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

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

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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 (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 on 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 the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO 18937:2014), which has been technically revised. The main changes compared to the previous edition are as follows:

— Removal of non-xenon light sources;

— Removal of non-essential verbiage to improve method clarity;

— Inclusion of annex on actual sample temperature measurements during exposure;

— Inclusion of continuous phase test for in-window display conditions.

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

This document addresses the methods and procedures for measuring the indoor light stability of photographic reflection prints[3]–[5][11]–[16][20].

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 may not be known at the outset. Knowledge of the lightfastness level of colour photographs is important to manufacturers to improve print materials and to many users, especially since stability requirements may vary depending upon the application.

The images of most modern analogue and digitally-printed colour photographs are made up of cyan, magenta, yellow, red, green, blue, orange, black, grey, 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 may form and physical degradation may 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. For silver halide prints, the quality of any chemical processing is another important factor. Post processing treatments and post-production treatments, such as application of lacquers, plastic laminates, and retouching colours, also may affect the stability of colour materials.

The light stability of colour photographs is influenced primarily by the intensity of the radiation/light source, the duration of exposure to light, the relative spectral irradiance of the light source, 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 the underlying substrate. 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 required amount of image fading (or staining). The temperature and moisture content of the specimen prints should be directly or indirectly controlled throughout the test period, and the types of light sources should 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 may 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 that can diffuse into a photograph’s image-containing layers from the surrounding atmosphere may be restricted in an accelerated test (dry gelatine, for example, is an excellent oxygen barrier). This may change the rate of colourant fading relative to the fading that would occur under normal display conditions. The magnitude of reciprocity failure may also be influenced by the temperature and moisture content of the test specimen prints. Furthermore, light fading may 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 document describes test equipment and procedures for measuring the light stability of colour photographic reflection prints designed for display, when subjected to a filtered xenon-arc light source simulating daylight through windows at specified temperatures and relative humidity.

This document is applicable to photographic reflection prints, made with analogue and digital print processes. The recommended test methods can be applied to both colour and black-and-white photographic prints.

This test method assesses colour and density change.

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 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 18913, *Imaging materials — Permanence — Vocabulary*

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*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 18913 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/

4 Requirements and limitations

This document specifies a set of recommended test methods with associated requirements for permitted reporting. Data from these tests shall not be used to make life expectancy claims, such as time-based print lifetime claims, either comparative or absolute. Conversion of data obtained from these methods for the purpose of making public statements regarding product life shall be in accordance with the applicable documents for specification of print life.

The test methods in this document may be useful as stand-alone test methods for the absolute or comparative stability of image materials with respect to colour fading or measurement of physical properties. Caution shall be used when comparing test results for different materials. Comparisons shall be limited to test cases using test apparatus with matching specifications and matching test conditions.