



# SLOVENSKI STANDARD

## SIST ISO 18903:2011

01-julij-2011

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### Upodobitveni materiali - Filmi in papir - Določanje dimenzijskih sprememb

Imaging materials - Films and paper - Determination of dimensional change

Matériaux pour l'image - Films et papiers - Détermination des variations dimensionnelles

Ta slovenski standard je istoveten z: **ISO 18903:2002**

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# INTERNATIONAL STANDARD

**ISO**  
**18903**

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## Imaging materials — Films and paper — Determination of dimensional change

*Matériaux pour l'image — Films et papiers — Détermination des variations dimensionnelles*

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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 18903 was prepared by Technical Committee ISO/TC 42, *Photography*.

This first edition of ISO 18903 cancels and replaces ISO 6221:1996, which has been technically revised.

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

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**ISO 18903:2002(E)****Introduction**

Photographic films and papers exhibit temporary or reversible dimensional changes as well as permanent dimensional changes. This International Standard is designed to provide uniform methods for treating the specimens and for expressing the dimensional changes which occur with changes in atmospheric conditions and those which occur in processing and ageing.

Temporary or reversible dimensional changes are the result of changes in the equilibrium moisture content (which is determined by the relative humidity of the surrounding atmosphere) or changes in temperature. Permanent dimensional changes occur as the result of processing and ageing. The rate of permanent shrinkage of film generally increases with temperature, but decreases with time. The rate of shrinkage may also be greatest at either high or low relative humidity, depending on the type of film. Some materials, particularly photographic film on polyester base, can show a swelling after a high humidity exposure.

The increasing use of photographic films in recent years, in applications where dimensional stability is critical, has emphasized the importance of an accurate measure of dimensional properties. For example, in photomechanical reproductions a dimensional change of as little as 0,01 % may be of practical importance. In the case of aerial mapping, uniform shrinkage is not serious since it can be easily corrected by a change in magnification, but any difference in shrinkage in the two principal directions is a source of error. Any localized or non-uniform changes in dimension are of practical concern.

The dimensional change properties of any film or paper depend not only on their composition and method of manufacture, but also on their thermal and moisture content history. Accurate evaluation of such properties requires some control over the specimen history as well as very precise control over the conditioning and measuring procedures. Film and paper dimensions are also subject to hysteresis effects. These are relatively more important with the more stable materials such as polyester photographic base films.

Additional information on the dimensional characteristics of photographic films and papers and on methods of measurement may be found in the bibliography.



# Imaging materials — Films and paper — Determination of dimensional change

## 1 Scope

This International Standard specifies a method for determining the dimensional change of photographic films and papers caused by:

- variations in equilibrium moisture content due to change in the relative humidity (RH) of the atmosphere (humidity coefficient of expansion);
- change in temperature (thermal coefficient of expansion);
- processing;
- ageing.

This International Standard deals with the moisture content and thermal history of the specimens before measurement, the atmospheric conditions during measurement, and the treatment of the data. It does not describe the various experimental techniques used to make the measurements.

This International Standard is not suitable for determining the dimensional change of instant photographic film.

## 2 Normative reference

The following normative document contains 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 edition of the normative document 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/TR 18931:2001, *Imaging materials — Recommendations for humidity measurement and control*

## 3 Terms and definitions

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

### 3.1

#### conditioning

exposure of a specimen to air at a given relative humidity and temperature until equilibrium is reached

### 3.2

#### differential dimensional change

difference between the dimensional changes of the material in the two principal directions (length and width)

NOTE Polyester-based films frequently have maximum and minimum dimensional changes in directions other than the length or width. These can be determined by rotating and viewing the uncoated base between a pair of crossed polarizers.

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When the direction corresponding to either the maximum or minimum dimensional change is coincident with the optical axis of one polarizer, there is minimum light transmission through the base.

**3.3**  
**dimensional change due to processing**

permanent dimensional change caused by photographic processing

NOTE This may be the conventional wet chemical processing, vapour processing or heat processing. It is measured after conditioning at the same relative humidity and temperature as used for the original measurement and is expressed as a percentage.

**3.4**  
**dimensional change due to processing plus ageing**

permanent dimensional change that occurs as a result of processing plus ageing of the processed material

NOTE It is measured after conditioning of the processed, aged film or paper at the same relative humidity and temperature as used for the original measurement and is expressed as a percentage.

**3.5**  
**dimensional hysteresis**

difference in the absolute dimensions of a specimen in equilibrium with air at a given relative humidity, when conditioned from a higher relative humidity and when conditioned from a lower relative humidity

NOTE See annex C.

**3.6**  
**humidity coefficient of expansion**

change in dimension per unit length per 1 % change in relative humidity at constant temperature

**3.7**  
**humidity expansion [contraction]**

dimensional change caused by the gain (or loss) of moisture following changes in the relative humidity of the ambient air at constant temperature

**3.8**  
**length direction**

direction of the film or paper parallel to its forward movement in the film- or paper-making machine

NOTE This is also termed "grain" or "machine direction" in the case of papers.

**3.9**  
**preconditioning**

establishment of a moisture content history by conditioning the specimen at a relative humidity above or below the conditioning relative humidity used for measurement

NOTE The purpose of preconditioning is to control the effects of hysteresis (see 3.5).

**3.10**  
**thermal coefficient of expansion**

change in dimension per unit length per 1 °C change in temperature at constant relative humidity

**3.11**  
**thermal expansion [contraction]**

dimensional change caused by a rise (or fall) of temperature at constant relative humidity

NOTE This is an apparent thermal expansion, since the moisture content of film varies slightly with temperature at constant relative humidity. However, the primary effect is thermal expansion. Thermal expansion is less important for paper because of the small changes involved, particularly compared to humidity effects.

### 3.12

#### **width direction**

direction of the film or paper at right angles to the length direction

NOTE This is also termed "cross direction".

## 4 Measurement technique

There are a number of different techniques used for measuring the dimensional change of sensitized materials. Specifications of measuring equipment are beyond the scope of this International Standard, but several approaches are described in annex B.

## 5 Sampling

### 5.1 Selection of specimens

Specimens intended for dimensional stability tests shall exhibit no obvious physical defects, be representative of the whole of the material being tested, be handled in the same manner as in actual use, and be treated uniformly. When different materials are to be compared, they shall have been subjected to the same conditioning history. The length direction should be indicated if known.

### 5.2 Handling of specimens

Specimens shall be prepared under controlled conditions and then separated into groups which are subjected to different atmospheric conditions. The operator shall take care not to breathe on the specimens and shall wear moisture-resistant gloves while handling them, since moisture from the skin may reduce the accuracy of the results.

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### 5.3 Conditioning of specimens

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#### 5.3.1 General

Specimens shall be suspended in the conditioning atmosphere by means of a hook or a rod through a hole in the middle of one end near the edge of the specimen. The specimens shall be separated to prevent contact with each other. An alternative method of conditioning is to place specimens in racks spaced so that there is free circulation of the air on both sides of the material.

Specimens shall not be removed from the conditioning atmosphere for measuring. Condition specimens until practical moisture equilibrium has been reached. The time required to achieve this condition shall be established by actual measurements on representative specimens or based on prior experience.

#### 5.3.2 Film

The conditioning time for film will be about 4 h, but will vary according to access of the conditioning air, the film type, base thickness, etc. Conditioning time shall not exceed 24 h.

At relative humidities of 60 % and above, films and papers sometimes undergo an irreversible change in size with time. For this reason, the conditioning time shall be standardized for comparison purposes.

#### 5.3.3 Paper

Double-weight fibre-base papers will require about 1 d of conditioning; resin-coated papers require at least 7 d.