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**Information technology — Data  
interchange on 130 mm (5,25 in) flexible  
disk cartridges using modified frequency  
modulation recording at 7 958 ftprad,  
1,9 tpmm (48 tpi), on both sides — ISO  
type 202 —**

[ISO/IEC 7487-1:1993](https://standards.iso.org/standards/sist/b57a24f0-f72f-4e10-8df6-8e63eb271b6/iso-iec-7487-1-1993)

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**Part 1:**  
Dimensional, physical and magnetic  
characteristics

*Technologies de l'information — Échange de données sur cartouches à disquettes de 130 mm (5,25 in) utilisant un enregistrement à modulation de fréquence modifiée (MFM) à 7 958 ftprad, 1,9 tpmm (48 tpi) sur les deux faces — Type ISO 202 —*

*Partie 1: Caractéristiques dimensionnelles, physiques et magnétiques*

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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. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 7487-1 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 11, *Flexible magnetic media for digital data interchange*.

This second edition cancels and replaces the first edition (ISO 7487-1:1985), of which it constitutes a technical revision.

ISO/IEC 7487 consists of the following parts, under the general title *Information technology — Data interchange on 130 mm (5,25 in) flexible disk cartridges using modified frequency modulation recording at 7 958 ftprad, 1,9 tpm (48 tpi), on both sides — ISO type 202*:

- Part 1: *Dimensional, physical and magnetic characteristics*
- Part 2: *Track format A*
- Part 3: *Track format B*

Annexes A, B and C form an integral part of this part of ISO/IEC 7487. Annexes D and E are for information only.

## Introduction

ISO/IEC 7487 specifies the characteristics of 130 mm (5,25 in) flexible disk cartridges recorded at 7 958 ftprad, 1,9 tpmm (48 tpi), on both sides using modified frequency modulation recording.

ISO 7487-2 and ISO 7487-3 each specify the quality of recorded signals, the track layout, and a track format to be used on such a flexible disk cartridge, which is intended for data interchange between data processing systems.

Together with the labelling scheme specified in ISO 7665, ISO/IEC 7487-1 and ISO 7487-2 provide for a full data interchange between data processing systems.

Together with the labelling scheme specified in ISO 9293, ISO/IEC 7487-1 and ISO 7487-3 provide for another full data interchange between data processing systems.

In accordance with ISO/IEC 9983, flexible disk cartridges conforming to this part of ISO/IEC 7487 should be designated as "ISO type 202"<sup>93</sup>

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# Information technology — Data interchange on 130 mm (5,25 in) flexible disk cartridges using modified frequency modulation recording at 7 958 ftprad, 1,9 tpmm (48 tpi), on both sides — ISO type 202 —

## Part 1:

## Dimensional, physical and magnetic characteristics

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### 1 Scope

This part of ISO/IEC 7487 specifies the dimensional, physical and magnetic characteristics of the cartridge so as to provide physical interchangeability between data processing systems.

editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

### 2 Conformance

A flexible disk cartridge shall be in conformance with ISO 7487 when it meets all the requirements of ISO/IEC 7487-1 and those of either ISO 7487-2 or ISO 7487-3.

ISO 7487-2:1985, *Information processing — Data interchange on 130 mm (5.25 in) flexible disk cartridges using modified frequency modulation recording at 7 958 ftprad, 1,9 tpmm (48 tpi), on both sides — Part 2: Track format A.*

NOTE 1 Numeric values in the SI and/or Imperial measurement system in this International Standard may have been rounded off and therefore are consistent with, but not exactly equal to, each other. Either system may be used, but the two should be neither intermixed nor reconverted. The original design was made using Imperial units and further developments were made using SI units.

ISO 7487-3:1986, *Information processing — Data interchange on 130 mm (5.25 in) flexible disk cartridges using modified frequency modulation recording at 7 958 ftprad, 1,9 tpmm (48 tpi), on both sides — Part 3: Track format B.*

ISO 7665:1983, *Information processing — File structure and labelling of flexible disk cartridges for information interchange.*

ISO 9293:1987, *Information processing — Volume and file structure of flexible disk cartridges for information interchange.*

### 3 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 7487. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 7487 are encouraged to investigate the possibility of applying the most recent

### 4 Definitions

For the purposes of this part of ISO/IEC 7487, the following definitions apply.

**4.1 flexible disk:** A flexible disk which accepts and retains on the specified side or sides magnetic signals

intended for input/output and storage purposes of information data processing and associated systems.

**4.2 master standard reference flexible disk cartridge:** A reference flexible disk cartridge selected as the standard for reference fields, signal amplitudes, resolution, and overwrite. Track 00 and Track 39 on each side are defined as reference tracks.

NOTE 2 The Master Standard has been established by the Physikalisch-Technische Bundesanstalt (PTB), Bundesallee 100, D-38023 Braunschweig, Germany.

**4.3 secondary standard reference flexible disk cartridge:** A flexible disk cartridge, the performance of which is known and stated in relation to that of the master standard reference flexible disk cartridge.

NOTE 3 Secondary standard reference flexible disk cartridges may be ordered from PTB Lab 1.41 under part number RM 7487, as long as available. It is intended that these be used for calibrating tertiary cartridges for use in routine calibrations.

**4.4 typical field** (for each side): The minimum recording field, which, when applied to a flexible disk cartridge, causes a signal output equal to 95 % of the maximum average signal amplitude when taken as a function of the recording field at the specified track and flux transition frequency of that flexible disk cartridge.

**4.5 reference field:** The typical field of the signal amplitude reference flexible disk cartridge. There are two reference fields, one for each side.

**4.6 test recording current** (for each side): The current between 145 % and 155 % of the current which produces the reference field at 125 000 flux transitions per second (ftps) on track 00 on both sides.

**4.7 standard reference amplitude (SRA)** (for each side): The average signal amplitudes derived from the reference tracks of the master standard reference flexible disk cartridge using the appropriate test recording current.

SRA<sub>1</sub> is the average signal amplitude from a recording written using 125 000 ftps ( $f_1$ ).

SRA<sub>2</sub> is the average signal amplitude from a recording written using 250 000 ftps ( $f_2$ ).

**4.8 average signal amplitude:** The arithmetically averaged value for a track of the output voltages measured peak-to-peak over the whole track.

**4.9 in-contact:** An operating condition in which the magnetic surface of the disk intended for data storage is in physical contact with the magnetic heads.

**4.10 formatting:** Writing the proper control information, establishing the physical tracks, and designating the addresses of physical records on the flexible disk's surfaces.

**4.11 initialization:** Writing the volume label, the ERMAP label and other information initially required to be on the flexible disk cartridge prior to the commencement of general processing or use.

**4.12 recording area:** That area of each disk surface with which the head may come into contact.

## 5 General description

### 5.1 General figures

A typical flexible disk cartridge is represented in figures 1 and 2.

### 5.2 Main elements

The main elements of this flexible disk cartridge are:

- the disk;
- the liner;
- the jacket.

The cartridge is stored in an envelope.

### 5.3 Description

The jacket is of a square form. It includes a central window, an index window and a head window in both sides.

The liner is fixed to the inside of the jacket. It comprises two layers of material between which the disk is held. The liner has the same openings as the jacket.

The disk has only a central window and an index window.

### 5.4 Optional features

The interchange characteristics of the cartridge allow for variations in its construction, as follows:

- the jacket may include flaps (for example three flaps as shown in the figures, or none);

— the jacket may include notches along the reference edge;

— the centre of the disk may be reinforced by hub support rings (see annex D).

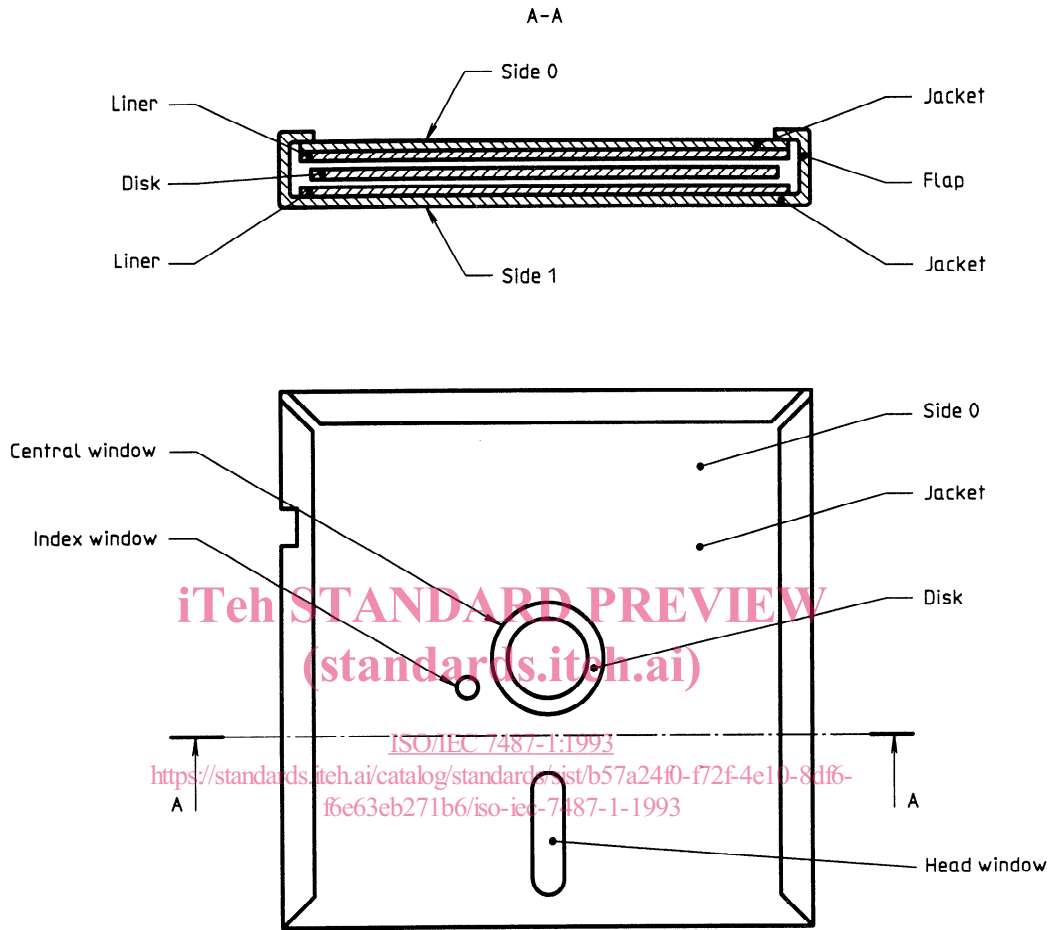
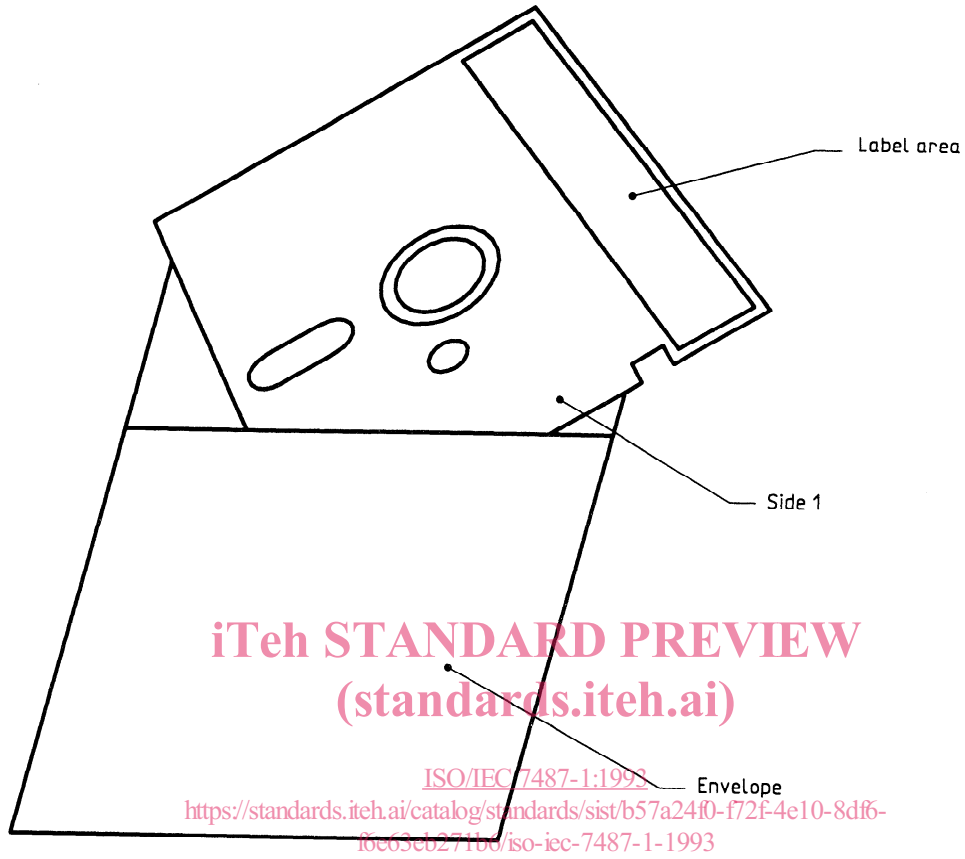


Figure 1 — Flexible disk cartridge



**Figure 2 — Protective envelope with cartridge**



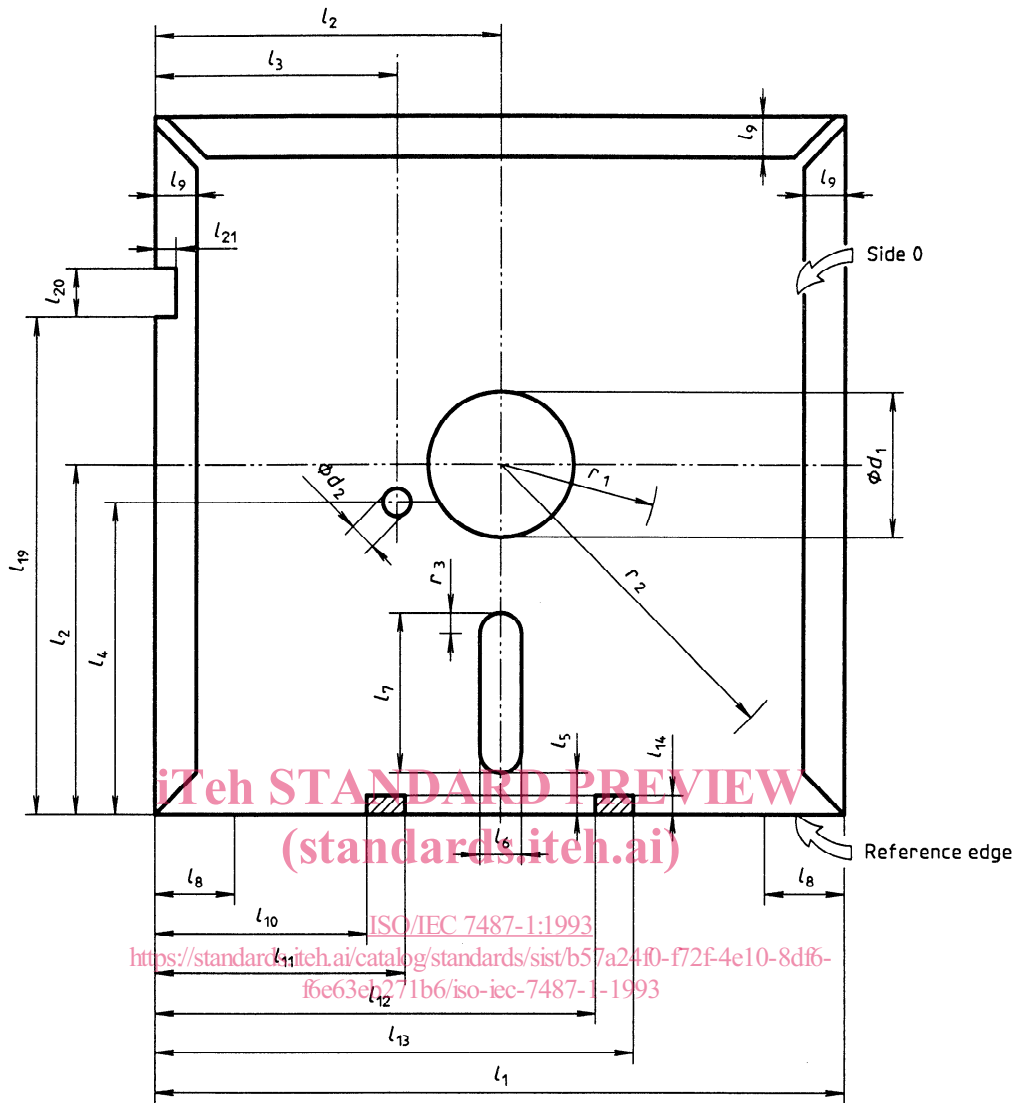


Figure 3 — Jacket dimensions

## 6 General requirements

### 6.1 Environment and transportation

#### 6.1.1 Testing environment

Tests and measurements made on the cartridge to check the requirements of this International Standard shall be carried out under the following conditions:

- temperature:  $23\text{ °C} \pm 2\text{ °C}$  ( $73\text{ °F} \pm 4\text{ °F}$ );
- relative humidity: 40 % to 60 %;
- conditioning before testing: 24 h minimum.

The temperature and the relative humidity shall be measured in the air immediately surrounding the cartridge.

The stray magnetic field at any point on the disk surface, including that resulting from the concentrating effect of the recording head, shall not exceed 4 000 A/m (50 Oe).

#### 6.1.2 Operating environment

Cartridges used for data interchange shall be operated under the following conditions:

- temperature:  $10\text{ °C}$  to  $51,5\text{ °C}$  ( $50\text{ °F}$  to  $125\text{ °F}$ );
- relative humidity: 20 % to 80 %;

— wet-bulb temperature: less than 29 °C (84 °F).

The temperature and the relative humidity shall be measured in the air immediately surrounding the cartridge. It is recommended that the rate of change of the temperature should not exceed 20 °C (68 °F) per hour.

There shall be no deposit of moisture on or in the cartridge.

The stray magnetic field at any point on the disk surface, including that resulting from the concentrating effect of the recording head, shall not exceed 4 000 A/m (50 Oe).

### 6.1.3 Storage environment

During storage the cartridges shall be kept under the following conditions:

- temperature: 4 °C to 51,5 °C (40 °F to 125 °F);
- relative humidity: 8 % to 80 %.

Each cartridge shall be in an envelope and in an upright position.

There shall be no deposit of moisture on or in the cartridge.

The ambient stray magnetic field at any point on the disk surface shall not exceed 4 000 A/m (50 Oe).

NOTE 4 Cartridges which have been stored at temperatures and humidities outside the operating conditions can exhibit degraded performance characteristics. Such cartridges should be subjected to a conditioning period of not less than 24 h within the operating environment prior to use.

### 6.1.4 Transportation

Responsibility for ensuring that adequate precautions are taken during transportation shall be with the sender. During transportation the cartridge shall be in its envelope and in a protective package. The latter shall be free from dust or extraneous matter. It shall have a clean interior and construction to minimize ingress of dust and moisture. It is recommended that a sufficient space exists between cartridge and outer surface of the final container so that risk of damage due to stray magnetic fields will be negligible.

It is recommended that the following conditions are not exceeded:

- temperature: – 40 °C to 51,5 °C (– 40 °F to 125 °F);

— maximum rate of temperature change: 20 °C (68 °F) per hour;

— relative humidity: 8 % to 90 %. To be measured only when temperature is 5 °C (41 °F) or greater.

There should be no deposit of moisture on or in the cartridge.

### 6.1.5 Handling

The cartridge shall remain out of its envelope for the shortest time possible. When handling the cartridge the operator shall not touch the exposed magnetic surfaces of the disk and shall avoid exposing the cartridge to direct sunlight, moisture and dust.

## 6.2 Materials

### 6.2.1 Jacket

The jacket may be constructed from any suitable material (for example, vinyl chloride sheet).

### 6.2.2 Liner

The material of the liner shall be able to retain dust without damage to the disk (for example, nonwoven fabric).

### 6.2.3 Disk

The disk may be constructed from any suitable material (for example, biaxially oriented polyethylene terephthalate) coated on both sides with a strong and flexible layer of magnetic material (for example,  $\gamma$  – Fe<sub>2</sub>O<sub>3</sub>).

### 6.2.4 Envelope

The envelope may be manufactured from any suitable material (for example, paper).

## 6.3 Direction of rotation

The direction of rotation shall be counterclockwise when looking at side 0.

## 7 Dimensional characteristics

The dimensional characteristics listed in the following subclauses are indicated in figures 3 to 5.

All dimensions are referred to the reference edge of the cartridge (see figure 3).

## 7.1 Jacket

### 7.1.1 Form

The jacket shall have a square form with angles of  $90^\circ \pm 30'$ , and a side length

$$l_1 = 133,3 \text{ mm} \pm 0,4 \text{ mm} \quad (5,250 \text{ in} \pm 0,015 \text{ in})$$

### 7.1.2 Thickness

#### 7.1.2.1 Jacket wall and liner

In an area defined by

$$r_1 = 35 \text{ mm} \quad (1,38 \text{ in})$$

$$r_2 = 50 \text{ mm} \quad (1,97 \text{ in})$$

and with a probe having a diameter of 15 mm (0,59 in) applied against the cartridge with a force of 1 N (3,6 ozf), the thickness of the jacket wall and liner shall be

$$e_1 = 0,45 \text{ mm} \pm 0,15 \text{ mm} \quad (0,018 \text{ in} \pm 0,006 \text{ in})$$

#### 7.1.2.2 Cartridge

The overall thickness of the cartridge shall be (see ISO/IEC 7487-1:1993 7.1.7):

$$1,2 \text{ mm} \quad (0,047 \text{ in}) < e_2 < 2,1 \text{ mm} \quad (0,083 \text{ in}),$$

when measured in accordance with A.1 and A.2.

The cartridge shall fall freely through a gauge with a  $2,60^{+0,05}_{0,00} \text{ mm}$  ( $0,100^{+0,002}_{0,000} \text{ in}$ ) wide opening having flat, vertical walls and depth of 150 mm (5,90 in).

### 7.1.3 Central windows

The central windows shall have a diameter

$$d_1 = 39,7 \text{ mm} \pm 0,2 \text{ mm} \quad (1,563 \text{ in} \pm 0,008 \text{ in})$$

The position of their centre is defined by

$$l_2 = 66,65 \text{ mm} \pm 0,30 \text{ mm} \quad (2,624 \text{ in} \pm 0,012 \text{ in})$$

### 7.1.4 Index windows

#### 7.1.4.1 Location

The centre of the index windows shall be defined by

$$l_3 = 42,10 \text{ mm} \pm 0,25 \text{ mm} \quad (1,657 \text{ in} \pm 0,010 \text{ in})$$

$$l_4 = 60,00 \text{ mm} \pm 0,25 \text{ mm} \quad (2,362 \text{ in} \pm 0,010 \text{ in})$$

#### 7.1.4.2 Diameter

The diameter of the index windows shall be

$$d_2 = 6,35 \text{ mm} \pm 0,20 \text{ mm} \quad (0,250 \text{ in} \pm 0,008 \text{ in})$$

### 7.1.5 Head windows

#### 7.1.5.1 Location

The location of the lowest point of the head windows shall be defined by

$$l_5 = 3,30 \text{ mm} \pm 0,25 \text{ mm} \quad (0,130 \text{ in} \pm 0,010 \text{ in})$$

#### 7.1.5.2 Dimensions

The width of the head windows shall be

$$l_6 = 12,7 \text{ mm} \pm 0,2 \text{ mm} \quad (0,500 \text{ in} \pm 0,008 \text{ in})$$

The nominal radius of their ends shall be

$$r_3 = 6,35 \text{ mm} \quad (0,25 \text{ in})$$

Their length shall be

$$l_7 = 35,00 \text{ mm} \pm 0,25 \text{ mm} \quad (1,378 \text{ in} \pm 0,010 \text{ in})$$

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### 7.1.6 Reference edge profile

Within an area defined by

$$l_8 = 25 \text{ mm} \quad (1,0 \text{ in})$$

the reference edge shall have a convex profile; for example rounded off with one or more radii of 0,3 mm min. (0,012 in min.).

### 7.1.7 Construction of the jacket

If the jacket utilizes flaps, their width shall not exceed

$$l_9 = 12 \text{ mm} \quad (0,47 \text{ in})$$

The total thickness  $e_2$  of the cartridge with flaps shall satisfy the conditions of 7.1.2.2 (see annex A).

### 7.1.8 Notches

Two notches may be provided along the reference edge. If provided, they shall be entirely contained within areas defined by

$$l_{10} = 48 \text{ mm min.} \quad (1,889 \text{ in min.})$$

$$l_{11} = 58 \text{ mm min.} \quad (2,283 \text{ in min.})$$