INTERNATIONAL STANDARD

ISO 18937

First edition
2014-02-01

Imaging materials — Photographic reflection prints — Methods for measuring indoor light stability

Matéruaux pour l'image — Tirages photographiques par réflexion — Méthodes de mesure de la stabilité de la lumière en intérieur

Reference number
ISO 18937:2014(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

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. 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. 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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 42, *Photography*.

Introduction

This International Standard addresses the methods and procedures for measuring the indoor light stability of reflection colour photographs.[6][8][9][18]–[23][30]

The length of time that such photographs are to be kept can vary from a few days to many hundreds of years and the importance of image stability can be correspondingly small or great. Often the ultimate use of a particular photograph might not be known at the outset. Knowledge of the useful life of colour photographs is important to many users, especially since stability requirements can vary depending upon the application.

The images of most modern analog and digitally-printed colour photographs are made up of cyan, magenta, yellow, red, green, blue, orange, black, gray, white or other colourants. Colour photographic images typically fade during storage and display; they will usually also change in colour balance because the various image colourants seldom fade at the same rate. In addition, a yellowish (or occasionally other colour) stain can form and physical degradation might occur, such as embrittlement and cracking of the support and image layers. The rate of fading and staining can vary appreciably and is governed principally by the intrinsic stability of the colour photographic material and by the conditions under which the photograph is stored and displayed. The quality of any chemical processing is another important factor. Post-processing treatments and, in the case of digitally generated photographs, post-production treatments, such as application of lacquers, plastic laminates, and retouching colours, also can affect the stability of colour materials.

The light stability of colour photographs is influenced primarily by the intensity of the illumination, the duration of exposure to light, the spectral distribution of the illumination, and the ambient temperature and humidity conditions. However, the normally slower dark fading and staining reactions also proceed during display periods and will contribute to the total change in image quality. Ultraviolet radiation is particularly harmful to some types of colour photographs and can cause rapid fading as well as degradation of plastic layers such as the pigmented polyethylene layer of RC (resin-coated) paper supports.

Information about the light stability of colour photographs can be obtained from accelerated light stability tests. These require special test units equipped with high-intensity light sources in which test strips can be exposed for days, weeks, months, or even years, to produce the desired amount of image fading (or staining). The temperature of the sample prints and their moisture content needs to be controlled throughout the test period, and the types of light sources need to be chosen to yield data that can be correlated satisfactorily with those obtained under conditions of normal use.

Accelerated light stability tests for predicting the behaviour of photographic colour images under normal display conditions might be complicated by “reciprocity failure”. When applied to light-induced fading and staining of colour images, reciprocity failure refers to the failure of a colourant to fade, or to form stain, equally when irradiated with high-intensity versus low-intensity light, even though the total light exposure (intensity × time) is kept constant through appropriate adjustments in exposure duration. The extent of colourant fading and stain formation can be greater or smaller under accelerated conditions, depending on the photochemical reactions involved in the colourant degradation, on the kind of colourant dispersion, on the nature of the binder material, and on other variables. For example the supply of oxygen, which can diffuse into a photograph’s image-containing layers from the surrounding atmosphere, can be restricted in an accelerated test (dry gelatine, for example, is an excellent oxygen barrier). This can change the rate of colourant fading relative to the fading that would occur under normal display conditions. The magnitude of reciprocity failure can also be influenced by the temperature and moisture content of the test sample prints. Furthermore, light fading can be influenced by the pattern of irradiation (continuous versus intermittent) as well as by light/dark cycling rates (see Annex A).

Imaging materials — Photographic reflection prints — Methods for measuring indoor light stability

1 Scope

This International Standard describes test equipment and procedures for measuring the light stability of images of colour photographic reflection prints designed for display in, for example, houses, apartments, other dwelling places, offices and commercial display, when subjected to certain illuminants at specified temperatures and relative humidities. This International Standard also addresses colour photographic reflection prints designed for display in galleries and museums.

Indoor illumination conditions described in this International Standard include a) simulated indoor daylight typical home display, b) simulated direct sunlight in-window display, c) fluorescent illumination using "cool white", and d) other types of illumination sources, such as other fluorescent lamps, tungsten halogen, LED, OLED and metal halide lamps.

This International Standard is applicable to reflection colour prints made with colour hardcopy materials. Included are inkjet prints, thermal dye diffusion transfer ("dye-sub") prints, liquid- and dry-toner electrophotographic prints, prints made with traditional chromogenic ("silver-halide") photographic colour materials and, in general, all types of colour prints made with direct analog and digital print processes. The recommended evaluation methods can also be applied to black-and-white photographic prints.

This International Standard does not include test procedures for determining the effects of light exposure on the physical stability of images, supports or binder materials. However, it is recognized that in some instances, physical degradation, such as support embrittlement, image layer cracking or delamination of an image layer from its support, rather than the stability of the image itself, will determine the useful life of a print material.

Print image stability results determined for one printer model, software settings, colourant and media combination might not be applicable to image prints produced through another printer model, software settings, colourant and media combination.

2 Normative references

The following documents, 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. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 5-3, *Photography and graphic technology — Density measurements — Part 3: Spectral conditions*

ISO 5-4, *Photography and graphic technology — Density measurements — Part 4: Geometric conditions for reflection density*

ISO 2471, *Paper and board — Determination of opacity (paper backing) — Diffuse reflectance method*

ISO 4892-1, *Plastics — Methods of exposure to laboratory light sources — Part 1: General guidance*

ISO 4892-2, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 9370, *Plastics — Instrumental determination of radiant exposure in weathering tests — General guidance and basic test method*

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

ISO 13655, *Graphic technology — Spectral measurement and colorimetric computation for graphic arts images*

ISO 18913, *Imaging materials — Permanence — Vocabulary*

ISO/TR 18931, *Imaging materials — Recommendations for humidity measurement and control*

ISO 18941, *Imaging materials —Colour reflection prints — Test method for ozone gas fading stability*

ISO 18944, *Imaging materials — Reflection colour photographic prints — Test print construction and measurement*

CIE S 023/E:2013, *Characterization of the Performance of Illuminance Meters and Luminance Meters*

ASTM G113, *Standard Terminology Relating to Natural and Artificial Weathering Tests of Nonmetallic Materials*

ASTM G151, *Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices that Use Laboratory Light Sources*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18913 and the following apply.

NOTE In any case where the terms and definitions are duplicated with ISO 18913, the following terms and definitions take precedence for the use of this International Standard.

3.1
operational control point
set point for equilibrium conditions measured at one or more sensor locations in an exposure device

[SOURCE: ASTM G 113-09, 3.2]

3.2
operational fluctuations
positive and negative deviations from the setting of the sensor at the operational control set point during equilibrium conditions in a laboratory accelerated weathering device

[SOURCE: ASTM G 113-09, 3.3]

Note 1 to entry: Operational fluctuations are the result of unavoidable machine variables and do not include measurement uncertainty. Operational fluctuations apply only at the location of the control sensor and do not imply uniformity of conditions throughout the test chamber.

3.3
operational uniformity
range around the operational control point for measured parameters within the intended exposure area within the limits of the intended operational range

[SOURCE: ASTM G 113-09, 3.6]

Note 1 to entry: Operational uniformity evaluates the measured parameters throughout the volume of a test chamber so that regions of the test chamber volume can be determined to comply within the required stated limits of the measured parameter operating aim.

3.4
uncertainty of measurement
parameter, associated with the result of a measurement, that characterizes the dispersion of the values that could be reasonably attributed to the measurement

Note 1 to entry: The parameter might be, for example, a standard deviation (or a given multiple of it), or the half-width of an interval having a stated confidence level.

