
**Identification cards — Optical
memory cards — Holographic
recording method —**

**Part 3:
Optical properties and characteristics**

*Cartes d'identification — Cartes à mémoire optique — Méthode
d'enregistrement holographique —*

Partie 3: Propriétés et caractéristiques optiques

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC 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).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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 World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

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

This second edition cancels and replaces the first edition (ISO/IEC 11695-3:2008), which has been technically revised.

A list of all the parts in the ISO/IEC 11695 series can be found on the ISO website.

Introduction

This document is one of a series of standards describing the parameters for optical holographic memory cards and the use of such cards for the storage and interchange of digital data.

The standards recognize the existence of different methods for recording and reading information on optical memory cards, the characteristics of which are specific to the recording method employed. In general, these different recording methods will not be compatible with each other. Therefore, the standards are structured to accommodate the inclusion of existing and future recording methods in a consistent manner.

This document is specific to optical memory cards using the holographic recording method. Characteristics which apply to other specific recording methods are found in separate standards.

This document defines the optical properties and characteristics and the extent of compliance with, addition to, and/or deviation from the relevant base document, ISO/IEC 11693.

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Identification cards — Optical memory cards — Holographic recording method —

Part 3: Optical properties and characteristics

1 Scope

This document specifies the optical properties and characteristics of optical memory cards using the holographic recording method.

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/IEC 10373-9, *Identification cards — Test methods — Part 9: Optical memory cards — Holographic recording method*

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

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11695-1, ISO/IEC 11695-2 and the following apply.

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

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

3.1

reflectivity

ratio of reflected light to the light incident at a specified wavelength measured at a normal incidence on the holographic 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

spatial resolution

ability of the storage material to distinguish and/or record physical details by electromagnetic means

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

3.4
contrast transfer function
CTF

mathematical function that expresses the ability of an optical device to transfer signals faithfully as a function of the spatial or temporal frequency of the signal

Note 1 to entry: The CTF is the ratio of percentage modulation of a square wave signal leaving to that entering the device over the range of frequencies of interest. The CTF is usually presented as a graph of CTF versus log (frequency).

4 Reading/writing test conditions

4.1 Test methods

The test methods specified in ISO/IEC 10373-9 shall apply.

4.2 Default test environment and conditioning

The default test environment and conditioning parameters specified in ISO/IEC 11693-1 shall apply.

5 Optical properties and characteristics

5.1 Surface roughness/scattering

The substrate shall provide a flat and smooth surface as the carrier for the reflective and optical storage layers. The surface roughness shall be less than $R_a = 100$ nm; 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.

5.2 Reflectivity of blank accessible optical area

The reflective layer enables reading of holographic memory cards in reflection mode. The reflectivity of the blank accessible optical area (not containing holograms) shall be greater than 90 % for wavelengths between 500 nm and 1 000 nm.

5.2.1 Spatial resolution

The limiting resolution of the holographic memory card is measured by determining the smallest group of bars, both vertically and horizontally, for which the correct number of bars can be recorded and/or seen. By calculating the contrast between the black and white areas at several different frequencies, points of the contrast transfer function (CTF) can be determined with the contrast equation; see [Formula \(1\)](#).

$$Contrast = \frac{c_{max} - c_{min}}{c_{max} + c_{min}} \quad (1)$$

where

- c_{max} is the normalized value of the maximum (for example, the voltage or grey value of the white area);
- c_{min} is the normalized value of the minimum (for example, the voltage or grey value of the black area).

When the system can no longer resolve the bars, the black and white areas have the same value, so $Contrast = 0$. At very low spatial frequencies, $c_{max} = 1$ and $c_{min} = 0$, so $Contrast = 1$.

For the holographic memory card, the minimum $Contrast$ shall be 1 up to a density of 1 000 line pairs per millimetre.