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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)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of technical committees is to prepare International Standards. Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member 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 shall not be held responsible for identifying any or all such patent rights.

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

Annexes A through G of this International Standard are normative; Annexes H through L are informative.

Introduction

Rectangular Micro QR Code (rMQR) is a matrix symbology. The symbols consist of an array of nominally square modules arranged in an overall rectangular pattern, including a unique finder pattern located 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 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 International Standard 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 Conformance

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

3 Normative references

The following standards, 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 and any later edition (including any amendments) will not apply. 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*

4 Terms and definitions

For the purpose of this document, the terms and definitions given in ISO/IEC 19762 and the following apply.

4.1
Character Count Indicator
bit sequence which defines the data string length in a mode

4.2
Encoding region
region of the symbol not occupied by function patterns and available for encoding of data and error correction codewords, and for format information

4.3
Format information
encoded pattern containing information on the error correction level and version applied to symbol characteristics, essential to enable the encoding region to be decoded

4.4
Function pattern
overhead component of the symbol (finder pattern, separator, timing patterns, alignment patterns, finder sub patterns and corner finder pattern) required for location of the symbol or identification of its characteristics to assist in decoding

4.5
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

4.6
Mode
method of representing a defined character set as a bit string

4.7
Mode Indicator
identifier indicating in which mode the following data sequence is encoded

4.8
Padding Bit
zero bit, not representing data, used to fill empty positions of the final codeword when converting the bit stream after data encoding process to codeword stream

4.9
Remainder Bit
zero bit, not representing data, used to fill empty positions of the symbol encoding region after the final symbol character, where the area of the encoding region does not divide exactly into 8-bit symbol characters

4.10
Remainder Codeword
Remainder 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 and error correction definitions

4.11
Segment
sequence of data encoded according to the rules of one ECI or encoding mode

4.12
Separator
function pattern of all light modules, one module wide, used to separate the finder pattern from the rest of the symbol

4.13
Terminator
bit pattern of defined number (depending on symbol) of all zero bits used to end the bit string representing data

4.14
Timing pattern
alternating sequence of dark and light modules enabling module coordinates in the symbol to be determined

4.15
Version
size of the symbol represented in terms of the number of modules in the vertical and horizontal axes. To indicate a symbol using versions, indicate Version R7x59 for example by putting the number of vertical and horizontal modules in order following R representing the rectangle

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

4.16
Version Indicator
five-bit identifier indicating symbol version used for a part of the format information

4.17
Error correction Level Indicator
one-bit identifier indicating error correction level used for a part of the format information

5 Mathematical and logical symbols, abbreviations and conventions

5.1 Mathematical and logical symbols

Mathematical symbols used in formulae and equations in this document are defined after the formula or equation in which they appear.

For the purposes of this document, the following mathematical operations apply.

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 $\oplus$.

5.2 Abbreviations

BCH Bose-Chaudhuri-Hocquenghem

ECI

RS Reed-Solomon

5.3 Conventions

5.3.1 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.

5.3.2 Byte notation

Byte contents are shown as hexadecimal (hex) values.

5.3.3 Version references

Symbol versions are referred to in the form Version $RC_V xC_H$-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 for vertical number of modules 13, horizontal number of modules 27 and 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).

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 are shown in Table 5.);

3) byte data (default: ISO/IEC 8859-1 (see Annex G); or other sets as otherwise defined (see 7.3.5));

4) Kanji characters. Kanji characters (Characters can be compacted into 13 bits (see 7.3.66))

b) Representation of data:

A dark module is nominally a binary one and a light module is nominally a binary zero. However, 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

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.

— Reflectance reversal

Symbols are intended to be read when marked so that the image is either dark on light or light on dark (see Figures 1). The specifications in this International Standard are based on dark images on a light background, therefore 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 International Standard 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.)

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

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 patterns, namely finder pattern, separator, timing patterns, alignment patterns, finder sub patterns and corner finder pattern.

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

Figure 2, Figure 3, Figure 4, Figure 5, Figure 6, and Figure 7 illustrate the structure of a Version R7x43, R9x43, R11x43, R13x43, R15x43 and R17x43 symbols respectively.

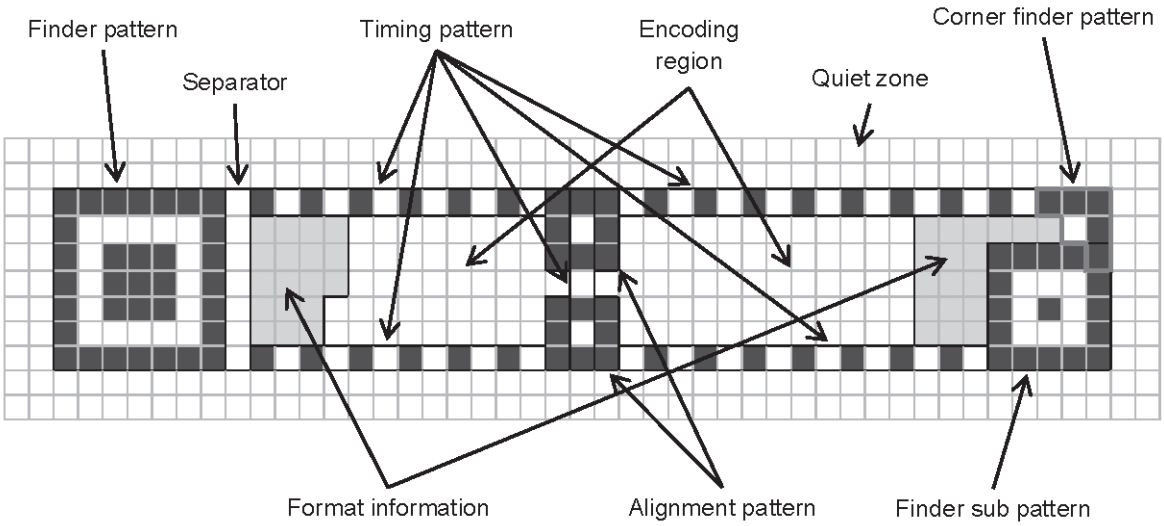

Figure 2 — Structure of Version R7x43 rMQR symbol

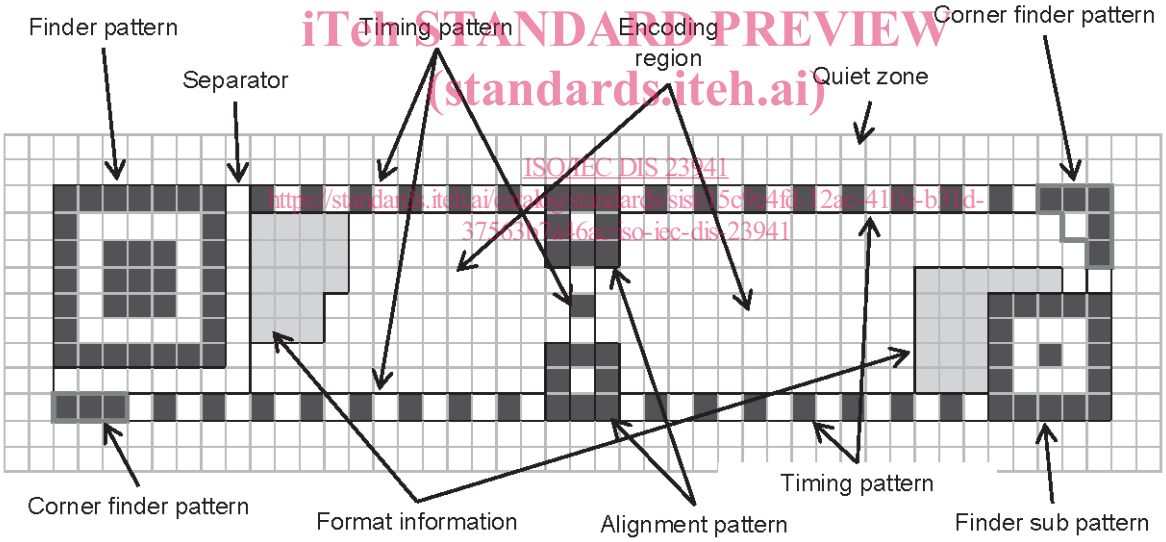

Figure 3 — Structure of Version R9x43 rMQR symbol

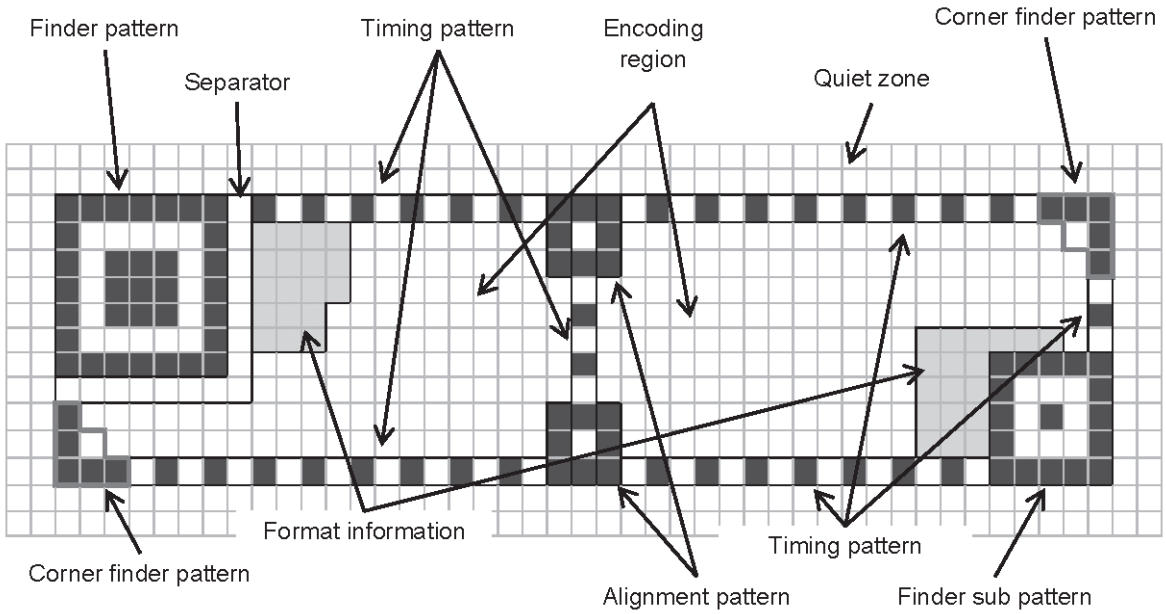

Figure 4 — Structure of Version R11x43 rMQR symbol

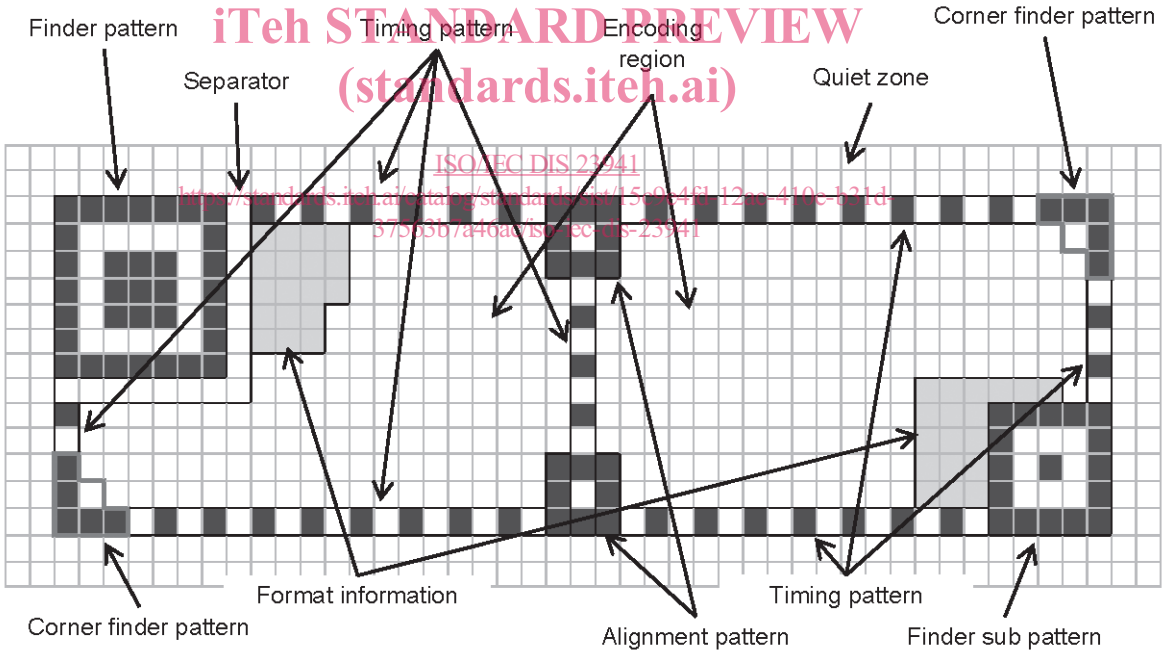

Figure 5 — Structure of Version R13x43 rMQR symbol

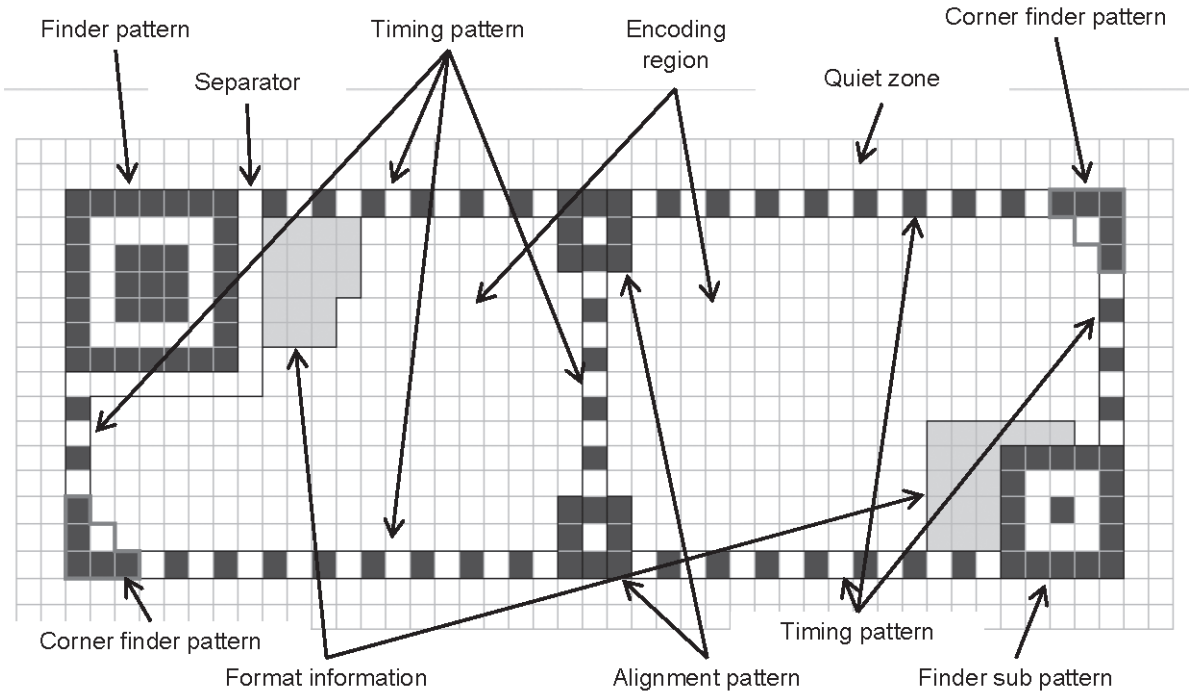

Figure 6 — Structure of Version R15x43 rMQR symbol

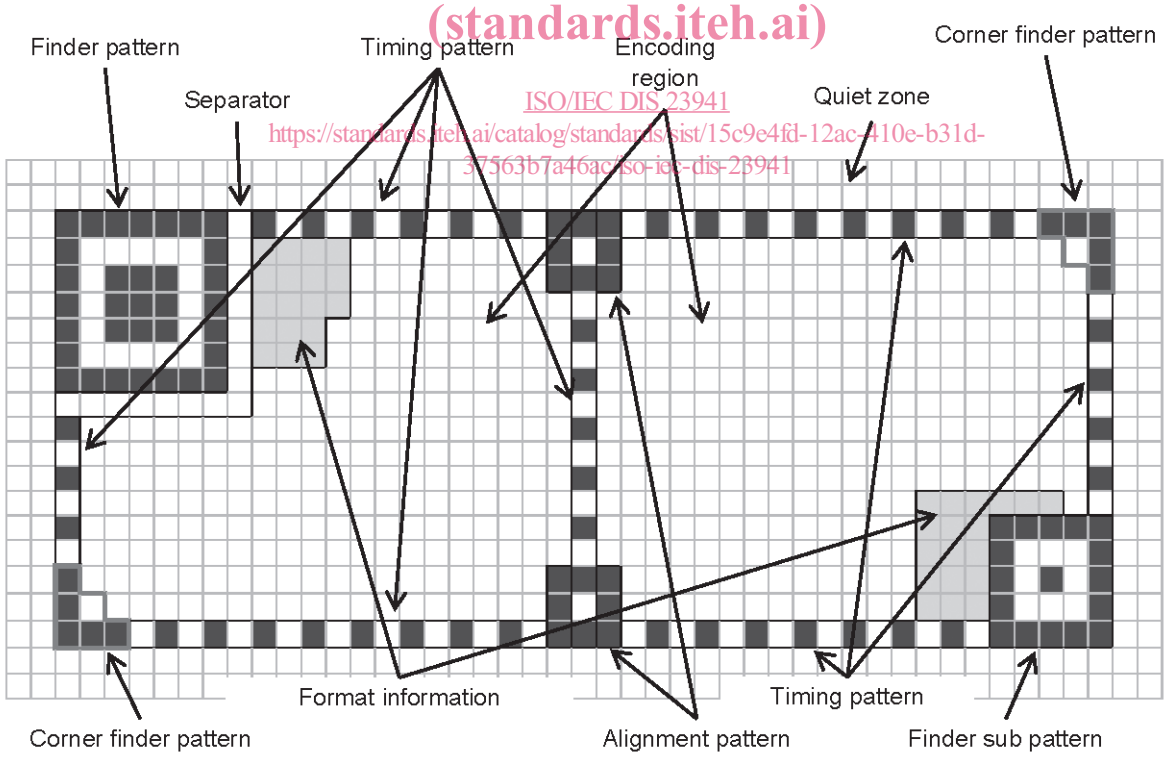

Figure 7 — Structure of Version R17x43 rMQR symbol

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