

# ISO/IEC 15438:2006-06 (E)

## Information technology - Automatic identification and data capture techniques - PDF417 bar code symbology specification

---

<b>Contents</b>		<b>Page</b>
Foreword .....		vi
Introduction .....		vii
<b>1</b>	<b>Scope .....</b>	<b>1</b>
<b>2</b>	<b>Normative references .....</b>	<b>1</b>
<b>3</b>	<b>Terms and definitions .....</b>	<b>2</b>
<b>4</b>	<b>Symbols, operations and abbreviated terms .....</b>	<b>3</b>
4.1	Symbols .....	3
4.2	Mathematical operations .....	4
4.3	Abbreviated terms .....	4
<b>5</b>	<b>Requirements .....</b>	<b>5</b>
5.1	Symbology characteristics .....	5
5.1.1	Basic characteristics .....	5
5.1.2	Summary of additional features .....	6
5.2	Symbol structure .....	7
5.2.1	PDF417 symbol parameters .....	7
5.2.2	Row parameters .....	7
5.2.3	Codeword sequence .....	7
5.3	Basic encodation .....	8
5.3.1	Symbol character structure .....	8
5.3.2	Start and stop characters .....	9
5.4	High level (data) encodation .....	10
5.4.1	Function codewords .....	10
5.4.2	Text Compaction mode .....	13
5.4.3	Byte Compaction mode .....	17
5.4.4	Numeric Compaction mode .....	19
5.4.5	Advice to select the appropriate compaction mode .....	21
5.4.6	Treatment of PDF417 reserved codewords .....	21
5.5	Extended Channel Interpretation .....	21
5.5.1	Encoding the ECI assignment number .....	22
5.5.2	Pre-assigned and default Extended Channel Interpretations .....	23
5.5.3	Encoding ECI sequences within compaction modes .....	23
5.5.4	Post-decode protocol .....	25
5.6	Determining the codeword sequence .....	25
5.7	Error detection and correction .....	26
5.7.1	Error correction level .....	26
5.7.2	Error correction capacity .....	26
5.7.3	Defining the error correction codewords .....	27
5.8	Dimensions .....	27
5.8.1	Minimum width of a module (X) .....	27
5.8.2	Row height (Y) .....	28
5.8.3	Quiet zones .....	28
5.9	Defining the symbol format .....	28
5.9.1	Defining the aspect ratio of the module .....	28
5.9.2	Defining the symbol matrix of rows and columns .....	28
5.10	Generating the error correction codewords .....	30

5.11	Low level encodation .....	31
5.11.1	Clusters .....	32
5.11.2	Determining the symbol matrix .....	32
5.11.3	Determining the values of the left and right row indicators .....	32
5.11.4	Row encoding .....	33
5.12	Compact PDF417 .....	33
5.13	Macro PDF417 .....	33
5.13.1	Compaction modes and Macro PDF417 .....	34
5.13.2	ECIs and Macro PDF417 .....	34
5.14	User guidelines .....	34
5.14.1	Human readable interpretation .....	34
5.14.2	Autodiscrimination capability .....	34
5.14.3	User-defined application parameters .....	34
5.14.4	PDF417 symbol quality .....	35
5.15	Reference decode algorithm .....	35
5.16	Error detection and error correction procedure .....	35
5.17	Transmitted data .....	35
5.17.1	Transmitted data in the basic (default) interpretation .....	35
5.17.2	Transmission protocol for Extended Channel Interpretation (ECI) .....	36
5.17.3	Transmitted data for Macro PDF417 .....	37
5.17.4	Transmission of reserved codewords using the ECI protocol .....	37
5.17.5	Symbology identifier .....	37
5.17.6	Transmission using older protocols .....	37
Annex A (normative) Encoding/decoding table of PDF417 symbol character bar-space sequences .		39
Annex B (normative) The default character set for Byte Compaction mode .....		55
Annex C (normative) Byte Compaction mode encoding algorithm .....		56
Annex D (normative) Numeric Compaction mode encoding algorithm .....		58
Annex E (normative) User selection of error correction level .....		60
E.1	Recommended minimum error correction level .....	60
E.2	Other user consideration of the error correction level .....	60
Annex F (normative) Tables of coefficients for calculating PDF417 error correction codewords .....		61
Annex G (normative) Compact PDF417 .....		66
G.1	Description .....	66
G.2	Print quality .....	66
Annex H (normative) Macro PDF417 .....		67
H.1	Macro PDF417 overview .....	67
H.2	Macro PDF417 syntax .....	67
H.3	High level encoding considerations .....	70
H.4	Encodation example .....	70
H.5	Macro PDF417 and the Extended Channel Interpretation protocol .....	71
H.6	Macro PDF417 data transmission .....	72
Annex I (normative) Testing PDF417 symbol quality .....		75
Annex J (normative) Reference decode algorithm for PDF417 .....		76
J.1	Initialisation .....	76
J.2	Reference decode algorithm for line decoding .....	76
J.3	Filling the matrix .....	78
J.4	Interpretation .....	79

<b>Annex K (normative) Error correction procedures .....</b>	<b>80</b>
<b>Annex L (normative) Symbology identifier .....</b>	<b>82</b>
<b>Annex M (normative) Transmission protocol for decoders conforming with original PDF417 standards .....</b>	<b>83</b>
<b>M.1 Basic Channel mode .....</b>	<b>83</b>
<b>M.2 GLI encoded symbols .....</b>	<b>83</b>
<b>M.3 Macro PDF417 symbols .....</b>	<b>85</b>
<b>M.4 Transmission of reserved codewords using the original PDF417 protocol .....</b>	<b>86</b>
<b>M.5 Achieving compatibility between old and new PDF417 equipment .....</b>	<b>86</b>
<b>Annex N (informative) Algorithm to minimise the number of codewords .....</b>	<b>89</b>
<b>Annex O (informative) Guidelines to determine the symbol matrix .....</b>	<b>91</b>
<b>O.1 Parameters affecting the determination of the matrix .....</b>	<b>91</b>
<b>O.2 Guidelines should any parameters not be achieved .....</b>	<b>94</b>
<b>Annex P (informative) Calculating the coefficients for generating the error correction codewords - worked example .....</b>	<b>95</b>
<b>Annex Q (informative) Generating the error correction codewords - worked example .....</b>	<b>96</b>
<b>Annex R (informative) Division circuit procedure for generating error correction codewords .....</b>	<b>99</b>
<b>Annex S (informative) Additional guidelines for the use of PDF417 .....</b>	<b>100</b>
<b>S.1 Autodiscrimination compatibility .....</b>	<b>100</b>
<b>S.2 Pixel-based printing .....</b>	<b>100</b>
<b>Bibliography .....</b>	<b>102</b>