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Graphic technology and photography — Viewing conditions

Technologie graphique et photographie — Conditions d'examen visuel

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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 document 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).

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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*, in collaboration with Technical Committee ISO/TC 130, *Graphic technology*.

This fourth edition cancels and replaces the third edition (ISO 3664:2009), which has been technically revised.

The main changes are as follows:

— adding new viewing conditions P3/P4 for prints using CIE standard illuminant D50 with UV excluded;

— changing some tolerances according to the advance in lighting technology;

— introduced a colour fidelity index in response to the spread of LED lighting;

— removing the conditions for appraisal of image displayed on colour monitor.

This revision of ISO 3664:2009 meets the current needs of the Graphic Technology and Photographic industries and minimizes differences between viewing equipment. It is noted that this revision contains multiple specifications, each of which is appropriate to specific requirements. Users need to ensure that they employ the specification which is appropriate to their application.

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.

Introduction

While colour and density measurements play important roles in the control of colour reproduction, they cannot replace the human observer for final assessment of the quality of complex images. Colour reflection artwork, photographic transparencies, photographic prints, and photomechanical reproductions such as on-press and off-press proofs, or press sheets, are commonly evaluated for their image and colour quality, or compared critically with one another for fidelity of colour matching. Paper and other substrates contribute to the colour appearance and controlling the colour of these is equally critical. However, it is noted that other industries, such as the textile industry and the paper industry for unprinted paper, have their own set of international standards which differ in illumination conditions from those recommended in this document.

There is no doubt that the best viewing condition for the visual assessment of colour is that in which the product will be finally seen. Where this is known, and it is practical to do so, the various people in the production chain can agree to use this viewing condition for all evaluation and comparison. However, it is important that this is properly agreed upon in advance and that it is specified that such a viewing condition is not ISO-defined.

Unfortunately, such agreement is often not practical. Even if a particular end-use condition is known, it can be impractical to provide everybody in the production chain with sufficiently consistent viewing apparatus. Differences in illumination and viewing conditions can cause corresponding differences in the colour appearance of substrates, reproductions, and artwork. Such differences are likely to cause misunderstandings about colour reproduction and processing. This document provides specifications for illumination and viewing conditions that, when properly implemented, will reduce errors and misunderstandings caused by such deficiencies and inconsistencies.

The illumination used to view colour photographic prints, photomechanical reproductions, and transparencies needs to provide adequate amounts of radiant power from all parts of the spectrum to avoid distorting their appearance from that observed under natural sources of illumination such as daylight. The ultraviolet content is important where fluorescent samples, which are excited in this region, are encountered and where the intended viewing environment includes UV; a phenomenon associated with many of the paper substrates on which images are reproduced as well as with some of the dyes and pigments themselves.

To ensure consistency with previous editions of this document, as well as most of the equipment in current use, reference spectral power distributions specified in this document are based on CIE standard illuminant D50. Many of the reasons for the selection of CIE standard illuminant D50 in the first edition in 1974, as opposed to any other CIE daylight illuminant, are equally applicable today. In this edition, the illumination conditions of CIE standard illuminant D50 excluding the UV component are newly added as viewing conditions P3 and P4 for prints. In practice, P3 and P4 can be achieved by turning off the energy below 420 nm to meet the P1 and P2 requirements.

Since the third edition was published, technological innovations have greatly improved the lighting quality of LED lamps and lowered their cost. The Minamata Convention on Mercury came into effect in 2017, and efforts to reduce the amount of mercury used have been promoted worldwide. Many manufacturers have discontinued producing fluorescent lamps that use mercury and so the fluorescent lamps used for indoor lighting have been rapidly replaced by LED lamps. Modern LED lamps have been commercially developed which contain a short wavelength (440 nm to 470 nm) LED pump source and a broadband long wavelength fluorescent emitter that together can produce a range of white lamp lights. Such sources contain very little radiation that excites optical brightening agents used in most modern papers that serve as the substrates for the printing of images for signs, packages, labels and publications. Therefore, in the case of print products viewed in an indoor environment, optical brightening agents contained in the substrate don't fluoresce significantly. For print products that are expected to be used in such an environment, colour evaluations with the M1 measurement condition of ISO 13655 and visual assessments under the P1/P2 reference viewing conditions (CIE standard illuminant D50) of this document overestimate the effect of fluorescence compared to that observed in the expected viewing environment. The P3/P4 reference viewing conditions (CIE standard illuminant D50 excluding UV) are designed to evaluate print products that are expected to be mainly viewed in an indoor environment. These viewing conditions correspond to the M2 measurement condition of ISO 13655. Just as visual (colorimetric) assessments under P1/P2 conditions are consistent with M1 measurements, visual assessments under P3/P4 conditions are consistent with M2 measurements.