenue Louise 326, bte 10, B-1050 Brussels, Belgium.