

INTERNATIONAL STANDARD

ISO/IEC
13923

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Information technology — 3,81 mm wide magnetic tape cartridge for information interchange — Helical scan recording — DDS-2 format using 120 m length tape

*Technologies de l'information — Cartouche de bande magnétique de
3,81 mm de large pour l'échange d'information — Enregistrement par
balayage en spirale — Format DDS-2 utilisant une bande de 120 m de long*



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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 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.

This International Standard was prepared by JISC (as Standard JIS X.6129-1993) with document support and contribution from ECMA and was adopted, under a special "fast-track procedure", by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, in parallel with its approval by national bodies of ISO and IEC.

Annexes A, D, E, F, G, H and K form an integral part of this International Standard. Annexes B, C, J, L and M are for information only.

Introduction

Numerous International Standards for cassettes and cartridges containing magnetic tapes of different width and characteristics have been published. Of these, the following relate to helical scan recording.

ISO/IEC 10777:1991	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical Scan Recording - DDS format</i>
ISO/IEC 11319:1993	<i>Information technology - 8 mm wide magnetic tape cartridge for information interchange - Helical scan recording</i>
ISO/IEC 11321:1992	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DATA/DAT format</i>
ISO/IEC 11557:1992	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DDS-DC format using 60 m and 90 m length tapes</i>
ISO/IEC 12246:1993	<i>Information technology - 8 mm wide magnetic tape cartridge dual azimuth format for information interchange - Helical scan recording</i>
ISO/IEC 12247:1993	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DDS format using 60 m and 90 m length tapes</i>
ISO/IEC 12248:1993	<i>Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DATA/DAT-DC format using 60 m and 90 m length tapes</i>

ISO/IEC 10777 defines a specification for data interchange using 3,81 mm wide magnetic tape cartridges, with the DDS format.

A derivative International Standard ISO/IEC 11557 defines another data interchange specification for the same cartridges, but with a recorded format, namely DDS-DC, which enables data to be compressed by the drive before being recorded.

This International Standard defines a specification, based on the features of both of these, which offers a further increase in data capacity. The primary change to the recorded format is an increase in the track density by a factor of 1,5. This produces a corresponding increase in data capacity for a cartridge of a given tape length. Such a track density, when recorded on a cartridge tape whose tape length is 125 metres, will provide a storage capacity of 4 Gigabytes of uncompressed user data and typically 8 to 16 Gigabytes of compressed user data.

The design philosophy is one of minimum change to the track format which is common to DDS and DDS-DC. This will aid the development of drives that support this DDS-2 format by derivation from existing products. It will also ease the development of drives that are able to support both previous formats as well as this format, thus providing the backwards compatibility which the market demands. However, it is not a requirement for compliance to this International Standard that a drive also reads and writes either the DDS format or the DDS-DC format. Nor is it a requirement for compliance to this International Standard that a drive compresses data and writes it in entities on the tape, or that a drive decompresses data contained within entities on the tape. All the recording on one cartridge will be at the same track density, either that of DDS and DDS-DC, or that of DDS-2. The media coating and the track density are indicated by the combination of the states of the Recognition Holes on the cartridge case.

This International Standard also includes the specifications of the Media Recognition System, namely a striped splicing tape.

Information technology - 3,81 mm wide magnetic tape cartridge for information interchange - Helical scan recording - DDS-2 format using 120 m length tape

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of a 3,81 mm wide magnetic tape cartridge to enable physical interchangeability of such cartridges between drives. It also specifies the quality of the recorded signals, the recording method and the recorded format, thereby allowing data interchange between drives by means of such magnetic tape cartridges.

The recorded format, known as DDS-2, includes all the features of the DDS recorded format specified in ISO/IEC 12247 and of the DDS-DC recorded format specified in ISO/IEC 11557. The principal difference between this recorded format and those recorded formats is the use of a greater track density by this format.

Information interchange between systems utilising this International Standard also requires the use, as a minimum, of a labelling specification, e.g. ISO 1001:1986, *Information processing - File structure and labelling of magnetic tapes for information interchange*, and an interchange code which shall be agreed upon by the interchange parties.

Under information interchange circumstances in which a processing algorithm is applied to the host data prior to recording on the tape and a complementary reprocessing algorithm is applied after the data is read from the tape, agreement upon the algorithms employed by the interchange parties is also required. It is outside the scope of this International Standard to specify any of these.

2 Conformance

2.1 Magnetic tape cartridge

A tape cartridge shall be in conformance with this International Standard if it meets all the mandatory requirements specified herein. The tape requirements shall be satisfied throughout the extent of the tape.

For each recorded Entity any algorithm used for Processing the data therein shall have been registered, and the registration identification shall be included, when appropriate, in Byte No. 3 of the Entity Header.

A recorded tape shall be either a Single Data Space Tape or a Partitioned Tape.

2.2 Generating system

A system generating a magnetic tape cartridge for interchange shall be entitled to claim conformance with this International Standard if all recordings on the tape meet the mandatory requirements of this International Standard, and if either or both methods of appending and overwriting are implemented.

A claim of conformance shall state which of the following optional features are implemented and which are not

- the performing of a Read-After-Write check and the recording of any necessary repeated frames;
- the recording of multiple representations of the same Basic Group;
- the generation of ECC3 Frames.

In addition a claim of conformance shall state

- whether or not one, or more, registered algorithm(s) are implemented within the system and are able to process data received from the host prior to collecting the data into Basic Groups, and
- the algorithm registration identification number(s) of the implemented algorithm(s).

2.3 Receiving system

A system receiving a magnetic tape cartridge for interchange shall be entitled to claim full conformance with this International Standard if it is able to handle any recording made on the tape according to this International Standard. In particular it shall

- be able to recognize repeated Frames and to make available to the host, data and Separator Marks from only one of these Frames;
- be able to recognize multiple representations of the same Basic Group, and to make available to the host, data and Separator Marks from only one of these representations;
- be able to recognize an ECC3 Frame, and ignore it if the system is not capable of using ECC3 check bytes in a process of error correction;
- be able to update the System Log(s) if the Write-inhibit Hole state so permits;
- be able to recognize processed data within an Entity, identify the algorithm used, and make the algorithm registration number available to the host;
- be able to make processed data available to the host.

In addition a claim of conformance shall state

- whether or not the system is capable of using ECC3 check bytes in a process of error correction;
- whether or not one or more Reprocessing algorithm(s) are implemented within the system, and are able to be applied to Processed Data prior to making such data available to the host;
- the algorithm registration number(s) of the processing algorithm(s) for which a complementary Reprocessing algorithm is implemented.

3 Normative References

The following standards contain provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid international standards.

ISO/R 527:1966,	<i>Plastics - Determination of tensile properties.</i>
ISO 1302:1992,	<i>Technical drawings - Method of indicating surface texture.</i>
ISO/IEC 11576:1994,	<i>Information technology - Procedure for the registration of algorithms for the lossless compression of data.</i>
IEC 950 :1991,	<i>Safety of information technology equipment including electrical business equipment.</i>

4 Definitions

For the purposes of this International Standard, the following definitions apply.

- 4.1 Absolute Frame Number (AFN) :** A sequence number, encoded in the Frame.
- 4.2 a.c. erase :** A process of erasure utilising magnetic fields of decaying intensity.
- 4.3 Access Point :** A point, at the start of a processed record sequence, at which the presentation of Codewords to a reprocessing algorithm is required to start, regardless of whether the data of interest in a retrieval operation starts at that point or at a subsequent point.
- 4.4 Algorithm :** A set of rules for transforming the logical representation of data.
- 4.5 Area ID :** An identifier defining the area of the tape and specifying the types of Frame written.
- 4.6 Automatic Track Finding (ATF) :** The method by which tracking is achieved.

- 4.7 Average Signal Amplitude** : The average peak-to-peak value of the output signal from the read head at the fundamental frequency of the specified physical recording density over a minimum of 7,8 mm of track, exclusive of missing pulses.
- 4.8 azimuth** : The angular deviation, in degrees, minutes and seconds of arc, made by the mean flux transition line with the line normal to the centreline of the recorded track.
- 4.9 back surface** : The surface of the tape opposite to the magnetic coating which is used to record data.
- 4.10 byte** : An ordered set of bits acted upon as a unit.
- 4.11 cartridge** : A case containing magnetic tape stored on twin hubs.
- 4.12 Channel bit** : A bit after 8-10 transformation.
- 4.13 Codeword** : A word which is generated by a processing algorithm. The number of bits in a Codeword is variable, and is not defined by this International Standard.
- 4.14 Data Format ID** : An identifier specifying which data format is being used on the tape.
- 4.15 Early Warning Point (EWP)** : A point along the length of the tape at which warning is given of the approach, in the forward direction of tape motion, of the partition boundary or of the Physical End of Tape.
- 4.16 End of Data (EOD)** : The point on the tape at the end of the group which contains the last user data.
- 4.17 Entity** : A unit of recorded data, comprising a Processed Record Sequence preceded by housekeeping information.
- 4.18 Error Correcting Code (ECC)** : A mathematical computation yielding check bytes used for the detection and correction of errors.
- 4.19 flux transition position** : That point which exhibits maximum free-space flux density normal to the tape surface.
- 4.20 flux transition spacing** : The distance along a track between successive flux transitions.
- 4.21 Frame** : A pair of adjacent tracks with azimuths of opposite polarity, in which the track with the positive azimuth precedes that with the negative azimuth.
- 4.22 Housekeeping Frame** : A Frame which contains no user data and which is identified as such by the values in the data fields therein.
- 4.23 Logical Beginning of Tape (LBOT)** : The point along the length of the tape where a recording of data for interchange commences.
- 4.24 magnetic tape** : A tape which will accept and retain the magnetic signals intended for input, output and storage purposes on computers and associated equipment.
- 4.25 Master Standard Amplitude Calibration Tape** : A pre-recorded tape on which the standard signal amplitudes have been recorded in the tracks of positive azimuth, 21 µm wide, recorded at a track pitch of 27,2 µm, on an a.c. erased tape.
- Note 1 - The tape includes recordings made at 83,3 ftpmm, 333,3 ftpmm, 500 ftpmm, 1 000,0 ftpmm and 1 499,9 ftpmm.
- Note 2 - The Master Standard Amplitude Calibration Tape has been established by Reliability Centre for Electronic Components of Japan (RCJ).

- 4.26 Master Standard Reference Tape :** A tape selected as the standard for Reference Recording Field, Signal Amplitude, Resolution, Overwrite and Signal-to-Noise Ratio.
- Note 3 - The Master Standard Reference Tape has been established by RCJ.
- 4.27 Optimum Recording Field :** In the plot of Average Signal Amplitude against the recording field at the physical recording density of 2 999,9 ftpmm, the field that causes the maximum Average Signal Amplitude.
- 4.28 Partition Boundary :** The point along the length of a magnetic tape at which partition 1 ends and partition 0 commences.
- 4.29 Physical Beginning of Tape (PBOT) :** The point where the leader tape is joined to the magnetic tape.
- 4.30 Physical End of Tape (PEOT) :** The point where the trailer tape is joined to the magnetic tape.
- 4.31 physical recording density :** The number of recorded flux transitions per unit length of track, expressed in flux transitions per millimetre (ftpmm).
- 4.32 pre-recording condition (see annex F) :** The recording levels above which a tape intended for interchange shall not previously have been recorded.
- 4.33 processing :** The use of an algorithm to transform host data into Codewords.
- 4.34 processed data :** A sequence of Codewords which results from the application of processing to data.
- 4.35 Processed Record :** A sequence of Codewords which results from the application of processing to an Unprocessed Record.
- 4.36 Processed Record Sequence :** A sequence of one or more Processed Records which starts on an 8-bit boundary and ends on a subsequent 8-bit boundary.
- 4.37 record :** Related data treated as a unit of information.
- 4.38 Reference Recording Field :** The Optimum Recording Field of the Master Standard Reference Tape.
- 4.39 reprocessing :** The use of an algorithm to transform Codewords into data as required by the host.
- 4.40 Secondary Standard Amplitude Calibration Tape :** A tape pre-recorded as defined for the Master Standard Amplitude Calibration Tape; the outputs are known and stated in relation to those of the Master Standard Amplitude Calibration Tape.
- Note 4 - Secondary Standard Amplitude Calibration Tapes can be ordered from RCJ, 1-1-12 Hachiman-cho, Higashikurume, Tokyo 203, Japan, under Part Number JCM 6129 until the year 2005. It is intended that these be used for calibrating tertiary reference tapes for use in routine calibration.
- 4.41 Secondary Standard Reference Tape :** A tape the performance of which is known and stated in relation to that of the Master Standard Reference Tape.
- Note 5 - Secondary Standard Reference Tapes can be ordered from RCJ, 1-1-12 Hachiman-cho, Higashikurume, Toyko 203, Japan, under Part Number JRM 6129 until the year 2005. It is intended that these be used for calibrating tertiary reference tapes for use in routine calibration.
- 4.42 Separator Mark :** A record containing no user data, which is used to separate data.
- 4.43 Standard Reference Amplitude :** The Average Signal Amplitude from the tracks of positive azimuth of the Master Standard Amplitude Calibration Tape at a specified physical recording density.

- 4.44 Tape Reference Edge** : The bottom edge of the tape when viewing the recording side of the tape, with the PEOT to the observer's right.
- 4.45 Test Recording Current** : The current that produces the Reference Recording Field.
- 4.46 track** : A diagonally positioned area on the tape along which a series of magnetic signals may be recorded.
- 4.47 unprocessed data** : Data which has not been subjected to processing.
- 4.48 Unprocessed Record** : A record of unprocessed data, comprising an integral number of bytes.
- 4.49 Virtual End of Tape (VEOT)** : The point along the length of the magnetic tape within partition 1 which defines the end of the part of partition 1 which is usable for recording data for interchange.

5 Environment and safety

Unless otherwise stated, the conditions specified below refer to the ambient conditions of the air immediately surrounding the cartridge.

5.1 Testing environment

Unless otherwise stated tests and measurements made on the tape cartridge to check the requirements of this International Standard shall be carried out under the following conditions:

temperature	: 23 °C ± 2 °C
relative humidity	: 40 % to 60 %
conditioning period before testing	: 24 h

5.2 Operating environment

Cartridges used for data interchange shall be capable of operating under the following conditions:

temperature	: 5 °C to 45 °C
relative humidity	: 20 % to 80 %
wet bulb temperature	: 26 °C max.

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

Conditioning before operating:

If a cartridge has been exposed during storage and/or transportation to a condition outside the above values, before use the cartridge shall be conditioned in the operating environment for a time at least equal to the period during which it has been out of the operating environment, up to a maximum of 24 h.

Note 6 - Rapid variations of temperature should be avoided.

5.3 Storage environment

For long-term or archival storage of cartridges the following conditions shall be observed:

temperature	: 5 °C to 32 °C
relative humidity	: 20 % to 60 %
wet bulb temperature	: 26 °C max.

The stray magnetic field at any point on the tape shall not exceed 4 000 A/m. There shall be no deposit of moisture on or in the cartridge.

5.4 Transportation

Recommended limits for the environment to which a cartridge may be subjected during transportation, and the precautions to be taken to minimize the possibility of damage, are provided in annex J.

5.5 Safety

The cartridge and its components shall satisfy the requirements of IEC 950.

5.6 Flammability

The cartridge and its components shall be made from materials, which if ignited from a match flame, do not continue to burn in a still carbon dioxide atmosphere.

Section 2 - Requirements for the case

6 Dimensional and mechanical characteristics of the case

6.1 General

The case of the cartridge shall comprise

- an upper half,
- a lower half,
- a slider movably mounted on the lower half,
- a lid pivotally mounted on the upper half.

In the drawings, using third angle projection, an embodiment of the cartridge is shown as an example.

- | | |
|----------------|--|
| Figure 1 | is a perspective view of the cartridge seen from top. |
| Figure 2 | is a perspective view of the cartridge seen from bottom. |
| Figure 3 | is a partial view of the rear side. |
| Figure 4 | is a schematic view showing the Reference Planes X, Y and Z. |
| Figure 5 | shows the front side. |
| Figure 6 | shows the top side with the lid in closed position. |
| Figure 7 | shows the left side. |
| Figure 8 | shows the top side with the lid in open position. |
| Figure 9 | shows the left side with the lid in open position. |
| Figure 10 | shows the bottom side with the lid and the slider in closed position. |
| Figure 11 | shows the bottom side with the lid and the slider in open position. |
| Figure 12 | is a view from the top of the inside of the lower half with the upper half removed. |
| Figure 13 | is a view of the bottom half with the lid and the slider in open position. |
| Figure 14 | is a view of the left side with the lid and the slider in open position. |
| Figure 15 | is a top view of a hub. |
| Figure 16 | is a side view of a hub with partial cross-section. |
| Figure 17 | is a partial cross-section through a hub and both halves of the case showing the interface with the drive spindle. |
| Figure 18 | shows at a larger scale the lid in the open position. |
| Figures 19, 20 | show at a larger scale the functional relationship between the lid and the locking mechanism of the hubs. |
| Figures 21, 22 | show the label areas on the top and the rear side. |
| Figure 23 | shows both corners of the bottom side, for autoloaders. |

The dimensions are referred to three orthogonal Reference Planes X, Y and Z (figure 4).

Plane X is perpendicular to Plane Z and passes through the centres of both the circular and elongated Datum Holes, revealed when the slider is opened (see 6.8.4 and figure 11).

Plane Y is perpendicular to Plane X and Plane Z and passes through the centre of the circular Datum Hole.

Plane Z is the plane on which the slider moves (see figure 7).

6.2 Overall dimensions (figures 6 and 7)

The overall dimensions of the case with the lid in the closed position shall be

$$l_1 = 73,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_2 = 54,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_3 = 10,5 \text{ mm} \pm 0,2 \text{ mm}$$

The edges formed by the rear side and the left and right sides shall be rounded off with a radius

$$r_1 = 1,5 \text{ mm max.}$$

The two edges of the lid shall be rounded off with a radius

$$r_2 = 0,5 \text{ mm max.}$$

6.3 Loading grip (figure 6)

The top side shall have a loading grip for loading and positioning the cartridge into the drive. The position and dimensions of the loading grip shall be

$$l_4 = 25,5 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_5 = 10 \text{ mm min.}$$

$$l_6 = 5,0 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_7 = 2,0 \text{ mm min.}$$

The depth of the loading grip below the surface of the top side shall be

$$0,5 \text{ mm} \begin{matrix} + 0,2 \\ - 0,0 \end{matrix} \text{ mm}$$

6.4 Holding areas (figure 6)

The two areas shown shaded in figure 6 shall be the areas along which the cartridge shall be held down when inserted in the drive. Their positions and dimensions shall be

$$l_8 = 6,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_9 = 5,0 \text{ mm} \pm 0,1 \text{ mm}$$

6.5 Notches of the lid (figures 5 and 8)

The lid shall have two pairs of notches.

The first pair of notches, the slider lock release notches, allows elements of the drive to release the locking mechanism of the slider. The positions and dimensions of these notches shall be

$$l_{10} = 0,4 \text{ mm max.}$$

$$l_{11} = 3,0 \text{ mm min.}$$

$$l_{12} = 1,2 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{13} = 49,8 \text{ mm} \pm 0,2 \text{ mm}$$

The second pair of notches, the slider movement notches, allows elements of the drive to move the slider from the closed to the open position (see also 6.8.1). The positions and dimensions of these notches shall be

$$l_{11} = 3,0 \text{ mm min.}$$

$$l_{14} = 0,9 \text{ mm min.}$$

$$l_{15} = 7,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{16} = 36,00 \text{ mm} \pm 0,15 \text{ mm}$$

6.6 Lid dimensions (figures 6 to 8)

The lid is shown in the closed position in figures 6 and 7. Its dimensions shall be

$$l_{17} = 1,2 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{18} = 6,8 \text{ mm} \pm 0,4 \text{ mm}$$

$$l_{19} = 1,1 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{20} = 2,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{21} = 6,4 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{22} = 1,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$r_3 = 6,8 \text{ mm} \pm 0,4 \text{ mm}$$

The lid shall have a chamfer of 45° by

$$l_{23} = 1,5 \text{ mm} \pm 0,1 \text{ mm}$$

There shall be a dimensional relationship between the height l_{24} shown in figure 7, which includes the slider and the upper half, and the height l_{25} of the lid. When a vertical force of 1 N is exerted on the upper half the following condition shall be met.

$$l_{24} = 10,5 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{25} \leq l_{24}$$

When no force is exerted

$$l_{24} = 10,9 \text{ mm max.}$$

In figure 8 the lid is shown in the open position. The distance from the front edge of the lid to the rear side shall be

$$l_{26} = 55,5 \text{ mm} \pm 0,3 \text{ mm.}$$

6.7 Optical detection of the beginning and end of tape (figures 8, 9 and 12)

Means for the optical detection of the beginning and end of tape shall be provided. These shall consist of a pair of windows on the left and right sides of the case (see also figure 18). The design of these windows allows this detection for two different drive designs:

- either a light source and a detector are provided in the drive on each side of the cartridge, in which case the light enters the case through the upper windows, falls on a prism (see section A-A) mounted inside the case, which reflects this light so that it goes through the tape and falls on the detector through the lower window; the light transmittance of the prism shall be greater than 50% of that of a reference prism when measured as specified in annex A,
- or, the light of a light source within the drive passes through the tape from inside the cartridge and falls through the lower windows onto the detectors placed on each side of the case.

The positions and dimensions of these windows allow the cartridge to be used with drives implementing either system, they shall be

$$l_{27} = 6,20 \text{ mm} \pm 0,10 \text{ mm}$$

$$l_{28} = 7,65 \text{ mm} \pm 0,10 \text{ mm}$$

$$l_{29} = 1,50 \text{ mm} \begin{matrix} + 0,20 \\ - 0,00 \end{matrix} \text{ mm}$$

$$l_{30} = 3,9 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{31} = 1,8 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{32} = 7,0 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{33} = 2,5 \text{ mm min.}$$

Dimension l_{32} specifies the position of the rear edge of the windows relative to Reference Plane X. Dimension l_{33} shall be measured relative to this rear edge.

6.8 Bottom side

The bottom side is shown in figure 10 with the lid and the slider in the closed position and in figure 11 with both in the open position.

The dimension l_{34} of the bottom half, l_{35} of the slider and l_{36} of the lid shall satisfy the following conditions

$$l_{34} = 73,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{35} \leq l_{34}$$

$$l_{36} \leq l_{34}$$

6.8.1 Locking mechanism of the slider (figure 10)

The cartridge shall have a locking mechanism for the slider which locks it in the closed and open positions. The design of this mechanism is not specified by this International Standard, except for the different forces acting on the slider, and for its detent.

The slider shall be spring-loaded by a spring holding it in the closed position when it is unlocked. The force required to operate the slider shall not exceed 2 N.

The slider shall have two grooves with an opening at each end. The detent of the locking mechanism shall protrude through these openings so as to hold the slider in both open and closed positions. The detent shown in cross-section C-C is only an example of implementation.

The grooves are parallel to Reference Plane Z and aligned with the slider lock release notches of the lid. The positions and dimensions of the grooves and of the openings for the detent of the locking mechanism when the slider is in the closed position shall be

$$l_{37} = 1,2 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{38} = 49,8 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{39} = 10,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{40} = 2,0 \text{ mm} \begin{matrix} + 0,5 \\ - 0,0 \end{matrix} \text{ mm}$$

$$l_{41} = 3,0 \text{ mm min.}$$

$$l_{42} = 1,5 \text{ mm min.}$$

$$l_{43} = 0,8 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{44} = 0,8 \text{ mm} \begin{matrix} + 0,5 \\ - 0,1 \end{matrix} \text{ mm}$$

$$\lambda = 45^\circ \text{ min.}$$

$$l_{45} = 0,65 \text{ mm} \pm 0,05 \text{ mm}$$

The position and dimensions of the openings for the detent when the slider is held in the open position are determined by l_{39} , l_{40} , l_{43} and l_{44} .

In the closed position of the slider, the maximum force to be exerted on the detent in a direction perpendicular to Reference Plane Z and over a stroke of 0,65 mm shall be 0,5 N max.

In the open position of the slider the holding force shall be 0,3 N min.

6.8.2 Access holes (figure 10)

The slider shall have two circular access holes (see section B-B) which, in the open position of the slider, allow penetration of the drive spindles into the hubs. The diameters of these access holes shall be

$$d_1 = 10,0 \text{ mm} \pm 0,2 \text{ mm}$$

$$d_2 = 12,0 \text{ mm max.}$$

6.8.3 Recognition, write inhibit and sub-datums holes (figure 11)

The bottom half shall have a number of holes on an edge at its rear. This edge shall be defined by

$$l_{46} = 45,2 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{47} = 49,2 \text{ mm} \pm 0,2 \text{ mm}$$

The centres of these holes lie on a line perpendicular to Reference Plane Y at a distance from Reference Plane X of

$$l_{48} = 47,2 \text{ mm} \pm 0,2 \text{ mm}$$

6.8.3.1 Recognition Holes (figures 10 and 11)

There shall be four Recognition Holes numbered from 1 to 4 as shown in figure 10. Their positions and dimensions shall be

$$d_3 = 2,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{49} = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{50} = 56,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{51} = 4,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{52} = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{53} = 3,0 \text{ mm min.}$$

All Recognition Holes shall have the cross-section shown in cross-section F-F in figure 11 for Recognition Hole No. 1.

One of the two cross-sections F-F shows a Recognition Hole closed by means of a plug, the other shows it with the plug punched out. These plugs shall withstand an applied force of 0,5 N max. without being punched out.

Recognition Hole No. 1 shall be open. Recognition Holes No. 2, No. 3 and No. 4 shall be closed.

Other combinations of the states of the Recognition Holes No. 1, No. 2, No. 3 and No. 4 are reserved for other applications (see annex B).

6.8.3.2 Write-inhibit Hole (figure 11)

The position and dimensions of the Write-inhibit Hole shall be

$$d_4 = 2,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{50} = 56,0 \text{ mm} \pm 0,3 \text{ mm}$$

When the Write-inhibit Hole is open recording on the tape is inhibited, when it is closed recording is enabled.

The Write-inhibit Hole shall have the cross-section shown in cross-section F-F in figure 11 for Recognition Hole No. 1. One of the two cross-sections F-F shows the hole closed by means of a plug, the other shows it with the hole punched out. These plugs shall withstand an applied force of 0,5 N max without being punched out.

The case may have a movable element allowing the Write-inhibit Hole to be opened and closed. If present, this element shall be such that the state of Write-inhibit Hole is visible (see figure 3 as an example). Such an element shall be neither broken nor moved by a force smaller than 0,5 N.

Regardless of whether a plug or a movable element is used to select the open and closed states of the Write-inhibit Hole, the following dimensions from cross-section F-F shall define the closed and open states, respectively.

$$l_{52} = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{53} = 3,0 \text{ mm min.}$$

6.8.3.3 Sub-datum holes (figure 11)

These holes are used to position the cartridge in the drive. Their position and dimensions shall be as follows.

- The hole seen below the Write-inhibit Hole in figure 11 shall have an elongated form and the same cross-section E-E as shown for the other hole.

$$l_{54} = 45,5 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{55} = 3,5 \text{ mm} \begin{matrix} + 0,1 \\ - 0,0 \end{matrix} \text{ mm}$$

$$l_{56} = 2,50 \text{ mm} \begin{matrix} + 0,05 \\ - 0,00 \end{matrix} \text{ mm}$$

- The position and dimensions of the other Sub-datum Hole shall be

$$d_5 = 2,50 \text{ mm} \begin{matrix} + 0,05 \\ - 0,00 \end{matrix} \text{ mm}$$

$$d_6 = 1,0 \text{ mm min.}$$

$$l_{57} = 5,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{58} = 2,0 \text{ mm min.}$$

$$l_{59} = 1,2 \text{ mm min.}$$

The edge of both Sub-datum Holes shall have a chamfer of

$$0,2 \text{ mm} \pm 0,1 \text{ mm.}$$

6.8.4 Datum holes (figure 11)

The lower half has two Datum Holes also used to position the cartridge within the drive. One of them has an elongated form, the other is circular. Cross-section D-D shown for the latter also applies to the former. Their positions and dimensions shall be

$$l_{60} = 51,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{61} = 2,80 \text{ mm} \begin{matrix} + 0,05 \\ - 0,00 \end{matrix} \text{ mm}$$

$$l_{62} = 3,5 \text{ mm} \begin{matrix} + 0,1 \\ - 0,0 \end{matrix} \text{ mm}$$

$$l_{63} = 3,0 \text{ mm min.}$$

$$d_7 = 2,80 \text{ mm} \begin{matrix} + 0,05 \\ - 0,00 \end{matrix} \text{ mm}$$

The upper edge of both Datum Holes shall have a chamfer of $0,2 \text{ mm} \pm 0,1 \text{ mm}$.

6.8.5 Access room for tape guides (figure 11)

When the cartridge is inserted into the drive, tape guides in the drive pull out the tape toward the heads of the drive. The shape and dimensions of the access room provided by the cartridge for these tape guides shall be (see also 6.8.7.5):

$$l_{64} = 3,1 \text{ mm max.}$$

$$l_{65} = 5,6 \text{ mm min.}$$

$$l_{66} = 11,0 \text{ mm max.}$$

$$l_{67} = 7,0 \text{ mm} \begin{matrix} + 0,7 \\ - 0,0 \end{matrix} \text{ mm}$$

$$l_{68} = 6,7 \text{ mm min.}$$

$$\alpha = 45^\circ \pm 1^\circ$$

$$l_{69} = 47,9 \text{ mm min.}$$

$$l_{70} = 3,30 \text{ mm} \begin{matrix} + 0,00 \\ - 0,15 \end{matrix} \text{ mm}$$

6.8.6 Holes for accessing the hubs (figure 11)

The lower half has two holes through which the spindles of the drive can access the hubs when the slider is in the open position. The positions and dimensions of these holes shall be

$$d_8 = 9,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{71} = 29,00 \text{ mm} \pm 0,15 \text{ mm}$$

$$l_{72} = 10,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{73} = 30,0 \text{ mm} \pm 0,1 \text{ mm}$$

6.8.7 Internal structure of the lower half (figure 12)

In figure 12 the different elements of the inside of the lower half are shown. There shall be a locking mechanism for the hubs to prevent them from rotating when the lid is in the closed position. The design of this locking mechanism is not specified by this Standard, thus it is not shown in figure 12. Locking and unlocking of the hubs shall depend upon the position of the lid as specified in 6.13.

6.8.7.1 Diameter of the wound tape

The diameter of the tape wound on a hub shall be

$$d_9 = 36,5 \text{ mm max.}$$

6.8.7.2 Tape wind

The magnetic surface of the tape shall face outwards.

6.8.7.3 Tape motion

The forward direction of tape motion is from the left side of the cartridge to its right side (see figures 1 and 2).

6.8.7.4 Guide posts

The tape shall pass around two guide posts in the cartridge, the axes of which are perpendicular to Reference Plane Z and pass through the centres of the Datum Holes. The positions and dimensions of these guide posts shall be

- their positions are determined by those of the centres of the Datum Holes,
- their cross-section shall be circular with a radius

$$r_4 = 3,0 \text{ mm} \pm 0,1 \text{ mm}$$

over an angle of 180° in clockwise sense starting at angle

$$\rho = 45^\circ \pm 1^\circ$$

- their cross-section over the other half of 180° is not specified by this Standard.

6.8.7.5 Position of the tape in the case (figure 12, view A)

When the tape runs from one guide post to the other it shall remain between two planes parallel to Reference Plane Z. The distance of these planes from Reference Plane Z shall be

$$l_{74} = 1,4 \text{ mm min.}$$

$$l_{75} = 6,4 \text{ mm max.}$$

The design centre for the position of the tape centreline is

$$l_{76} = 3,9 \text{ mm}$$

The height of the access room specified in 6.8.5 for the tape guides shall be

$$l_{77} = 8,0 \text{ mm} \begin{matrix} + 0,6 \\ - 0,0 \end{matrix} \text{ mm}$$

6.8.7.6 Tape path zone

When the cartridge is inserted into the drive, the tape is pulled outside the case by tape guides as mentioned above. It is then no longer in contact with the guide posts. The tape path zone of the case is the zone in which the tape must be able to move freely. This zone is defined by

$$l_{78} = 5,5 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{79} = 56,5 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{80} = 8,0 \text{ mm} \pm 0,2 \text{ mm}$$

6.8.8 Light path (figure 12)

As specified in 6.7 there is a lower window in the right and left sides of the case through which light having passed through the tape can pass and fall onto a detector of the drive. In order to ensure that the corresponding light path is not obstructed by inner elements of the case, its configuration in this zone shall be as follows.

The position and dimensions of the lower window are specified by l_{30} and l_{31} (see figure 9). The dimensions

$$l_{81} = 1,5 \text{ mm max.}$$

$$l_{82} = 5,0 \text{ mm min.}$$

ensure that no elements of the case obstruct the light path.

6.8.9 Support Areas (figure 13)

When the cartridge is inserted into the drive and held in position by forces perpendicular to Reference Plane Z acting on the Holding Areas (see 6.4), it shall be supported by three Support Areas A', B', C' on its bottom side, shown shaded in figure 13. The position and dimensions of these areas shall be as follows.

- Areas A' and B' are not specified by this Standard because they depend on parts of the lower half for which this Standard does not specify requirements.
- Area C' shall be defined by

$$l_{83} = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{84} = 49,0 \text{ mm} \pm 0,3 \text{ mm}$$

6.8.10 Datum Areas (figure 13)

There shall be two annular Datum Surfaces A and B and one circular such surface C. All three Datum Areas shall lie in Reference Plane Z. Their position and dimensions shall be

- Datum Area A shall be centred on the intersection of Reference Planes X, Y and Z, its inner diameter shall be d_7 (see 6.8.4 and figure 11), its outer diameter shall be

$$d_{10} = 5,0 \text{ mm} \pm 0,1 \text{ mm}$$

- Datum Area B shall be centred on the intersection of Reference Planes X and Z at a distance l_{60} (see 6.8.4 and figure 11) from the centre of Datum Area A. Its inner dimensions shall be l_{61} and l_{62} , its outer diameter shall be d_{10} .

- Datum Area C shall be centred on a point defined by

$$l_{85} = 42,0 \text{ mm} \pm 0,3 \text{ mm}$$

$$l_{86} = 25,5 \text{ mm} \pm 0,3 \text{ mm}$$

Its diameter shall be d_{10} .

6.8.11 Relationship between Support and Datum Areas and Reference Plane Z (figure 14)

Support Area A' shall be coplanar with Datum Area A within 0,1 mm.

Support Area B' shall be coplanar with Datum Area B within 0,1 mm.

Support Area C' shall be parallel to Reference Plane Z within 0,1 mm. It shall be at a distance

$$l_{87} = 1,10 \text{ mm} \pm 0,05 \text{ mm}$$

from Reference Plane Z.

6.9 Hubs (figures 15 and 16)

The dimensions of the hubs shall be

$$d_{11} = 6,60 \text{ mm} \begin{matrix} + 0,08 \\ - 0,00 \end{matrix} \text{ mm}$$

$$d_{12} = 8,8 \text{ mm} \begin{matrix} + 0,0 \\ - 0,1 \end{matrix} \text{ mm}$$

$$d_{13} = 15,00 \text{ mm} \pm 0,05 \text{ mm}$$

$$\beta = 60^\circ \pm 1^\circ$$

$$\gamma = 45^\circ \pm 1^\circ$$

$$l_{88} = 2,5 \text{ mm} \begin{matrix} + 0,1 \\ - 0,0 \end{matrix} \text{ mm}$$

$$l_{89} = 2,6 \text{ mm} \begin{matrix} + 0,20 \\ - 0,00 \end{matrix} \text{ mm}$$

The two cylindrical surfaces with diameters d_{11} and d_{13} shall be co-axial within 0,05 mm.

The torque necessary to rotate the hub with a partially or fully wound tape shall be 0,000 2 N·m max.

6.10 Attachment of leader and trailer tapes

The method of attachment of the leader and trailer tapes to the hubs shall be such that when subjected to a force of 5 N max, they will not be detached from the hubs.

6.11 Interface between the hubs and the drive spindles (figure 17)

The interface between the hubs and the spindles, shown in figure 17 in cross-section, is specified in terms of the following relationships:

$$d_{15} - d_{14} = \begin{matrix} 1,2 \text{ mm max.} \\ 1,0 \text{ mm min.} \end{matrix}$$

$$l_{91} - l_{90} = 1,3 \text{ mm max.}$$

Note 7 - It is expected that the top of the drive spindle will not penetrate within the hub beyond a distance $l_d = 7,65 \text{ mm max.}$ above Reference Plane Z.

6.12 Opening of the lid (figure 18)

When the lid is opened its lower front edge moves along an arc of a circle with radius

$$r_5 = 9,6 \text{ mm} \pm 0,2 \text{ mm}$$

The centre of rotation is defined by l_{17} and l_{21} . The end position of the lid, i.e. when it is fully open, is defined by

$$l_{92} = 10,9 \text{ mm} \pm 0,2 \text{ mm}$$

$$l_{93} = 0,3 \text{ mm} \pm 0,1 \text{ mm}$$

$$l_{94} = 6,3 \text{ mm} \pm 0,2 \text{ mm}$$

The force F required to open the lid shall not exceed 1,2 N. It shall be applied at a distance

$$l_{95} = 5,0 \text{ mm} \pm 0,1 \text{ mm}$$

measured parallel to Reference Plane Z from the centre of rotation of radius r_5 (see also annex C).

6.13 Release of the hub locking mechanism (figures 19 and 20)

As mentioned in 6.8.7 the design of the locking mechanism for the hubs is not specified by this Standard, except that it shall be connected to the lid so that the hubs are locked or unlocked as a function of the angular position of the lid.

When the lid rotates from the closed to the open position (clockwise as seen in figures 19 and 20) the hubs shall remain locked as long as the lid has not reached the position defined by:

$$l_{96} = 7,0 \text{ mm}$$

$$l_{97} = 7,5 \text{ mm} \pm 0,2 \text{ mm}$$

as shown in figure 19.

The hubs shall be completely released as soon as the lid has reached the position defined by:

$$l_{98} = 10,3 \text{ mm}$$

$$l_{99} = 6,6 \text{ mm} \pm 0,2 \text{ mm}$$

as shown in figure 20.

6.14 Label areas (figures 21 and 22)

On the top and rear sides of the case there shall be an area on which adhesive labels can be placed. The dimensions of these areas shall be

$$l_{100} = 28,9 \text{ mm max.}$$

$$l_{101} = 5,2 \text{ mm min.}$$

$$l_{102} = 43,4 \text{ mm max.}$$

$$l_{103} = 39,4 \text{ mm max.}$$

$$l_{104} = 8,8 \text{ mm max.}$$

$$r_6 = 0,5 \text{ mm min.}$$

6.15 Requirement for autoloaders (figure 23)

To allow use with autoloaders, the channel from the Z Datum to the l_{87} dimension shall be clear. Within this channel, the dimensions of the corners and edges shown in figure 23 shall be

$$l_{87} = 1,10 \text{ mm} \pm 0,05 \text{ mm}$$

$$r_7 = 0,3 \text{ mm max. or } 0,3 \text{ mm max. chamfer}$$

$$\delta = 6^\circ \text{ max.}$$

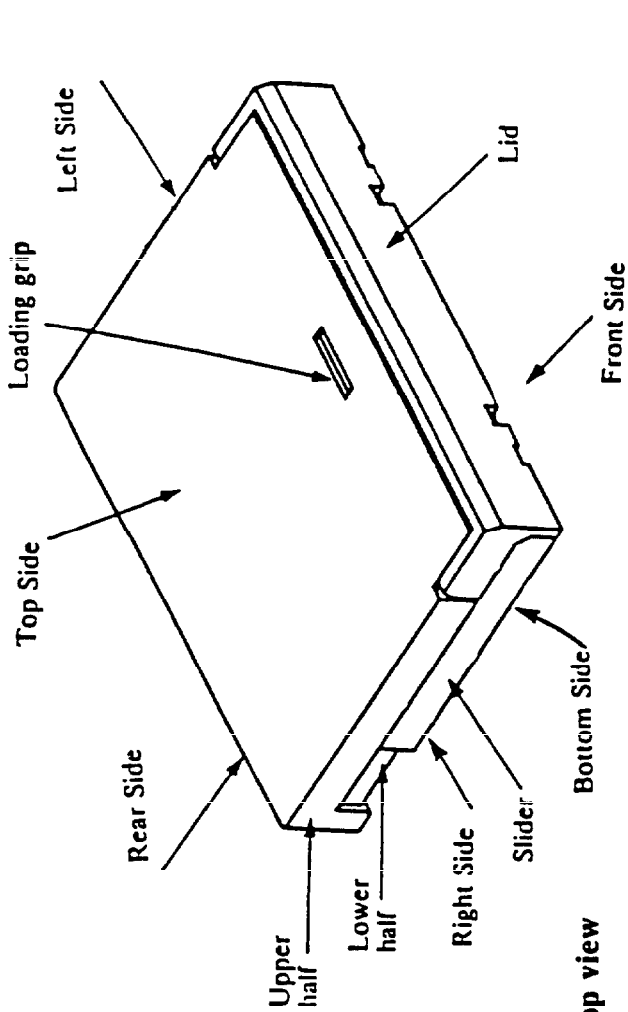


Figure 1 - Top view

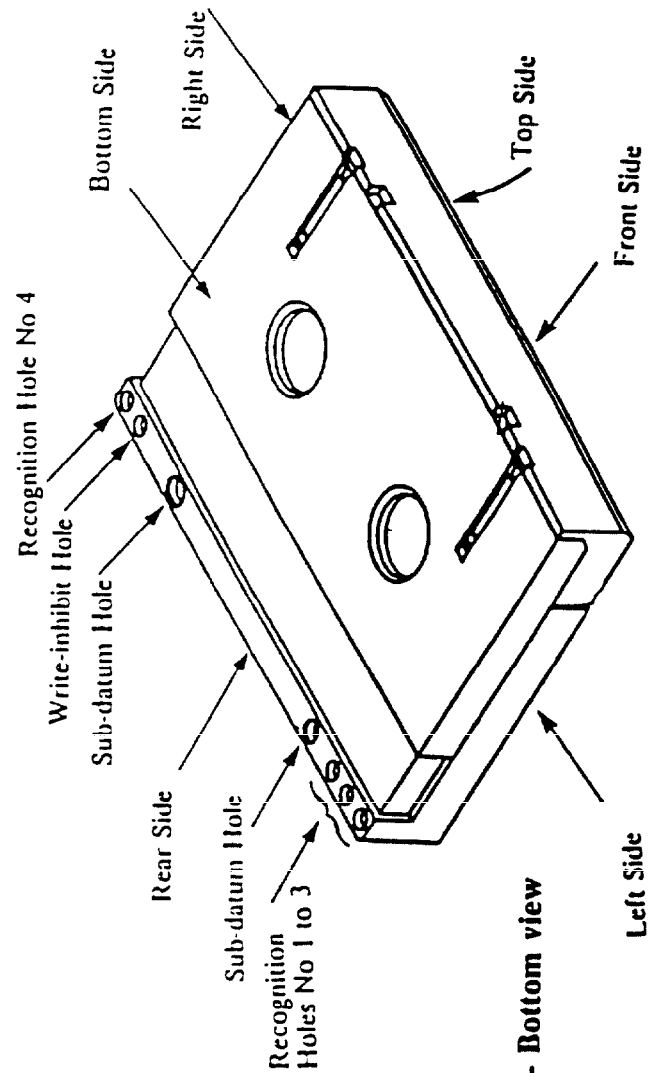


Figure 2 - Bottom view

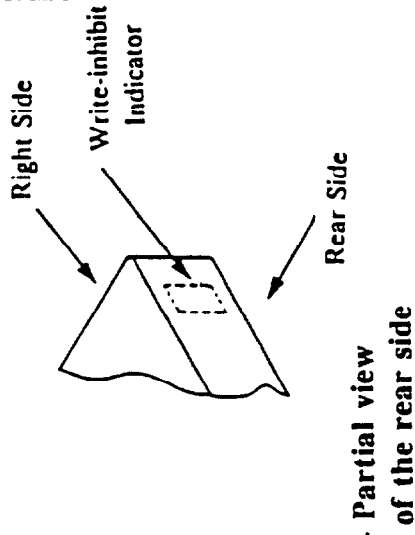


Figure 3 - Partial view of the rear side

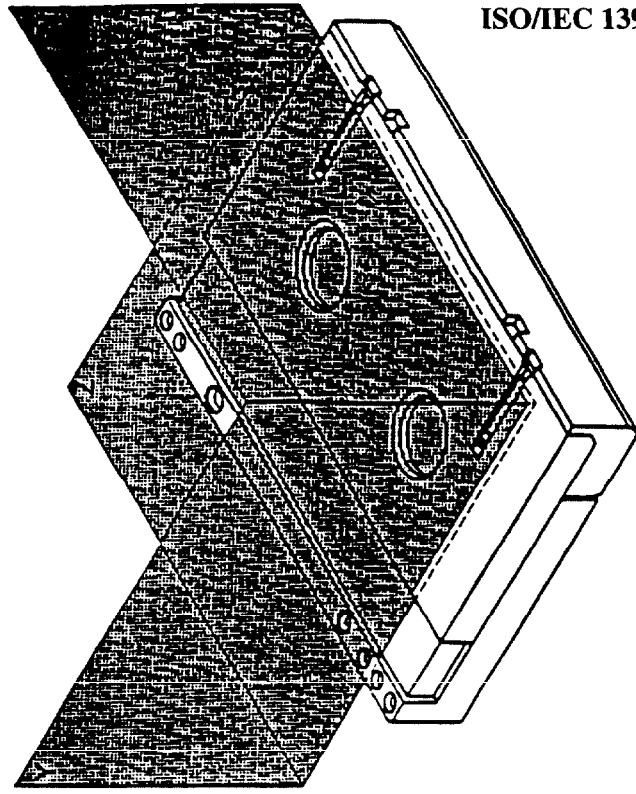


Figure 4 - Reference Planes X, Y, Z

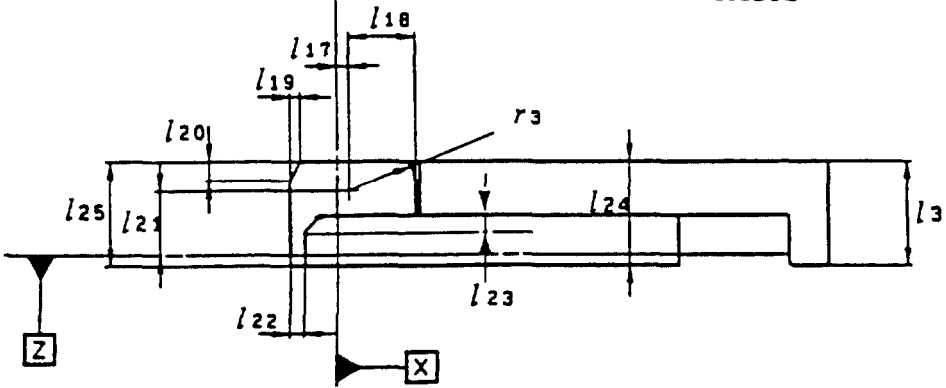
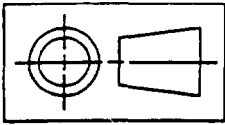
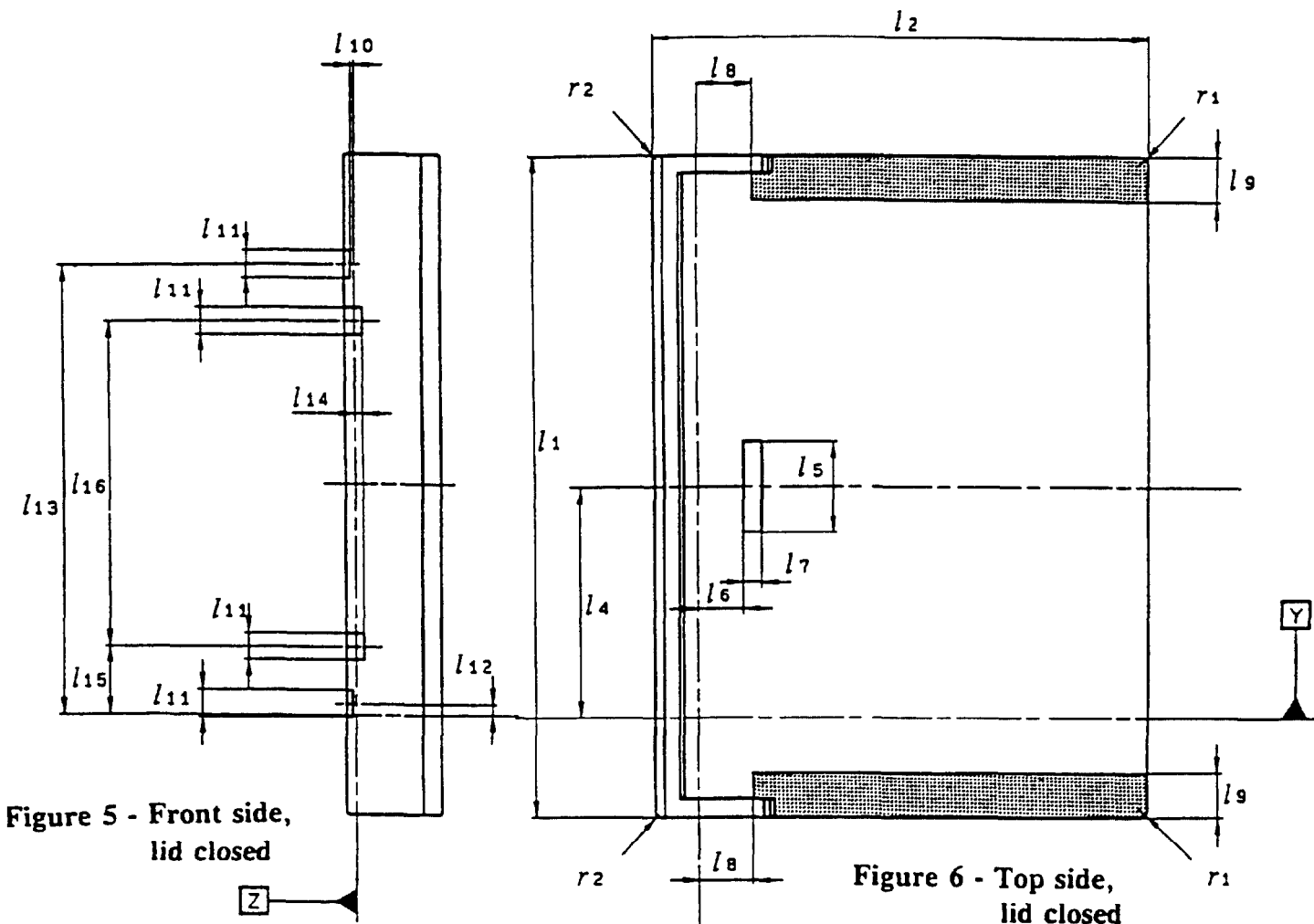


Figure 7 - Left side, lid closed

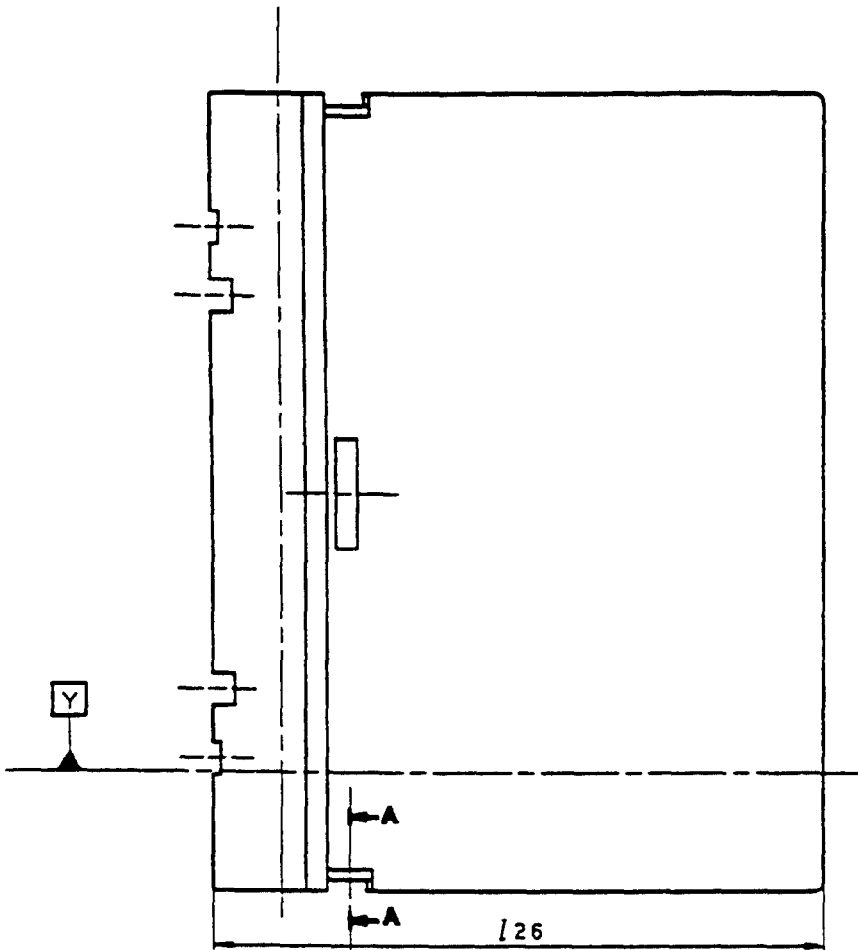


Figure 8 - Top side, lid open

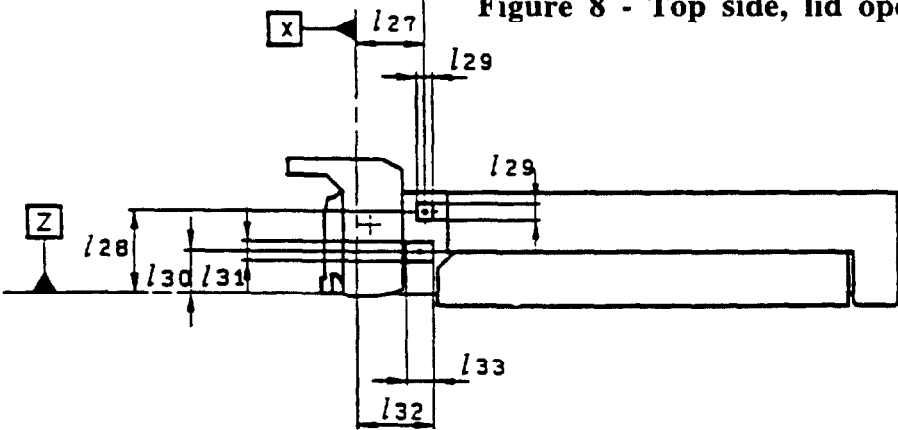
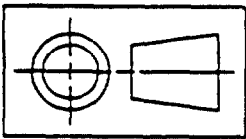
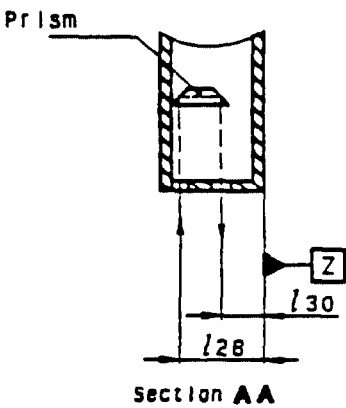


Figure 9 - Left side, lid open

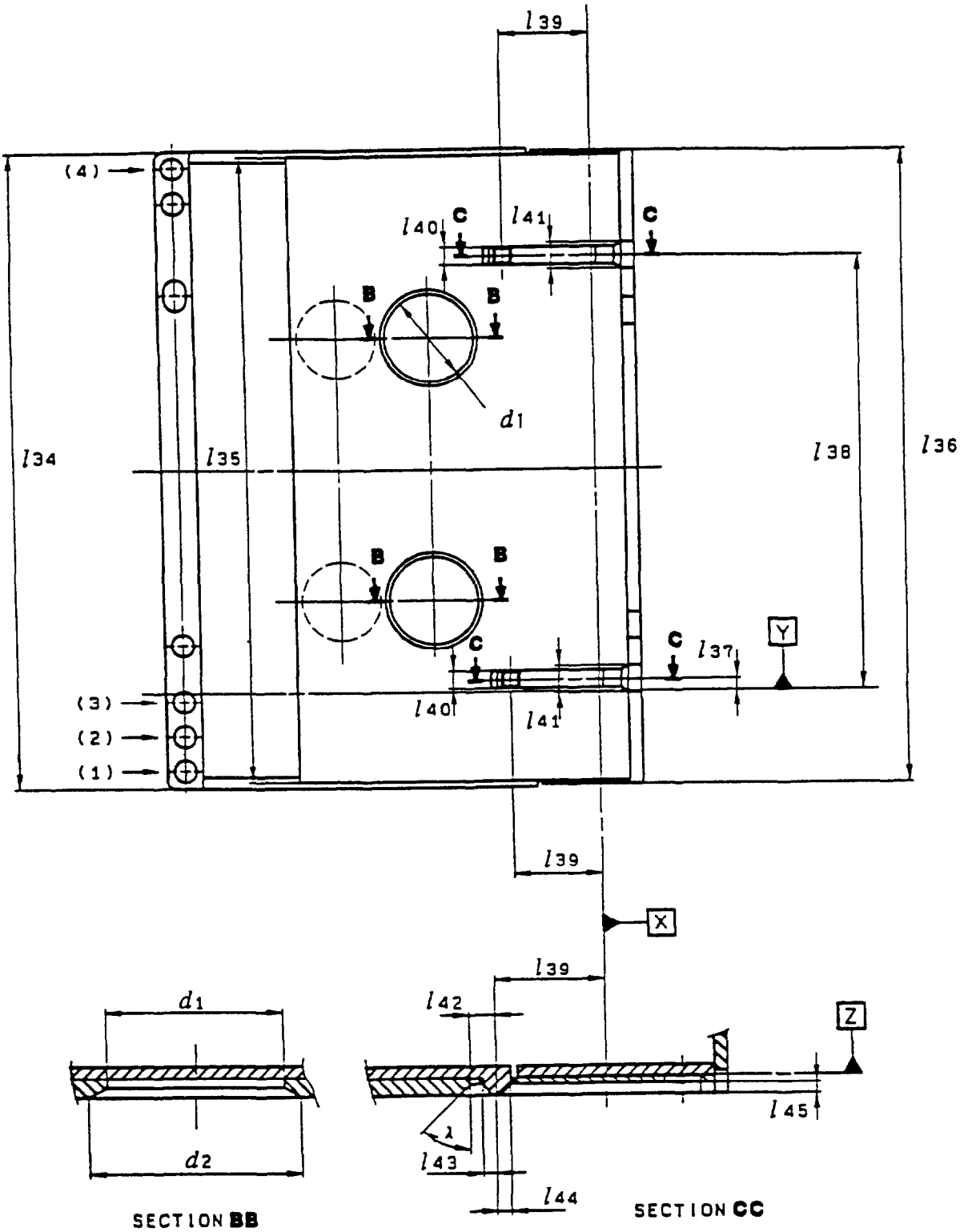


Figure 10 - Bottom side, lid closed

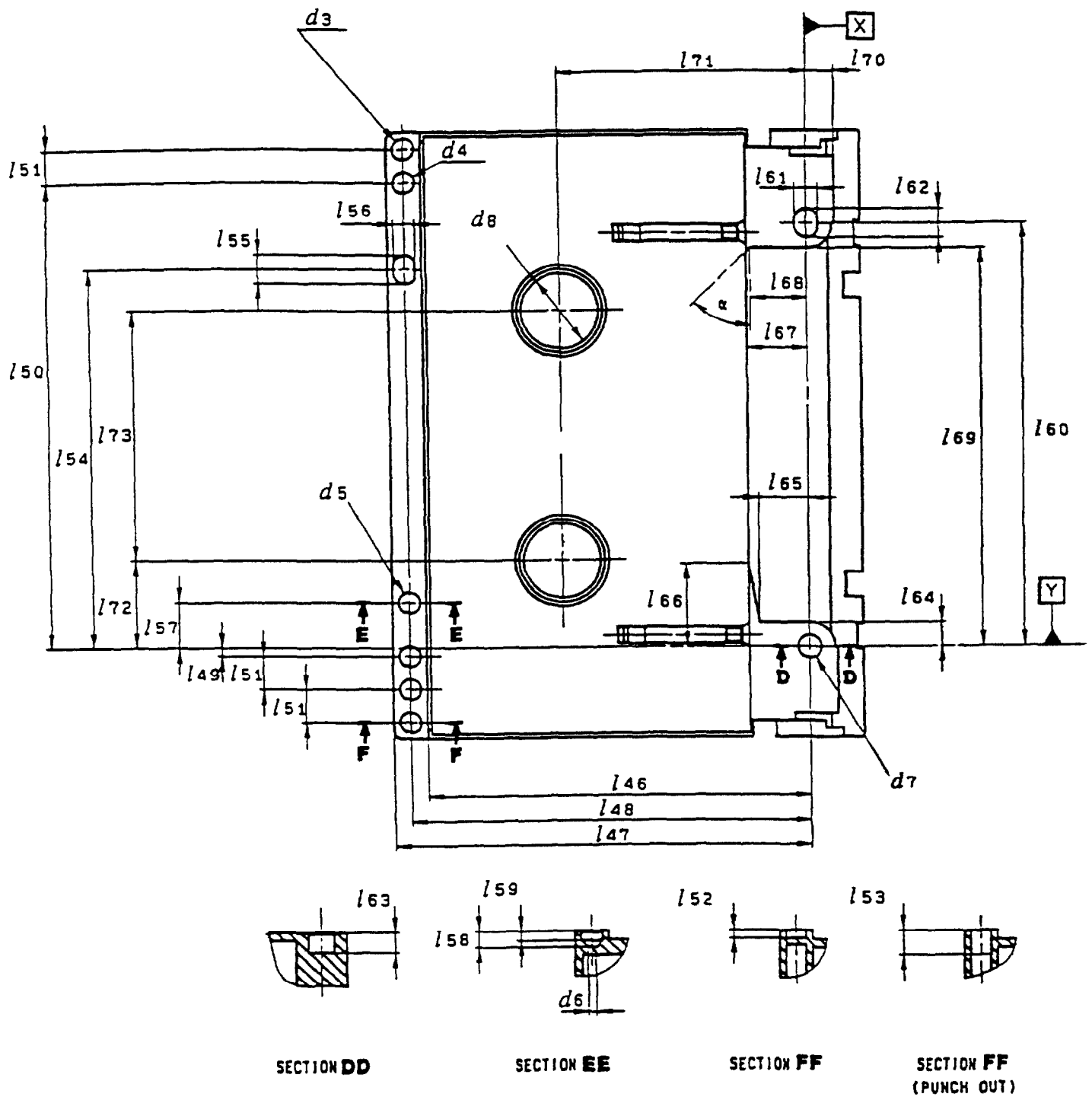


Figure 11 - Bottom side, lid open

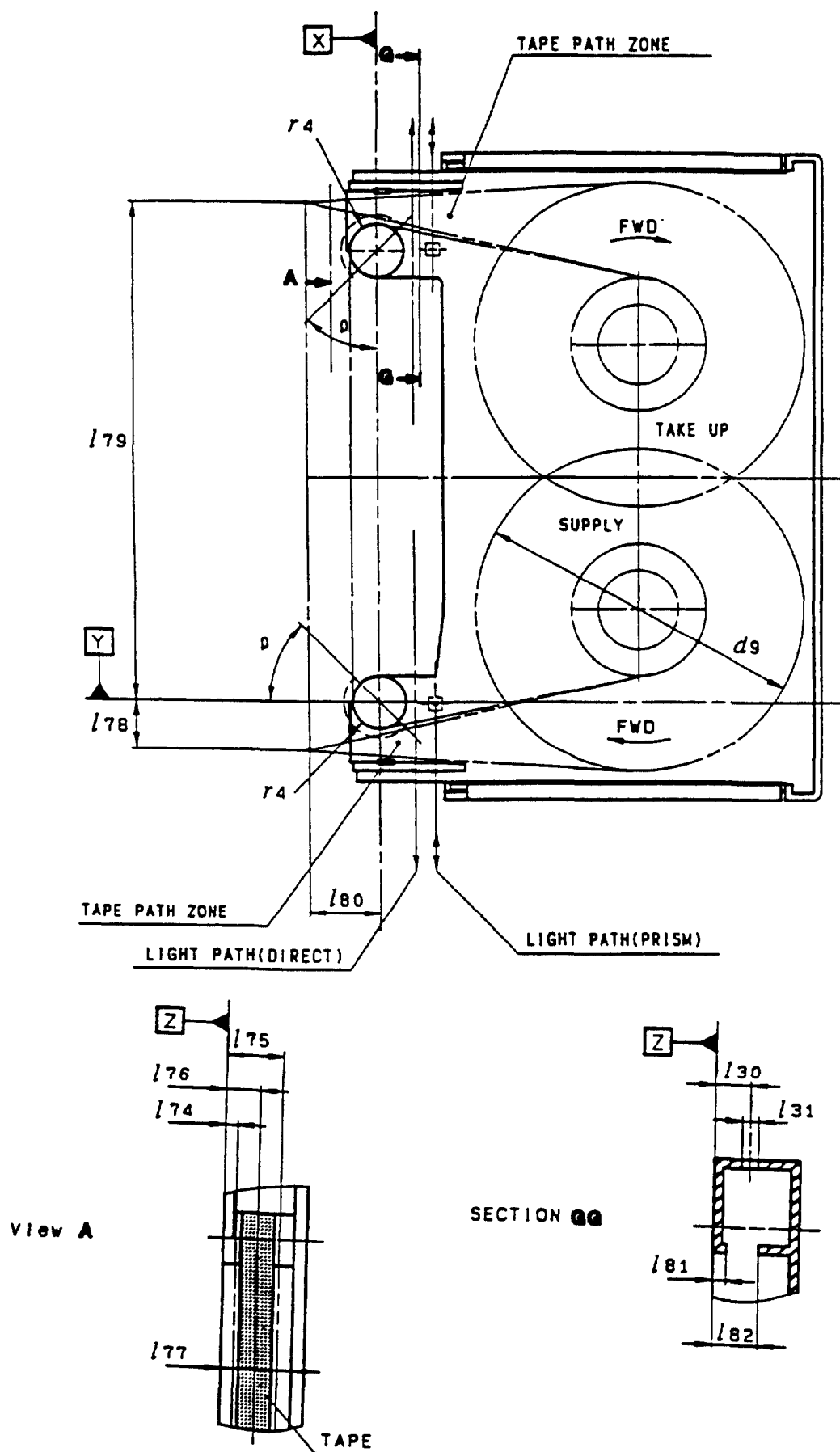


Figure 12 - Inside view of the lower half

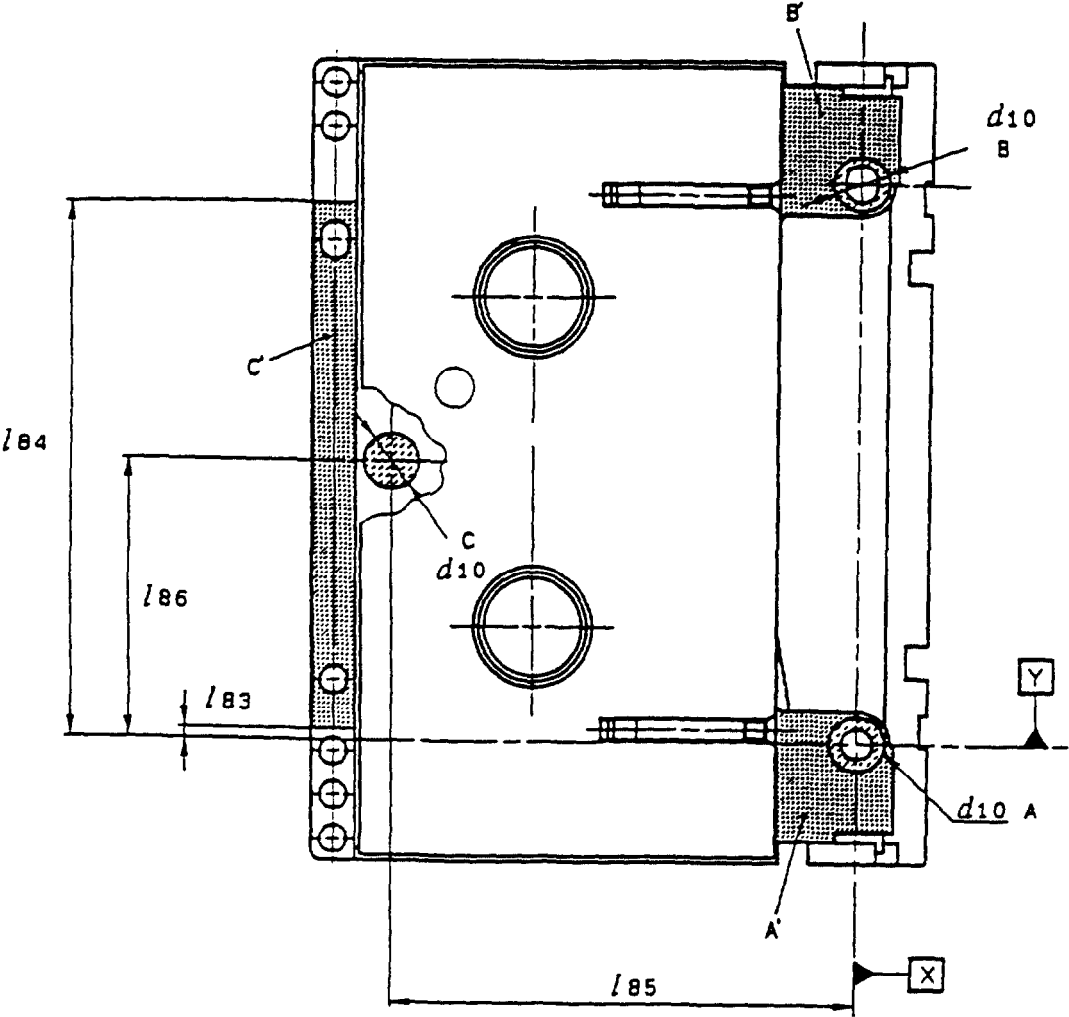


Figure 13 - Bottom side, lid and slider in open position

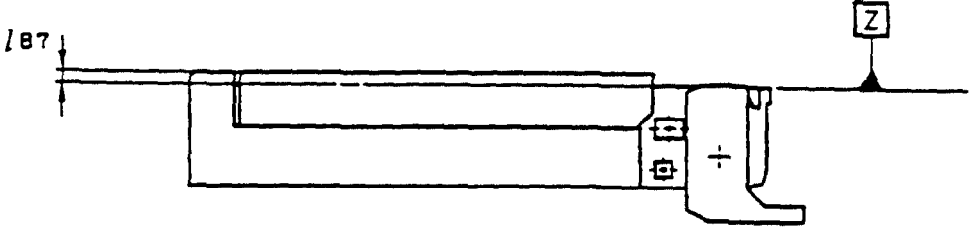


Figure 14 - Left side, lid open

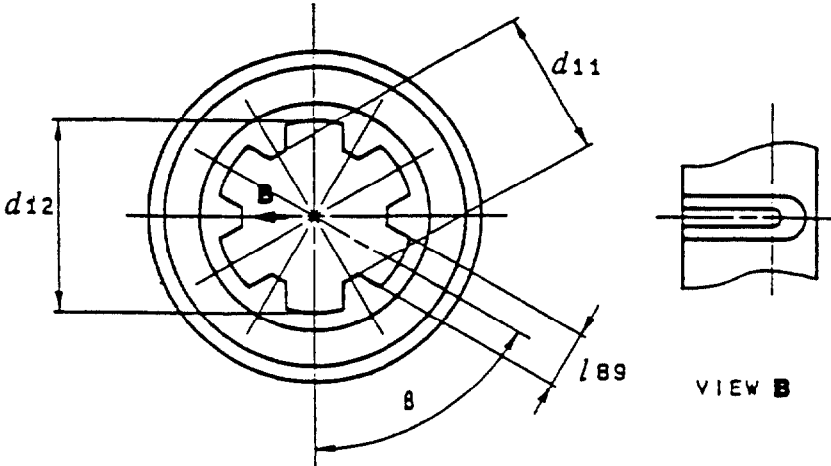


Figure 15 - Top view of a hub

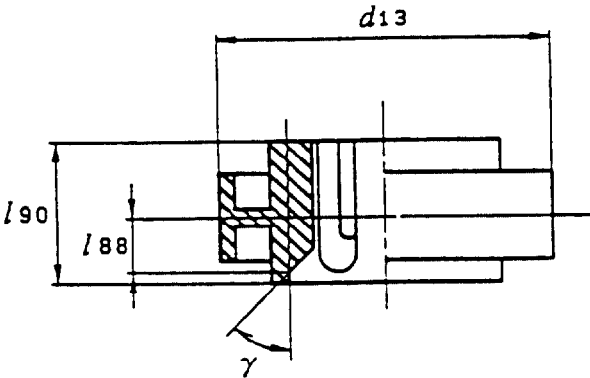


Figure 16 - Side view of a hub

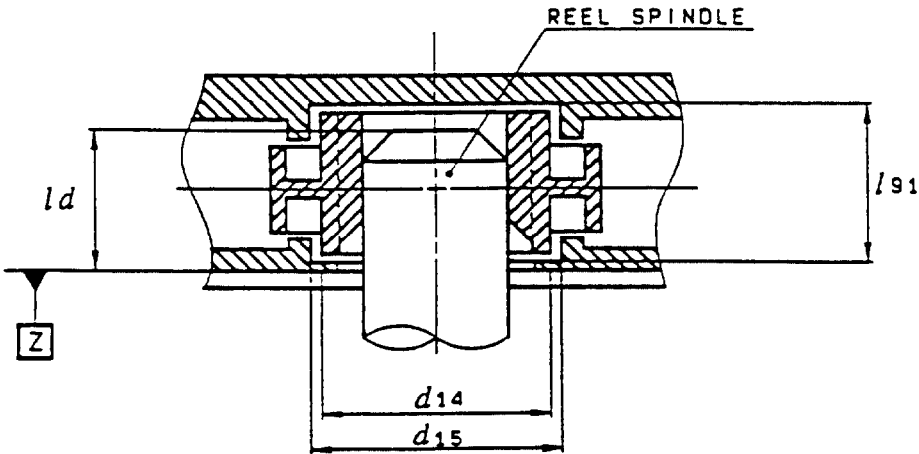


Figure 17 - Interface with the drive spindle