

**DIN EN 62345**

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**ID-Format für das magneto-optische System mit 50-mm-Platte  
(IEC 62345:2005);****Deutsche Fassung EN 62345:2005, Text Englisch**

ID format for 50 mm magneto-optical disc system (IEC 62345:2005);  
German version EN 62345:2005, text in English

Format de l'identifiant pour un système à disque magnéto-optique de 50  
mm(CEI 62345:2005);

Version allemande EN 62345:2005, texte en anglais

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## Beginn der Gültigkeit

Die von CENELEC am 2005-02-01 angenommene EN 62345 gilt als DIN-Norm ab 2005-09-01.

## Nationales Vorwort

*Vorausgegangener Norm-Entwurf: E DIN IEC 62345:2003-01.*

Für die vorliegende Norm ist das nationale Arbeitsgremium K 742 „Audio-, Video- und Multimediasysteme, -geräte und -komponenten“ der DKE Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE zuständig.

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**ID-Format für das magneto-optische System mit 50-mm-Platte**  
(IEC 62345:2005)

ID format for 50 mm magneto-optical disc  
system  
(IEC 62345:2005)

Format de l'identifiant pour un système  
à disque magnéto-optique de 50 mm  
(CEI 62345:2005)

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European Committee for Electrotechnical Standardization  
Comité Européen de Normalisation Electrotechnique

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## Vorwort

Der Text des Schriftstücks 100/870/FDIS, zukünftige 1. Ausgabe von IEC 62345, ausgearbeitet von dem IEC TC 100 „Audio, video and multimedia systems and equipment“, wurde der IEC-CENELEC Parallelen Abstimmung unterworfen und von CENELEC am 2005-02-01 als EN 62345 angenommen.

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Der Text der Internationalen Norm IEC 62345:2005 wurde von CENELEC ohne irgendeine Abänderung als Europäische Norm angenommen.

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## INTERNATIONAL ELECTROTECHNICAL COMMISSION

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### ID FORMAT FOR 50 mm MAGNETO-OPTICAL DISC SYSTEM

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International Standard IEC 62345 has been prepared by IEC technical committee 100: Audio, video, and multimedia systems and equipment.

The text of this standard is based on the following documents:

| FDIS         | Report on voting |
|--------------|------------------|
| 100/870/FDIS | 100/912/RVD      |

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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- reconfirmed;
- withdrawn;
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

## ID FORMAT FOR 50 mm MAGNETO-OPTICAL DISC SYSTEM

### 1 Scope

This International Standard specifies the characteristics of 50 mm Optical Disc Cartridges (ODC) with a capacity of 730 Mbytes per Cartridge. This regulation covers the logical format of removable 50 mm magneto-optical discs used on digital still cameras, digital movie cameras, electronic albums and similar devices and combinations of these devices that record, play or process the digital data of still pictures, motion pictures and audio. This standard specifies the recording and reproducing format and processing method of files of still pictures, motion pictures and audio on 50 mm magneto-optical discs so that the users can use these discs on various compatible devices.

### 2 Normative references

The following referenced documents are indispensable for the application 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.

IEC 60950-1:2001, *Information technology equipment – Safety – Part 1: General requirements*

ISO/IEC 13346-1:1995, *Information technology – Volume and file structure of write-once and rewritable media using non-sequential recording for information interchange – Part 1: General*

### 3 Terms and definitions

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

#### 3.1

##### **band**

part of the Data Zone comprising a fixed number of consecutive physical tracks

#### 3.2

##### **base band wobble address**

address information formed by wobbling with bi-phase modulation

#### 3.3

##### **case**

housing for an optical disc, that protects the disc and facilitates disc interchange

#### 3.4

##### **channel bit**

smallest element for the representation of data on a disc. It is recorded as either a space or a mark

#### 3.5

##### **clamping zone**

annular part of the disc within which the clamping force is applied by the clamping device

**3.6****control zone**

zone containing the information on media parameters and format necessary for writing and reading the remaining tracks of the optical disc

**3.7****Cyclic Redundancy Check****CRC**

method for detecting errors in data

**3.8****data clock**

clock for data detection and data recording, generated by a PLL synchronized to fine clock marks

**3.9****defect management**

method for handling the defective areas on the disc

**3.10****disc reference plane**

plane defined by the perfectly flat annular surface of an ideal spindle onto which the clamping zone of the disc is clamped, and which is normal to the axis of rotation

**3.11****ECC Block**

group of frames to perform ECC 32 kB ECC Block execute Error Correction with a set of 16 frames

**3.12****embossed information**

information so formed as to be unalterable by magneto-optical means

**3.13****entrance surface**

surface of the disc onto which the optical beam first impinges

**3.14****Error Correction Code****ECC**

error-detecting code designed to correct certain kinds of errors in data

**3.15****Fine Clock Mark**

embossed mark on disc for generating a clock

**3.16****format**

arrangement of information on the disc

**3.17****frame**

least physical addressable unit, which holds 2 048 data bytes and ECC bytes, and is comprised numbers of segments

**3.18**

**interleaving**

process of allocating the physical sequence of units of data so as to render the data more immune to burst errors

**3.19**

**land and groove**

trench-like feature of the disc, applied before the recording of any information, and used to define the track location. The groove is located nearer to the entrance surface than the land with which it is paired to form a track

**3.20**

**Logical Zone**

user data area including spare sector for Defect Management

**3.21**

**magnetic field modulation**

technique for recording encoded information on the disc by switching a recording magnetic field between two opposite directions

**3.22**

**optical disc**

disc that will accept and retain information in the form of marks in a recording layer that can be read with an optical beam

**3.23**

**optical disc cartridge**

**ODC**

device consisting of a case containing an optical disc

**3.24**

**polarization**

direction of polarization of an optical beam is the direction of the electric vector of the beam

**3.25**

**protective coating**

layer coated on top of the recording layer to protect from environmental influences and emergency landing of magnetic head

**3.26**

**read power**

optical power, incident at the entrance surface of the disc, used when reading

**3.27**

**recording magnetic field**

magnetic field that switches between two opposite directions (both perpendicular to the disc surface) according to the encoded information. When the focus spot of a laser beam heats the disc sufficiently, this magnetic field causes a permanent magnetic domain in the magneto-optical layer on the disc

**3.28**

**recording layer**

layer of the disc on or in which data is written during manufacture and/or use

**3.29**

**Reed-Solomon code**

error detection and/or correction code which is particularly suited for the correction of errors which occur in bursts or are strongly correlated

### 3.30 sector

least logical addressable unit from host interface, which holds 2 048 user bytes with Defect Management process adopted

### 3.31 segment

subdivision of a Frame bounded by an interval of Fine Clock Mark. The first segment of a frame is used as an address segment

### 3.32 spindle

part of the disc drive which is in contact with the disc

### 3.33 substrate

transparent layer of the disc, provided for mechanical support of the recording layer, through which the optical beam accesses the recording layer

### 3.34 track

path which is followed by the focus of the optical beam during one revolution of the disc. A track consists of a groove or a land

### 3.35 track pitch

distance between adjacent track (a groove and a land) centre lines, measured in a radial direction

### 3.36 zone

annular area of the disc

## 4 Conventions and notations

### 4.1 Representation of numbers

A measured value is rounded off to the least significant digit of the corresponding specified value. It implies that a specified value of 1,26 with a positive tolerance of +0,01, and a negative tolerance of -0,02 allows a range of measured values from 1,235 to 1,275.

- Letters and digits in parentheses represent numbers in hexadecimal notation.
- The setting of a bit is denoted by ZERO or ONE.
- Numbers in binary notation and bit combinations are represented by strings of 0 and 1.
- Numbers in binary notation and bit combinations are shown with the most significant bit to the left.
- Negative values of numbers in binary notation are given in TWO's complement.
- In each field the data is recorded so that the most significant byte (byte 0) is recorded first.

Within each byte the least significant bit is numbered 0 and is recorded first, the most significant bit (numbered 7 in an 8-bit byte) is recorded last. This order of recording applies also to the data input of the Error Detection and Correction circuits and to their output.

### 4.2 Names

The names of entities, for example, specific tracks, fields etc., are given with a capital initial.

## 5 List of acronyms

|      |                                 |
|------|---------------------------------|
| ALPC | Auto Laser Power Control        |
| ADB  | Address Data Bit                |
| CDS  | Codeword Digital Sum            |
| CRC  | Cyclic Redundancy Check         |
| DCB  | Data Channel Bit                |
| DDS  | Disc Definition Structure       |
| DMA  | Defect Management Area          |
| DSV  | Digital Sum Value               |
| ECC  | Error Correction Code           |
| EDC  | Error Detection Code            |
| FA1  | Functional Area 1               |
| FA2  | Functional Area 2               |
| FCM  | Fine Clock Mark                 |
| ID   | Identifier                      |
| IED  | ID Error Detection code         |
| LSB  | Least Significant Byte          |
| LZ   | Logical Zone                    |
| MO   | Magneto-Optical                 |
| MSB  | Most Significant Byte           |
| NRZI | Non Return to Zero Inverted     |
| ODC  | Optical Disc Cartridge          |
| PDL  | Primary Defect List             |
| PI   | Parity of Inner-code            |
| PO   | Parity of Outer-code            |
| R/W  | Rewritable                      |
| RS   | Reed-Solomon                    |
| SDL  | Secondary Defect List           |
| ZCAV | Zoned Constant Angular Velocity |
| ZCLV | Zoned Constant Linear Velocity  |

## 6 General description of the optical disc cartridge

The optical disc cartridge which is the subject of this standard consists of a case containing an optical disc.

The case is a protective enclosure for the disc. It has access windows covered by a shutter. The windows are automatically uncovered by the drive when the cartridge is inserted into it.

The optical disc is recordable on one side. Data can be written onto the disc as marks in the form of magnetic domains in the recording layer and can be overwritten with new data with a focused optical beam, using the thermo-magnetic effect. The data can be read with a focused optical beam, using the magneto-optical effect. The beam accesses the recording layer through the transparent substrate of the disc.

## 7 General requirements

### 7.1 Environments

#### 7.1.1 Testing environment

|                       |                   |
|-----------------------|-------------------|
| Temperature:          | 23 °C ± 2 °C      |
| Relative humidity:    | 45 % to 55 %      |
| Atmospheric pressure: | 60 kPa to 106 kPa |
| Air cleanliness:      | Class 100 000     |

#### 7.1.2 Operating environment

|                                                                                                        |                                           |
|--------------------------------------------------------------------------------------------------------|-------------------------------------------|
| Temperature:                                                                                           | 0 °C to 60 °C                             |
| Relative humidity:                                                                                     | 3 % to 85 %                               |
| Absolute humidity:                                                                                     | 1 g/m <sup>3</sup> to 30 g/m <sup>3</sup> |
| Atmospheric pressure:                                                                                  | 60 kPa to 106 kPa                         |
| Temperature gradient:                                                                                  | 10 °C/h maximum                           |
| Relative humidity gradient:                                                                            | 10 %/h maximum                            |
| Air cleanliness:                                                                                       | office environment                        |
| Magnetic field strength at the recording layer<br>for any condition under which a beam is in<br>focus: | 2 000 A/m maximum                         |
| Magnetic field strength at the recording layer<br>during any other condition:                          | 48 000 A/m maximum                        |

#### 7.1.3 Storage environment

|                                                 |                                           |
|-------------------------------------------------|-------------------------------------------|
| Temperature:                                    | −20 °C to 70 °C                           |
| Relative humidity:                              | 3 % to 90 %                               |
| Absolute humidity:                              | 1 g/m <sup>3</sup> to 30 g/m <sup>3</sup> |
| Atmospheric pressure:                           | 60 kPa to 106 kPa                         |
| Temperature gradient:                           | 15 °C/h maximum                           |
| Relative humidity gradient:                     | 10 %/h maximum                            |
| Air cleanliness:                                | office environment                        |
| Magnetic field strength at the recording layer: | 48 000 A/m maximum                        |

#### 7.1.4 Transportation

This standard does not specify requirements for transportation; guidance is given in Annex I.

### 7.2 Temperature shock

The optical cartridge shall withstand a temperature shock of up to 20 °C when inserted into, or removed from, the drive.

### 7.3 Safety requirements

The cartridge shall satisfy the safety requirements of IEC 60950, when used in the intended manner or in any foreseeable use in an information processing system.

## 8 Reference drive

### 8.1 Optical system

The basic set-up of the optical system of the reference drive used for measuring the write and read parameters is shown in Figure 1. Different components and locations of components are permitted, provided that the performance remains the same as that of the set-up in Figure 1. The optical system shall be such that the detected light reflected from the entrance surface of the disc is minimized so as not to influence the accuracy of the measurements.

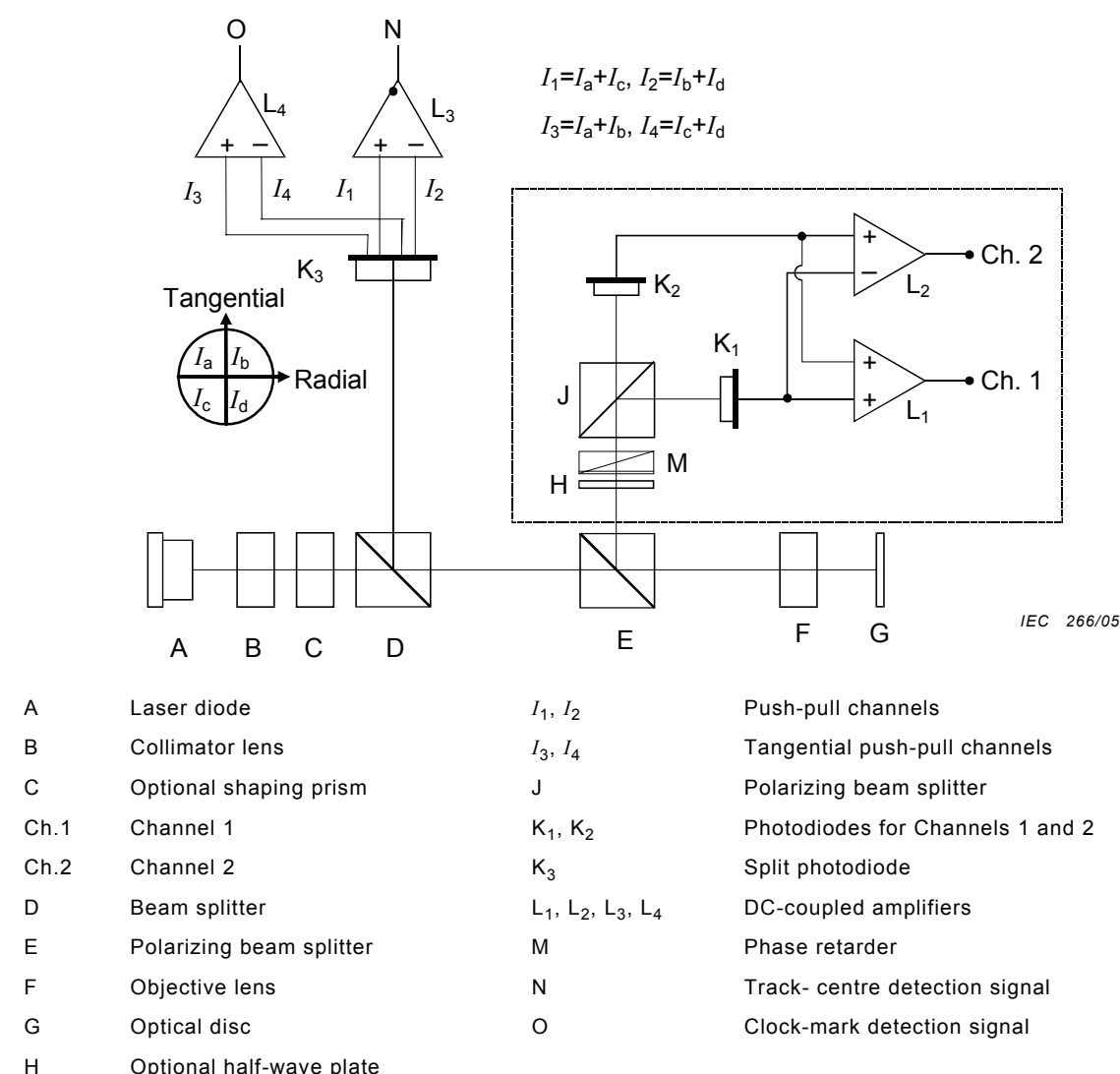


Figure 1 – Optical system of the reference drive

In the absence of polarization changes in the disc, the polarizing beam splitter J shall be aligned to make the signal of detector  $K_1$  equal to that of detector  $K_2$ . The direction of polarization in this case is called the neutral direction. The phase retarder M shall be adjusted in such a way that the optical system does not have more than 2,5° phase retardation between the neutral polarization and the polarization perpendicular to it. This position of the retarder is called the neutral position.

The beam splitter J shall have a p-s intensity reflectance ratio of at least 100.

The beam splitter E shall have an intensity reflectance  $R_p$  from F to H of nominally 0,30 for the neutral polarization direction. The reflectance  $R_s$  for the polarization perpendicular to the neutral direction shall be nominally 0,95. The actual value of  $R_s$  shall not be smaller than 0,90.

The imbalance of the magneto-optical signal is specified for a beam splitter with nominal reflectance. If the measurement is made on a drive with reflectances  $R_p'$  and  $R_s'$  for beam splitter E, then the measured imbalance shall be multiplied by

$$\sqrt{\frac{R_s \cdot R_p'}{R_p \cdot R_s'}}$$

to make it correspond to the nominal beam splitter E.

The output of Channel 1 is the sum of the currents through photodiodes  $K_1$  and  $K_2$  and is used for reading embossed marks. The output of Channel 2 is the difference between photodiode currents and is used for reading user-written marks with the magneto-optical effect.

## 8.2 Optical beam

The focused optical beam used for writing and reading data shall have the following properties:

- a) Wavelength ( $\lambda$ ): 650 nm  $\pm$  10 nm
- b) Wavelength ( $\lambda$ ) divided by the numerical aperture of the objective lens (NA):  
 $\lambda/NA = 1,083 \mu\text{m} \pm 0,017 \mu\text{m}$
- c) Filling D/W of the aperture of the objective lens:  
Radial 0,85  $\pm$  0,05; tangential 0,85  $\pm$  0,05
- d) Variance of the wavefront of the optical beam near the recording layer, after passing through an ideal substrate:  
0 to  $\lambda^2/330$
- e) Polarization: Perpendicular to the track
- f) Extinction ratio: 0,01 max.
- g) The optical power for writing and reading and the magnetic field shall be as specified in Clause 12.

$D$  is the diameter of the lens aperture and  $W$  is the beam diameter of the Gaussian beam where the intensity is  $1/e^2$  of the maximum intensity.

The extinction ratio is the ratio of the minimum over the maximum power observed behind a linear polarizer in the optical beam, which is rotated over at least 180°.

## 8.3 Read channels

Two read channels shall be provided to generate signals from the marks in the recording layer. Channel 1 shall be used for reading the embossed marks, using the diffraction of the optical beam by the marks. Channel 2 shall be used for reading the user-written marks, using the rotation of the polarization of the optical beam due to the magneto-optical effect of the marks. The read amplifiers after the photo-detectors in Channel 1 and Channel 2 shall have a flat response within 1 dB from DC to 10 MHz for rotational frequencies of the disc as specified in 8.5.

## 8.4 Tracking

The Tracking Channel of the drive provides the tracking error signal to control the servo for the axial and radial tracking of the optical beam. The method of generating the axial tracking error is not specified for the reference drive. The radial tracking error is generated by a split photodiode detector in the Tracking Channel. The division of the diode runs parallel to the image of the tracks on the diode.

## 8.5 Rotation of the disc

The spindle shall position the disc as specified in 9.3. It shall rotate the disc at a linear speed of 4,8 m/s.

The direction of rotation shall be counter-clockwise when viewed from the objective lens.

# 9 Mechanical and physical characteristics

## 9.1 Dimensional and physical characteristics of the cartridge

### 9.1.1 Cartridge Outline (Figure 2)

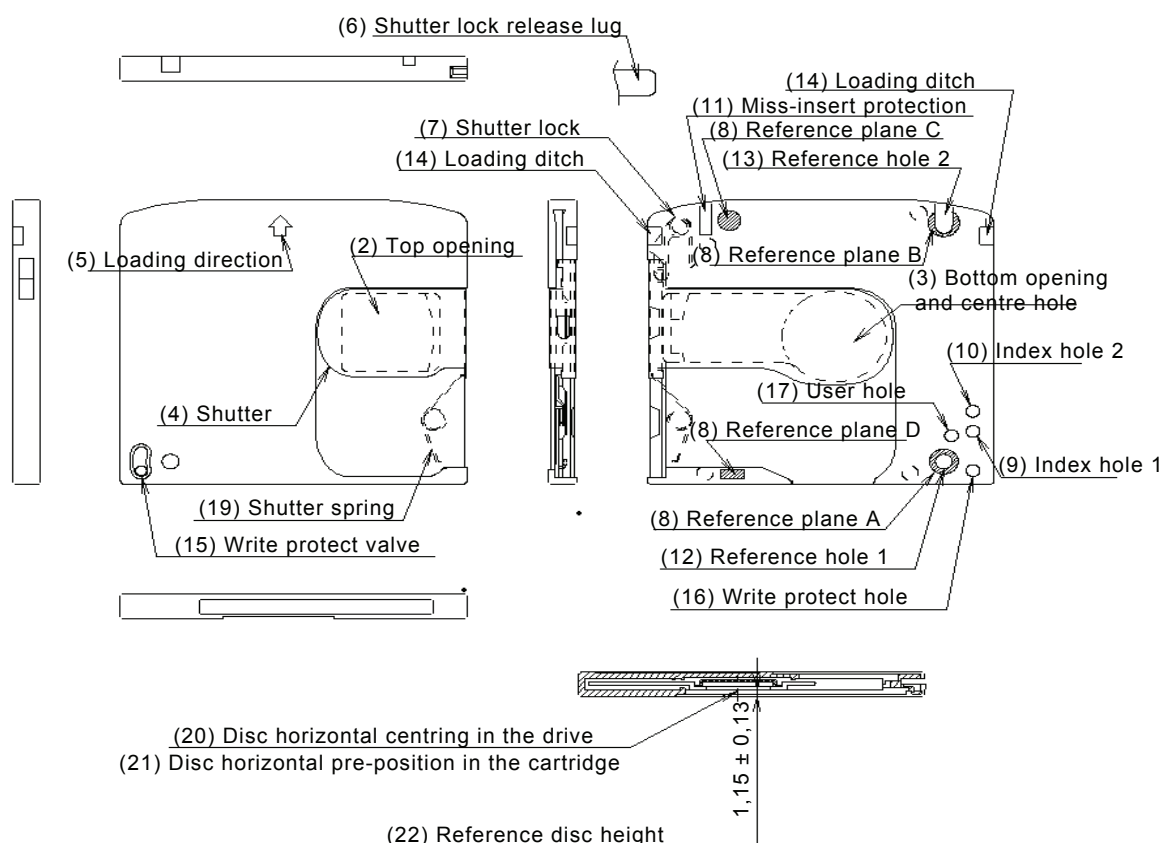
The cartridge is a rectangular parallelepiped having a curvature on one side. It has the hole (centre hole) on the bottom side to accept a disc rotating axis from the drive. It has a top opening for the magnetic head on the top side, and a bottom opening for the optical head of the drive on the bottom side.

The shutter of the cartridge, when left as it is, always covers the access window (top opening, bottom opening) and the centre hole by the force from shutter spring and the shutter lock. When the cartridge is inserted into the drive, the shutter fully opens the access window and the centre hole, being ready for recording/reading operation. When it is pulled out of the drive, the shutter again closes the access window and centre hole by using the force from the shutter spring.

The cartridge can insert the drive when correctly directed to the drive. The cartridge is set to write enable or write protected.

- |                                     |                                                                                                   |
|-------------------------------------|---------------------------------------------------------------------------------------------------|
| (1) Dimensions:                     | 56,5 ( <i>D</i> ) mm × 59,5 ( <i>W</i> ) mm × 4,8 ( <i>H</i> ) mm                                 |
| (2) Top opening:                    | Magnetic head                                                                                     |
| (3) Bottom opening and centre hole: | Optical head and disc rotating axis                                                               |
| (4) Shutter:                        | Covers top and bottom opening and bottom centre hole                                              |
| (5) Loading direction:              | An arrowhead indicating the loading direction is marked on the top side                           |
| (6) Shutter-lock release lug:       | For insertion depth into the cartridge (see Figure 2)                                             |
| (7) Shutter lock:                   | Shutter engages with shutter lock while the shutter is closed.                                    |
| (8) Reference planes:               | Four, A to D, on the bottom side                                                                  |
| (9) Index hole 1:                   | —                                                                                                 |
| (10) Index hole 2:                  | —                                                                                                 |
| (11) Miss-insert protection         | Allows the cartridge inserted to the bottom of the drive only when it is in the correct direction |
| (12) Reference hole 1:              | Circle                                                                                            |
| (13) Reference hole 2:              | U-shape                                                                                           |
| (14) Loading ditch:                 | Two symmetrical ditches for power loading                                                         |
| (15) Write protect valve:           | Slides to open/close the write protect hole (16)                                                  |

- (16) Write protect hole: Open when the write protect valve knob is at up position – write protect – depth 3 mm min. Closed when the write protect valve knob is at down position – write enable – depth  $1^{+0,3}_{-0,1}$  mm
- (17) User hole: Open – depth 3 mm min. Closed – depth  $1^{+0,3}_{-0,1}$  mm
- (18) Holding area: Cartridge holding force in the holding area 1,5 N to 4 N
- (19) Shutter spring: Applies force to the shutter in the direction to top/bottom opening (2), (3)
- (20) Disc horizontal centring in the drive:  $((X - 18,8)^2 + (Y - 24,8)^2) \text{ mm} \leq (0,15)^2 \text{ mm}$
- (21) Disc horizontal pre-positioning in the cartridge:  $((X - 18,8)^2 + (Y - 24,8)^2) \text{ mm} \leq (0,8)^2 \text{ mm}$
- (22) Disc reference height: 1,15 mm  $\pm$  0,13 mm (from the cartridge reference plane)
- (23) Turntable inclination: 0,3° max.
- (24) Shutter locking force: 5 N min.
- (25) Cartridge mass: 20 g maximum (including disc)
- (26) Fixing by screw: The cartridge can be screw-assembled. For location of screw, see Figure 9.
- (27) Standard test tools: See Annexes B, C and D.



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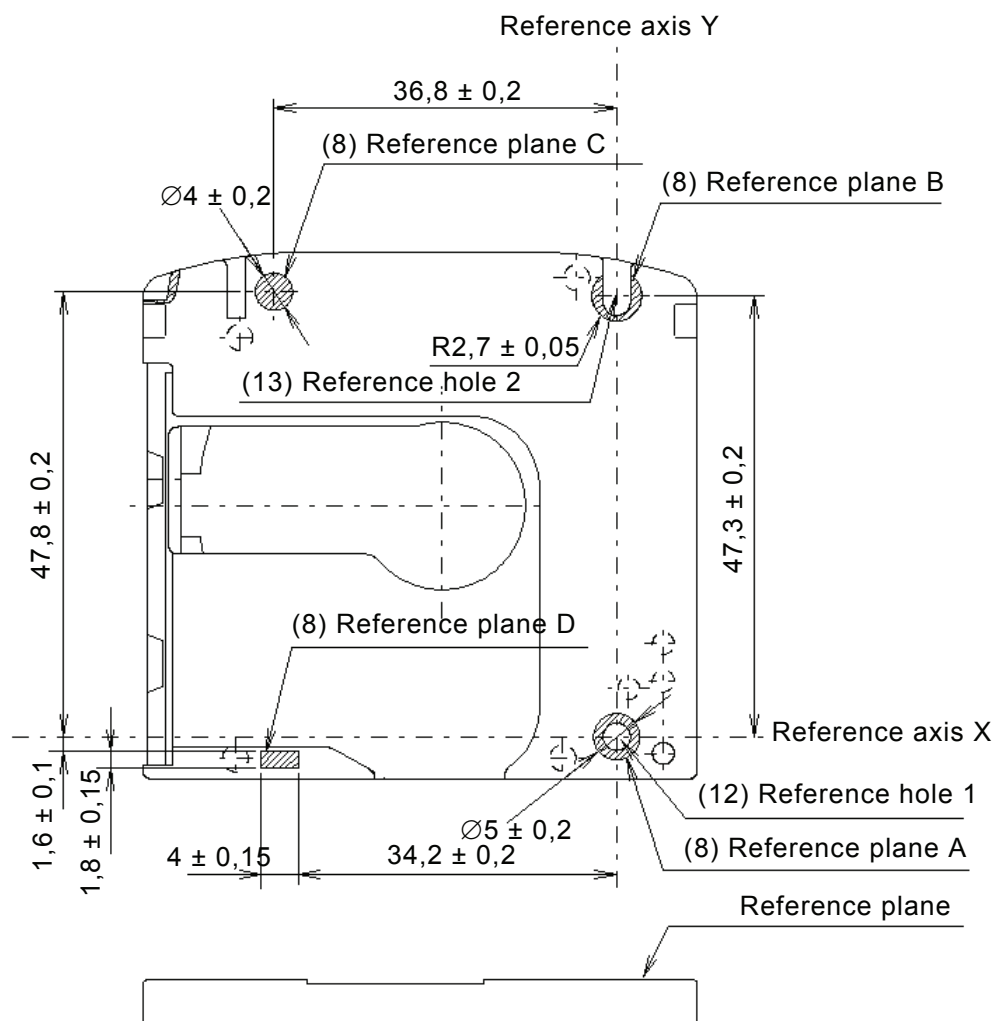
Figure 2 – Outline of cartridge

### 9.1.2 Cartridge reference line and reference plane (see Figure 3)

The plane defined with the reference planes A, B and C is the reference plane.

The cartridge reference lines: the line connecting the reference holes 1 and 2 together is the reference axis Y, the line normal to the reference axis Y and passing the centre of the reference hole 1 is the reference axis X.

Reference planes A, B, C and D and reference holes 1 and 2 are located at the position shown in Figure 3.



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Figure 3 – Cartridge reference line and reference plane

**9.1.3 Cartridge shape**

|                                                   |                                                                               |
|---------------------------------------------------|-------------------------------------------------------------------------------|
| Width (see Figures 4 and 5):                      | $59,5 \begin{smallmatrix} 0 \\ -0,4 \end{smallmatrix}$ mm                     |
| Depth (see Figures 4 and 5):                      | $56,5 \begin{smallmatrix} +0,6 \\ 0 \end{smallmatrix}$ mm                     |
| Thickness (see Figures 4 and 5):                  | 4,8 mm $\pm$ 0,2 mm                                                           |
| Cartridge reference plane flatness (see Annex B): | 0,1 mm max.                                                                   |
| Cartridge flatness (see Annex C):                 | 0,1 mm max.                                                                   |
| Curvature (see Annex D):                          | The cartridge shall pass through the reference tool smoothly by its gravity   |
| Screw (see Figure 9):                             | The cartridge can be screw-assembled. The screw location is shown in Figure 9 |

**9.1.4 Mass**

|               |                           |
|---------------|---------------------------|
| Maximum mass: | 20 g max.(including disc) |
|---------------|---------------------------|

**9.1.5 Bottom centre hole**

|                          |                                                                     |
|--------------------------|---------------------------------------------------------------------|
| Diameter (see Figure 5): | $\varnothing 18 \begin{smallmatrix} +0,2 \\ 0 \end{smallmatrix}$ mm |
|--------------------------|---------------------------------------------------------------------|

**9.1.6 Opening**

|                                |                                                           |
|--------------------------------|-----------------------------------------------------------|
| Top opening (see Figure 4):    | $15,5 \begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$ mm |
| Bottom opening (see Figure 5): | $13,7 \begin{smallmatrix} +0,4 \\ 0 \end{smallmatrix}$ mm |

**9.1.7 Holding area and label area (see Figures 4 and 8)**

Holding area: see Figure 8.

Label area is on the topside without the holding area.

No label area on the bottom side of the cartridge.

The cartridge may have a label area on the rear side.

The depth of the label area is 0,3 mm maximum. The label should be put within the label area.

**9.1.8 Shutter****9.1.8.1 Function (see Figure 6)**

The shutter shall be capable of covering the top opening, bottom opening and centre hole.

**9.1.8.2 Shutter closing force**

A force of 0,5 N to 0,7 N shall be enough to close the shutter fully. With the cartridge kept fixed, measure the closing force of the shutter on the spring scale when the shutter completely releases the centre hole located on the bottom side of the cartridge.

#### 9.1.8.3 Shutter locking force

The shutter locking force shall be 5 N min.

#### 9.1.8.4 Material

The material shall be metal

#### 9.1.8.5 Play between the shutter and shutter lock at shutter full-closed position

The play shall be 0,6 mm max.

#### 9.1.8.6 Shutter full-open position (see Figures 4, 5 and 6)

The engaged parts of the cartridge and the shutter are E and F, respectively.

### 9.1.9 Write protect hole (see Figures 2 and 5)

#### 9.1.9.1 Diameter

The diameter shall be  $2,4^{+0,1}_0$  mm.

#### 9.1.9.2 Depth of hole

Write protect: 3 mm min.

Write enable:  $1^{+0,3}_{-0,1}$  mm

#### 9.1.9.3 Function

Table 1 – Write protection

| Write protect hole | Function         |
|--------------------|------------------|
| CLOSE              | Write enable     |
| OPEN               | Write protection |

### 9.1.10 User hole (see Figures 2 and 5)

#### 9.1.10.1 Diameter

The diameter shall be  $2,4^{+0,1}_0$  mm.

#### 9.1.10.2 Depth of hole

User hole open: 3 mm min.

User hole close:  $1^{+0,3}_{-0,1}$  mm

**9.1.10.3 Function****Table 2 – User hole**

| User hole | Function |
|-----------|----------|
| CLOSE     | -        |
| OPEN      | -        |

A cartridge conforming to this specification does not use a hole. The hole shall be closed

**9.1.11 Index hole (see Figures 2 and 5)****9.1.11.1 Diameter of index hole**

The diameter shall be  $2,4^{+0,1}_0$  mm.

**9.1.11.2 Depth of hole**

OPEN: 2,4 mm min.

CLOSE: 0,1 mm max.

**9.1.11.3 Function****Table 3 – Index hole**

| Index hole 1 | Index hole 2 | Function |
|--------------|--------------|----------|
| CLOSE        | CLOSE        | -        |
| CLOSE        | OPEN         | -        |
| OPEN         | CLOSE        | -        |
| OPEN         | OPEN         | -        |

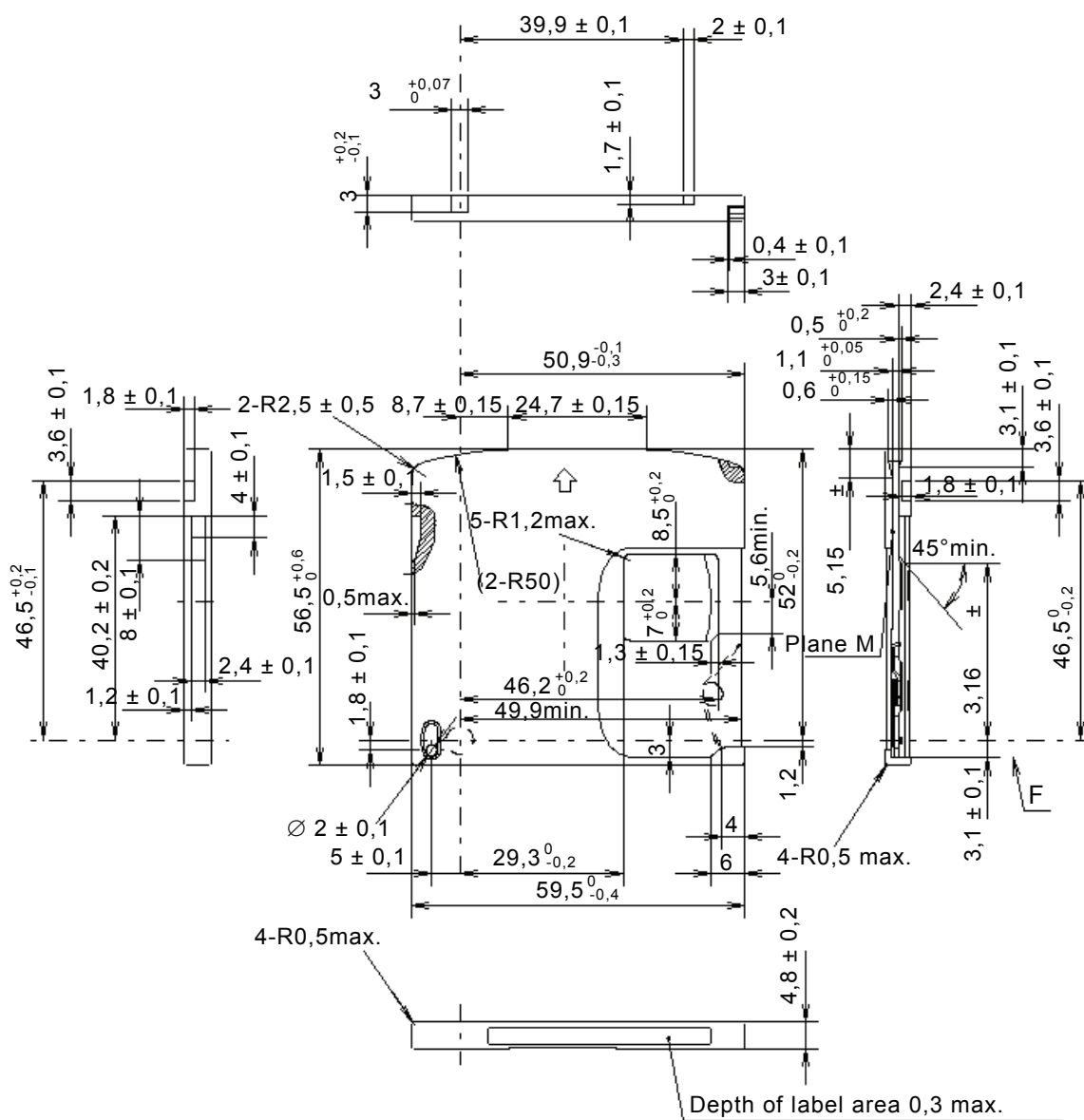
A cartridge conforming to this specification does not use holes. The holes shall be closed.

**9.1.12 Cartridge holding force****9.1.12.1 Holding force per point**

The holding force shall be 1 N max.

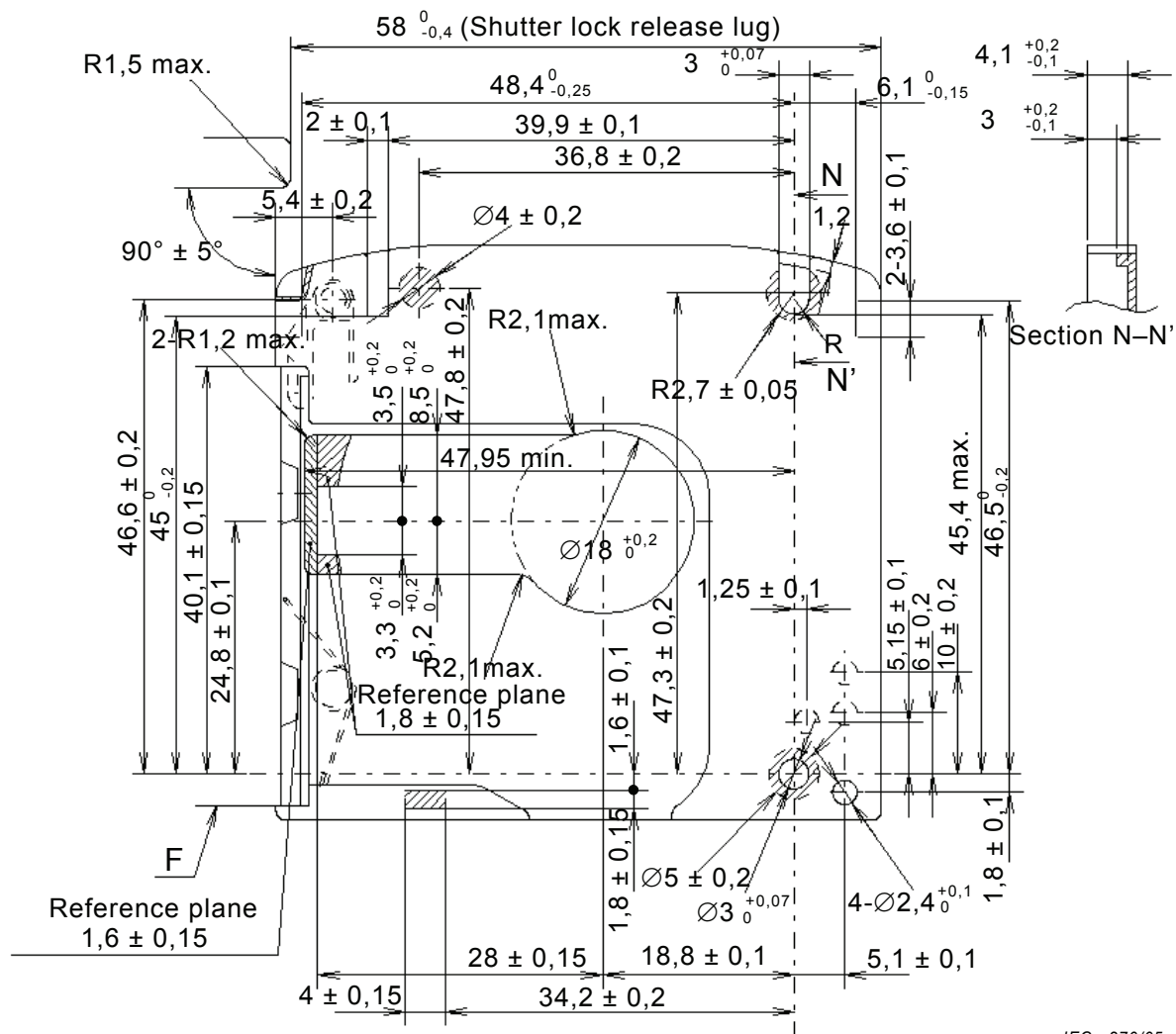
**9.1.12.2 Total holding force**

The total holding force shall be 1,5 N to 4 N.



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Figure 4 – Cartridge Top and Side View



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Figure 5 – Cartridge Bottom View

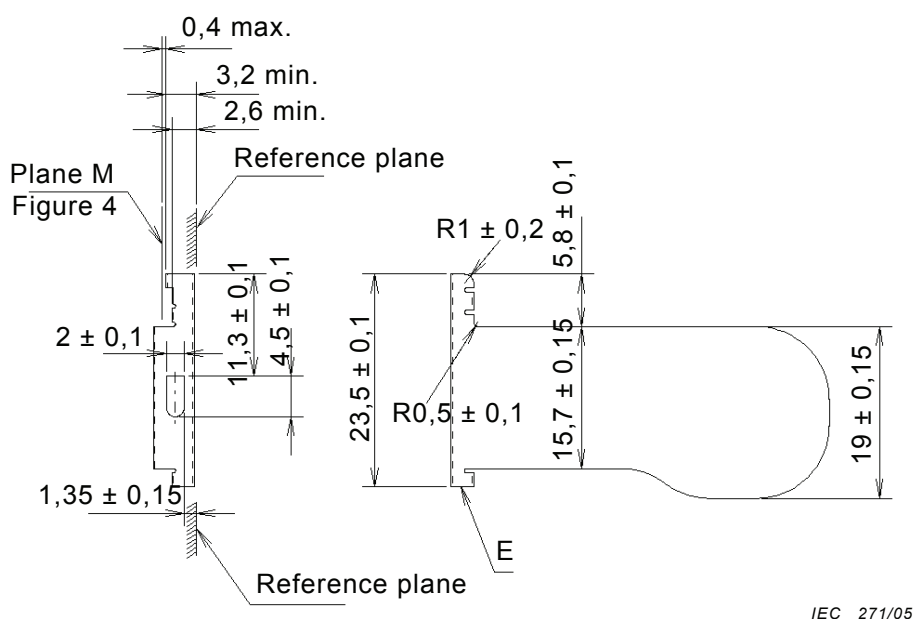


Figure 6 – Shutter

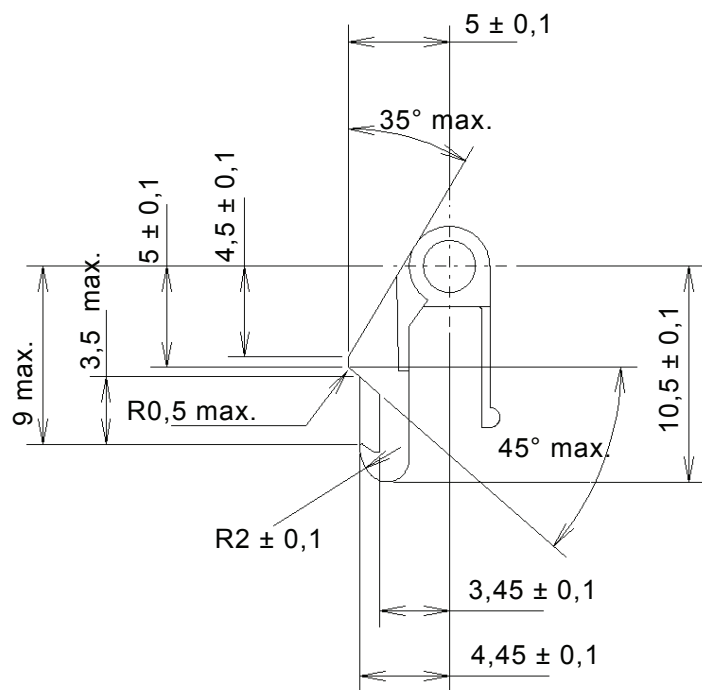


Figure 7 – Shutter lock

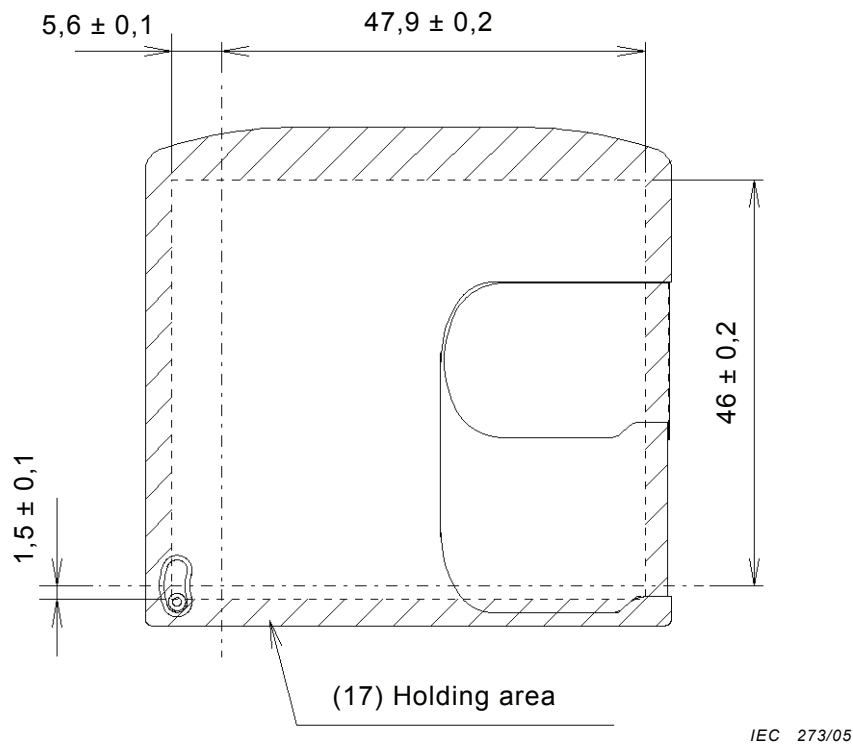


Figure 8 – Holding area

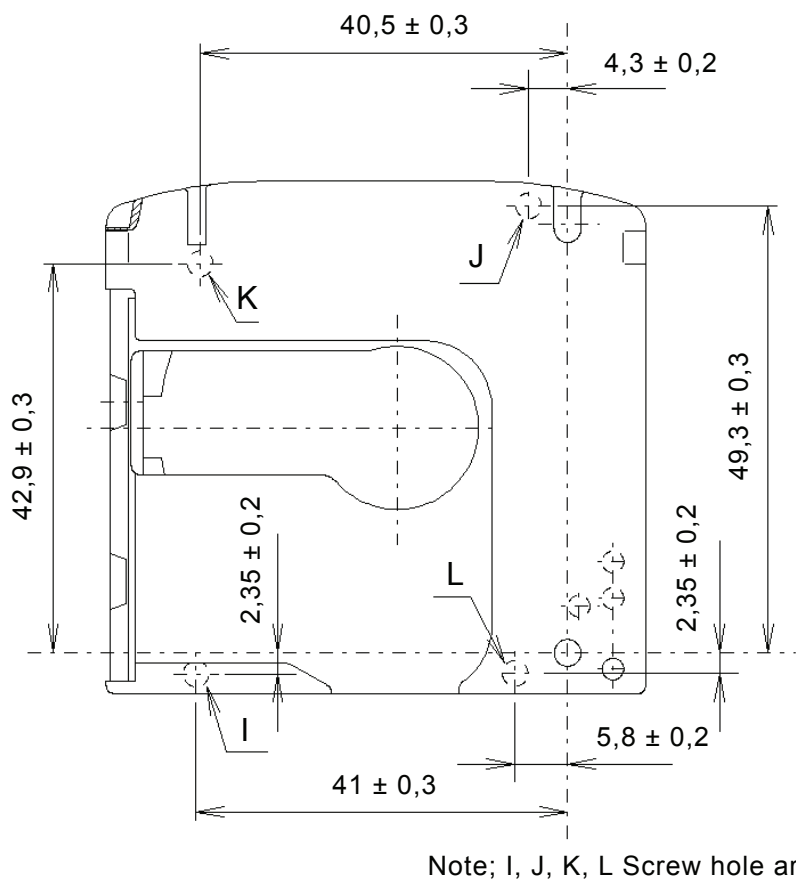


Figure 9 – Screw location

## 9.2 Dimensional, mechanical and physical characteristics of the disc

### 9.2.1 General description of the disc

The disc shall consist of a circular substrate with a recording layer that can be protected from environmental influences by a protective layer. The information zone of the substrate is transparent to allow an optical beam to focus on the recording layer through the substrate. The disc substrate has a centre hole for providing the radial centring of the disc.

### 9.2.2 Reference axis and plane of the disc

The disc reference plane P is defined by the perfectly flat annular surface of an ideal spindle onto which the clamping zone of the disc is clamped, and which is normal to the axis of rotation of this spindle. This axis H passes through the centre of the centre hole of the disc and is normal to plane P.

### 9.2.3 Dimensions of the disc (see Figure 10)

#### 9.2.3.1 Disc

The dimensions of the disc shall be measured in the testing environment. The dimensions of the disc in an operating environment can be estimated from the dimensions specified below.

Outer diameter = 50,8 mm  $\pm$  0,2 mm

Excluding axial deflection (see 9.2.4.5), the total thickness of the disc shall not exceed 0,7 mm in the range from

Ø 23,0 mm max.  
to outer diameter – 1,0 mm.

Diameter of the centre hole = 11,0<sup>+0,05</sup><sub>0,0</sub> mm

The eccentricity between the outline circle and the centre hole shall not exceed 0,1 mm.

The normal position of the recording layer = 1,6 mm  $\pm$  0,05 mm from the reference plane P in a direction normal to plane P.

Outer diameter of the clamping block = 16,8 mm  $\pm$  0,01 mm

#### 9.2.3.2 Clamping zone

Outer diameter of the clamping zone = 16,4 mm min.

Inner diameter of the clamping zone = 11,4 mm max.

Thickness of the clamping zone = 0,7 mm  $\pm$  0,05 mm

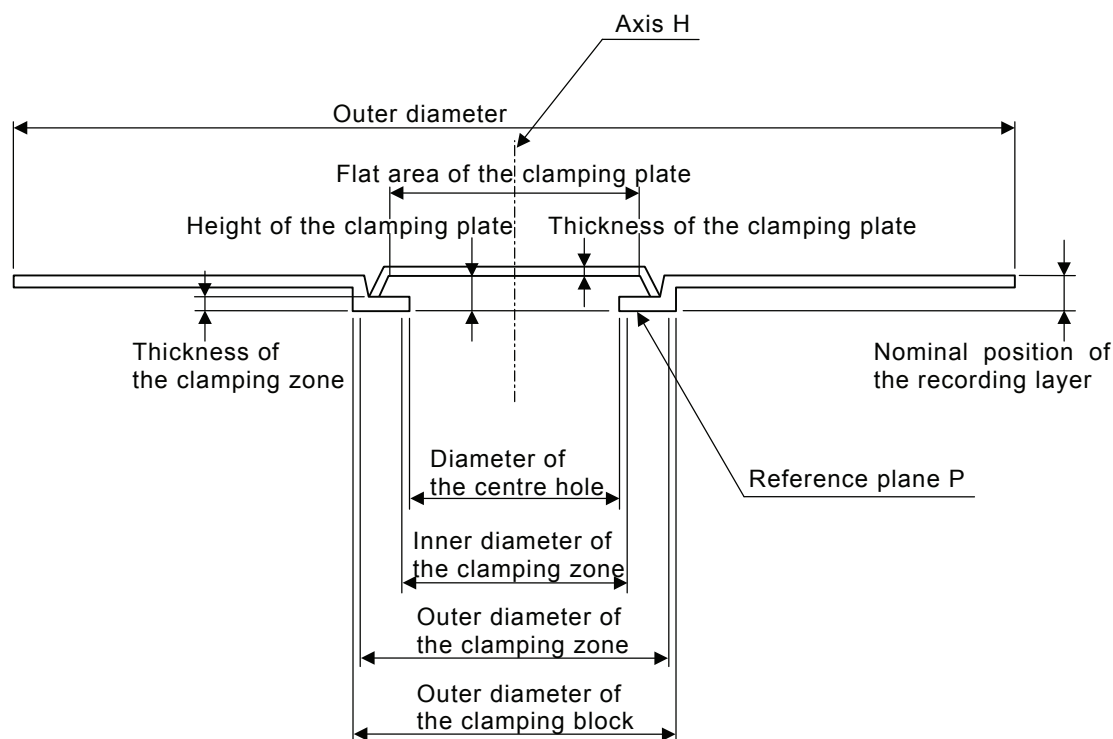
Thickness of the clamping plate = 0,4 mm  $\pm$  0,04 mm

Height of the clamping plate = 1,7 mm  $\pm$  0,1 mm

from the reference plane, in the range of < Ø 9,0 mm.

Flat area diameter of the clamping plate = 9,85 mm min.

The disc clamping force shall be less than 5 N.



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**Figure 10 – Disc dimensions****9.2.4 Mechanical characteristics**

All requirements in this clause shall be met in the testing environment.

**9.2.4.1 Material**

The disc shall be made from any suitable materials in such a way that it meets the requirements of this standard.

**9.2.4.2 Mass**

The mass of the disc shall not exceed 3 g.

**9.2.4.3 Moment of inertia**

The moment of inertia of the disc relative to axis H shall not exceed 0,001 g/m<sup>2</sup>.

**9.2.4.4 Imbalance**

The imbalance of the disc relative to axis H shall not exceed 0,001 g/m.

**9.2.4.5 Axial deflection**

The axial deflection of the disc is measured as the axial deviation of the recording layer. Thus, it comprises the tolerances on the thickness of the substrate, on its index of refraction and the deviation of the entrance surface from plane P. The nominal position of the recording layer with respect to reference plane P is determined by the nominal thickness of the substrate.

The deflection of any point of the recording layer in the Information Zone from its nominal position, in a direction normal to plane P, shall not exceed  $\pm 0,10$  mm for rotational frequencies of the disc as specified in 8.5.

#### 9.2.4.6 Axial acceleration

The maximum allowed axial error  $e_{\max}$  shall be specified in 11.1.3.4. The rotational frequency of the disc shall be 50 Hz. The stationary part of the motor is assumed to be motionless (no external disturbances). The measurement shall be made using a servo with the transfer function

$$H_s(i\omega) = \frac{1}{3} \left( \frac{\omega_0}{i\omega} \right)^2 \frac{1 + \frac{3i\omega}{\omega_0}}{1 + \frac{i\omega}{3\omega_0}}$$

where

$$\begin{aligned}\omega &= 2\pi f \\ \omega_0/2\pi &= 2\,125 \text{ Hz} \\ i &= \sqrt{-1}\end{aligned}$$

or any other servo with  $|1+H|$  within 20 % of  $|1+H_s|$  in the bandwidth of 50 Hz to 100 kHz. Thus, the disc shall not require an axial acceleration of more than  $35,0 \text{ m/s}^2$  at low frequencies from the servo motor of the Reference Servo.

#### 9.2.4.7 Radial run-out

The radial run-out of the tracks in the recording layer in the Information Zone is measured as seen by the optical head of the Reference Drive. Thus it includes the distance between the axis of rotation of the spindle and reference axis H, the tolerances on the dimensions between axis H and the location of the track, and effects of non-uniformities in the index of refraction.

The run-out, defined as the difference between the maximum and the minimum distance of the centre of any track from the axis of rotation, measured along a fixed radial line over the one revolution of the disc, shall not exceed  $50 \text{ }\mu\text{m}$  at a rotation frequency of 50 Hz.

#### 9.2.4.8 Radial acceleration

The maximum allowed tracking error  $e_{\max}$  shall be as specified in 11.1.3.4. The rotational frequency of the disc shall be 50 Hz. The stationary part of the motor is assumed to be motionless (no external disturbances). The measurement shall be made using a servo with the transfer function.

$$H_s(i\omega) = \frac{1}{3} \left( \frac{\omega_0}{i\omega} \right)^2 \frac{1 + \frac{3i\omega}{\omega_0}}{1 + \frac{i\omega}{3\omega_0}}$$

where

$$\begin{aligned}\omega &= 2\pi f \\ \omega_0/2\pi &= 2\,125 \text{ Hz} \\ i &= \sqrt{-1}\end{aligned}$$

or any other servo with  $|1+H|$  within 20 % of  $|1+H_s|$  in the bandwidth of 50 Hz to 100 kHz. Thus, the disc shall not require a radial acceleration of more than  $7,5 \text{ m/s}^2$  at low frequencies from the servo motor of the Reference Servo.

#### 9.2.4.9 Tilt

The tilt is the angle which the normal to the entrance surface, averaged over an area of 1 mm in diameter, makes with the normal to plane P. It shall not exceed

- 6,0 mrad (radial)
- 5,0 mrad (tangential)
- 6,0 mrad (all over)

in the Information Zone.

### 9.2.5 Optical characteristics

#### 9.2.5.1 Index of refraction

The index of refraction of the substrate in the Information Zone shall be within the range from 1,46 to 1,60.

#### 9.2.5.2 Thickness of the substrate

The thickness of the substrate, from the entrance surface to the recording layer, in the Information Zone shall be

$$0,9 \leq n \times d \leq 1,0$$

where  $n$  is the index of refraction and  $d$  is the thickness of the substrate.

#### 9.2.5.3 Reflectance

The reflectance  $R$  is the value of the reflectance on-land and in-groove of the Data Zone of the disc measured through the substrate and does not include the reflectance of the entrance surface.

The value of  $R$  at the standard wavelength specified in 8.2 shall lie within the range from 0,12 to 0,25.

At any point of the Data Zone, the value  $R$  shall meet the requirement

$$(R_{\max} - R_{\min}) / (R_{\max} + R_{\min}) \leq 0,3$$

where

$R_{\max}$  is the maximum value of measured reflectance in the Data Zone;

$R_{\min}$  is the minimum value of measured reflectance in the Data Zone.

#### 9.2.5.4 Birefringence

The birefringence of the transparent substrate in the Information Zone shall be less than 100 nm (double pass).

## **9.2.6 Protective coating**

### **9.2.6.1 General description of protective coating**

The protective coating shall cover the recording layer to protect from environmental influences and to fly the slider with a magnetic head.

The slider with magnetic head usually does not touch the protective coating at under the operating condition of over 4,5 m/s linear velocity.

The protective coating shall not disturb recording magnetic field.

### **9.2.6.2 General description of the operating zone**

The operating zone is part of the protective coating area. It is the area over which the slider with a magnetic head can fly.

### **9.2.6.3 Characteristics of the protective coating in the operating zone (Figure 11)**

The dimensions and physical characteristics of the protective coating in the operating zone shall meet the requirements specified in 9.2.6.4 to 9.2.6.7.

### **9.2.6.4 Dimensions of the protective coating in the operating zone**

Inner diameter of the operating zone = 24,6 mm max.

Outer diameter of the operating zone = 48,8 mm min.

The thickness of the protective coating in the operating zone shall not exceed 20 µm (see Figure 11).

### **9.2.6.5 Surface roughness**

The surface roughness of the protective coating in the operating zone is determined by the value of  $R_y$ .

$R_y$  shall not exceed 1,6 µm at any point of the operating zone.

### **9.2.6.6 Surface irregularity**

Surface irregularity of the protective coating in the operating zone shall not exceed 10 µm at any point of the operating zone.

### **9.2.6.7 Friction force and wear in thickness test (see Annex E)**

The friction force should not exceed 50 mN after 100 times Contact Start-Stop wear test.

### **9.2.6.8 Dimensions of the protective coating outside the operating zone**

The thickness of the protective coating in the zone outside the operating zone shall not exceed 100 µm from the recording layer (see Figure 11).