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Information technology — Automatic identification and data capture techniques — Direct Part Mark (DPM) Quality Guideline

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National foreword

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TECHNICAL REPORT

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Information technology — Automatic identification and data capture techniques — Direct Part Mark (DPM) Quality Guideline

Technologies de l'information — Techniques automatiques d'identification et de capture de données — Ligne directrice de qualité du marquage direct sur pièce (DPM)

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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.

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

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, when the joint technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example) it may decide to publish a Technical Report. A Technical Report is entirely informative in nature and shall be subject to review every five years in the same manner as an International Standard.

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.

ISO/IEC TR 29158 was prepared jointly by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 31, *Automatic identification and data capture techniques*.

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Introduction

Direct Part Marking (DPM) is a technology whereby, generally, an item is physically altered to produce two different surface conditions. This alteration can be accomplished by various means including, but not limited to, dot peen, laser, ink jet, and electro-chemical etch. The area of the alteration is called “the mark”. The area that includes the mark and background as a whole, when containing a pattern defined by a bar code symbology specification, is called “a symbol”.

When light illuminates a symbol, it reflects differently depending on whether it impinges on the background of the part or on the physical alteration. In most non-DPM bar code scanning environments, light is reflected off a smooth surface that has been coloured to produce two different diffuse reflected states. The DPM environment generally does not fit this model because the two different reflected states depend on at least one of the states having material oriented to the lighting such that the angle of incidence is equal to the angle of reflection. Sometimes the material so oriented produces a specular (mirror-like) reflectance that results in a signal that is orders of magnitude greater than the signal from diffuse reflectance.

In addition, from the scanner point-of-view, some marking and printing methods generate dots and are not capable of producing smooth lines.

Current specifications for matrix symbologies and two-dimensional print quality are not exactly suited to reading situations that have either specular reflection or unconnected dots or both. This is intended to act as a bridge between the existing specifications and the DPM environment in order to provide a standardized image-based measurement method for DPM that is predictive of scanner performance.

As with all symbology and quality standards, it is the responsibility of the applicator to define the appropriate parameters of this guideline for use in conjunction with a particular application.

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Information technology — Automatic identification and data capture techniques — Direct Part Mark (DPM) Quality Guideline

1 Scope

This Technical Report is an engineering document intended for verifier manufacturers and application specification developers.

This Technical Report describes modifications which are to be considered in conjunction with the symbol quality methodology defined in ISO/IEC 15415 and a symbology specification. It defines alternative illumination conditions, some new terms and parameters, modifications to the measurement and grading of certain parameters, and the reporting of the grading results.

This Technical Report was developed to assess the symbol quality of direct marked parts, where the mark is applied directly to the surface of the item and the reading device is a two-dimensional imager.

When application specifications allow, this method may also be applied to symbols produced by other methods. This is appropriate when direct part marked (DPM) symbols and non-DPM symbols are being scanned in the same scanning environment. The symbol grade is reported as a DPM grade rather than as an ISO/IEC 15415 grade.

2 Normative references

The following referenced documents are indispensable for the application 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 15415, *Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Two-dimensional symbols*

ISO/IEC 15416, *Information technology — Automatic identification and data capture techniques — Bar code print quality test specification — Linear 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)*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 15415, ISO/IEC 15416, ISO/IEC 19762-1, ISO/IEC 19762-2 and the following apply.

3.1
MLcal
mean of the light lobe from a histogram of the calibrated standard

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3.2
MLtarget
mean of the light lobe from the final grid-point histogram of the symbol under test

3.3
reference symbol
high-contrast printed calibration card

EXAMPLE The GS1 Data Matrix calibrated conformance standard test card.

3.4
Rcal
reported reflectance value, Rmax, from a calibration standard

3.5
Rtarget
measured percent reflectance of the light elements of the symbol under test relative to the calibrated standard

3.6
SRcal
system response parameters (such as exposure and/or gain) used to create an image of the calibration standard

3.7
SRtarget
system response parameters (such as exposure and/or gain) used to create an image of the symbol under test

3.8
stick
line segment comprised of image pixels that is used to connect areas of the same colour that are near to each other

3.9
T1
threshold created using a histogram of the defined grey-scale pixel values in a circular area twenty times the aperture size in diameter, centred on the image centre using the algorithm defined in Annex A

3.10
T2
threshold created using the histogram of the reference grey-scale image pixel values at each intersection point of the grid using the method defined in Annex A

4 Abbreviated terms

CM Cell Modulation

CC Cell Contrast

FPD Fixed pattern damage

LED Light emitting diode

MD MeanDark

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