

INTERNATIONAL STANDARD

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Information technology — 12,65 mm wide magnetic tape cassette for information interchange — Helical scan recording — DTF-1 format

*Technologies de l'information — Cassette de bande magnétique de
12,65 mm de large pour l'échange d'information — Enregistrement par
balayage en spirale — Format DTF-1*



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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 15731 was prepared by ECMA (as Standard ECMA-248) 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, and B form an integral part of this International Standard. Annexes C and D are for information only.

ISO and IEC draw attention to the fact that it is claimed that compliance with this International Standard may involve the use of patents concerning the Master Standard Reference Tape and Secondary Standard Reference Tape given in clause 4.

ISO and IEC take no position concerning the evidence, validity and scope of this patent right.

The holder of this patent right has assured ISO and IEC that he is willing to negotiate licences under reasonable and non-discriminatory terms and conditions with applicants throughout the world. In this respect, the statement of the holder of this patent right is registered with ISO and IEC. Information may be obtained from:

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Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights other than those identified above. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

Information technology — 12,65 mm wide magnetic tape cassette for information interchange — Helical scan recording — DTF-1 format

Section 1 - General

1 Scope

This International Standard specifies the physical and magnetic characteristics of magnetic tape cassettes, using magnetic tape 12,65 mm wide so as to provide physical interchange of such cassettes between drives. It also specifies the quality of the recorded signals, the recording method and the recorded format, called Digital Tape Format-1 (DTF-1), thereby allowing data interchange between drives by means of such cassettes. The format supports variable length Logical Records, high speed search, and the use of a registered algorithm for data compression.

This International Standard specifies two sizes of cassette. For the purposes of this International Standard the larger cassette is referred to as Type L, and the smaller as Type S.

Together with a standard for volume and file structure, e.g. ISO 1001, this International Standard provides for full data interchange between data processing systems.

2 Conformance

2.1 Magnetic tape cassette

A claim of conformance with this International Standard shall specify the Type of cassette. It shall be in conformance with this International Standard if

- the case meets all the requirements of clause 4 and clauses 6 to 10 for that Type
- the recording on the tape meets the requirements of clauses 11 to 17

2.2 Generating system

A claim of conformance with this International Standard shall specify which Type(s) of cassette is (are) supported. A system generating a magnetic tape cassette for interchange shall be in conformance with this International Standard if all the recordings that it makes, meet the mandatory requirements of this International Standard. A claim of conformance with this International Standard shall state whether or not one, or more, registered algorithm(s) is (are) implemented and, if so, the registered number(s) of (all) the implemented algorithm(s).

2.3 Receiving system

A claim of conformance with this International Standard shall specify which Type(s) of cassette is (are) supported. A system receiving a magnetic tape cassette for interchange shall be in conformance with this International Standard if it is able to handle any recording made on the tape according to this International Standard, and a claim of conformance shall state whether or not one, or more, registered algorithm(s) is (are) implemented and, if so, the registered number(s) of (all) the implemented algorithm(s).

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 527 (all parts),	<i>Plastics — Determination of tensile properties.</i>
ISO 1001:1986,	<i>Information processing — File structure and labelling of magnetic tapes for information interchange.</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.</i>
JIS-B-7502,	<i>Characteristics of plastic goods.</i>
SMPTE timecode:	(C98.12 : time and control code for video and audio tape for 525/60 television system).

4 Definitions

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

- 4.1 Absolute block number:** A number N allocated to each block, indicating that the block is the Nth block from the beginning of the Logical volume containing it.
- 4.2 a.c. erase:** A process of erasure utilizing alternating magnetic fields of decaying intensity.
- 4.3 algorithm:** A set of rules for transforming the logical representation of data.
- 4.4 Append file:** A new file added from the End of Data (EOD) of a Logical volume.
- 4.5 Append volume:** A Logical volume added after the last Logical volume recorded on the cassette.
- 4.6 Average Signal Amplitude (ASA):** The average peak-to-peak value of the signal output of a read head measured over a minimum of 1,40 mm of track, exclusive of missing pulses.
- 4.7 azimuth:** The angular deviation, in degrees of arc, of the recorded flux transitions on a track from the line normal to the track centreline.
- 4.8 back surface:** The surface of the tape opposite to the magnetic coating used to record data.
- 4.9 bit cell:** A distance along the track allocated for the recording of a Channel bit.
- 4.10 block:** A unit of data which is sent to the tape controller when a single write command is executed.
- 4.11 Block Management Table (BMT):** A table included in each Track Set to manage blocks contained in that Track Set.
- 4.12 byte:** An ordered set of bits acted upon as a unit.
- 4.13 cassette:** A case containing magnetic tape stored on twin reels.
- 4.14 compressed data:** A representation of host-transmitted data after transformation by a data compression algorithm.
- 4.15 Control Track:** A track used for recording the servo control signals.
- 4.16 flux transition position:** That point along a track on the magnetic tape that exhibits the maximum free-space flux density normal to the tape surface.
- 4.17 flux transition spacing:** The distance along a track between successive flux transitions.
- 4.18 Logical track set ID:** The track set ID assigned to each track set containing data received from the host.
- 4.19 Logical volume:** A data entity received by the generating system from the host.
- 4.20 magnetic tape:** A tape which will accept and retain the magnetic signals intended for input, output, and storage purposes.
- 4.21 Master Standard Reference Tape (MSRT):** A tape selected as the standard for Signal Amplitude, Reference Field, Resolution and Signal to Noise Ratio (S/N).

NOTE - The Master Standard Reference Tape has been established at SONY Corporation.

- 4.22 physical recording density:** The number of recorded flux transitions per unit length of track, specified as flux transitions per millimetre (ftpm).
- 4.23 Reference Field (RF):** The Typical Field of the MSRT. There are two Reference Fields:
RF1 is that for a helically recorded track
RF2 is that for a longitudinally recorded track.

- 4.24 Secondary Standard Reference Tape (SSRT):** A tape the performance of which is known and stated in relation to that of the MSRT.

NOTE - Secondary Standard Reference Tapes can be ordered under the Part Number SSRT-DTF-1, from the Sony Corporation, Magnetic Product Group, Data Media Sales Division, 6-7-3S Kitashinagawa, Shinagawa-ku, TOKYO 141, Japan. In principle such tapes will be available for a period of 10 years from the publication of the International Standard. However, by agreement between ISO and Sony Corporation, this period may be shortened or extended to take account of demand for such SSRTs.

It is intended that these SSRTs be used for calibrating tertiary reference tapes for use in routine calibration.

- 4.25 Standard Reference Amplitude (SRA):** The Average Signal Amplitude derived from the MSRT, using the appropriate Test Recording Current and the appropriate physical recording density. There are three SRAs: SRA1 is derived

from a helically recorded track, recorded at 3 201 ftpmm with TRC1. SRA2 is derived from a longitudinally recorded track at 20,75 ftpmm with TRC2. SRA3 is derived from a helically recorded track, recorded at 800,3 ftpmm with TRC1.

Traceability to the SRAs is provided by the calibration factors supplied with each Secondary Standard Reference Tape.

4.26 Standard Reference Current (Ir): The current that produces a Reference Field. There are two Irs:

Ir1 is the current that produces RF1 on a helically recorded track.

Ir2 is the current that produces RF2 on a longitudinally recorded track.

4.27 Tape Reference Edge: The lower edge of the tape when the magnetic coating is facing the observer and the supply reel is to the observer's right.

4.28 Test Recording Current (TRC): The current used to record an SRA. There are two Test Recording Currents:

TRC1 is 1,1 times Ir1

TRC2 is 1,0 times Ir2

4.29 track: A narrow, defined area on the tape along which a series of magnetic transitions may be recorded. A track may be parallel to the Tape Reference Edge or at an angle to it.

4.30 track angle: The angle between the centreline of a helically recorded track and the Tape Reference Edge.

4.31 Track Set: A set of four consecutive helical tracks uniquely identified by a track set identification.

4.32 Typical Field (TF): There are two TFs:

In the plot of the ASA against the recording field:

TF1 is the minimum recording field giving an ASA equal to 90 % of the maximum ASA at the physical recording density of 3 201 ftpmm on a helically recorded track.

TF2 is the value of the recording field for which the increase of ASA resulting from an increase of 1 dB of the recording field falls to 0,5 dB at the physical recording density of 20,75 ftpmm on a longitudinally recorded track.

4.33 Unique Identifier (UID): An unambiguous value uniquely distinct from every other UID.

4.34 word: A group (or set) of four 8-bit bytes, numbered 0 to 3, byte 3 being the most significant.

5 Conventions and notations

5.1 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 0s and 1s. Within such strings, X may be used to indicate that the setting of a bit is not specified within the string.
- Numbers in binary notation and bit combinations are shown as Words with the MSB to the left, and with the msb in each byte to the left.
- Negative values of numbers in binary notation are given in TWOs complement.
- In each field the data is processed so that the MSB is processed first. Within each byte the msb (numbered 7 in an 8-bit byte) is processed first. This order of processing applies also to the data input to the Error Detection and Correction circuits and to their outputs, unless otherwise stated.

5.2 Names

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

6 Acronyms

ASA Average Signal Amplitude

CRC	Cyclic Redundancy Check
BMT	Block Management Table
BST	Bad Spot Table
DIT	Directory Information Table
DM	Dummy Track
ECC	Error Correcting Code
EOD	End of Data
FIT	File Information Table
LBOT	Logical Beginning of Tape
LEOT	Logical End of Tape
LIDT	Logical ID Table
lsb	Least Significant Bit
LSB	Least Significant Byte
msb	Most Significant Bit
MSB	Most Significant Byte
MSRT	Master Standard Reference Tape
NEOT	Near End of Tape
PBOT	Physical Beginning of Tape
PEOT	Physical End of Tape
SRA	Standard Reference Amplitude
SSRT	Secondary Standard Reference Tape
TF	Typical Field
TPS	Tracking Pilot Signal
TRC	Test Recording Current
TSID	Track Set Identification
UID	Unique Identifier
UT	Update Table
VEOV	Virtual End of Volume
VIT	Volume Information Table
VSIT	Volume Set Information Table

7 Environment and safety

The conditions specified below refer to ambient conditions immediately surrounding the cassette. Cassettes exposed to environments outside these limits may still be able to function usefully; however, such exposure may cause permanent damage.

7.1 Testing environment

Unless otherwise specified, tests and measurements made on the tape to check the requirements of this Standard shall be made under the following conditions.

temperature	23 °C ± 1 °C
relative humidity	48 % to 52 %
conditioning period before use	24 h min.

7.2 Operating environment

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

temperature	5 °C to 40 °C
relative humidity	20 % to 80 % non-condensing
wet bulb temperature	26 °C max

The cassette shall be conditioned before use 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 - Rapid variations of temperature should be avoided.

7.3 Storage environment

The following conditions shall be observed for storage.

temperature: 5 °C to 32 °C

relative humidity: 20 % to 60 %

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 cassette.

7.4 Transportation

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

7.5 Safety

The cassette and its components shall satisfy the requirements of ECMA-129 when used in the intended manner or in any foreseeable use in an information processing system.

7.6 Flammability

The tape and the case components shall be made from materials which, when ignited from a match flame, do not continue to burn in a still carbon dioxide atmosphere.

Section 2 - Requirements for the case

8 Dimensional and mechanical characteristics of the case

8.1 General

The case of the cassette shall comprise

- an upper half,
- a lower half,
- a lid pivotally mounted on the upper half
- a latch mechanism for the lid
- two reels for magnetic tape
- a locking mechanism for the reels
- a write-inhibit mechanism
- recognition holes.

In the drawings, embodiments of the cassettes are shown as examples.

For the Type S cassette the dimensions are referred to three orthogonal Reference Planes X, Y, and Z where

- The three datum areas A, B and C in the bottom surface of the case are in Plane Z
- Plane X is perpendicular to Plane Z and intersects the centres of datum holes A and B
- Plane Y is perpendicular to Plane X and Plane Z and intersects the centre of datum hole A.

For the Type L cassette the dimensions are referred to three orthogonal Reference Planes X, Y, and Z where

- The three datum areas E, F and G in the bottom surface of the case are in Plane Z
- Plane X is perpendicular to Plane Z and intersects the centres of datum holes E and F
- Plane Y is perpendicular to Plane X and Plane Z and intersects the centre of datum hole E.

Figures 1 to 19 and sub-clause 8.2 define the dimensions of the case and reels for a Type S cassette.

Figures 20 to 39 and sub-clause 8.3 define the dimensions of the case and reels for a Type L cassette.

8.2 Type S cassette

- Figure 1 is a perspective view seen from the top.
 Figure 2 is a perspective view seen from the bottom.
 Figure 3 shows the top side with the lid closed using third angle projection.
 Figure 4 shows the top side holding and label areas.

- Figure 5 shows the bottom side with the lid removed.
 Figure 6 shows the bottom side with the lid closed.
 Figure 7 shows the details of the recognition holes.
 Figure 8 shows the details of the write-inhibit plug.
 Figure 9 shows the detail of the lid release insertion channel.
 Figure 10 shows the lid unlock force direction.
 Figure 11 shows the detail of the lid opening insertion channel.
 Figure 12 shows the lid opening force direction.
 Figure 13 shows the side view with the lid open.
 Figure 14 shows the cassette reel.
 Figure 15 shows the height of reels upon rotation.
 Figure 16 shows the internal tape path.
 Figure 17 shows the tape path to measure the extraction force.
 Figure 18 shows the tape path to measure the friction torque of the take-up reel.
 Figure 19 shows the tape access cavity requirements.

8.2.1 Overall dimensions (figure 3)

The overall dimensions of the case with the lid in the closed position are defined as follows. The total width of the case shall be

$$l_1 = 96,0 \text{ mm} \pm 0,3 \text{ mm}$$

The total length of the case shall be

$$l_2 = 156,0 \text{ mm} \begin{matrix} +0,2 \text{ mm} \\ -0,3 \text{ mm} \end{matrix}$$

The distance from the top of the case to the Reference Plane Z shall be

$$l_3 = 25,0 \text{ mm} \pm 0,3 \text{ mm}$$

The front-top bevel edge shall start in the top surface at a distance

$$l_4 = 3,0 \text{ mm} \pm 0,5 \text{ mm} \text{ from the front side and shall terminate in the front side at a distance}$$

$$l_5 = 5,0 \text{ mm} \pm 0,5 \text{ mm from the top surface}$$

The bottom-front edge of the case shall be rounded with a radius

$$r_1 = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

The distance from the rear side to plane X shall be

$$l_6 = 9,0 \text{ mm} \begin{matrix} +0,2 \text{ mm} \\ -0,1 \text{ mm} \end{matrix}$$

The distance from the right side to plane Y shall be

$$l_7 = 8,0 \text{ mm} \begin{matrix} +0,2 \text{ mm} \\ -0,1 \text{ mm} \end{matrix}$$

8.2.2 Holding areas (figure 4)

The holding areas, shown cross-hatched, lie in Plane Z and shall be the areas along which the cassette shall be held down when inserted into the drive. The left and right edge holding areas shall extend from the rear side a distance of

$$l_8 = 69,4 \text{ mm min.}$$

The width of the holding surface along the rear edge shall be

$$l_9 = 10,2 \text{ mm min.}$$

The width of the left and right holding surfaces shall be

$$l_{10} = 5,7 \text{ mm min.}$$

8.2.3 Window

A window may be provided on the top surface so that a part of the reels is visible. The window, if provided, shall not extend beyond the height of the cassette and shall not extend beyond the inner edge of the holding areas.

8.2.4 Label areas (figure 4)

A portion of the rear side of the cassette and a portion of the top surface of the cassette may be used for labels. The position and the size of the labels shall not interfere with the operation or clearance requirement of the cassette component parts. The area used for labels on the top surface shall not extend beyond the inner edges of the holding areas.

The position and dimensions of the label area on the rear side are defined as follows.

The distance from the top of the case to the top of the label area, and from the bottom of the label area to Plane Z, shall be

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

The distance from both the left and right sides of the case to the edges of the label area shall be

$$l_{12} = 7,0 \text{ mm} \pm 0,3 \text{ mm}$$

The depth of the top surface label depression shall be 0,3 mm max.

The depth of the rear side label depression shall be 0,5 mm $\pm$ 0,1 mm.

8.2.5 Datum areas and datum holes (figures 5 and 6)

The annular datum areas A, B and C shall lie in plane Z and determine the vertical position of the cassette in the drive.

The annular datum area D shall be parallel to datum plane Z and within 0,3 mm of it.

Each datum area shall have a diameter $d_1 = 10,0 \text{ mm} \pm 0,1 \text{ mm}$ and be concentric with the respective datum hole.

The centres of datum holes A and B lie in plane X.

The centre of datum hole A shall be at the intersection of planes X and Y.

The distance from the centre of the datum hole B to plane Y shall be

$$l_{13} = 140,0 \text{ mm} \pm 0,3 \text{ mm}$$

The distance from the centre of the datum hole C to plane Y shall be

$$l_{14} = 120,0 \text{ mm} \pm 0,3 \text{ mm}$$

The distance from the centre of the datum hole D to plane Y shall be

$$l_{15} = 20,0 \text{ mm} \pm 0,2 \text{ mm}$$

The distance from the centre of the datum holes C and D to plane X shall be

$$l_{16} = 74,0 \text{ mm} \pm 0,2 \text{ mm}$$

The diameter of datum holes A and D shall be

$$l_{17} = 5,5 \text{ mm} \begin{smallmatrix} +0,1 \text{ mm} \\ -0,0 \text{ mm} \end{smallmatrix} \text{ as shown in section C-C of figure 6}$$

The depth of all four datum holes shall be

$$l_{19} = 9 \text{ mm min.}$$

The distance across the flats of datum holes B and C shall be l_{17}

The distance of the elongation in datum holes B and C shall be

$$l_{18} = 8,00 \text{ mm} \pm 0,15 \text{ mm as shown in section E-E of figure 6.}$$

8.2.6 Support areas (figure 5)

The cassette support areas are shown cross-hatched, in figure 5. Support areas A, B, C and D shall be coplanar with datum area A, B, C and D, respectively, within $\pm 0,05 \text{ mm}$.

The areas within 1 mm of the edge of the cassette shall not be included in the support areas and shall be recessed from the support areas.

The dimensions and position of the support areas shall be defined as follows.

The support area surrounding datum hole A shall be defined by

$$\begin{aligned}l_{20} &= 9,0 \text{ mm} \pm 0,2 \text{ mm} \\l_{21} &= 20,0 \text{ mm} \pm 0,2 \text{ mm} \\l_{22} &= 10,00 \text{ mm} \pm 0,15 \text{ mm} \\l_{23} &= 0,4 \text{ mm} \pm 0,2 \text{ mm}\end{aligned}$$

The support area surrounding datum hole B shall be defined by l_{20} , l_{21} and

$$\begin{aligned}l_{24} &= 130,0 \text{ mm} \pm 0,3 \text{ mm} \\l_{25} &= 140,4 \text{ mm} \pm 0,3 \text{ mm}\end{aligned}$$

The support area surrounding datum hole D shall be defined by

$$\begin{aligned}l_{26} &= 62,0 \text{ mm} \pm 0,2 \text{ mm} \\l_{27} &= 72,3 \text{ mm} \pm 0,3 \text{ mm} \\l_{28} &= 80,0 \text{ mm} \pm 0,3 \text{ mm} \\l_{29} &= 85,0 \text{ mm} \pm 0,3 \text{ mm} \\l_{30} &= 10,00 \text{ mm} \pm 0,15 \text{ mm} \\l_{31} &= 40,0 \text{ mm} \pm 0,2 \text{ mm}\end{aligned}$$

The support area surrounding datum hole C shall be defined by l_{26} , l_{28} , l_{29} and

$$\begin{aligned}l_{32} &= 68,0 \text{ mm} \begin{smallmatrix} +0,2 \text{ mm} \\ -0,5 \text{ mm} \end{smallmatrix} \\l_{33} &= 100,0 \text{ mm} \pm 0,3 \text{ mm} \\l_{34} &= 130,0 \text{ mm} \pm 0,3 \text{ mm}\end{aligned}$$

8.2.7 Guiding grooves (figure 3 and 6)

The cassette shall be provided with four guiding grooves for correct insertion into the drive.

The distance from Plane X to the rear edge of the guiding groove on the top surface shall be

$$l_{35} = 2,5 \text{ mm} \pm 0,1 \text{ mm}$$

The width of top and bottom guiding grooves shall be

$$l_{36} = 3,0 \text{ mm} \pm 0,1 \text{ mm}$$

The distance across the flanged opening at the left and right edges of both the top and bottom guiding grooves shall be

$$l_{37} = 6,0 \text{ mm} \pm 0,3 \text{ mm}$$

The depth of the top and bottom guiding grooves shall be

$$l_{38} = 1,4 \text{ mm min.}$$

The distance from Plane Z to the bottom edge of the right side guiding groove shall be

$$l_{39} = 11,00 \text{ mm} \begin{smallmatrix} +0,15 \text{ mm} \\ -0,30 \text{ mm} \end{smallmatrix}$$

The width of right and left side guiding grooves shall be

$$l_{40} = 3,0 \text{ mm} \begin{smallmatrix} +0,4 \text{ mm} \\ -0,1 \text{ mm} \end{smallmatrix}$$

The distance from Plane Z to the bottom of the right side flanged opening at the front shall be

$$l_{41} = 9,0 \text{ mm} \pm 0,3 \text{ mm}$$

The width of the flanged opening of the right and left guiding grooves at the front shall be

$$l_{42} = 7,00 \text{ mm} \pm 0,15 \text{ mm}$$

The distance from the front along the right and left guiding grooves to the termination of the flanges shall be

$$l_{43} = 8,00 \text{ mm} \pm 0,15 \text{ mm}$$

The depth of the left and right side guiding grooves shall be

$$l_{44} = 1,1 \text{ mm min.}$$

The distance from Plane Z to the bottom of the left flanged opening at the front shall be

$$l_{45} = 14,00 \text{ mm } \begin{matrix} +0,15 \text{ mm} \\ -0,30 \text{ mm} \end{matrix}$$

The distance from Plane Z to the bottom edge of the left side guiding groove shall be

$$l_{46} = 12,0 \text{ mm } \pm 0,3 \text{ mm}$$

The distance from the top surface to the extent of chamfer in the bottom of the top guiding groove on the left and right sides shall be

$$l_{47} = 1,90 \text{ mm } \pm 0,15 \text{ mm}$$

The angle of the chamfer in the bottom of the top guiding groove at the left and right ends shall be

$$\alpha_1 = 30^\circ \pm 3^\circ$$

The angle of the flange opening of the top guiding groove at both ends shall be

$$\alpha_2 = 30^\circ \pm 3^\circ$$

8.2.8 Recognition holes (figure 6 and 7)

There shall be 7 recognition holes numbered 1 to 7.

The position and dimensions of the recognition holes 1 to 6 are as follows.

A line through and locating the centres of holes 6 and 1 shall be

$$l_{48} = 70,00 \text{ mm } \pm 0,15 \text{ mm from Plane Y}$$

The centre of hole 6 shall be located

$$l_{49} = 48,0 \text{ mm } \pm 0,2 \text{ mm from Plane X}$$

The centres of holes 4 and 5 shall be located

$$l_{50} = 3,40 \text{ mm } \pm 0,05 \text{ mm to the left and right of a line through the centres of holes 1 and 6}$$

The location of a line through the centres of hole 4 and 5 shall be a distance

$$l_{51} = 3,6 \text{ mm } \pm 0,1 \text{ mm from the centre of hole 6}$$

Recognition holes 2 and 3 are D shaped with the flats next to hole 1; the flats shall be a distance

$$l_{52} = 4,00 \text{ mm } \pm 0,05 \text{ mm from the centre of hole 1}$$

The distance of a line through the centres of holes 1,2 and 3 from Plane X shall be

$$l_{53} = 56,0 \text{ mm } \pm 0,2 \text{ mm}$$

The length of the flat of holes 2 and 3 shall be

$$l_{54} = 3,4 \text{ mm } \begin{matrix} +0,2 \text{ mm} \\ -0,0 \text{ mm} \end{matrix}$$

The distance from the centre to the flat of holes 2 and 3 shall be

$$l_{55} = 1,7 \text{ mm } \begin{matrix} +0,2 \text{ mm} \\ -0,0 \text{ mm} \end{matrix} \text{ with radius } l_{55}, \text{ located } l_{55} \text{ from the flat.}$$

Holes 1 and 3 contain a tab as shown in view Q of figure 6 in figure 7.

The distance from the tab surface to the bottom of the cavity behind the tab shall be

$$l_{56} = 10 \text{ mm min. as shown in section F-F in figure 7.}$$

The depth of holes 4, 5 and 6 shall be

$$l_{57} = 5 \text{ mm min. as shown in section G-G of figure 7}$$

The radius of the D holes 2 and 3 shall be

$$r_2 = 1,7 \text{ mm } \begin{matrix} +0,2 \text{ mm} \\ -0,0 \text{ mm} \end{matrix}$$

The diameter of holes 1, 4, 5 and 6 shall be

$$d_2 = 3,4 \text{ mm } \begin{matrix} +0,2 \text{ mm} \\ -0,0 \text{ mm} \end{matrix}$$

Recognition hole 7 is located in the bottom right side of the case shown in view P of figure 6 in figure 7.

The distance from Plane Y to the surface of hole 7 nearest to the right edge of the case shall be

$$l_{58} = 5,8 \text{ mm } \pm 0,2 \text{ mm}$$

The distance from Plane Y to the surface of hole 7 farthest from the right edge of the case shall be

$$l_{59} = 1,6 \text{ mm } \pm 0,1 \text{ mm}$$

The distance from Plane X to the surface of hole 7 nearest to the rear edge of the case shall be

$$l_{60} = 50,0 \text{ mm } \begin{matrix} +0,5 \text{ mm} \\ -0,2 \text{ mm} \end{matrix}$$

The distance from Plane X to the surface of hole 7 farthest from the rear edge of the case shall be

$$l_{61} = 57,00 \text{ mm } \begin{matrix} +0,35 \text{ mm} \\ -0,50 \text{ mm} \end{matrix}$$

The surfaces on the case bottom and right side surrounding recognition hole 7 are slightly recessed.

The distance from Plane Y to the edge of the recessed area farthest from the right edge shall be

$$l_{62} = 0,4 \text{ mm } \pm 0,2 \text{ mm}$$

The distance from Plane X to the nearest edge of the recessed area along the right edge of the case shall be

$$l_{63} = 46,0 \text{ mm } \pm 0,5 \text{ mm}$$

The extent of the recessed area along the right edge of the case shall be

$$l_{64} = 15,0 \text{ mm } \pm 0,5 \text{ mm}$$

The inside corners of the recognition hole 7 farthest from the right edge of the case shall have fillets defined by

$$l_{65} = 1,0 \text{ mm } \pm 0,2 \text{ mm} \text{ as shown in view P of figure 7.}$$

The depth of the recess below the bottom and right side surfaces shall be

$$l_{66} = 0,5 \text{ mm max.}$$

The depth of recognition hole 7 shall be

$$l_{67} = 10 \text{ mm min.}$$

This International Standard prescribes the following states of these recognition holes.

- Recognition hole 1 shall be closed.
- Recognition hole 2 shall be open.
- Recognition hole 3 shall be closed.
- Recognition hole 4 shall be open.
- Recognition hole 5 shall be open.
- Recognition hole 6 shall be open.
- Recognition hole 7 shall be open.

Tabs may be used to close the recognition holes. The dimensions of the tabs, if used, shall be as defined in the section F-F of figure 7. The tabs shall withstand an applied force of 2,0 N max. without being punched out.

The surface of the tabs shall be recessed from the bottom surface a distance

$$l_{68} = 0,3 \text{ mm max.}$$

The space around the knockout tab in recognition holes 1 and 3, as viewed in section F-F of figure 7, shall be

$$l_{69} = 0,7 \text{ mm max.}$$

8.2.9 Write-inhibit plug (figure 8)

The write-inhibit plug is located on the left side at the bottom of the case as shown in figure 6, view R.

The distance in Plane Z from Plane X to the near edge of the write-inhibit plug hole shall be

$$l_{70} = 52,5 \text{ mm} \pm 0,2 \text{ mm}$$

The span of the write-inhibit plug hole shall be

$$l_{71} = 7,00 \text{ mm} \begin{smallmatrix} +0,15 \text{ mm} \\ -0,00 \text{ mm} \end{smallmatrix} \text{ as shown in view R of figure 8.}$$

The distance on the left side of the case from Plane X to the near edge of the slider opening shall be

$$l_{72} = 52,8 \text{ mm min.}$$

The distance on the left side of the case from Plane X to the far edge of the slider opening shall be

$$l_{73} = 58,8 \text{ mm max.}$$

The distance in Plane Z from Plane Y to the inner side of the write-inhibit plug hole shall be

$$l_{74} = 141,60 \text{ mm} \pm 0,15 \text{ mm}$$

The distance from the inner side of the write inhibit hole to the slide rail shoulder shall be

$$l_{75} = 5,00 \text{ mm} \begin{smallmatrix} +0,15 \text{ mm} \\ -0,00 \text{ mm} \end{smallmatrix}$$

The distance on the left side from Plane Z to the far edge of the write-inhibit plug detent hole shall be

$$l_{76} = 9,4 \text{ mm max.}$$

The tang on the left side of the body of the write-inhibit plug shall extend

$$l_{77} = 1,7 \text{ mm max.}$$

The surface of the write-inhibit plug, when in the write-enable position, shall be recessed from Plane Z a distance

$$l_{78} = 0,5 \text{ mm max.}$$

When the write-inhibit plug is pushed down, recording on the tape is inhibited.

The distance from Plane Z to the surface of the plug in the write-inhibit position shall be

$$l_{79} = 4,5 \text{ mm min.}$$

The write-inhibit plug shall not be deformed by 0,3 mm or more when a force of 2,0 N is applied to the centre of it. The force required to push down or lift up the write-inhibit plug shall be less than 40 N.

8.2.10 Pre-positioning surface (figures 3 and 5)

The pre-positioning surfaces are parallel to Plane Y in the front of the bottom surface and determine the initial location of the cassette as it is inserted into the drive loading slot.

The distance of the right side pre-position surface from Plane Y shall be

$$l_{80} = 1,2 \text{ mm} \pm 0,4 \text{ mm as shown in figure 5}$$

The distance of the left side pre-position surface from Plane Y shall be

$$l_{81} = 137,7 \text{ mm} \pm 0,5 \text{ mm}$$

The height of the pre-position surfaces above Plane Z shall be

$$l_{82} = 3,0 \text{ mm} \pm 0,1 \text{ mm as shown in figure 3}$$

The distance from Plane X to the front of the left and right pre-position surfaces shall be $l_{83} = 87,0 \text{ mm} \begin{smallmatrix} +0,1 \text{ mm} \\ -0,2 \text{ mm} \end{smallmatrix}$

8.2.11 Cassette lid (figures 9, 10, 11, 12 and 13)

The cassette shall include a lid for protection of the tape during handling, storage and transportation. The lid shall be automatically locked when the lid is closed and it shall be unlocked when the release pin in the drive is inserted into the channel shown in figure 9.

The distance from Plane X to the near edge of the lid release insertion channel shall be $l_{84} = 75,0 \text{ mm} \begin{smallmatrix} +0,0 \text{ mm} \\ -0,3 \text{ mm} \end{smallmatrix}$

The distance from Plane Y to the far wall of the lid release insertion channel shall be

$$l_{85} = 141,8 \text{ mm min.}$$

The distance from Plane Z to the near wall of the cavity containing the locking mechanism shall be

$$l_{86} = 2,4 \text{ mm max.}$$

The distance from Plane Z to the far wall of the cavity containing the locking mechanism shall be

$$l_{87} = 5,85 \text{ mm min.}$$

The design of the locking mechanism is not specified by this International Standard except that it shall be operated by the release pin in the drive. The lid release mechanism shall be actuated when the drive release pin is in the cross-hatched area shown in section J-J and defined by l_{87} and

$$l_{88} = 74,2 \text{ mm max.}$$

$$l_{89} = 75,8 \text{ mm min.}$$

$$l_{90} = 3 \text{ mm max.}$$

The force needed to unlock the lid shall be less than 1 N in the direction shown by figure 10.

After the lid is unlocked, the lid shall be open when the lid opening lever in the drive is inserted into the channel shown in figure 11.

The distance from Plane X to the near end of the lid opening channel shall be

$$l_{91} = 77,3 \text{ mm max.}$$

The distance from Plane Y to the relief edge in the front bottom lid surface shall be

$$l_{92} = 2,4 \text{ mm max.}$$

The distance from Plane Y to the right inside wall of the lid shall be

$$l_{93} = 5 \text{ mm min.}$$

The distance from bottom surface of the case to the front bottom edge of the lid shall be

$$l_{94} = 0,1 \text{ mm} \pm 0,1 \text{ mm}$$

The bottom front edge of the lid shall have a flat for the distance defined by

$$l_{95} = 1,2 \text{ mm} \pm 0,2 \text{ mm}$$

The inside corner of the lid shall be rounded with a radius

$$r_3 = 1,0 \text{ mm} \pm 0,1 \text{ mm}$$

The inside front bottom edge of the lid shall be chamfered at an angle defined by

$$\alpha_3 = 30^\circ \pm 3^\circ \text{ starting at the flat defined by } l_{95}$$

The force needed to open the lid shall be 1,5 N max. in the direction shown in figure 12.

The lid rotates around an axis defined in figure 13 by dimensions

$$l_{96} = 69,0 \text{ mm} \pm 0,5 \text{ mm and}$$

$$l_{97} = 18,0 \text{ mm} \pm 0,5 \text{ mm}$$

The maximum possible lid opening distance shall be

$$l_{98} = 29 \text{ mm min.}$$

8.2.12 Cassette reel lock (figure 13)

The reels shall be locked when the cassette is removed from the tape drive and shall be unlocked when the cassette is inserted into the drive.

The design of the locking mechanism is not specified by this International Standard except that the reel shall be completely released when the cassette lid is opened a distance from reference plane Z defined by

$$l_{99} = 23,5 \text{ mm max. The minimum distance required to unlock the reels is not specified.}$$

8.2.13 Reel access holes (figure 6)

The case shall have two circular reel access holes in the bottom of the case which shall allow penetration of the drive spindles.

The centreline of both reel holes shall be the distance from Plane X defined by

$$l_{100} = 31,0 \text{ mm} \pm 0,2 \text{ mm}$$

The distance from Plane Y along the line defined by l_{100} to the centre of the right reel hole shall be

$$l_{101} = 32,0 \text{ mm} \pm 0,2 \text{ mm}$$

The distance from Plane Y along the line defined by l_{100} to the centre of the left reel hole shall be

$$l_{102} = 108,0 \text{ mm} \pm 0,2 \text{ mm}$$

The diameter of both reel holes shall be

$$d_3 = 33 \text{ mm min.}$$

8.2.14 Reels (figure 14)

The reels have a spindle-receiving cavity extending from the bottom surface, with inward facing gear teeth for transferring drive, and a round upper cylinder to define the axis of rotation precisely.

The diameter of the round upper cylinder in the receiving cavity shall be

$$d_4 = 11,00 \text{ mm} \begin{matrix} +0,15 \text{ mm} \\ -0,00 \text{ mm} \end{matrix}$$

The tops of the inside gear teeth shall lie in a cylinder surface with a diameter defined by

$$d_5 = 14,0 \text{ mm} \begin{matrix} +0,4 \text{ mm} \\ -0,2 \text{ mm} \end{matrix}$$

The base of the inside gear teeth shall lie in a cylinder surface with a diameter defined by

$$d_6 = 18,0 \text{ mm} \pm 0,2 \text{ mm}$$

The base surface of the reel is formed by an annular ring with an inside diameter that shall be

$$d_7 = 27,6 \text{ mm} \pm 0,2 \text{ mm} \text{ and an outside diameter that shall be}$$

$$d_8 = 30,0 \text{ mm} \pm 0,2 \text{ mm}$$

The width of the tops of the inside gear teeth shall be

$$l_{103} = 2,0 \text{ mm} \pm 0,5 \text{ mm}$$

The distance from the reel base annular ring to the inside lower flange at the tape hub surface shall be

$$l_{104} = 3,75 \text{ mm} \begin{matrix} +0,20 \text{ mm} \\ -0,10 \text{ mm} \end{matrix}$$

The distance between the lower and upper flanges at the tape hub surface shall be

$$l_{105} = 13,5 \text{ mm} \begin{matrix} +0,2 \text{ mm} \\ -0,5 \text{ mm} \end{matrix}$$

The distance from the reel base annular ring to the top of the inside gear teeth base cylinder shall be

$$l_{106} = 9,00 \text{ mm} \pm 0,15 \text{ mm}$$

The distance from the reel base annular ring to the start of the round upper cylinder shall be

$$l_{107} = 10,5 \text{ mm} \pm 0,3 \text{ mm}$$

The distance from the reel base annular ring to the top of the round upper cylinder shall be

$$l_{108} = 15,0 \text{ mm} \begin{matrix} +0,5 \text{ mm} \\ -0,0 \text{ mm} \end{matrix}$$

The length of the tops of the gear teeth from the top of the inside gear teeth base cylinder shall be

$$l_{109} = 6,50 \text{ mm} \pm 0,15 \text{ mm}$$

The gear teeth side surfaces extend from the base cylinder to the tops cylinder and shall be at an angle with respect to each other defined by

$$a_4 = 60^\circ \pm 5^\circ$$

The 6 gear teeth shall be spaced around the base cylinder at an angle defined by

$$a_5 = 60^\circ \pm 1^\circ$$

The reels assembled in a cassette shall rotate freely under the condition described in figure 15.

The distance from Plane Z to the annular base reel surface which provides free rotation of the reel when the cassette is loaded into a drive shall be

$$l_{110} = 2,4 \text{ mm } \begin{matrix} +0,2 \text{ mm} \\ -0,6 \text{ mm} \end{matrix}$$

The reels assembled in a cassette shall be spring-loaded with a force F of $1,5 \text{ N} \pm 0,5 \text{ N}$ as shown in figure 15.

8.2.15 Position of the tape in the case (figure 16)

Four tape guides define the tape path inside the cassette. Two guides on the left side, one close to the front opening of the case and one close to the supply reel. Two guides on the right side, one close to the front opening of the case and one near to the take-up reel.

The distance from Plane X to a line through the centres of the guides close to the reels shall be

$$l_{111} = 69,0 \text{ mm} \pm 0,5 \text{ mm}$$

The distance from Plane Y to the centre of the right guide close to the take-up reel shall be

$$l_{112} = 12,5 \text{ mm} \pm 0,5 \text{ mm}$$

The distance from Plane Y to the centre of the left guide close to the supply reel shall be

$$l_{113} = 128,7 \text{ mm} \pm 0,5 \text{ mm}$$

The distance from Plane X to a line through the centres of the guides close to the front shall be

$$l_{114} = 81,0 \text{ mm} \pm 0,5 \text{ mm}$$

The distance from Plane Y to the centre of the right guide close to the front shall be

$$l_{115} = 13,0 \text{ mm} \pm 0,5 \text{ mm}$$

The distance from Plane Y to the centre of the left guide close to the front shall be

$$l_{116} = 127,0 \text{ mm} \pm 0,5 \text{ mm}$$

The diameter of all four guides shall be

$$d_9 = 5,0 \text{ mm} \pm 0,3 \text{ mm}$$

8.2.16 Tape path zone (figure 16)

When the cassette is inserted into the drive, the tape is pulled outside of the case by tape guides. The tape path zone of the case is the zone in which the tape shall be able to move freely.

The distance from Plane X to the furthest points defining the zone limit on the left and right in front of the case shall be

$$l_{117} = 100,0 \text{ mm} \pm 0,2 \text{ mm}$$

The distance from Plane Y to the right front point defining the zone limit shall be

$$l_{118} = 7 \text{ mm min.}$$

The distance from Plane Y to the left front point defining the zone limit shall be

$$l_{119} = 132 \text{ mm min.}$$

With a holdback torque of $0,001 \text{ N}\cdot\text{m}$ applied to a nearly empty reel under the condition described in figure 17, the force required to pull the tape out from the reel (see figure 17) shall not exceed $0,17 \text{ N}$. This specification shall be applied to both the supply and take-up reels.

With a holdback tension of 0,3 N applied to the take-up reel nearly full of the tape under the condition described in figure 18, the torque required to wind the tape shall not exceed 0,015 N·m.

8.2.17 Tape access cavity (figure 19)

When the cassette is inserted into the drive, tape guides in the drive pull the tape out into the drive tape path. The shape and dimensions of the access cavity for these tape guides shall be defined as follows.

The inside shape of the lid is not specified by this International Standard except that clearance shown cross-hatched shall be provided for drive tape threading mechanisms when the lid is opened.

The distance from Plane Y to the edge in the bottom surface which defines the right extent of the tape access cavity shall be

$$l_{120} = 14,5 \text{ mm} \pm 0,3 \text{ mm}$$

The distance from Plane X to the starting point for the right rear surface of the access cavity shall be

$$l_{121} = 86,0 \text{ mm} \begin{matrix} +0,2 \text{ mm} \\ -0,5 \text{ mm} \end{matrix}$$

The distance from Plane Y to the extent of the right rear surface of the access cavity shall be

$$l_{122} = 27,75 \text{ mm max.}$$

The distance from Plane X to the curved surface defining the rear extent of the tape access cavity shall be

$$l_{123} = 70,6 \text{ mm max.}$$

The distance from Plane X to the surface defining the rear extent of the tape access cavity shall be

$$l_{124} = 62,1 \text{ mm max.}$$

The distance from Plane Y to the extent of the left rear surface of the access cavity shall be

$$l_{125} = 112,25 \text{ mm min.}$$

The distance from Plane Y to the left-most edge of the tape access cavity in the bottom surface shall be

$$l_{126} = 125,5 \text{ mm} \pm 0,3 \text{ mm}$$

The width at the end of the centre tape position limit post shall be

$$l_{127} = 8,7 \text{ mm max.}$$

The width at the base of the centre tape position limit post shall be

$$l_{128} = 14,7 \text{ mm max.}$$

The width of the rearmost surface of the tape access cavity shall be

$$l_{129} = 26,5 \text{ mm min.}$$

The distance from Plane X to the inside surface of the centre tape position limit post shall be

$$l_{130} = 82,5 \text{ mm min.}$$

The distance from Plane Z to the inside surface of the support for the centre tape position limit post shall be

$$l_{131} = 19 \text{ mm min.}$$

The distance from Plane Z to the top inside surface of the support for the centre tape position limit post shall be

$$l_{132} = 20,8 \text{ mm min.}$$

The distance from Plane Z to the edge in the top surface of the case which defines the lid case interface shall be

$$l_{133} = 77 \text{ mm max.}$$

The distance from Plane Z to the inside of the case top surface shall be

$$l_{134} = 23 \text{ mm min.}$$

The distance from Plane Z in the lid area representing the depth of the access cavity shall be

$$l_{135} = 24 \text{ mm min.}$$

The distance from Plane Z to the lid edge when the lid is opened shall be

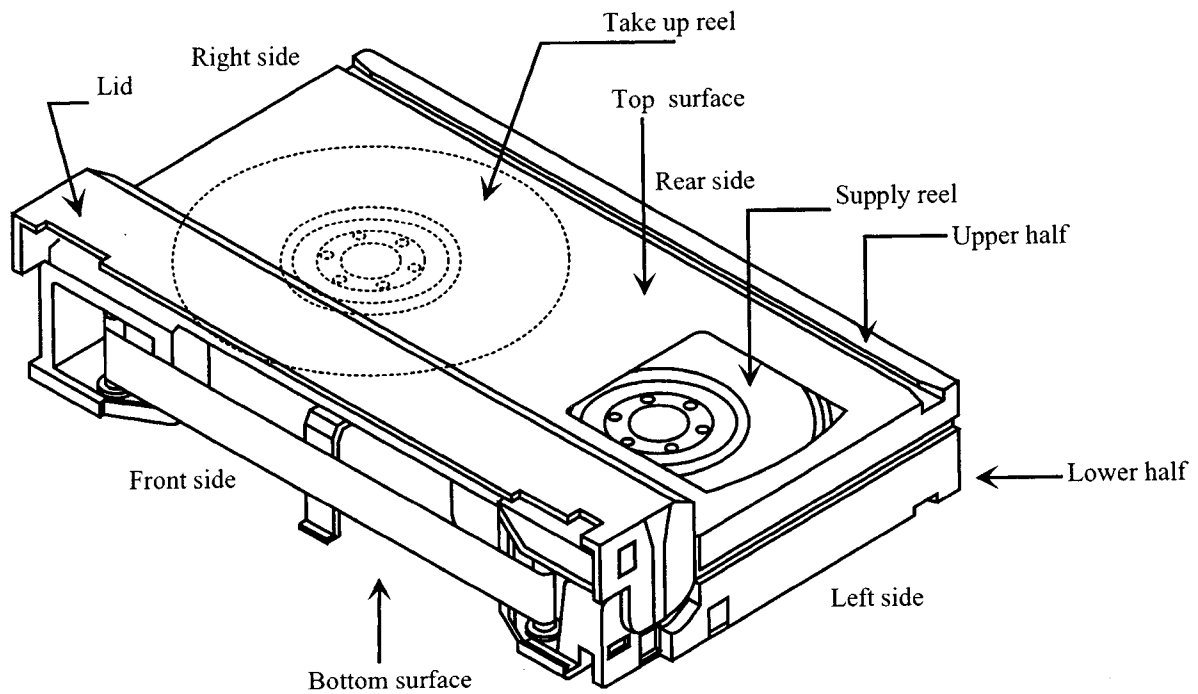
$l_{136} = 27,5 \text{ mm } \begin{smallmatrix} +1,5 \text{ mm} \\ -0,0 \text{ mm} \end{smallmatrix}$ and shall provide clear entrance to the above defined tape access cavity

The angle of the fillet at the inside and outside of the corner of the centre tape position limit post shall be

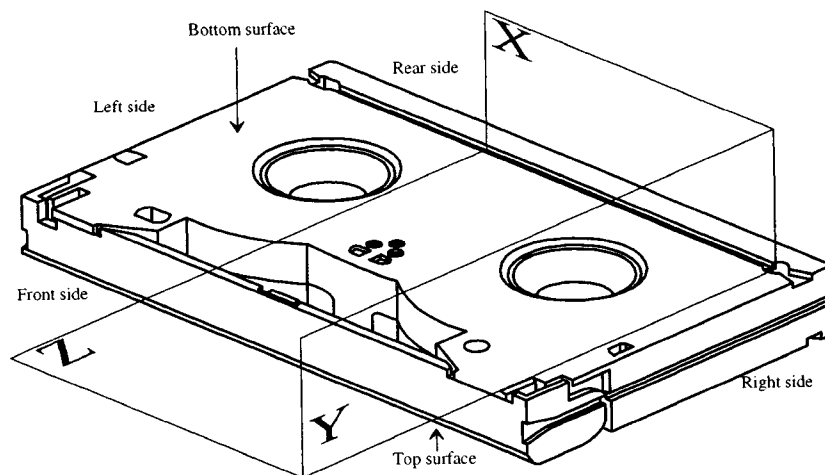
$a_6 = 35^\circ \text{ max.}$

The curvature of the rear tape access cavity surfaces shall have a radius defined by

$r_4 = 39,6 \text{ mm max.}$ and centred at the reel centres.



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Figure 1 - Type S cassette top view (lid open)**Figure 2 - Type S cassette bottom view (lid closed)**

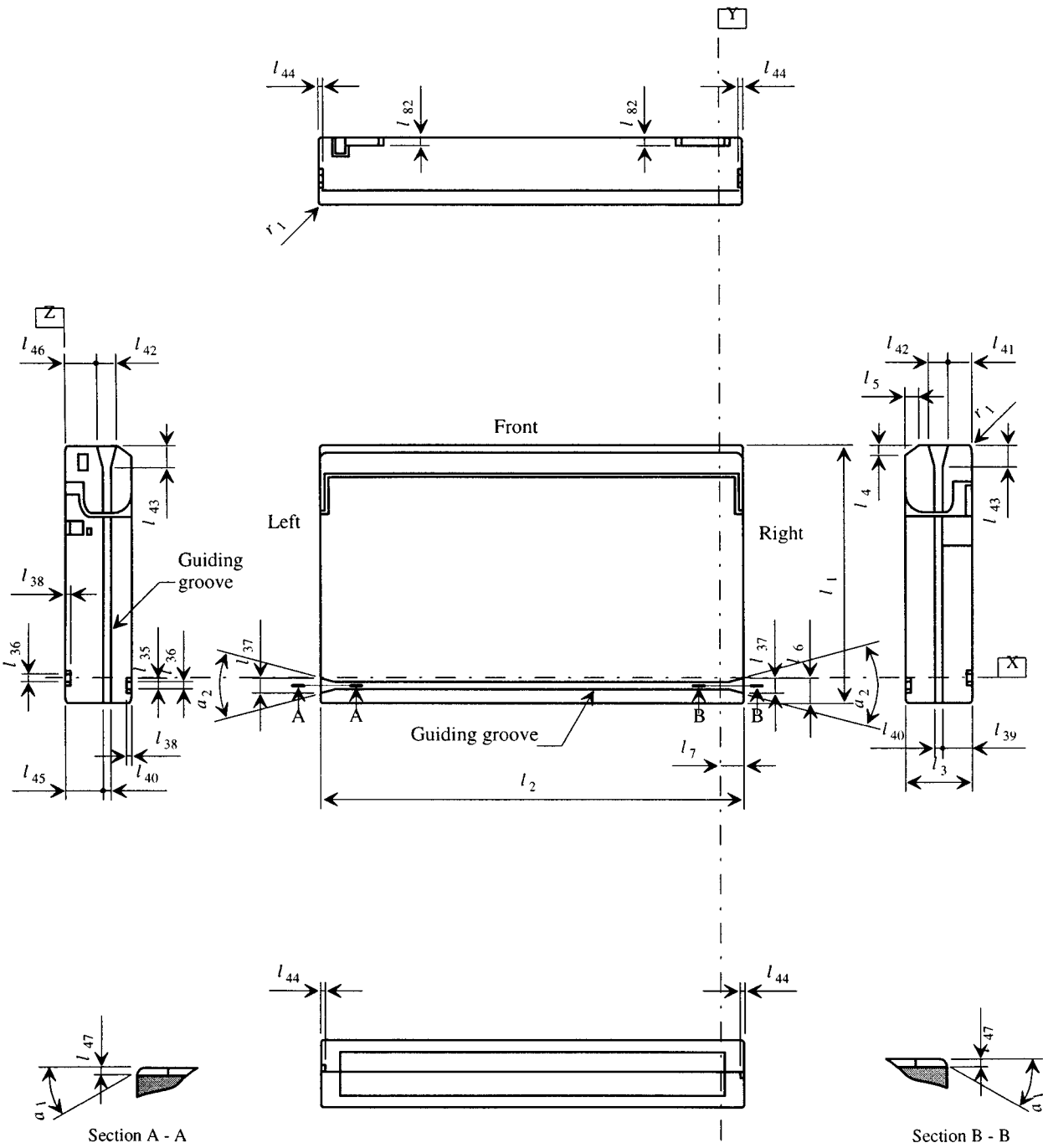


Figure 3 - Top side of Type S cassette (lid closed)

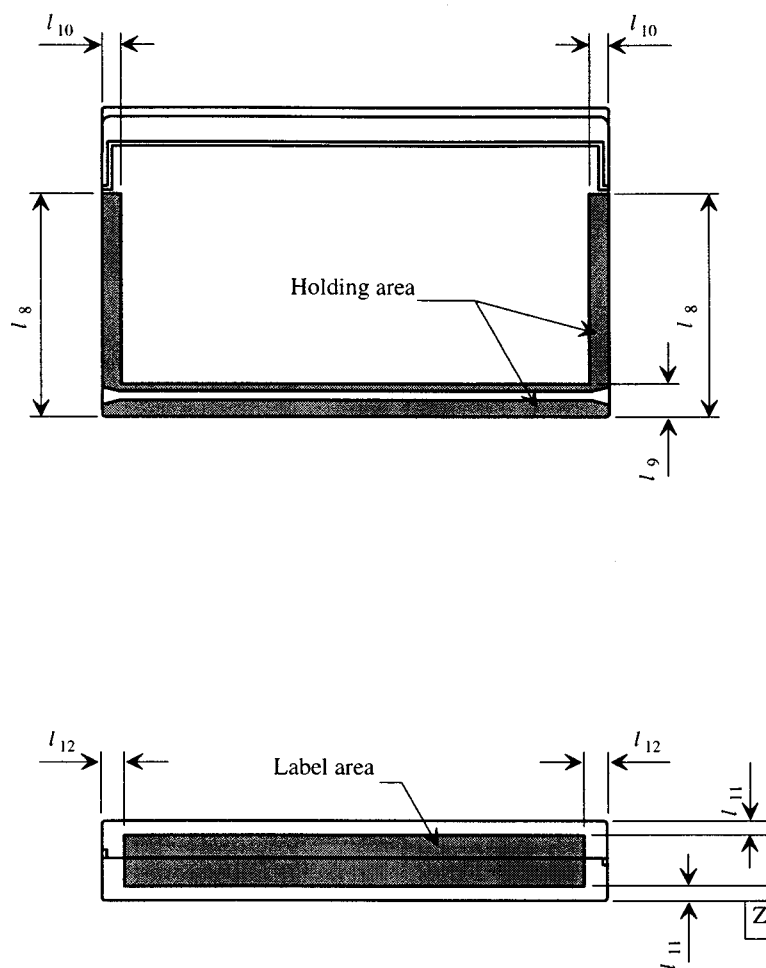


Figure 4 - Top side of Type S cassette, holding and label areas.

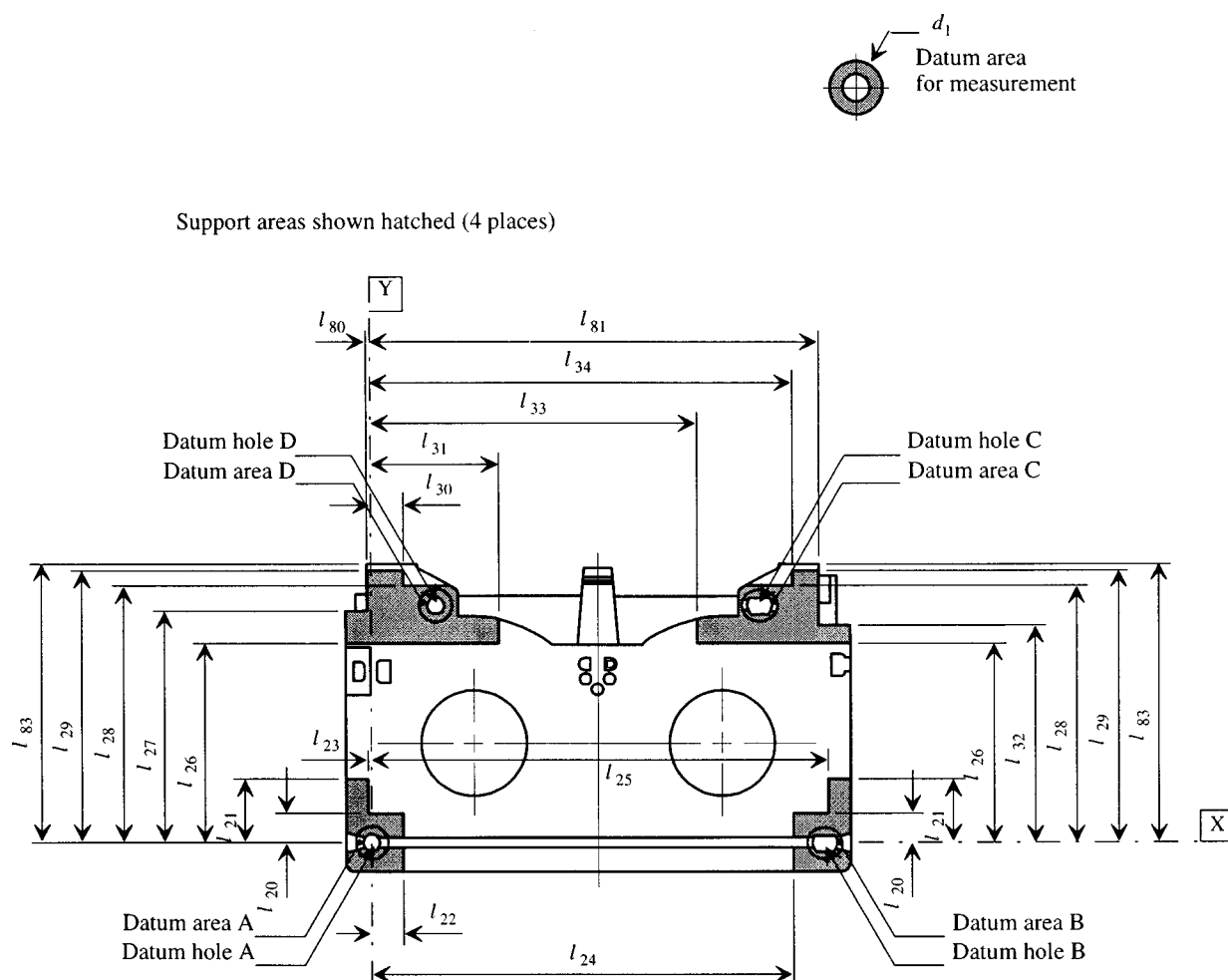


Figure 5 - Bottom side of Type S cassette (lid removed)

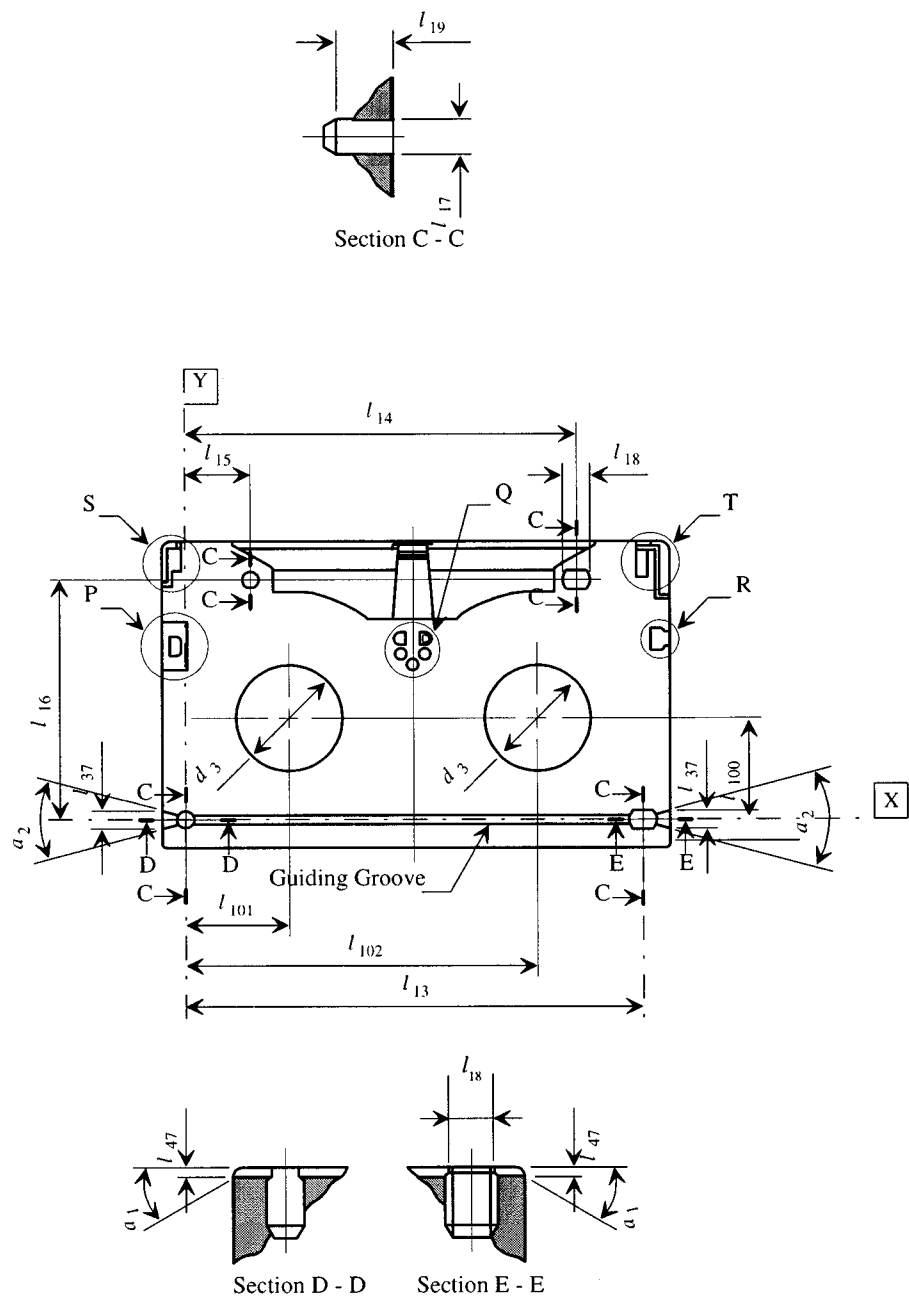


Figure 6 - Bottom side of Type S cassette (lid closed)

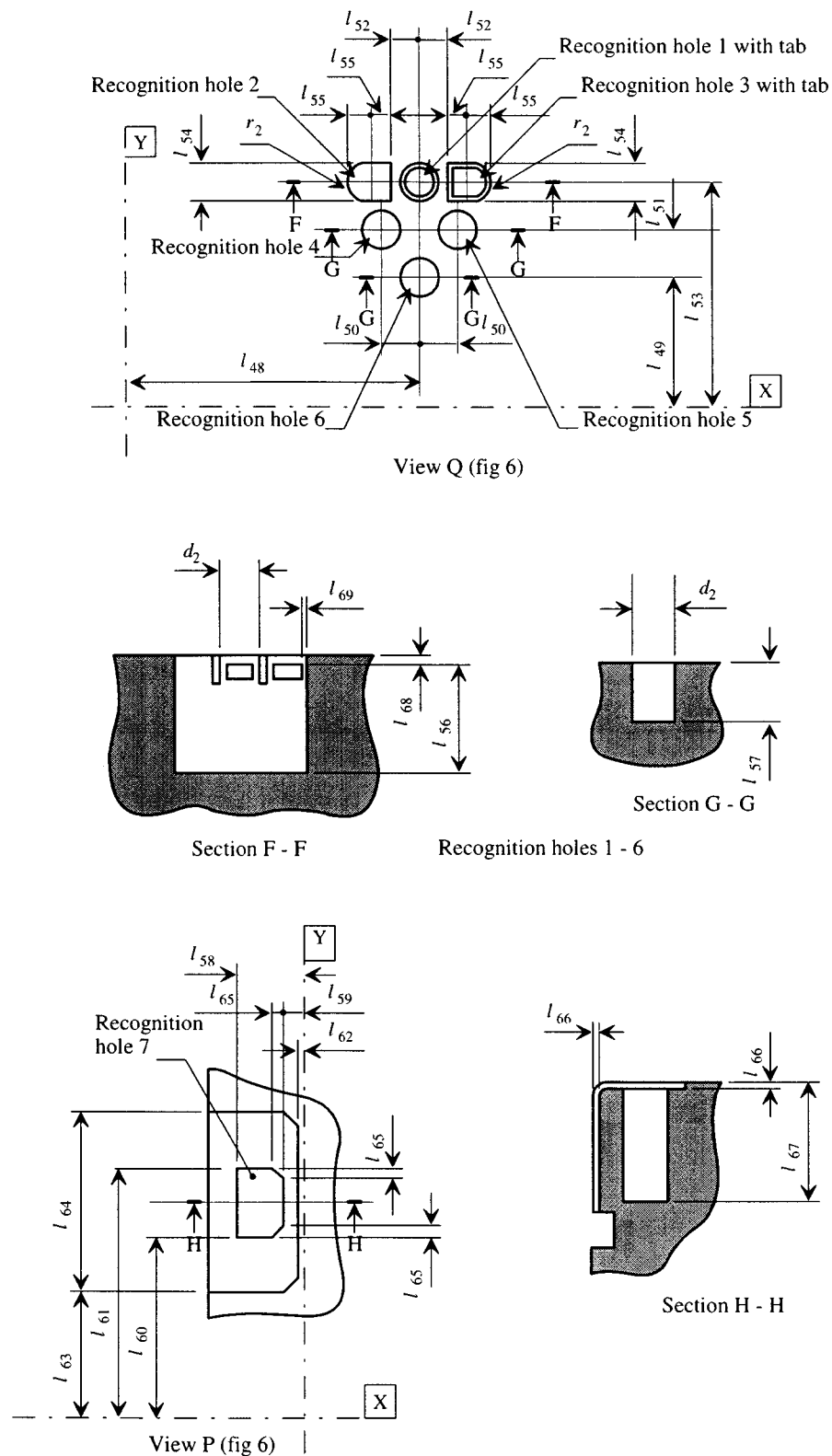


Figure 7 - Details of recognition holes of Type S cassette

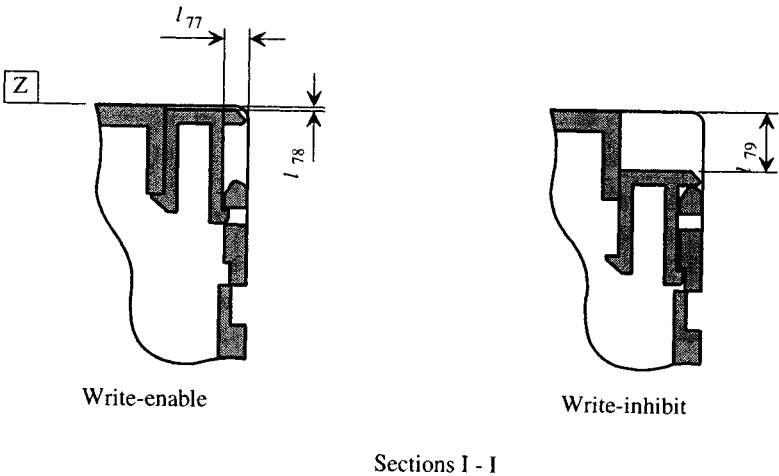
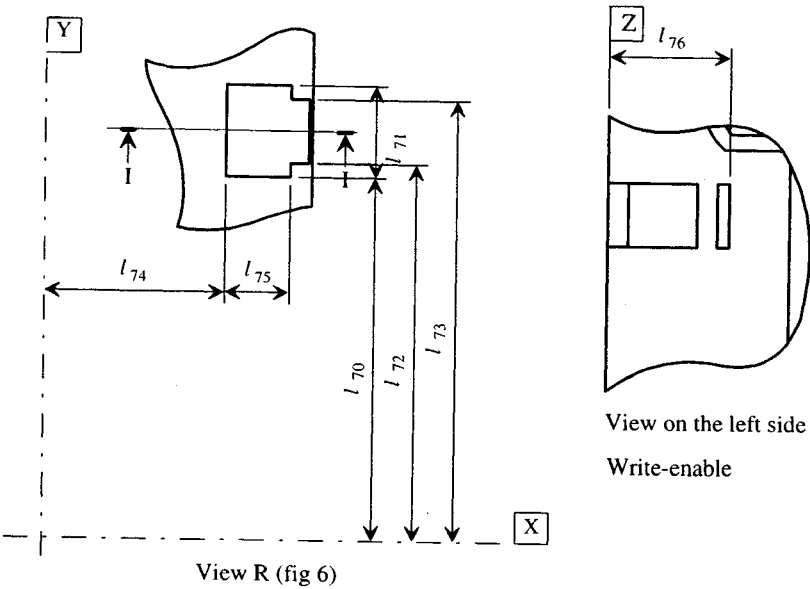


Figure 8 - Details of write - inhibit plug of Type S cassette

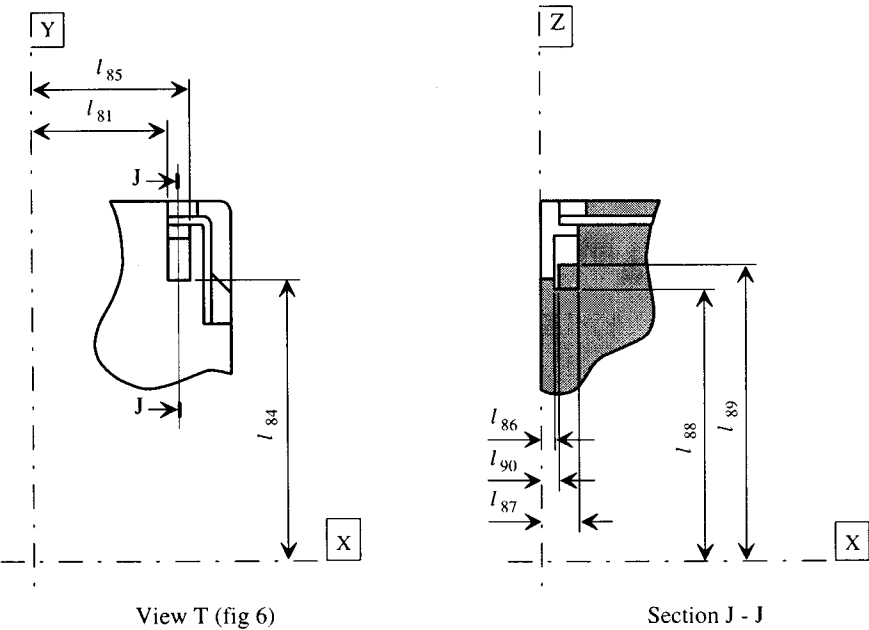


Figure 9 - Lid release insertion channel of Type S cassette

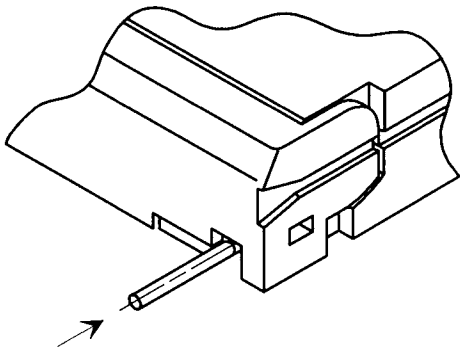


Figure 10 - Direction of force required to unlock the lid with Type S cassette

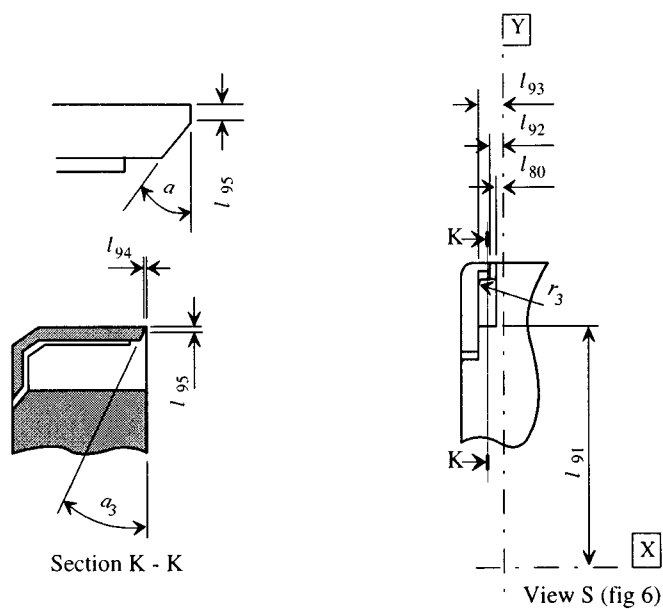


Figure 11 - Lid opening insertion channel of Type S cassette

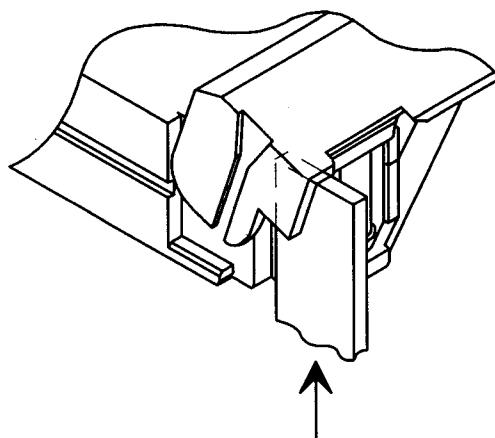


Figure 12 - Direction of force required to open the lid with Type S cassette

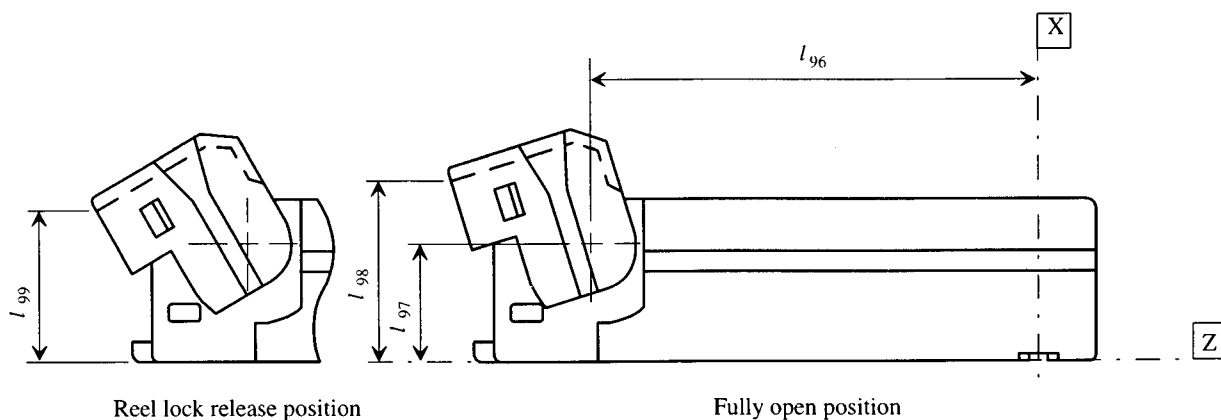


Figure 13 - Side view of Type S cassette (lid open)