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Photography — Archiving systems — Imaging systems quality analysis —

Part 1: Reflective originals

Photographie — Systèmes d'archivage — Analyse de la qualité des systèmes d'image —

Partie 1: Documents réfléchissants

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Contents

Page

Foreword ... **iv**
Introduction ... **v**
1 Scope ... **1**
2 Normative references ... **1**
3 Terms and definitions ... **1**
4 System setup and calibration ... **6**
4.1 General ... 6
4.2 System configuration ... 6
4.3 Camera/scanner settings ... 6
4.4 Exposure ... 6
4.5 White balancing ... 6
4.6 ICC Profiling ... 7
4.7 Focusing ... 7
4.8 Colour encoding ... 7
4.9 Reproduction scale ... 8
5 Imaging system quality analysis procedure ... **8**
6 Imaging systems quality characteristics and metrics ... **8**
6.1 General ... 8
6.2 Tones and noise ... 9
6.3 Colour ... 11
6.4 Details ... 13
6.5 Geometry ... 14
7 Reporting results ... **15**
7.1 General ... 15
7.2 Example report for tone reproduction results ... 16
7.3 Gain modulation ... 17
7.4 Dynamic range ... 19
7.5 Noise ... 19
7.6 Banding ... 20
7.7 Defect pixels ... 22
7.8 White balance ... 22
7.9 Colour reproduction ... 23
7.10 Colour mis-registration ... 24
7.11 Sampling rate ... 24
7.12 Resolution ... 24
7.13 MTF 50/MTF 10 ... 24
7.14 Sharpening ... 24
7.15 Acutance ... 24
7.16 Lightness non-uniformity ... 24
7.17 Chrominance non-uniformity ... 24
7.18 Distortion ... 24
7.19 Reproduction scale ... 24
Annex A (normative) **Test chart requirements** ... **25**
Annex B (informative) **Guidelines for imaging performance aims and tolerances** ... **27**
Annex C (informative) **Example of multi-pattern chart: Universal Test Target (UTT)** ... **29**
Bibliography ... **49**

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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.

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 ISO documents 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 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 of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 42, *Photography*.

This first edition of ISO 19264-1 cancels and replaces the first edition of ISO/TS 19264-1, which has been technically revised.

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.

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Introduction

Electronic imaging systems, such as scanners and cameras, can be used for digitizing physical records, e.g. documents, pictures, maps. The resulting digital images can be more or less accurate in terms of how well they reproduce the original record's tones, colours, details, etc. These and other characteristics of a digital image can be assessed by imaging systems' quality analysis. In general, the achievable accuracy of digital reproductions depends on the nature of the original record and the digitization, especially the performance of the imaging system and the applied system settings.

In some organizations, e.g. within the archiving and cultural heritage field, where considerable resources are put into digitization projects, it is key to ensure that the required imaging systems' quality is met and that it is consistent. To this end, imaging systems' quality analysis can assist those developing or acquiring imaging systems with the assessment and verification of system performance, such as the specified resolution and dynamic range of a scanner, and the comparative performance of different imaging systems. Imaging systems' quality analysis is also used for setting up and calibrating imaging systems as well as for enhancing their performance. Finally, imaging systems' quality analysis is used for assessing accuracy and controlling imaging consistency over time. Note, that while the need to ensure imaging systems' quality is generic, the required level of imaging systems' quality and accuracy is use-case specific. For example, when digitizing watercolours it is usually essential to reach a high degree of accuracy in the capture of the colour information, while this is not normally equally critical when digitizing newspapers. Also, some image processing programs, such as Optical Character Recognition (OCR), are more accurate if the contrast is enhanced during imaging.

In practice, imaging systems' quality is analysed by digitizing a physical reference target (test chart) with known (measured) values and comparing these reference values to the corresponding captured values represented in the digital image file (see Figure 1).

The use of a test chart ensures that the imaging systems' quality characteristics can be determined objectively. However, to be usable the quality of the target needs to exceed the performance of the imaging system. For example, to determine the resolution of an imaging system, the target needs to have a technical pattern with more details than the system is capable of resolving. Imaging systems' quality analysis reports how accurately the imaging system reproduces the reference target. Therefore, if the original record differs significantly from the target, e.g. with respect to tone, tonal range, colours, details, and light reflectance/absorbance, this may, in spite of a well performing system, compromise the accuracy of the reproduced image. See also References [29] and [32] Ideally, the targets should resemble the nature of the original material. However, given the many different types of original records this is often not practical or technically impossible. Even though systems may perform differently on the different types of originals this document provides tools to verify if a system is accurately calibrated and in general performs well on a selected type of original. This is sufficient in most cases because systems are usually designed to handle various types of originals (being close to the Luther condition[42]) Performance on specific types of originals however can only be verified if the tools are made of that material. It is also important to note that an accurate reproduction usually requires subsequent processing to render a visually pleasing image.

There are ISO standards for objectively measuring different performance characteristics of imaging systems, e.g. resolution, noise, dynamic range, tone and colour reproduction (see Clause 2). This document combines all of the standards that relate to the imaging systems quality analysis for cultural heritage and defines a tool set to apply them to these devices and workflows. These tools are based on the use of a test chart with multiple technical patterns coupled with software that allows the user to analyse several imaging systems' quality characteristics simultaneously and receive comprehensive results. However, these tools are not based on a standardized image quality analysis method, which has caused confusion among users. With the publication of this specification imaging systems' quality analysis tools can refer to an ISO document.

To support this document a standard with a glossary including all relevant terms and definitions has been developed (ISO 19262). Further this document is accompanied by a Technical Report (ISO/TR 19263-1) that provides practical guidance on how to use this document.

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Photography — Archiving systems — Imaging systems quality analysis —

Part 1: Reflective originals

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1 Scope

This document describes a method for analysing imaging systems quality in the area of cultural heritage imaging. The method described analyses multiple imaging systems quality characteristics from a single image of a specified test target. The specification states which characteristics are measured, how they are measured, and how the results of the analysis need to be presented.

This specification applies to scanners and digital cameras used for digitization of cultural heritage material.

NOTE This document addresses imaging of reflective originals, a future part two will address imaging of transparent originals.

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 12233, *Photography — Electronic still picture imaging — Resolution and spatial frequency responses*

ISO 14524, *Photography — Electronic still-picture cameras — Methods for measuring opto-electronic conversion functions (OECFs)*

ISO 15739, *Photography — Electronic still-picture imaging — Noise measurements*

ISO 16067-1, *Photography — Spatial resolution measurements of electronic scanners for photographic images — Part 1: Scanners for reflective media*

ISO 17957, *Photography — Digital cameras — Shading measurements*

ISO 21550, *Photography — Electronic scanners for photographic images — Dynamic range measurements*

ISO/CIE 11664-4, *Colorimetry — Part 4: CIE 1976 L*a*b* colour space*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

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