INTERNATIONAL STANDARD

ISO/IEC 11693-3

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Identification cards — Optical memory cards —

Part 3: Authentication techniques

Cartes d'identification — Cartes à mémoire optique —

Partie 3: Techniques d'authentification

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Foreword

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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 document 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).

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For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/IEC JTC 1, *Information technology*, Subcommittee SC 17, *Cards and Personal Identification*.

ISO/IEC 11693 consists of the following parts, under the general title *Identification cards — Optical memory cards*:

— *Part 1: General characteristics*

— *Part 2: Co-existence with other machine readable technologies*

— *Part 3: Authentication techniques*

Introduction

This part of ISO/IEC 11693 is one of a series of International Standards defining the parameters for authentication technology for optical memory cards.

This part of ISO/IEC 11693 is specific to authentication techniques for memory cards using the holographic and linear recording methods. Characteristics which apply to other specific recording methods are found in separate Standards documents.

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Identification cards — Optical memory cards —

Part 3: Authentication techniques

1 Scope

This part of ISO/IEC 11693 defines the authentication techniques.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO/IEC 7810, *Identification cards — Physical characteristics*

ISO/IEC 11693-1, *Identification cards — Optical memory cards — Part 1: General characteristics*

ISO/IEC 11693-2, *Identification cards — Optical memory cards — Part 2: Co-existence of optical memory with other machine readable technologies*

ISO/IEC 10373-1, *Identification cards — Test methods — Part 1: General characteristics*

ISO/IEC 10737-5, *Identification cards — Test methods — Part 5: Optical memory cards*

ISO/IEC 11694-2, *Identification cards — Optical memory cards — Linear recording method — Part 2: Dimensions and location of the accessible optical area*

ISO/IEC 11694-3, *Identification cards — Optical memory cards — Linear recording method — Part 3: Optical properties and characteristics*

ISO/IEC 11694-4, *Identification cards — Optical memory cards — Linear recording method — Part 4: Logical data structures*

ISO/IEC 11695-2, *Identification cards — Optical memory cards — Holographic recording method — Part 2: Dimensions and location of accessible optical area*

ISO/IEC 11695-3, *Identification cards — Optical memory cards — Holographic recording method — Part 3: Optical properties and characteristics*

ISO/IEC 11695-4, *Identification cards — Optical memory cards — Holographic recording method — Part 4: 3.3*

3 Terms and Definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11693-1, ISO/IEC 11693-2, and the following apply.

3.1
reflectivity
ratio of reflected light to the light incident at a specified wavelength measured at a normal incidence on the optical memory card

Note 1 to entry: Reflectivity is generally expressed as a percentage.

3.2
scattering
deviation of reflected radiation from the angle predicted by the law of reflection.

Note 1 to entry: Reflections that undergo scattering are called *diffuse* reflections. Diffuse reflections are measured by means of an integration sphere, while properly averaging over all angles of illumination and observation.

3.3
optical resolution
ability of the storage material to resolve physical details by optical means

Note 1 to entry: The (spatial) resolution is typically expressed in line pairs per millimetre.

3.4
diffraction
effect occurring when light is incident on an optical structure, the light is diffracted in discrete directions, called diffraction orders

3.5
diffraction efficiency
relation of the power of the diffracted light beam, P_{diff}, to the incident power of the readout beam, P_{inc}:

$$\eta = \frac{P_{\text{diff}}}{P_{\text{inc}}}$$

Note 1 to entry: The diffraction efficiency is dependent upon the holographic storage medium. It varies between 1 % and 100 %.

3.6
diffraction grating
device having periodic variations of reflectivity and/or refractive index and/or optical path length

3.7
read power
laser power used to read-out information from the accessible optical area

3.8
authentication element
user defined feature integral to the accessible optical area which is appropriate to the specified authentication technique

4 Authentication techniques

Authentication techniques are based upon the use of an authentication element integral to the optical medium; see the existing standards ISO/IEC 11694-3 and ISO/IEC 11695-3.

5 Physical characteristics of authentication elements

5.1 Dimensions

The dimension of the authentication element is user defined in compliance with accessible optical area as specified in ISO/IEC 11693-2. A minimum area of $a \times b$, whereas $a = 10$ mm and $b = 10$mm is recommended.

5.2 Technology combinations

Numerous combinations of technology are possible; see ISO/IEC 11693-2.

5.3 Card construction

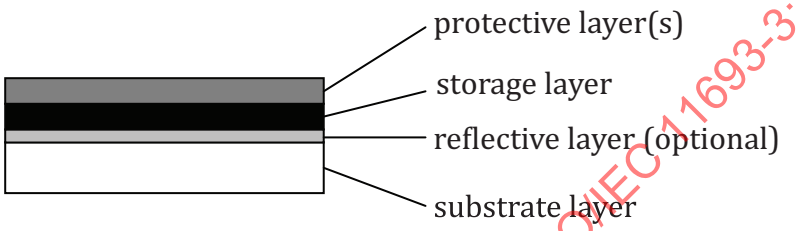
ISO/IEC 7810 applies.

5.4 Cross section at accessible optical area

See Figure 1.

The accessible optical area contains an area that is reserved for the authentication element.

The authentication element is composed of different layers: which can include an adhesive layer, a substrate layer, a reflective layer, a storage layer and one or more protective layers to protect the sub-layers from damage e.g. by surface damage, humidity and other environmental influence. In the simplest configuration only a storage layer is required.



NOTE Drawing not to scale.

Figure 1 — Cross-section of the authentication element for optical memory cards

Authentication elements are laminated, coated, or glued onto the card surface or inserted into the card body.

5.4.1 Protective layer(s)

There is one or multiple protective layer(s) to protect the sub-layers (storage layer, reflective layer) from surface damage, humidity and other environmental influence.

The protective layer shall be transparent to the writing and reading beam.

When using a reading or writing beam with linear or circular polarization, the protective layer shall be free of birefringence.

The protective layer ensures that the authentication element can survive the action of a destructive influence to the extent that it continues to show optical characteristics which conform to the base standard.

5.4.2 Storage layer

The storage layer is a photosensitive material applied to the reflective or substrate layers. Examples of materials, which can be used are:

— high-resolution photographic silver-halide film;

— silver-halide sensitized gelatin;

— dichromated gelatin;

— photoresists;

— photopolymers;

— functionalized liquid crystalline polymers;

— metal films;

— dye-polymer films.

The thickness of the storage layer may vary depending on the specific optical characteristics of the material chosen. The material as well as the parameters for recording and/or reading authentication elements shall be specified by the card manufacturer.

The material composing the storage layer determines the parameters for recording and reading information (wavelength of writing/reading beam, writing/reading power). Information can be macroscopic, microscopic or holographic; a single authentication element shall incorporate information in one or more of these forms.

5.4.3 Reflective layer

A reflective layer is necessary if the storage layer is not inherently reflective. The reflective layer can be metallic or non-metallic: metals which can be used include aluminium, silver, tin, gold, titanium and chromium. Non metallic materials which can be used include materials with a very high refractive index such as special polymer films. The thickness of the reflective layer may vary depending on the specific optical characteristics of the selected material.

5.4.4 Substrate layer

A substrate layer is necessary if an authentication element is attached to the card body, unless the card body itself serves as the substrate layer.

The substrate layer shall be made of a material which provides a flat, smooth surface on the side to which the optical storage layer is applied and with a material which can be bonded to the card surface on the other side.

The thickness of the substrate layer may vary depending on the materials used and the manufacturing process employed.

5.4.5 Adhesive layer

An adhesive layer is necessary if the substrate layer or storage layer of the authentication element is not self adhering to the card surface.

5.5 Bending stiffness

ISO/IEC 7810 applies.

5.6 Card warpage

ISO/IEC 7810 applies.

5.7 X-rays

ISO/IEC 7816-1 applies.

5.8 Toxicity

ISO/IEC 7810 applies.

5.9 Ultraviolet light

ISO/IEC 7816-1 applies.

5.10 Light transmittance

ISO/IEC 7810 applies.

5.11 Bending properties

ISO/IEC 7816-1 applies.

5.12 Resistance to chemicals

ISO/IEC 7810 applies.

5.13 Atmospheric requirements

The authentication element shall continue to function in accordance with this International Standard when exposed to

— Salt (NaCl) concentrations of less than 2,7 µg/m^3,

— Gaseous concentrations of less than 0,1 µg/kg of SO_2, H_2S, or NO_x.

NOTE NO_x means NO, NO_2 or a mixture of NO and NO_2.

5.14 Durability

ISO/IEC 7810 applies.

5.15 Dimensional stability and warpage with temperature and humidity

ISO/IEC 7810 applies.

5.16 Default test environment and conditioning

ISO/IEC 10373-1 applies, plus the following conditions:

— atmospheric pressure: 75 kPa to 105 kPa;

— condensation: none permitted.

6 Optical properties and characteristics

6.1 Surface roughness/scattering

The surface of the substrate layer shall provide a flat and smooth surface as the carrier for the reflective and optical storage layers. The surface roughness shall be less than *Ra* = 100nm: higher values can cause substantial scattering of the read-out beam. Scattered light shall be less than 10 % for wavelengths between 500 nm and 1 000 nm.

6.2 Reflectivity of blank accessible optical area

The reflective layer enables reading of information from the add-on optical element in reflection mode. The reflectivity of the blank accessible optical area shall be greater than 90 % for wavelengths between 500 nm and 1 000 nm when using the holographic authentication element. For macroscopic or microscopic authentication elements the minimum reflectivity shall be 75 % for wavelengths between 500 nm and 1 000 nm.