

Imaging materials — Processed silver-gelatin type black-and-white films — Specifications for stability

ICS 37.040.20

National foreword

This British Standard reproduces verbatim ISO 18901:2002 and implements it as the UK national standard. It supersedes BS ISO 10602:1995 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee CPW/42, Photography, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

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Imaging materials — Processed silver-gelatin type black-and-white films — Specifications for stability

Matériaux pour l'image — Film noir et blanc de type gélatino-argentique traité — Spécifications relatives à la stabilité



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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.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

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

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 18901 was prepared by Technical Committee ISO/TC 42, *Photography*.

This first edition cancels and replaces the second edition of ISO 10602, of which it constitutes a technical revision.

This International Standard is one of a series of International Standards dealing with the physical properties and stability of imaging materials. To facilitate identification of these International Standards, they are assigned a number within the block from 18900 to 18999 (see annex A).

Annexes A to F of this International Standard are for information only.

Introduction

Since 1930, great advances have been made in the use of photographic films for the preservation of records. The preservation of film records by governments, banks, insurance companies, industry and other enterprises has been stimulated by a recognition of the economies in storage space, organization, accessibility and ease of reproduction that result from the use of film records.

During the early development period of the art of copying documents, 35-mm nitrate motion-picture film was sometimes used. This material is highly flammable and is not a safety film as specified in ISO 18906. Nitrate film is not acceptable for any record film. The manufacture of nitrate film declined after World War II and was discontinued in most countries in the 1950s.

From about 1908 to 1956, the only safety type film bases in commercial use were cellulose acetate, cellulose acetate propionate and cellulose acetate butyrate. The useful life of these cellulose-ester type bases is somewhat conjectural because of limited practical experience. However, the results of laboratory incubation tests indicate a useful life of at least 100 years when cellulose-ester base films are stored under recommended conditions (see [1], [2], [3], [4] in the bibliography).

A second type of polymer safety film base was introduced commercially in 1956. This is a polyester class material whose chemical name is polyethylene terephthalate. [Another type of polyester base, known as polyethylene naphthalate, has been used for APS (Advanced Photo System) type films since 1996.] Polyester base has several advantages over cellulose-ester base, including greater strength, stiffness, tear resistance and dimensional stability which are important in many photographic applications (see [5], [6] in the bibliography). Accelerated ageing tests supplemented by 35 years of practical experience indicate a potential useful life of 500 years.

This International Standard provides image stability predictions for three classes of black and white films in terms of LE (life expectancy) ratings. These three classes are radiographic films, microfilms and all other films. Two or three LE ratings are given for each of these film classes, depending on their residual thiosulfate concentrations.

Studies on the stability of silver-gelatin-type films have investigated the effect of residual hypo on the image permanence of radiographic films, microfilms and aerial films (see [7], [8], [9] respectively in the bibliography). This work suggested modifications to the residual hypo limits and a more quantitative image-stability test was included in the first edition of ISO 10602. Residual hypo limits and image-stability tests are now included for all film categories.

This International Standard identifies certain hazards to permanence attributable to the chemical or physical characteristics of processed film and gives methods of evaluating them. Some of these are inherent film characteristics, some are related to the chemical processing procedure and some are influenced by both factors. However, storage conditions also can have a pronounced influence on film permanence. The essential requirements for longevity are proper storage temperature and humidity as well as protection from the hazards of fire, water, fungus, and atmospheric pollutants. Proper storage conditions are specified in ISO 18902 and ISO 18911.

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1 Scope

This International Standard establishes the specifications for photographic films intended for the storage of records.

It is applicable specifically to films with a base of safety cellulose ester or polyester having silver-gelatin emulsions, processed to produce a black-and-white silver image by negative or full-reversal processing. It applies to film processed by a monobath, which includes thiosulfate as the fixing agent, followed by a conventional wash. It also is applicable to silver films given a stabilizing treatment by partial or full conversion to silver sulfide, silver selenide or gold.

This International Standard is applicable to films having ultrasonic or dielectric (induction heated) splices. It does not cover films with splices made by means of adhesive tape or solvent-type splices.

NOTE Solvent-type splices are suspect since they may retain traces of residual solvents containing peroxide which can pose some risk of oxidative attack on the silver image.

This International Standard is not applicable to films with chromogenic black-and-white images, colour images of any type, nor to films with a magnetic recording track. It does not apply to films with silver images produced by dry or thermal processing or by diffusion-reversal processing, nor to films that have been processed by a monobath using a means other than a thiosulfate-type fixing solution. It is not applicable to films where the silver salts are removed by means other than thiosulfate solutions (see [10] in the bibliography).

This International Standard is not applicable to films to which lacquers have been applied.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 5-2:2001, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*

ISO 5-3:1995, *Photography — Density measurements — Part 3: Spectral conditions*

ISO 527-3:1995, *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets*

ISO 18902:2001, *Imaging materials — Processed photographic films, plates and papers — Filing enclosures and storage containers*

ISO 18906:2000, *Imaging materials — Photographic films — Specifications for safety film*

ISO 18911:2000, *Imaging materials — Processed safety photographic films — Storage practices*

ISO 18917:1999, *Photography — Determination of residual thiosulfate and other related chemicals in processed photographic materials — Methods using iodine-amylose, methylene blue and silver sulfide*

3 Terms and definitions

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

3.1

archival medium

recording material that can be expected to retain information for ever, so that such information can be retrieved without significant loss when properly stored

NOTE There is, however, no such material and it is not a term to be used in International Standards or system specifications.

3.2

emulsion layer(s)

image or image-forming layer(s) of photographic films, papers and plates

3.3

extended-term storage conditions

storage conditions suitable for the preservation of recorded information having permanent value

3.4

film base

plastic support for the emulsion and backing layers

3.4.1

cellulose-ester base

base for record materials composed mainly of the cellulose esters of acetic, propionic, or butyric acids, or mixtures thereof

3.4.2

polyester base

base for recording materials composed mainly of a polymer of ethylene glycol and terephthalic acid (also referred to as polyethylene terephthalate), or a polymer of ethylene glycol and 2,6 naphthalene dicarboxylic acid (also referred to as polyethylene naphthalate)

3.5

full-reversal processing

reversal photographic processing that consists of development, bleach, clear, reexposing and second development, followed by fixing and washing

3.6

life expectancy

LE

length of time that information is predicted to be acceptable in a system after dark storage at 21 °C and 50 % RH

3.7

LE designation

rating for the "life expectancy" of recording materials and associated retrieval systems

NOTE The number following the LE symbol is a prediction of the minimum life expectancy in years for which information can be retrieved without significant loss when stored at 21 °C and 50 % RH, e.g., LE-100 indicates that information can be retrieved after at least 100 years of storage.