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

*Technologies de l'information — Technologie d'identification
automatique et de capture des données — Spécification de la
symbologie de code à barres Code QR*

This document is a preview generated by EBS



COPYRIGHT PROTECTED DOCUMENT

© ISO/IEC 2015

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested 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
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	vi
Introduction	vii
1 Scope	1
2 Conformance	1
3 Normative references	1
4 Terms and definitions	2
5 Mathematical and logical symbols, abbreviations and conventions	4
5.1 Mathematical and logical symbols	4
5.2 Abbreviations	4
5.3 Conventions	4
5.3.1 Module positions	4
5.3.2 Byte notation	4
5.3.3 Version references	4
6 Symbol description	4
6.1 Basic characteristics	4
6.2 Summary of additional features	6
6.3 Symbol structure	7
6.3.1 General	7
6.3.2 Symbol Versions and sizes	9
6.3.3 Finder pattern	16
6.3.4 Separator	17
6.3.5 Timing pattern	17
6.3.6 Alignment patterns	17
6.3.7 Encoding region	17
6.3.8 Quiet zone	17
7 Requirements	18
7.1 Encode procedure overview	18
7.2 Data analysis	20
7.3 Modes	20
7.3.1 General	20
7.3.2 Extended Channel Interpretation (ECI) mode	20
7.3.3 Numeric mode	21
7.3.4 Alphanumeric mode	21
7.3.5 Byte mode	21
7.3.6 Kanji mode	21
7.3.7 Mixing modes	21
7.3.8 Structured Append mode	21
7.3.9 FNC1 mode	22
7.4 Data encoding	22
7.4.1 Sequence of data	22
7.4.2 Extended Channel Interpretation (ECI) mode	23
7.4.3 Numeric mode	25
7.4.4 Alphanumeric mode	26
7.4.5 Byte mode	27
7.4.6 Kanji mode	29
7.4.7 Mixing modes	30
7.4.8 FNC1 modes	30
7.4.9 Terminator	32
7.4.10 Bit stream to codeword conversion	32
7.5 Error correction	36
7.5.1 Error correction capacity	36
7.5.2 Generating the error correction codewords	44

7.6	Constructing the final message codeword sequence.....	45
7.7	Codeword placement in matrix.....	46
7.7.1	Symbol character representation.....	46
7.7.2	Function pattern placement.....	46
7.7.3	Symbol character placement.....	46
7.8	Data masking.....	50
7.8.1	General.....	50
7.8.2	Data mask patterns.....	50
7.8.3	Evaluation of data masking results.....	53
7.9	Format information.....	55
7.9.1	QR Code symbols.....	55
7.9.2	Micro QR Code symbols.....	57
7.10	Version information.....	58
8	Structured Append.....	59
8.1	Basic principles.....	59
8.2	Symbol Sequence Indicator.....	60
8.3	Parity Data.....	61
9	Symbol printing and marking.....	61
9.1	Dimensions.....	61
9.2	Human-readable interpretation.....	61
9.3	Marking guidelines.....	61
10	Symbol quality.....	62
10.1	Methodology.....	62
10.2	Symbol quality parameters.....	62
10.2.1	Fixed pattern damage.....	62
10.2.2	Scan grade and overall symbol grade.....	62
10.2.3	Grid non-uniformity.....	62
10.3	Process control measurements.....	62
11	Decoding procedure overview.....	62
12	Reference decode algorithm for QR Code.....	63
13	Autodiscrimination capability.....	70
14	Transmitted data.....	70
14.1	General principles.....	70
14.2	Symbology Identifier.....	71
14.3	Extended Channel Interpretations.....	71
14.4	FNC1.....	72
Annex A (normative)	Error detection and correction generator polynomials.....	73
Annex B (normative)	Error correction decoding steps.....	77
Annex C (normative)	Format information.....	79
Annex D (normative)	Version information.....	81
Annex E (normative)	Position of alignment patterns.....	83
Annex F (normative)	Symbology Identifier.....	85
Annex G (normative)	QR Code print quality.....	86
	symbology-specific aspects.....	86
Annex H (informative)	JIS8 and Shift JIS character sets.....	92
Annex I (informative)	Symbol encoding examples.....	94
Annex J (informative)	Optimisation of bit stream length.....	99
Annex K (informative)	User guidelines for printing and scanning of QR Code symbols.....	108
Annex L (informative)	Autodiscrimination.....	110

Annex M (informative) Process control techniques	111
Annex N (informative) Characteristics of Model 1 symbols	113
Bibliography	116

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.

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).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: [Foreword - Supplementary information](#)

The committee responsible for this document is ISO/IEC JTC 1, *Information technology, SC 31, Automatic identification and data capture techniques*.

This third edition cancels and replaces the second edition (ISO/IEC 18004:2006), which has been technically revised.

Introduction

It is necessary to distinguish four technically different, but closely related members of the QR Code family, which represent an evolutionary sequence.

- QR Code Model 1 was the original specification for QR Code and is described in AIM ITS 97-001 International Symbolology Specification-QR Code.
- QR Code Model 2 was an enhanced form of the symbology with additional features (primarily the addition of alignment patterns to assist navigation in larger symbols), and was the basis of the first edition of ISO/IEC 18004.
- QR Code (the basis of the second edition of ISO/IEC 18004) is closely similar to QR Code Model 2, its QR Code format differs only in the addition of the facility for symbols to appear in a mirror image orientation for reflectance reversal (light symbols on dark backgrounds) and the option for specifying alternative character sets to the default.
- The Micro QR Code format (also specified in the second edition of ISO/IEC 18004), is a variant of QR Code with a reduced number of overhead modules and a restricted range of sizes, which enables small to moderate amount of data to be represented in a small symbol, particularly suited to direct marking on parts and components, and to applications where the space available for the symbol is severely restricted.

QR Code is a matrix symbology. The symbols consist of an array of nominally square modules arranged in an overall square pattern, including a unique finder pattern located at three corners of the symbol (in Micro QR Code symbols, at a single corner) and intended to assist in easy location of its position, size, and inclination. A wide range of sizes of symbol is provided for, together with four levels of error correction. Module dimensions are user-specified to enable symbol production by a wide variety of techniques.

QR Code Model 2 symbols are fully compatible with QR Code reading systems.

Model 1 QR Code symbols are recommended only to be used in closed system applications and it is not a requirement that equipment complying with this International Standard should support Model 1. Since QR Code is the recommended model for new, open systems application of QR Code, this International Standard describes QR Code fully, and lists the features in which Model 1 QR Code differs from QR Code in [Annex N](#).

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

1 Scope

This International Standard defines the requirements for the symbology known as QR Code. It specifies the QR Code symbology characteristics, data character encoding methods, symbol formats, dimensional characteristics, error correction rules, reference decoding algorithm, production quality requirements, and user-selectable application parameters.

2 Conformance

QR Code symbols (and equipment designed to produce or read QR Code symbols) shall be considered as conforming with this International Standard if they provide or support the features defined in this International Standard.

Symbols complying with the requirements for QR Code Model 1, as described in ISO/IEC 18004:2006, may not be readable with equipment complying with this International Standard.

Symbols complying with the requirements for QR Code Model 2, as defined in ISO/IEC 18004:2000, are readable with equipment complying with this International Standard.

Reading equipment complying with ISO/IEC 18004:2000 will not be able to read all symbols complying with this International Standard. Symbols that make use of the additional features of QR Code will not be readable by such equipment.

Printing equipment complying with ISO/IEC 18004:2000 will not be able to print all symbols defined in this International Standard. Symbols that make use of the additional features of QR Code will not be printable by such equipment.

It should be noted, however, that QR Code Model 2 and Micro QR Code are the form of the symbology recommended for new and open systems applications.

3 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 8859-1:1998, *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 symbol print quality test specification — Two-dimensional symbols*

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)*

JIS X 0201, 7-bit and 8-bit coded character sets for information interchange