



SLOVENSKI STANDARD
oSIST ISO/DIS 11798:2022

01-december-2022

Informatika in dokumentacija - Trajnost in obstojnost pisanja, tiskanja in razmnoževanje na papir - Zahteve in preskusne metode

Information and documentation — Permanence and durability of writing, printing and copying on paper — Requirements and test methods

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Information et documentation — Permanence et durabilité de l'écriture, de l'impression et de la reprographie sur des documents papier — Prescriptions et méthodes d'essai

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Ta slovenski standard je istoveten z: ISO/DIS 11798

ICS:

01.140.20 Informacijske vede Information sciences

oSIST ISO/DIS 11798:2022

en,fr,de

DRAFT INTERNATIONAL STANDARD

ISO/DIS 11798

ISO/TC 46/SC 10

Secretariat: SIS

Voting begins on:
2022-08-04Voting terminates on:
2022-10-27

Information and documentation — Permanence and durability of writing, printing and copying on paper — Requirements and test methods

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Reference number
ISO/DIS 11798:2022(E)

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Published in Switzerland

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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.

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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 46, Subcommittee SC 10 *Requirements for document storage and conditions for preservation*.

This second edition cancels and replaces the first edition (ISO 11798:1999), which has been technically revised.

The main changes are as follows:

- The reference material used for the testing of mechanical properties has been defined and shall, prior to testing, be handled according to [clause 4.5](#)
- CIELAB measurements replaces optical density measurements, i.e. evaluation of monocoloured printing shall be performed by CIELAB measurements (formerly evaluated by optical density measurements). Accordingly, microdensitometers or densitometers are no longer needed
- Colour fastness ([clause 5.1](#) and [6.1](#)) shall be followed to evaluate recording (monocoloured and multicoloured) for lightfastness ([clause 6.3](#)), water resistance ([clause 6.4](#)) and resistance to heat ([clause 6.8](#))
- [Table 1](#) ([clause 5.1](#)) presents, for printing devices, elaborated CIELAB lightness and colour shift requirements ΔL^* , Δa^* , Δb^* , and in addition, a new requirement of ΔE_{ab}^* (Euclidean distance between two CIELAB coordinates)
- [Table 2](#) ([clause 5.1](#)) presents, for pens and stamp pads, requirement of maximum CIELAB lightness change ΔL^*
- Abrasion resistance (formerly referred to as *resistance to wear*) shall be evaluated by the degree of abrasion ([clause 6.6](#)) and is determined by CIELAB measurements prior to, and after, abrasion
- Detailed descriptions of specimen preparation for pens and stamp pads, three printout templates for specimen preparation from printers and copying machines and reporting forms are given in Annexes

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.

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Introduction

It is of great importance that recording of images on paper which, during long-term storage in libraries, archives, and other protected environments, will undergo little or no change in properties that affects its use. The documents must preserve their information content and thus enable information storage and information supply for the future. Accordingly, it is important to study the permanence and durability of recording on paper.

Writing materials and printing equipment meeting the requirements given in this document can be used in the preparation of paper documents intended for long-term storage and recurrent use. Such documents contain permanent and durable images, i.e. images likely to be stable and thus undergo little or no change in properties that influence legibility and the possibility of copying or converting the paper documents to other data carriers.

This document specifies requirements and testing methods for evaluation of the permanence and durability of images. It is primarily intended for recording on writing, printing, and photo-copying papers in accordance with ISO 9706 (permanent paper) or ISO 11108 (archival paper). The standard does not specifically evaluate permanence and durability of books, but if permanent/archival paper is used in combination with recording that meets the requirements in this standard, the book content will most likely become permanent. However, book bindings and covers are not included.

Permanent paper and archival paper, used in the preparation of documents, may differ widely in properties of importance for the quality and permanence of the image. Some properties of an image, e.g. abrasion resistance, depend on the combination of the image and the paper. The testing conditions of this document are chosen so that results, representative of most papers on the market to be used for a particular imaging process, shall be obtained.

In this document, the requirements are given in the following attributes:

- visual image colour strength and appearance;
- lightfastness;
- water resistance;
- transfer of recorded image;
- abrasion resistance;
- resistance to heat;
- effect of recording on the mechanical strength of the paper

Experience has shown that images written with carbon black ink as well as printed images using commercial printing inks have proved to be consistently reliable. There are, however, many documents where acidic inks have affected the paper to such an extent that the paper has corroded, and images produced from dry or liquid toner are also susceptible to ageing problems.

Images prepared with modern material and machinery are often completely different from old images with respect to composition and properties. The rapid development of new printing techniques makes this testing very important. One printing device may have a successor only within a few years after it was launched. Therefore, conclusions based on studies of old documents in libraries and archives are of limited use when discussing the permanence of modern documents.

Strictly speaking, the only way to test the permanence and durability of documents is to handle them and to store them under the relevant conditions for long periods of time. In practice, one must rely upon observations made on documents kept for a few decades only, and on evaluation of the effect of factors known to influence the permanence and durability of the image. Accordingly, the testing according to this International Standard does not correlate to lifetime of documents, but rather that documents that fulfil the requirements can be stored for a long time in the future in archives and protected environments, probably for several hundred years.

Information and documentation — Permanence and durability of writing, printing and copying on paper — Requirements and test methods

1 Scope

This document specifies requirements and test methods for evaluation of the permanence and durability of writing, printing, and copying on paper stored in libraries, archives, and other protected environments for long periods of time, in which the information contents of images must be retained but not necessarily the full artistic quality.

It is applicable to:

- images on white permanent paper in accordance with ISO 9706 or ISO 11108;
- recording obtained from pens, stamp pads, copying machines and printers (that can produce monocoloured and/or multicoloured images)

It does not apply to:

- documents stored under harmful conditions, such as high humidity that promotes microbiological attack, excessive heat, radiation (e.g. light), high levels of pollutants, or the influence of water. Since documents are kept in non-protected environments before being transferred to protected environments, resistance to water and light is, however, of importance;
- legal documentation, e.g. banking documents, where the authenticity is of primary interest;
- documents where the information contents are influenced by small colour changes;
- documents within the scope of ISO/TC 42, *Photography*.

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 1924-2, *Paper and board — Determination of tensile properties — Part 2: Constant rate of elongation method (20 mm/min)*

ISO 2470-1, *Paper, board and pulps — Measurement of diffuse blue reflectance factor — Part 1: Indoor daylight conditions (ISO brightness)*

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

ISO 5626, *Paper — Determination of folding endurance*

ISO 9352, *Plastics — Determination of resistance to wear by abrasive wheels*

ISO 9706, *Information and documentation — Paper for documents — Requirements for permanence*

ISO 11108, *Information and documentation — Archival paper — Requirements for permanence and durability*

ISO 12757-1, *Ball point pens and refills — Part 1: General use*

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ISO 12757-2, *Ball point pens and refills — Part 2: Documentary use (DOC)*

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

ISO 14145-1, *Roller ball pens and refills — Part 1: General use*

ISO 14145-2, *Roller ball pens and refills — Part 2: Documentary use (DOC)*

3 Terms and definitions

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

ISO and IEC maintain terminology databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1
abrasion resistance (or rub resistance)
 characteristic of a document with *recording* (3.14) against losses of image or text from the action of abrasion (i.e. the ability of materials and structures to withstand mechanical wear or rubbing by means of friction)

Note 1 to entry: Abrasion resistance can be evaluated by the *degree of abrasion* (3.4)

3.2
archival paper
 paper of high *permanence* (3.11) and high *durability* (3.6) in accordance with ISO 11108

3.3
CIELAB
 three-dimensional colour space defined by International Commission on Illumination in 1976 (synonymously referred to as CIE 1976 $L^*a^*b^*$)

Note 1 to entry: The three coordinates that constitute the colour space (referred to as $L^*a^*b^*$) represents the following:

L^* = lightness, where 0 represents black and 100 represents white

a^* = position between red and green, where negative a signifies green and positive a signifies red

b^* = position between blue and yellow, where negative b indicates blue and positive b indicates yellow

[SOURCE: Modified from ISO 11164-4]

3.4
degree of abrasion
 measure of the magnitude of loss of recorded image (or text) on paper because of abrasion (or wear, or rubbing)

Note 1 to entry: Degree of abrasion is evaluated by measuring L^* of a printed image or text prior to and after the abrasion test, according to ISO 13655, and is calculated according to [clause 6.6](#).

3.5
document
 recorded information which can be treated as a unit in a documentation process

[SOURCE: ISO 5127-1:1983¹]

1) ISO 5127-1:2017, *Documentation and information — Vocabulary — Part 1: Basic concepts*.

3.6**durability**

ability to resist the effects of wear and tear during recurrent use

3.7**image**

visual representation with colourants (such as dyes or pigments) distributed on paper as text characters, lines, colour patches or other visually identifiable patterns

3.8**monochromatic image**

image with *recording* (3.14) in one colour

3.9**multicoloured image**

image composed of *recording* (3.14) in more than one colour, where the colours constitute part of the information contents

Note 1 to entry: It can be separated into different base colours (e.g. black, cyan magenta and yellow)

Note 2 to entry: Not to be confused with a coloured image. A coloured image is in this standard referred to as an image recorded uniformly of one colour.

3.10**performance testing paper**

permanent paper (3.13) or *archival paper* (3.2) used for sample preparation

Note 1 to entry: The performance testing paper shall be handled according to [clause 4.1](#) and meet the requirements of [Annex A](#)

3.11**permanence**

ability to remain chemically and physically stable over long periods of time

3.12**permanent image**

image (3.7) which, during long-term storage in libraries, archives and other protected environments will undergo little or no change in properties that affect its use

3.13**permanent paper**

paper of high *permanence* (3.11) in accordance with ISO 9706

3.14**recording**

the process of performing writing, printing, and copying on paper

3.15**spot-coloured image**

specialized ink mixes to create a specific predetermined uniform colour in commercial printing

3.16**sample**

aggregate of all the *specimens* (3.17) taken to be representative of a lot

[SOURCE: ISO 4046-5:2016]

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3.17 specimen

a portion of a paper or board sample (in this context performance testing paper with recording from the tested writing, printing, or copying material) sufficient in size so that *test pieces* (3.18) can be obtained from it

[SOURCE: Modified from ISO 4046-5:2016, 5.118]

3.18 test piece

piece or pieces of paper or board on which the measurement is carried out in accordance with the stipulations of the method of test

[SOURCE: ISO 4046-5:2016]

4 Preparation of specimens

4.1 Performance testing paper

Paper used for production of specimens shall meet the requirements of [Annex A](#).

For the use of archival paper (in accordance with ISO 11108) as performance testing paper, watermarks may be present on various spots throughout the specimens. Such imprints are basically attenuations of the paper and indicate authenticity. To avoid misleading testing results, the watermarks shall be avoided for the test piece preparation when tested according to [6.1](#), [6.3](#), [6.4](#), [6.6](#), [6.7](#) and [6.8](#).

4.2 Conditioning of document substrates and recording atmosphere

Preferably, material (including paper) should be conditioned for at least 15 h at (23 ± 1) °C and (50 ± 2) % RH before recording. The recording should be performed in the same atmosphere. If this is not possible, instructions from the manufacturer of the recording equipment to be tested shall be followed.

4.3 Specifications for sample preparation

Specimens for testing purposes shall be prepared as described in an International Standard dealing with the specific type of recording equipment. If no such standard is available, the preparation of specimens shall be performed according to the instructions of the manufacturer of the recording equipment.

The test patterns shall be recorded to conform with each clause of chapter 6 using the same printing/writing method, ink, and paper combination, identical to the intended application or user case. Characters, spacing, etc. shall represent normal use of the recording equipment intended for testing. Specimen preparation shall also meet the requirements of [Annex B](#).

Three printout templates and number of specimens that shall be used for sample preparation are given [Table C.1](#) in [Annex C](#).

For printers and other machines, in addition to the product designation, note the serial number and the print adjustment (such as paper setting, driver setting, colour mode and printing speed used) if specific print adjustments are to be made.

NOTE Print adjustments and other print settings have major impact on the permanence of images. Accordingly, the print adjustments and print settings are two very important parameters to mention because other settings, on the same printer, can drastically change the quality of the document and may thus not be permanent.

4.4 Conditioning of specimens

Printed specimens shall be dried or cured and conditioned to the level of the intended use prior to testing. The specimens shall be kept at (23 ± 1) °C and (50 ± 2) % RH for at least 24 hours (depending