INTERNATIONAL STANDARD

ISO/IEC 23941

First edition
2022-05

Information technology — Automatic identification and data capture techniques — Rectangular Micro QR Code (rMQR) bar code symbology specification

Technologies de l'information — Techniques d'identification automatique et de capture des données — Spécification de la symbologie de code à barres Rectangular Micro QR Code (rMQR)

Reference number
ISO/IEC 23941:2022(E)

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Published in Switzerland

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Foreword

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

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

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

Information technology — Automatic identification and data capture techniques — Rectangular Micro QR Code (rMQR) bar code symbology specification

1 Scope

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

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 19762, *Information technology — Automatic identification and data capture (AIDC) techniques — Harmonized vocabulary*

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 symbol print quality test specification — Two-dimensional symbols*

3 Terms and definitions

For the purpose of this document, the terms and definitions given in 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
character count indicator
bit sequence which defines the data string length in a *mode* (3.6)

3.2
encoding region
region of the symbol not occupied by *function patterns* (3.4) and available for encoding of data and error correction codewords, and for *format information* (3.3)

3.3
format information
encoded pattern containing information on the error correction level and *version* (3.15) applied to symbol characteristics

3.4
function pattern
overhead component of the symbol [finder pattern, *separator* (3.12), *timing patterns* (3.14), alignment patterns, finder sub patterns and corner finder pattern] required for location of the symbol or identification of its characteristics to assist in decoding

3.5
masking
process of XORing the bit pattern in an area of the symbol with a mask pattern to equalize the number of light and dark modules

3.6
mode
method of representing a defined character set as a bit string

3.7
mode indicator
identifier indicating in which *mode* (3.6) the following data sequence is encoded

3.8
padding bit
zero bit, not representing data, used to fill empty positions of the final codeword during the encoding process

3.9
remainder bit
zero bit, not representing data, used to fill empty positions of the symbol *encoding region* (3.2) after the final symbol character, where the area of the *encoding region* (3.2) does not divide exactly into 8-bit symbol characters

3.10
remainder codeword
codeword, placed after the data codeword stream that was generated in data encoding process, used to fill empty codeword positions to meet the requirements of number of data codeword of the *version* (3.15) and error correction definitions

3.11
segment
sequence of data encoded according to the rules of one ECI or encoding mode

3.12
separator
function pattern (3.4) of all light modules, one module wide, used to separate the finder pattern from the rest of the symbol

3.13
terminator
bit pattern of defined number (depending on symbol) of all zero bits used to end the bit string representing data

3.14
timing pattern
alternating sequence of dark and light modules enabling module coordinates in the symbol to be determined

3.15
version
size of the symbol represented in terms of the number of modules in the vertical and horizontal axes, indicated, for example, as R7x59

Note 1 to entry: The error correction level applied to the symbol can be suffixed to the Version Indicator, e.g., Version R11x27-M.

3.16
version Indicator
five-bit identifier indicating symbol version used for a part of the *format information* (3.3)

3.17
error correction level indicator
one-bit identifier indicating error correction level used for a part of the *format information* (3.3)

4 Mathematical and logical symbols, abbreviated terms and conventions

4.1 Mathematical and logical symbols

DIV is the integer division operator

MOD is the integer remainder after division

XOR is the exclusive-or logic function whose output is one only when its two inputs are not equivalent. It is represented by the symbol $\oplus$.

4.2 Abbreviated terms

BCH Bose-Chaudhuri-Hocquenghem

ECI Extended Channel Interpretation

RS Reed-Solomon

4.3 Conventions

4.3.1 Module positions

For ease of reference, module positions are defined by their row and column coordinates in the symbol, in the form (*i, j*) where *i* designates the row (counting from the top downwards) and *j* the column (counting from left to right) in which the module is located, with counting commencing at 0. Module (0, 0) is therefore located at the upper left corner of the symbol.

4.3.2 Byte notation

Byte contents are shown as hexadecimal (hex) values.

4.3.3 Version references

Symbol versions are referred to in the form Version RC_VxC_H-E where C_V identifies the vertical number of modules (7, 9, 11, 13, 15, 17), C_H identifies the horizontal number of modules (27, 43, 59, 77, 99, 139), and E indicates the error correction level (M and H). For example, R13x27-M indicates a rectangular symbol that has 13 vertical modules, 27 horizontal modules, and an error correction level M. Versions may be referred to without error correction level. For example, R13x27.

NOTE For M and H, see 6.1 e).

5 Conformance

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

6 rMQR specifications

6.1 Basic characteristics

rMQR is a matrix symbology with the following characteristics.

a) Encodable character set:

   1) numeric data (digits 0 - 9);

   2) alphanumeric data (digits 0 - 9; upper case letters A - Z; nine other characters, as shown in Table 5.);

   3) byte data [default shall be the character set defined in Annex G; or other sets as otherwise defined (see 7.3.5)];

   4) Kanji characters (Characters can be compacted into 13 bits (see 7.3.6).

b) Representation of data:

   A dark module is nominally a binary one and a light module is nominally a binary zero. See 6.2 for details of reflectance reversal.

c) Symbol size (not including quiet zone):

   See Table 1 for the symbol sizes for 7 x 43 modules to 17 x 139 modules (Version R7x43 to R17x139).

d) Data characters per symbol:

   The maximum symbol size of Version R17x139-M is as specified below.

   — numeric data: 361 characters

   — alphanumeric data: 219 characters

   — Byte data: 150 characters

   — Kanji data: 92 characters

e) Selectable error correction:

   This symbology supports two levels of Reed-Solomon error correction, M and H, which allows the recovery of rMQR codewords up to the indicated rate below.

   — M 15 %

   — H 30 %

f) Code type:

   Matrix

g) Orientation independence:

   Yes (both rotation and reflection)

Figure 1 illustrates a Version R13x27 rMQR symbol in normal colour and with reflectance reversal (see 6.2), in both normal and mirror image orientations.

6.2 Summary of additional features

The use of the following additional features is optional in rMQR.

— Extended channel interpretations (ECI)

This mechanism enables data using character sets other than the default encodable set (e.g., Arabic, Cyrillic, Greek) and other data interpretations (e.g., compacted data using defined compression schemes) or other industry-specific requirements to be encoded. See 7.3.2.

— Reflectance reversal

Symbols are intended to be read when marked so that the image is either dark on light or light on dark (see Figure 1). The specifications in this document are based on dark images on a light background. In the case of symbols produced with reflectance reversal, references to dark or light modules should be taken as references to light or dark modules respectively.

— Mirror imaging

The arrangement of modules defined in this document represents the "normal" orientation of the symbol. It is, however, possible to achieve a valid decode of a symbol in which the arrangement of the modules has been laterally transposed. When viewed with the rMQR finder pattern at the top left, and the finder sub pattern at the bottom right corners of the symbol, the effect of mirror imaging is to interchange the row and column positions of the modules. (See Figure 1.)

a) Normal orientation and normal reflectance arrangement

b) Normal orientation and reversed reflectances

c) Mirror image orientation and normal reflectance arrangement

d) Mirror image orientation and reversed reflectances

NOTE The corner marks in Figures 1 indicate the extent of the quiet zone.

Figure 1 — Examples of rMQR symbol encoding the text "12345678901234567890123456"

6.3 Symbol structure

6.3.1 General

Each rMQR symbol shall be constructed of nominally square modules set out in a rectangular array and shall consist of an encoding region and function pattern. The function pattern shall contain a finder pattern, separator, timing patterns, alignment patterns, finder sub patterns and corner finder pattern. See Figure 2.

Function patterns do not encode data. The symbol shall be surrounded on all four sides by a quiet zone border.

Figures 2 to 7 illustrate the structure of a Version R7x43, R9x43, R11x43, R13x43, R15x43 and R17x43 symbols, respectively.

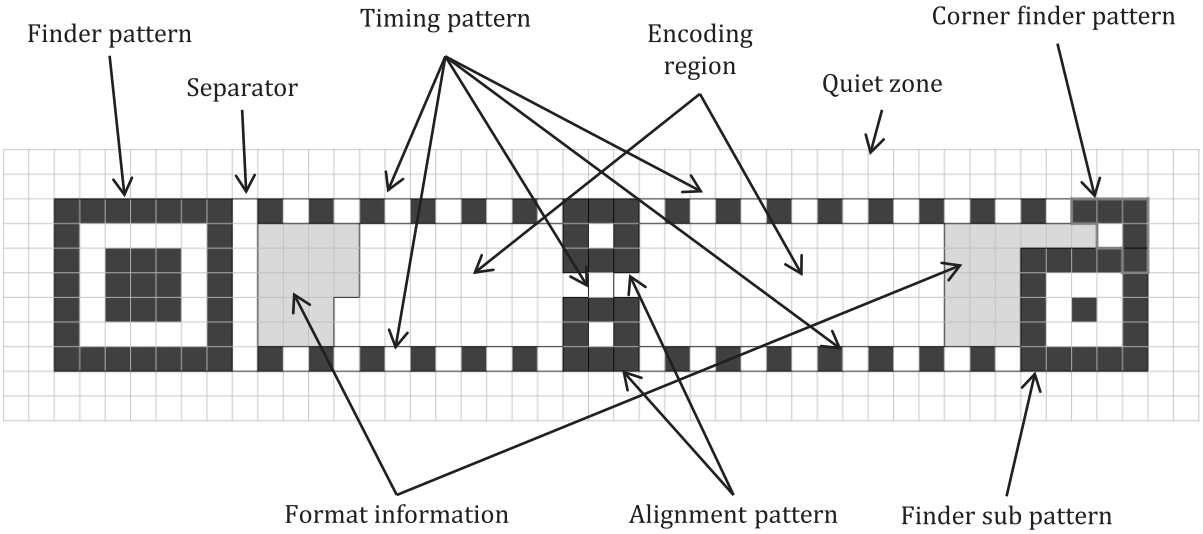

Figure 2 — Structure of Version R7x43 rMQR symbol

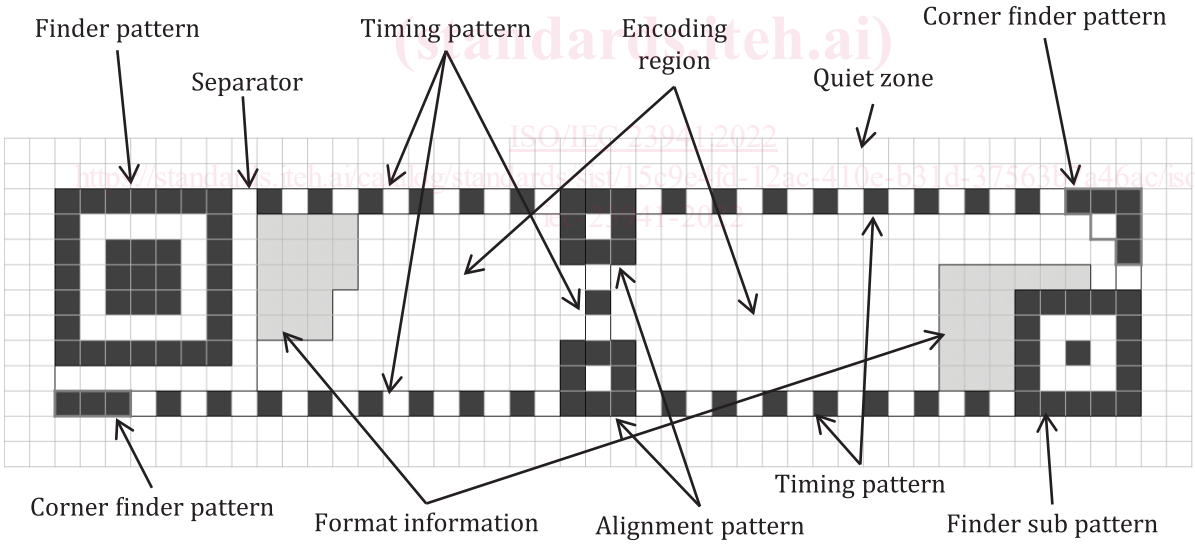

Figure 3 — Structure of Version R9x43 rMQR symbol

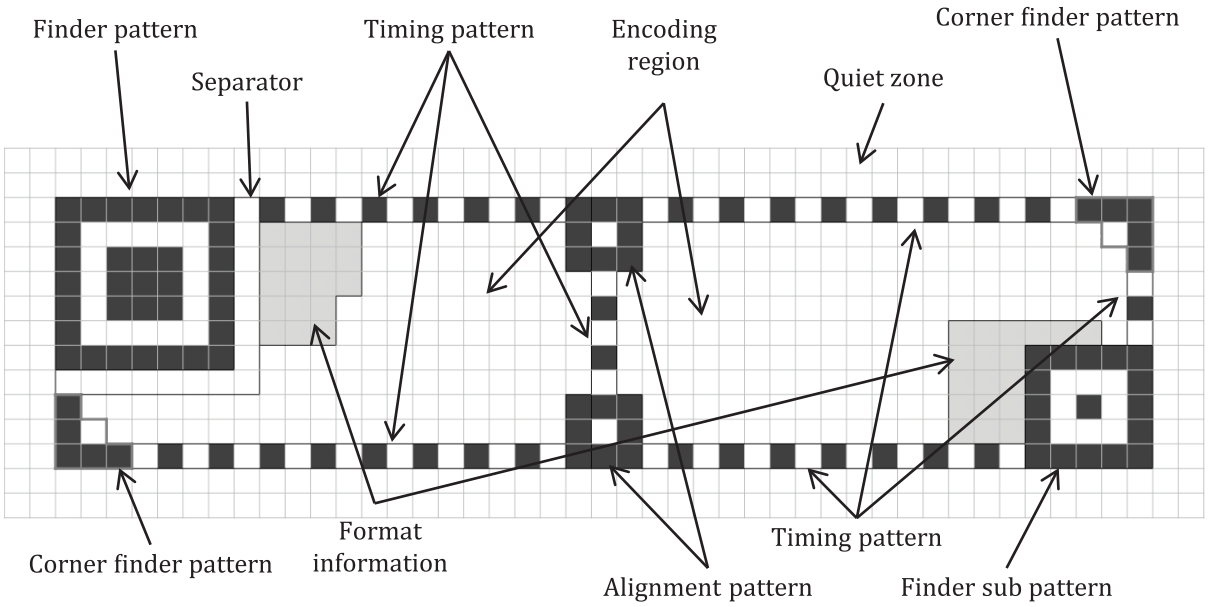

Figure 4 — Structure of Version R11x43 rMQR symbol

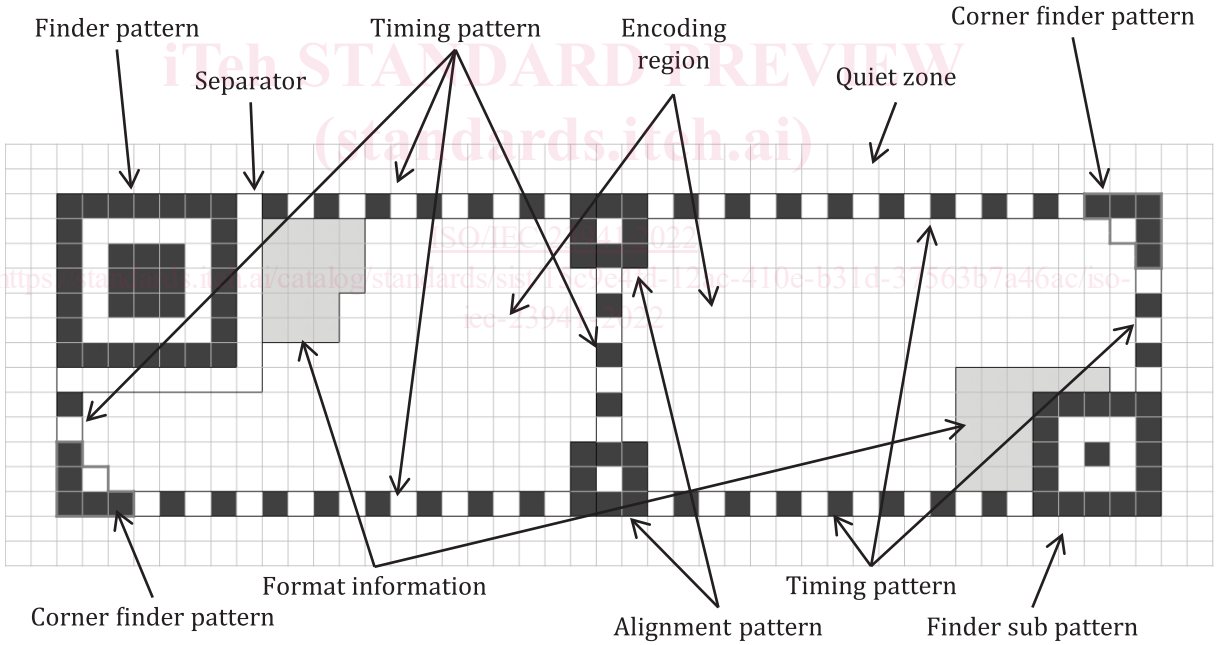

Figure 5 — Structure of Version R13x43 rMQR symbol

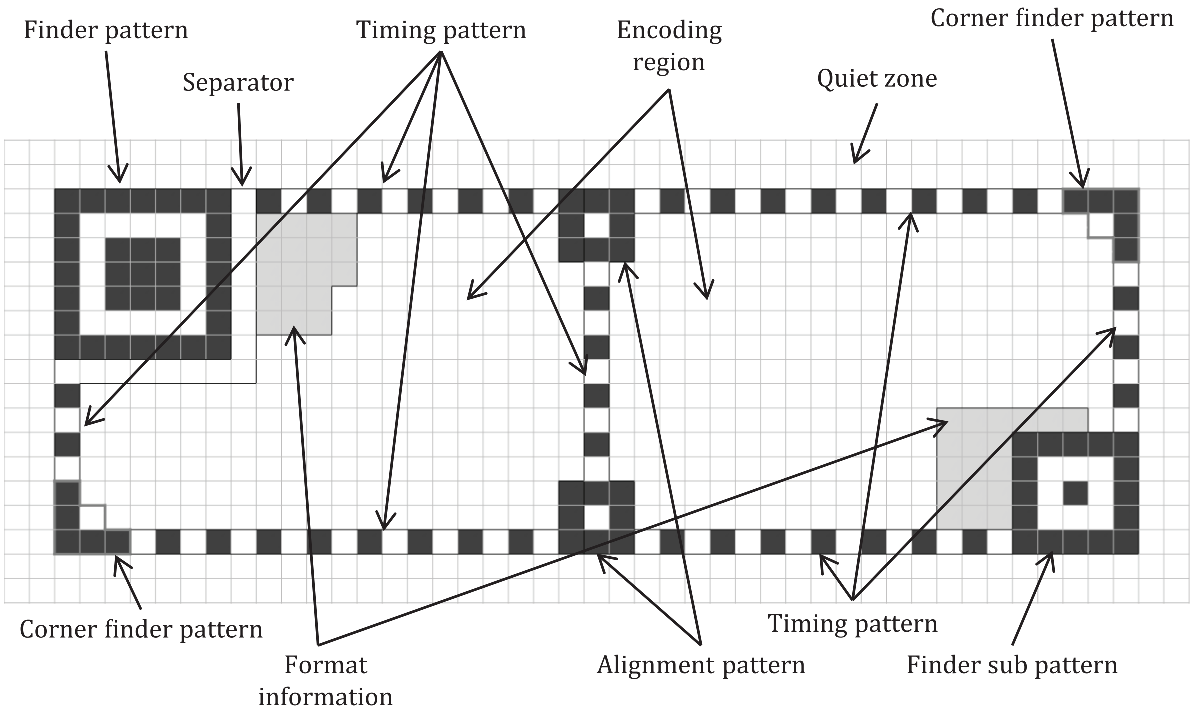

Figure 6 — Structure of Version R15x43 rMQR symbol

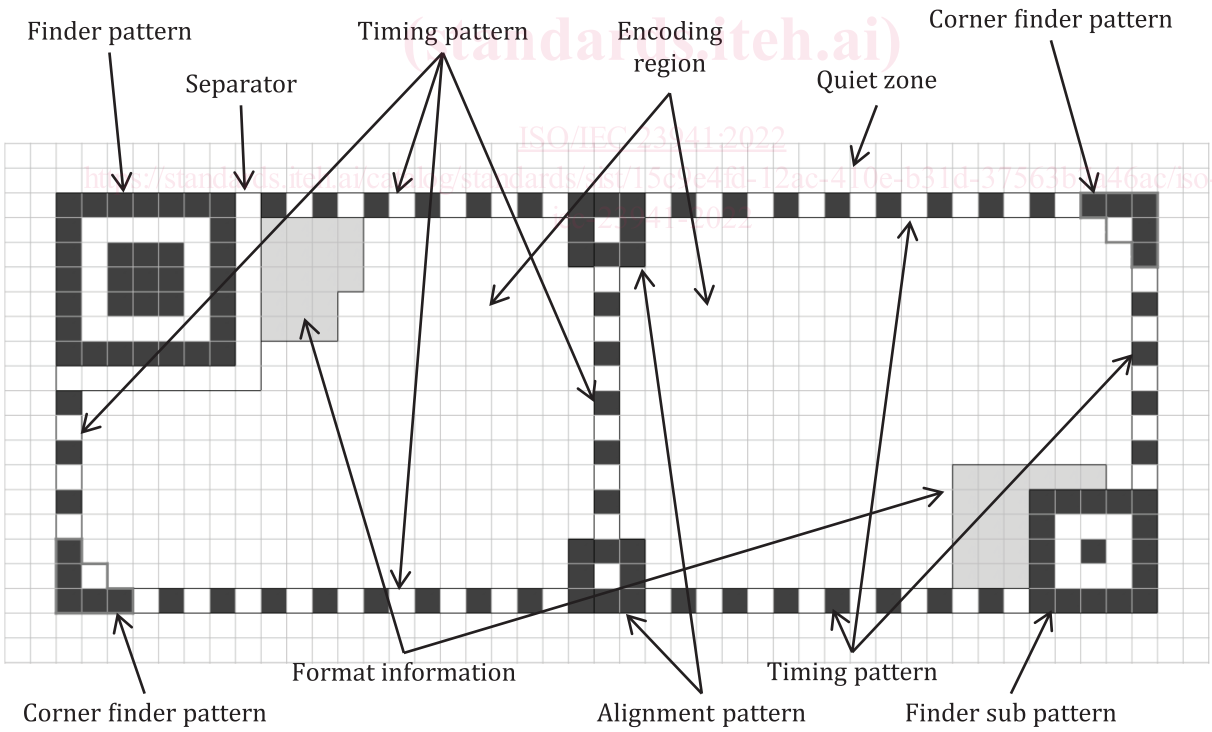

Figure 7 — Structure of Version R17x43 rMQR symbol

6.3.2 Symbol Versions and sizes

There are 32 sizes of rMQR symbol, referred to as Version R7x43 to R17x139. The vertical module has 6 sizes depending on the number of modules, e.g., 7, 9, 11, 13, 15, 17, and the horizontal module has 6 sizes depending on the number of modules, e.g., 27, 43, 59, 77, 99, 139. Table 1 shows code sizes for all versions. Figure 8 illustrates the structure of symbols with 11 vertical modules and 27 to 139

horizontal modules. Figure 9 illustrates the structure of symbols with 43 horizontal modules and 7 to 17 vertical modules.

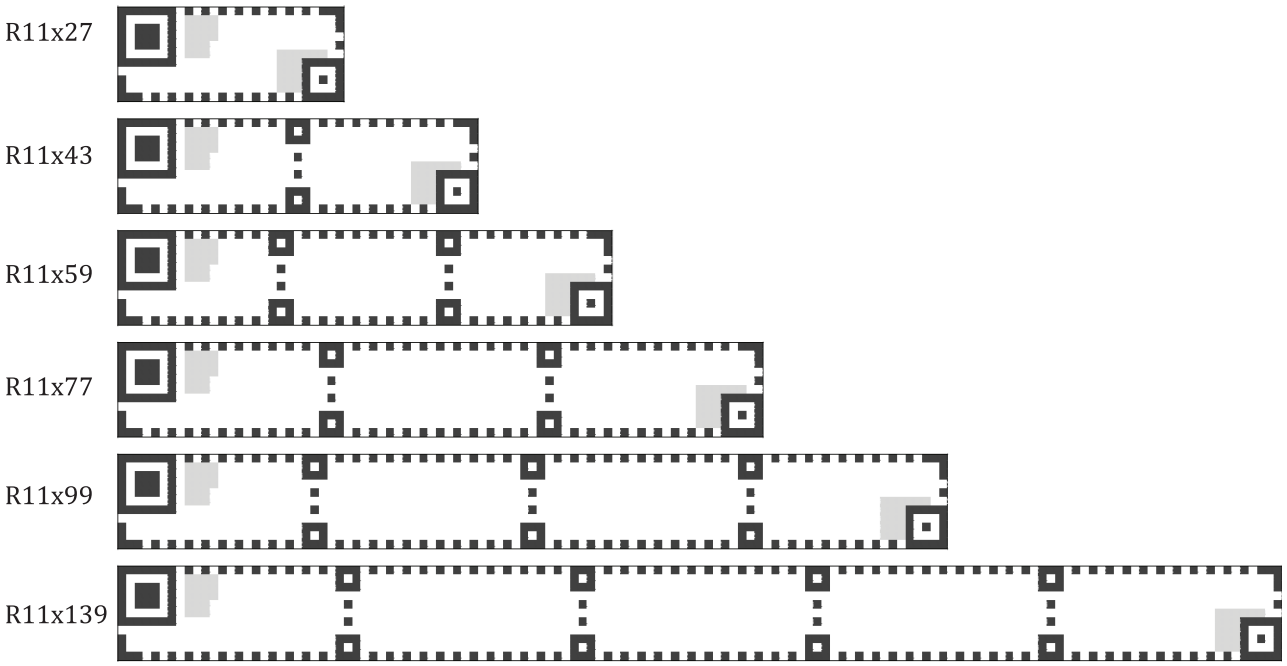

Figure 8 — rMQR symbols with 11 vertical modules and 27 to 139 horizontal modules

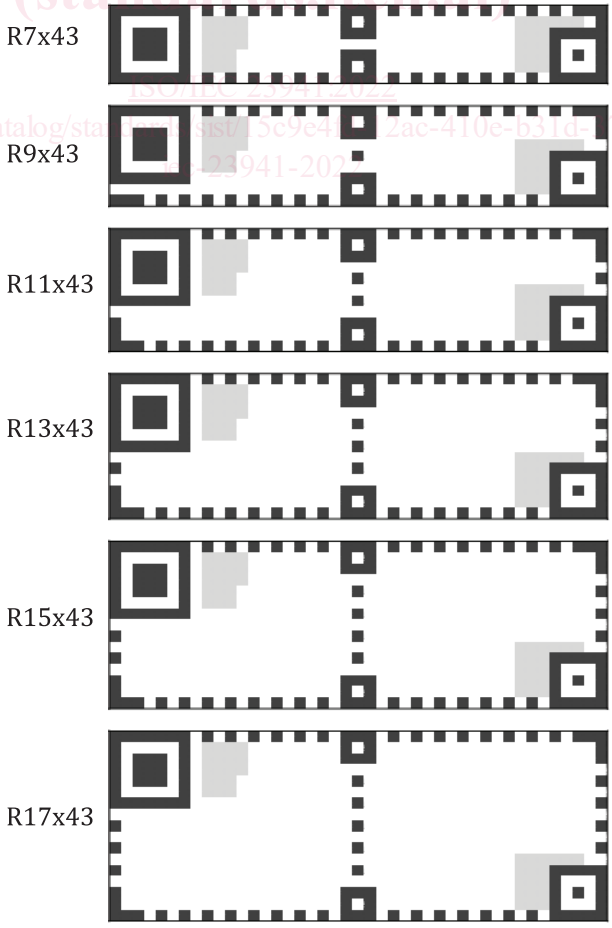

Figure 9 — rMQR symbols with 43 horizontal modules and 7 to 17 vertical modules