
**Imaging materials — Thermally processed
silver microfilm — Specifications for
stability**

*Matériaux pour image — Microfilm à l'argent traité thermiquement —
Spécifications pour 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.

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.

International Standard ISO 18919 was prepared by Technical Committee ISO/TC 42, *Photography*.

This International Standard is one of a series of 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 B).

Annex A forms an integral part of this International Standard. Annexes B, C, D and E are for information only.

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Introduction

Thermally processed silver (TPS) films are used widely for computer-output microfilming (COM) and for document recording. This International Standard is intended to provide the desired information on the stability of IPS images as well as other relevant properties of TPS microfilms. The basic elements of the TPS imaging process are also reviewed.

The first commercial TPS imaging product for the micrographic market was a photothermographic paper, called dry silver paper. It was introduced in 1964. This paper was designed for exposure by projection and for processing with a heated drum in a combination reader-printer processor. A TPS film based on this technology, but adopted for COM recording, followed in 1968. Since then, several other TPS-type films for computer-output and source-document microfilming have been introduced by several manufacturers. Special TPS products for other imaging applications have also been developed, including films for graphic arts and for duplication of aerial photographs, radiographic applications, as well as for line recording and remote sensing systems using laser beam and cathode-ray tube (CRT) imaging devices. However, these special products are not covered by this International Standard. It covers only the currently available TPS microfilms based on the present state of photothermographic technology.

The unique feature of TPS microfilm and its major advantage over conventional silver-gelatin products is its one-step, dry processing method. Another notable difference is that the image-forming components and, therefore, also the final silver image are dispersed in a non-gelatin binder, primarily [poly(vinylbutyral)]. This renders them inert to moisture and its deleterious effects. The support of TPS films is normal, photographic grade PET [poly(ethylene terephthalate)] safety film ([1], [2], [3], [4], [5], [6]).

In most contemporary TPS films, the metallic silver that forms the image is contributed by light-insensitive silver behenate salts that react with an incorporated reducing agent during heat development. This reaction is catalyzed by latent image silver formed during light exposure of silver halide crystals that are also incorporated in the imaging layer. Accordingly, the reaction occurs at a much higher rate in exposed than in unexposed areas, akin to the different rate of reduction of exposed and unexposed silver halide crystals by a chemical developer in a conventional photographic system.

Two important advantages offered by the TPS process include rapid, relatively simple and convenient dry processing and inertness to oxidation of silver images. These images are relatively stable, based on behaviour under normal user and storage conditions as well as on accelerated ageing studies. ([7], [8], [9]). Since TPS films are heat-processed by raising the temperature to between 119 °C and 125 °C, which is well above any expected use and recommended storage temperatures, no chemical fixation is required. Hence, TPS films do not fall within the provisions of ISO 10602 that apply to chemical fixation.

These attractive features should be weighed against the disadvantage that, in the TPS process, the residual image-forming components are not removed during processing. Therefore, the potential for formation of excessive fog exists throughout the life of the record; such fog may render the image unusable. This may occur during dark storage at elevated temperatures, or on prolonged exposure to ambient illumination, or especially on excessive exposure to light and heat in a reader-printer or to heat generated by a nearby fire. In the case of fire, the temperature inside a "fireproof" vault or safe can also rise to cause image degradation. Concerns with these possible causes of degradation have led to the adoption of considerably lower life expectancy ratings of TPS films in these specifications than indicated by accelerated ageing studies.

This International Standard includes all the requirements for the stability of wet-processed silver-gelatin films on safety bases, set forth in ISO 10602. They also include special thermal requirements applicable to TPS films and the requirement of at least ten duplications with a high-intensity mercury vapour lamp, stipulated for diazo and vesicular films. A few other relevant requirements for thermally processed vesicular films (ISO 9718) and ammonia processed diazo films (ISO 8225) are also included.

Imaging materials — Thermally processed silver microfilm — Specifications for stability

1 Scope

This International Standard establishes specifications for the stability of photographic films intended for storage of records; specifically, microfilms with a base of safety polyester [poly(ethylene terephthalate)] having predominantly silver behenate salts dispersed in nongelatinous emulsions, and thermally processed to produce a black-and-white silver image.

This International Standard applies to thermally processed silver (TPS) microfilms having ultrasonic or dielectric (induction-heated) splices. It does not cover films with splices made by means of adhesive tape.

This International Standard does not cover other types of black-and-white TPS films, black-and-white paper, colour images and colour prints that are produced with thermally processed silver behenate systems.

It does not apply to films to which lacquers have been applied.

It also does not apply to conventional black-and-white silver images that are produced by wet processing of silver-gelatin films (see ISO 10602).

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 5-2:1991, *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 543:1990, *Photography — Photographic films — Specifications for safety film.*

ISO 6077:1993, *Photography — Photographic films and papers — Wedge test for brittleness.*

ISO 7565:1993, *Micrographics — Readers for transparent microforms — Measurement of characteristics.*

ISO 8225:1995, *Photography — Ammonia-processed diazo photographic film — Specifications for stability.*

ISO 9718:1995, *Photography — Processed vesicular photographic film — Specifications for stability.*

ISO 10602:1995, *Photography — Processed silver-gelatin type black-and-white film — Specifications for stability.*

3 Terms and definitions

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

**3.1
archival medium**

recording material that can be expected to retain information for ever so that it 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
life expectancy
LE**

length of time that information is predicted to be retrievable in a system under extended-term storage conditions

NOTE However, the actual useful life of film is very dependent upon the existing storage conditions (for example, see ISO 5466 [19] and ISO 10214) [21].

**3.3
LE designation**

rating for the "life expectancy" of recording materials and associated retrieval systems; 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 under extended-term storage conditions

NOTE For example, LE-100 indicates that information can be retrieved for at least 100 years storage.

**3.4
extended-term storage conditions**

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

**3.5
medium-term storage conditions**

storage conditions suitable for the preservation of recorded information for a minimum of ten years

**3.6
film base**

plastic support for the emulsion and backing layers

**3.7
emulsion layer(s)**

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

**3.8
non-curl backing layer**

layer, usually made of gelatin, applied to the side of the film base opposite to that of the emulsion layer, for the purpose of preventing curl

NOTE 1 It is comparable to the emulsion layer in thickness and is not removed in processing.

NOTE 2 Antihalation or other layers removed are excluded from this definition.

**3.9
safety photographic film**

photographic film which passes the ignition time test and burning time test as specified in ISO 543

**3.10
safety poly(ethylene terephthalate) base**

polyester film base composed mainly of a polymer of ethylene glycol and terephthalic acid

4 Safety and hazards

4.1 Hazard warnings

Some of the chemicals specified in the test procedures are caustic, toxic or otherwise hazardous. Safe laboratory practice for the handling of chemicals requires the use of safety glasses or goggles, rubber gloves and other protective apparel such as face-masks or aprons where appropriate. Specific danger notices are given in the text for particularly dangerous materials, but normal precautions are required during the performance of any chemical procedures at all times. The first time that a hazardous material is noted in the test procedure section, the hazard is indicated by the word "DANGER" followed by a symbol consisting of angle brackets "<>" containing a letter which designates the specific hazard. A double bracket "<<>>" is used for particularly perilous situations. In subsequent statements involving handling of these hazardous materials, only the hazard symbol consisting of the brackets and letter(s) is displayed. Furthermore, for a given material, the hazard symbol is used only once in a single paragraph.

Detailed warnings for handling chemicals and their diluted solutions are beyond the scope of this International Standard.

Employers shall provide training and health and safety information in conformance with legal requirements.

The hazard symbol system used in this International Standard is intended to provide information to the users and is not meant for compliance with any legal requirements for labelling as these vary from country to country.

It is strongly recommended that anyone using these chemicals obtain from the manufacturer pertinent information about the hazards, handling and disposal of these chemicals.

4.2 Hazard information code system

- ⟨B⟩ Harmful if inhaled. Avoid breathing dust, vapour, mist or gas. Use only with adequate ventilation.
- ⟨C⟩ Harmful if contact occurs. Avoid contact with eyes, skin or clothing. Wash thoroughly after handling.
- ⟨S⟩ Harmful if swallowed. Wash thoroughly after handling. If swallowed, obtain medical attention immediately.
- ⟨⟨S⟩⟩ May be fatal if swallowed. If swallowed, obtain medical attention immediately.
- ⟨F⟩ Will burn. Keep away from heat, sparks and open flame. Use with adequate ventilation.

The flammable warning signal ⟨F⟩ shall not be used for quantities of common solvents under 1 litre.

4.3 Safety precautions

All pipette operations shall be performed with a pipette bulb or plunger pipette. This is a critical safety warning. Safety glasses shall be worn for all laboratory work.

5 Requirements for the film base

The base used for record films, as specified in this International Standard, shall be a safety polyester [i.e. poly(ethylene terephthalate)] type and can be identified by the method described in 9.1.

6 Requirements for the thermally processed silver microfilm

6.1 Safety film

The film shall meet the requirements specified in ISO 543.