

# ISO/IEC 15415:2024-12 (E)

## Automatic identification and data capture techniques - Bar code symbol print quality test specification - Two-dimensional symbols

### Contents

Page

Foreword..... v

Introduction..... vi

**1 Scope..... 1**

**2 Normative references..... 1**

**3 Terms and definitions..... 1**

**4 Symbols and abbreviated terms..... 3**

4.1 Symbols..... 3

4.2 Abbreviated terms..... 3

**5 Quality grading..... 4**

5.1 General..... 4

5.2 Expression of quality grades..... 4

5.3 Symbol grade..... 4

5.4 Specifying the symbol grade requirement in an application specification..... 5

5.5 Reporting of symbol grade..... 5

5.6 Optical setup and obtaining the test images..... 6

5.6.1 General requirements..... 6

5.6.2 Convolution with the measuring aperture..... 7

5.6.3 Geometry of the optical setup..... 7

5.6.4 Inspection area..... 9

5.6.5 Measurement conditions..... 9

**6 Measurement methodology for two-dimensional multi-row bar code symbols..... 10**

6.1 General..... 10

6.2 Symbolologies with cross-row scanning ability..... 10

6.2.1 Basis of grading..... 10

6.2.2 Grade based on analysis of scan reflectance profile..... 10

6.2.3 Grade based on codeword yield..... 11

6.2.4 Grade based on unused error correction..... 12

6.2.5 Grade based on codeword print quality..... 13

6.2.6 Overall symbol grade..... 15

6.3 Symbolologies requiring row-by-row scanning..... 15

**7 Measurement methodology for two-dimensional matrix symbols..... 16**

7.1 Overview of methodology..... 16

7.2 Test images..... 16

7.2.1 Raw image..... 16

7.2.2 Reference grey-scale image..... 16

7.2.3 Binarised image..... 16

7.3 Reference reflectivity measurements..... 17

7.3.1 Application specification defines the aperture size..... 17

7.4 Grading procedure..... 17

7.5 Image assessment parameters and grading..... 18

7.5.1 Use of reference decode algorithm..... 18

7.5.2 Decode..... 18

7.5.3 Computing  $R_{max}$  and  $R_{min}$ ..... 18

7.5.4 Symbol contrast..... 19

7.5.5 Modulation and related measurements..... 19

7.5.6 Fixed pattern damage..... 22

7.5.7 Axial nonuniformity..... 22

7.5.8	Grid nonuniformity .....	23
7.5.9	Unused error correction .....	23
7.5.10	Print growth .....	24
7.5.11	Additional grading parameters .....	25
7.6	Symbol grade .....	25
<b>8</b>	<b>Measurement methodologies for composite symbologies .....</b>	<b>25</b>
<b>Annex A</b>	<b>(normative) Thresholding algorithm based on histogram .....</b>	<b>27</b>
<b>Annex B</b>	<b>(informative) Interpreting the scan and symbol grades .....</b>	<b>31</b>
<b>Annex C</b>	<b>(informative) Guidance on selecting grading parameters in application specifications .....</b>	<b>33</b>
<b>Annex D</b>	<b>(informative) Substrate characteristics .....</b>	<b>39</b>
<b>Annex E</b>	<b>(informative) Parameter grade overlay applied to two-dimensional symbologies .....</b>	<b>41</b>
<b>Annex F</b>	<b>(informative) Explanation of the main changes in this edition of this document .....</b>	<b>42</b>
<b>Bibliography</b>	<b>.....</b>	<b>45</b>