REAFFIRMED 2004

SMPTE STANDARD

for Television Digital Recording — 12.65-mm Type D-9 Component Format — Tape Cassette

1 Scope

This standard specifies dimensions for the video tape cassette used with the 12.65-mm type D-9 digital component television recorder.

2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below.

SMPTE 316M-1999, Television Digital Recording — 12.65-mm Type D-9 Component Format — 525/60 and 625/50

3 Measurement

Tests and measurements on cassette parameters shall be carried out under the following atmospheric conditions:

- Temperature 20°C ± 1°C
- Relative humidity (50 ± 2)%
- Barometric pressure 86 kPa to 106 kPa
- Stabilization time 24 hours

4 Video tape cassette

4.1 General specifications

4.1.1 The dimensions of the cassette used for recording shall be in accordance with figures 1 to 17.

4.1.2 The magnetic coating on the tape shall face out of the cassette as specified in figure 12.

4.2 Datum plane

4.2.1 Datum plane Z is determined by datum areas A, B, and C as specified in figure 7.

4.2.2 Datum plane Y shall be orthogonal to datum plane Z and shall run through the center of datum hole A and datum hole B as specified in figures 4 and 5.

4.2.3 Datum plane X shall be orthogonal to both datum plane Y and datum plane Z and shall run through the center of datum hole A as specified in figures 4 and 5.

4.3 Window and labels

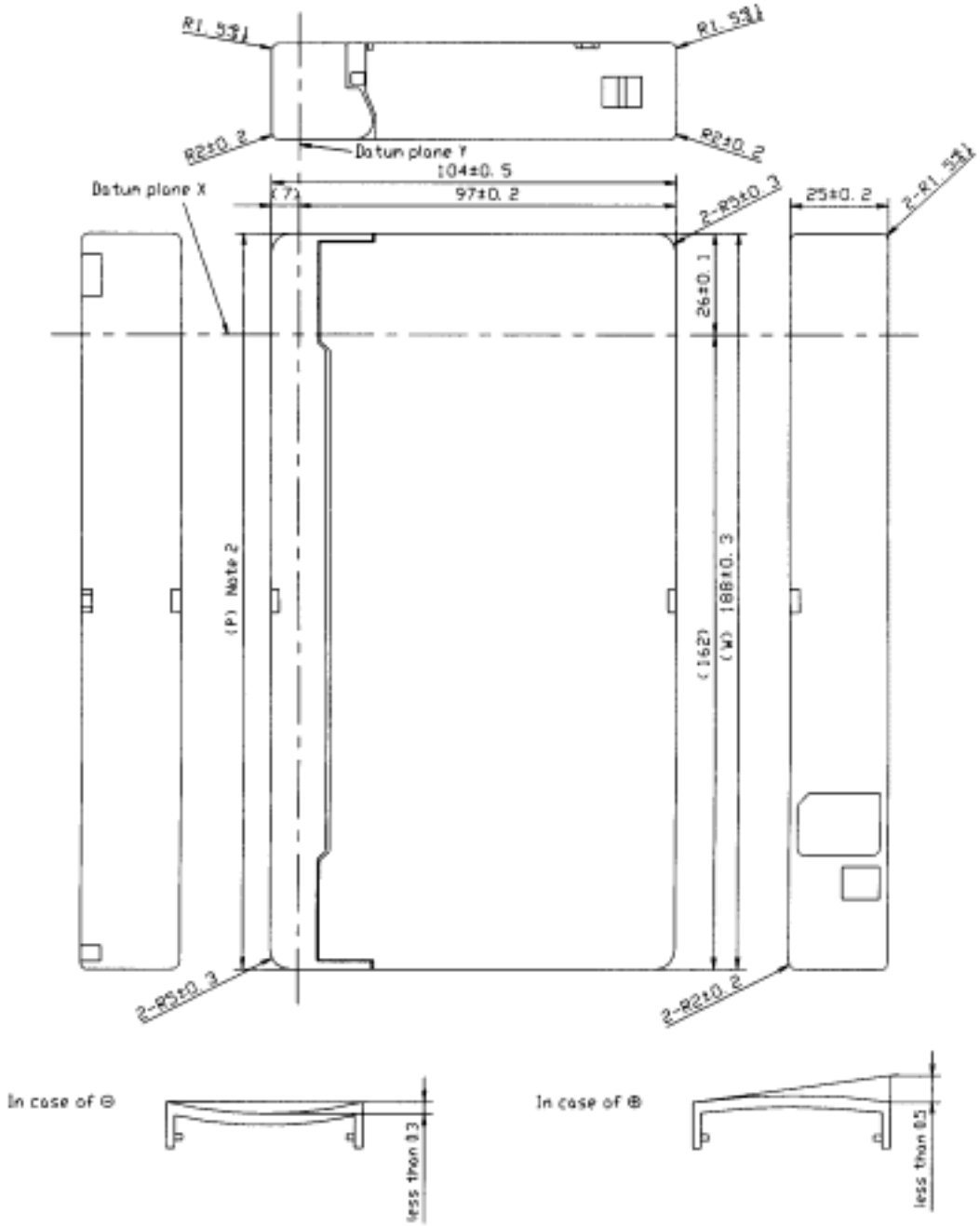
Window and label areas shall be as specified in figures 2 and 3.

4.4 Color

Window and reel upper flange: Transparent

Cassette shell: A color shall be selected so that overall light transmission of the cassette shell including wound tape is less than 2% when the light on the cassette upper surface is measured at the positions of the VTR light sensors. A VHS cassette optical tester or an equivalent measuring instrument shall be used.

Approved
August 1, 1999



Dimensions in millimeters

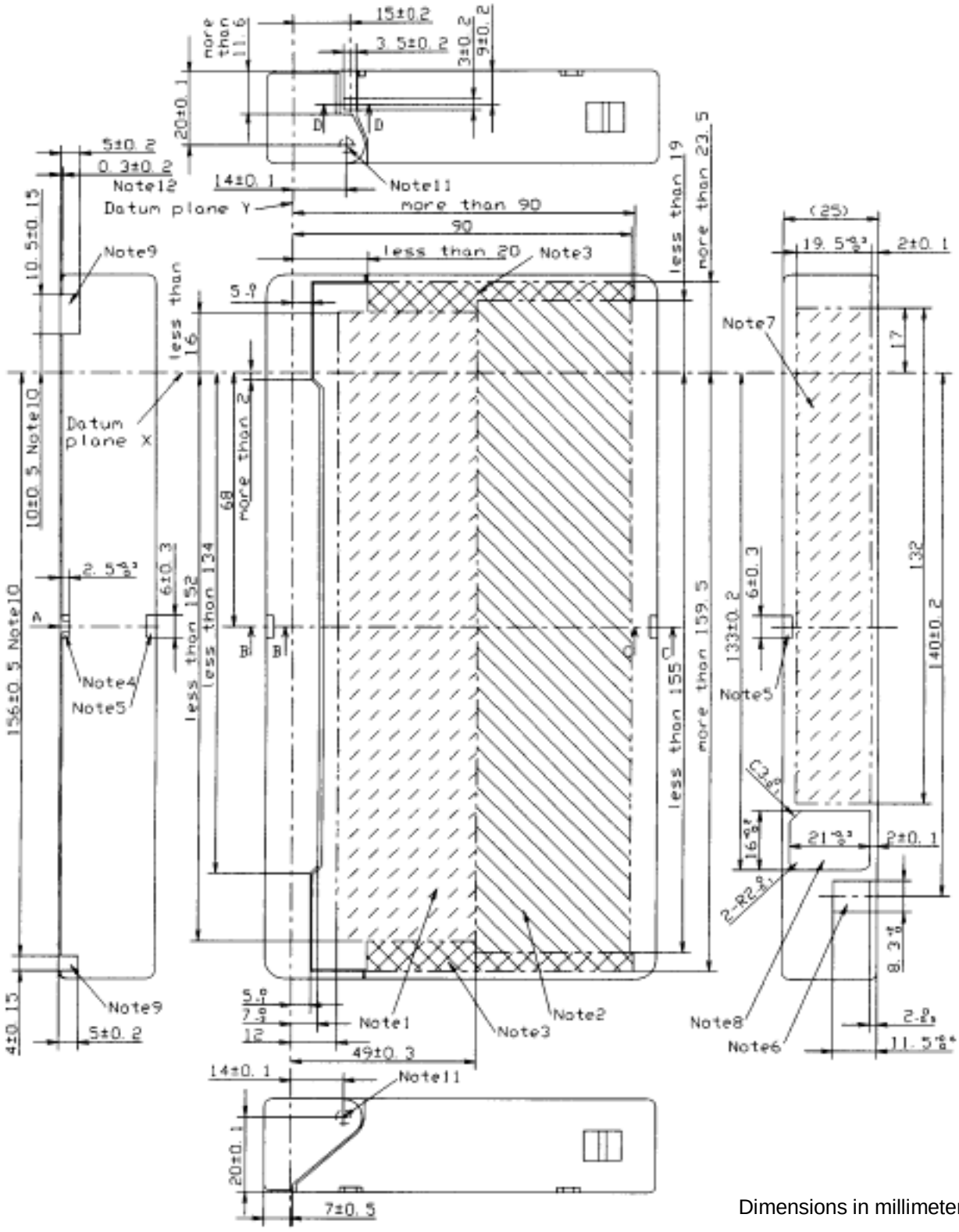
NOTES

1 Cassette warpage: The cassette shall pass through the tunnel gauge with an insertion force of less than 10 N. The tunnel gauge dimensions are a width of 188.6 mm + 0 mm – 0.02 mm , a height of 25.5 mm + 0 mm – 0.02 mm, and a depth of 100 mm + 5 mm – 0 mm.

2 The front cover dimension (P) can be made up to 0.7 mm smaller than the overall width dimension (W).

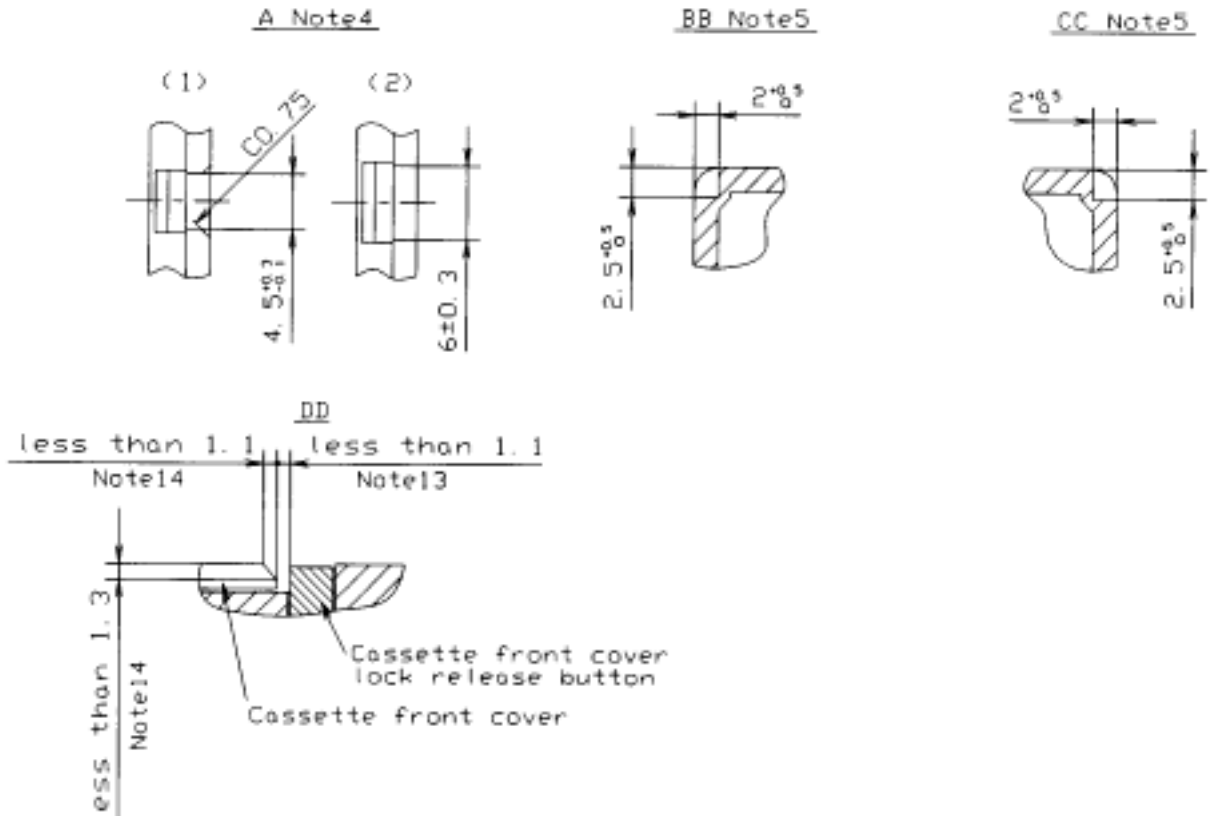
3 Front cover warpage shall be within + 0.5 mm – 0.3 mm. The drawings in the lower portion of the figure show the downward view.

Figure 1 – Cassette overall shape and dimensions



Dimensions in millimeters

Figure 2 – Cassette top and side view dimensions (1)

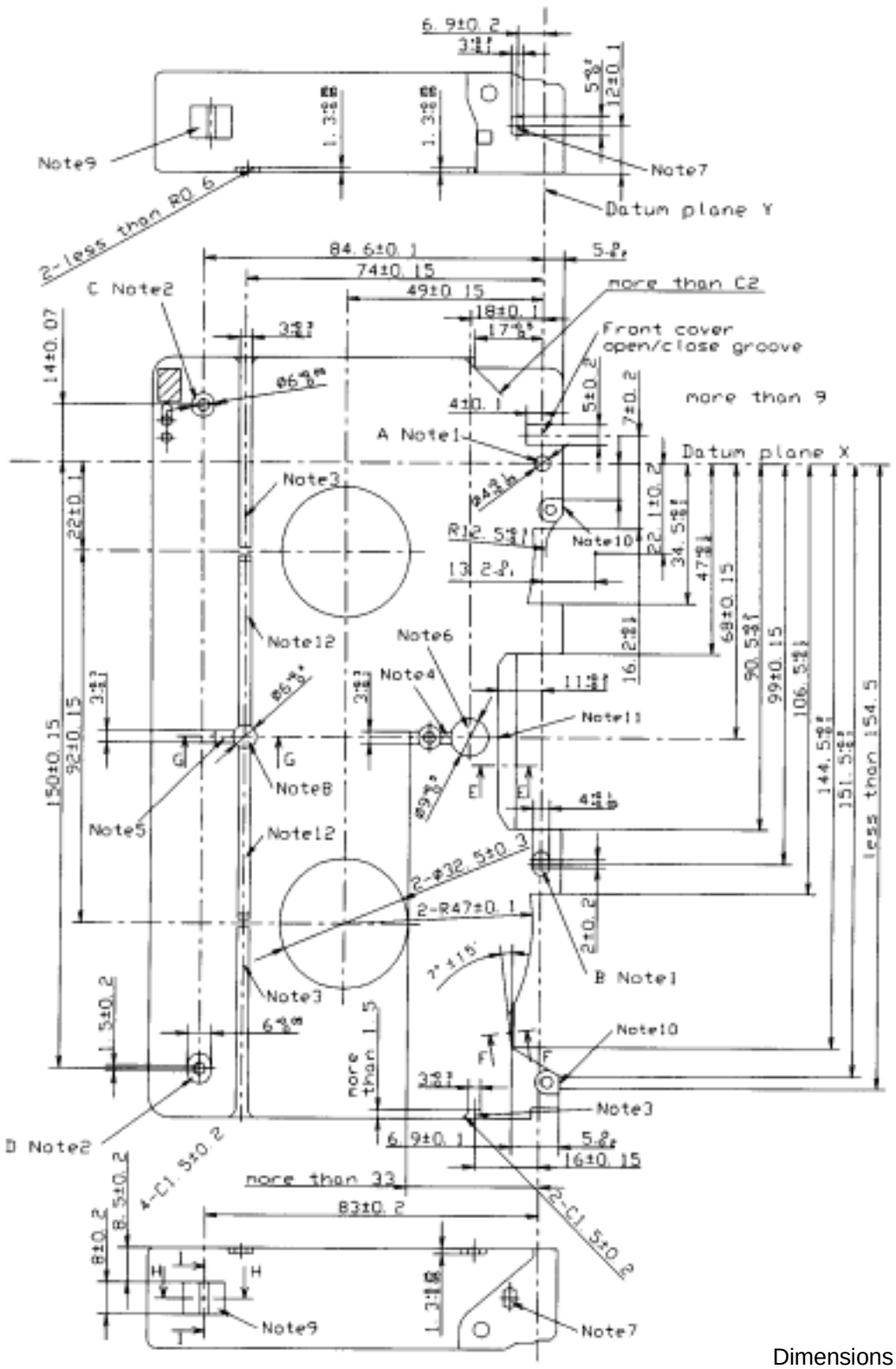


Dimensions in millimeters

NOTES

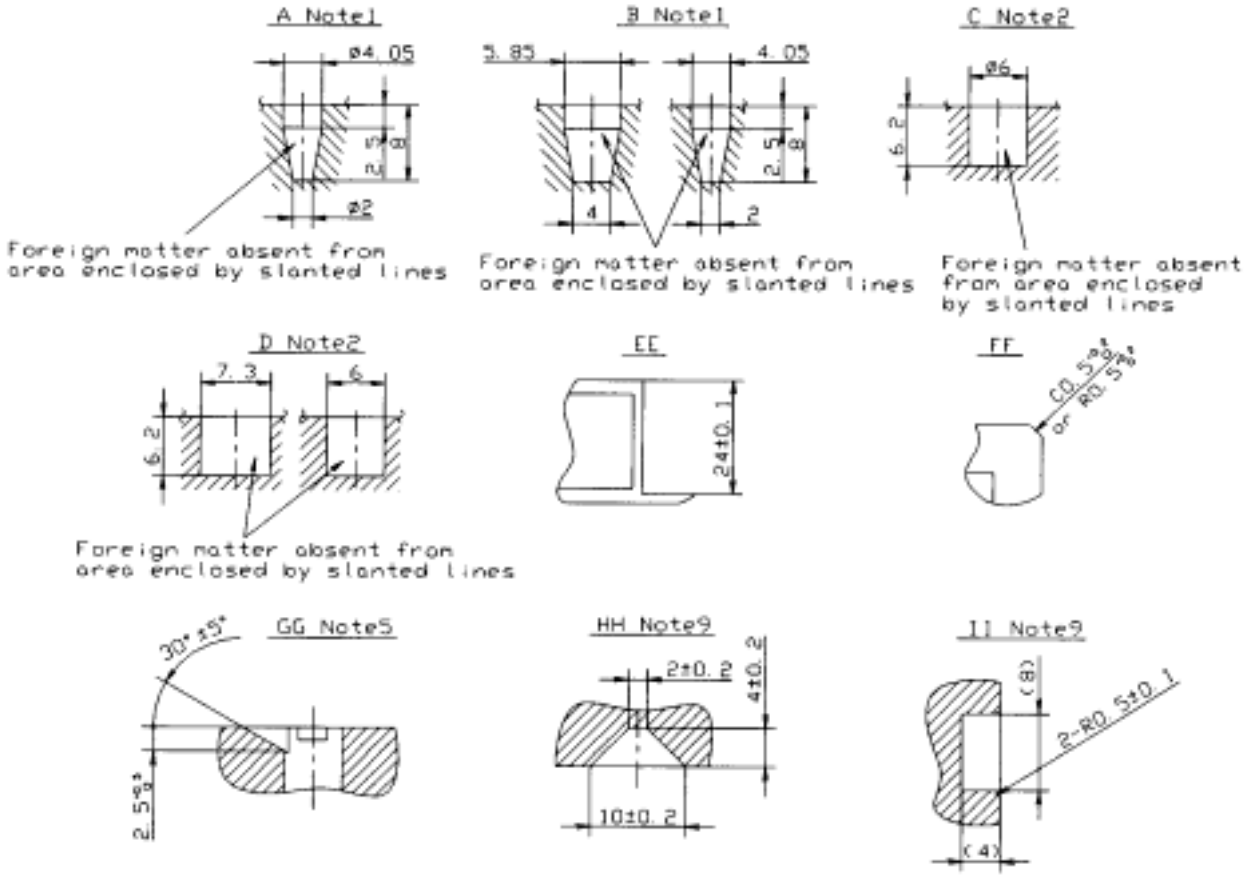
1 Top label area: Provide label attachment portion within this area. The attachment area depth is 0.3 mm ± 0.1 mm and the border of the attachment portion shall be visually indicated.
2 Tape amount display window area: Provide window within this area. The window shall not protrude above the top plane of the cassette.
3 Cassette holding area: The cassette is held by the recorder or player in this area. This area shall be flat.
4 Insertion error prevention groove: This dimension includes mechanical play of the front and rear covers.
5 Insertion error prevention notch.
6 Insertion error prevention hole: Depth greater than 2.9 mm.
7 Rear label area: Depth 0.5 mm + 0.1 mm – 0.2 mm.
8 Index device attachment portion: Depth 1 mm + 0.2 mm – 0 mm, attachment plane step difference shall be less than 0.2 mm.
9 Cassette position control portion.
10 This dimension includes mechanical play of the front and rear covers.
11 Front cover open/close axis center position.
12 Height dimension between cassette bottom cover and front cover bottom edge.
13 Space between front cover lock release button and front cover.
14 Front cover chamfer.

Figure 3 – Cassette top and side view dimensions (2)



Dimensions in millimeters

Figure 4 – Cassette bottom and side view dimensions (1)

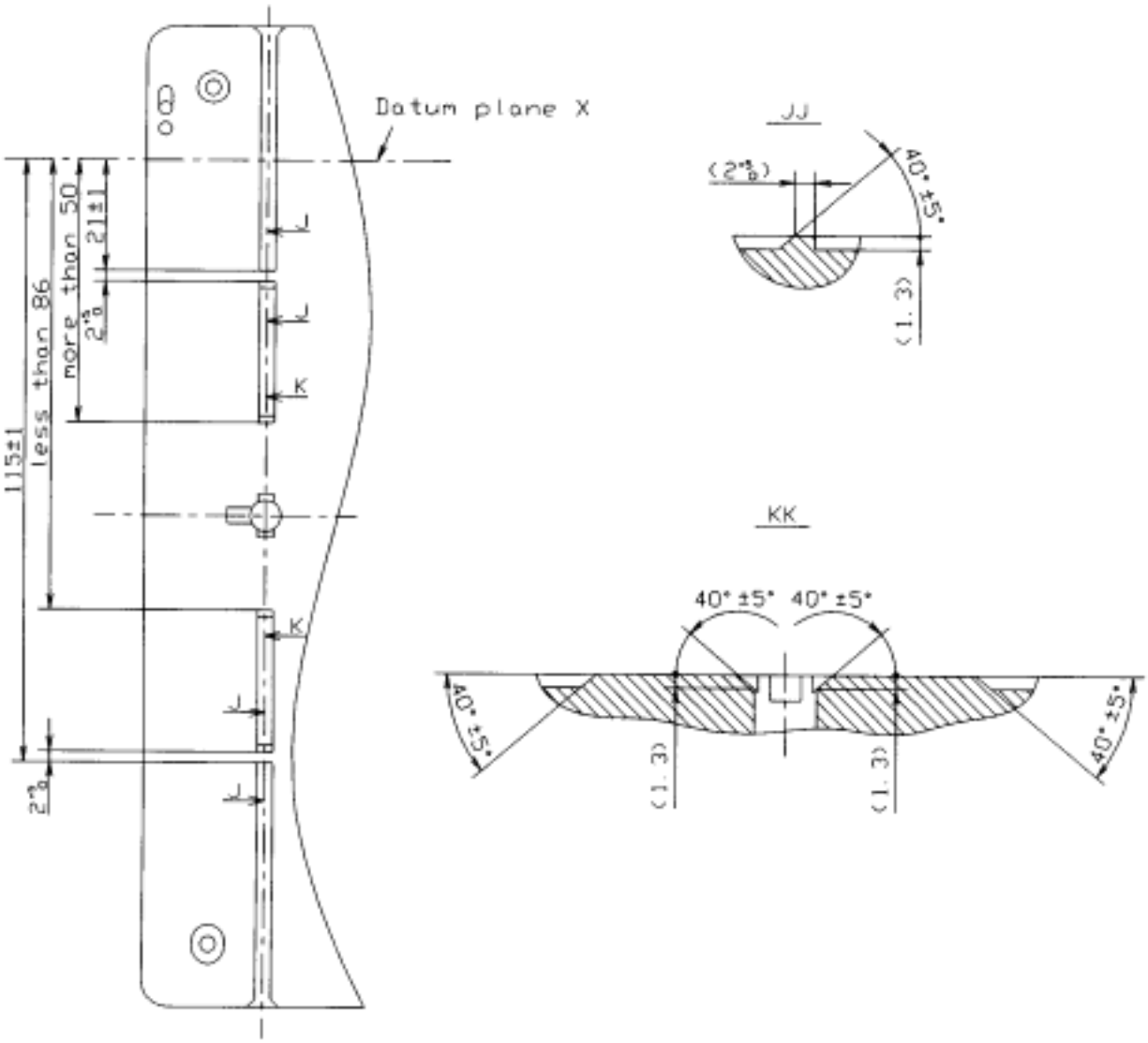


Dimensions in millimeters

NOTES

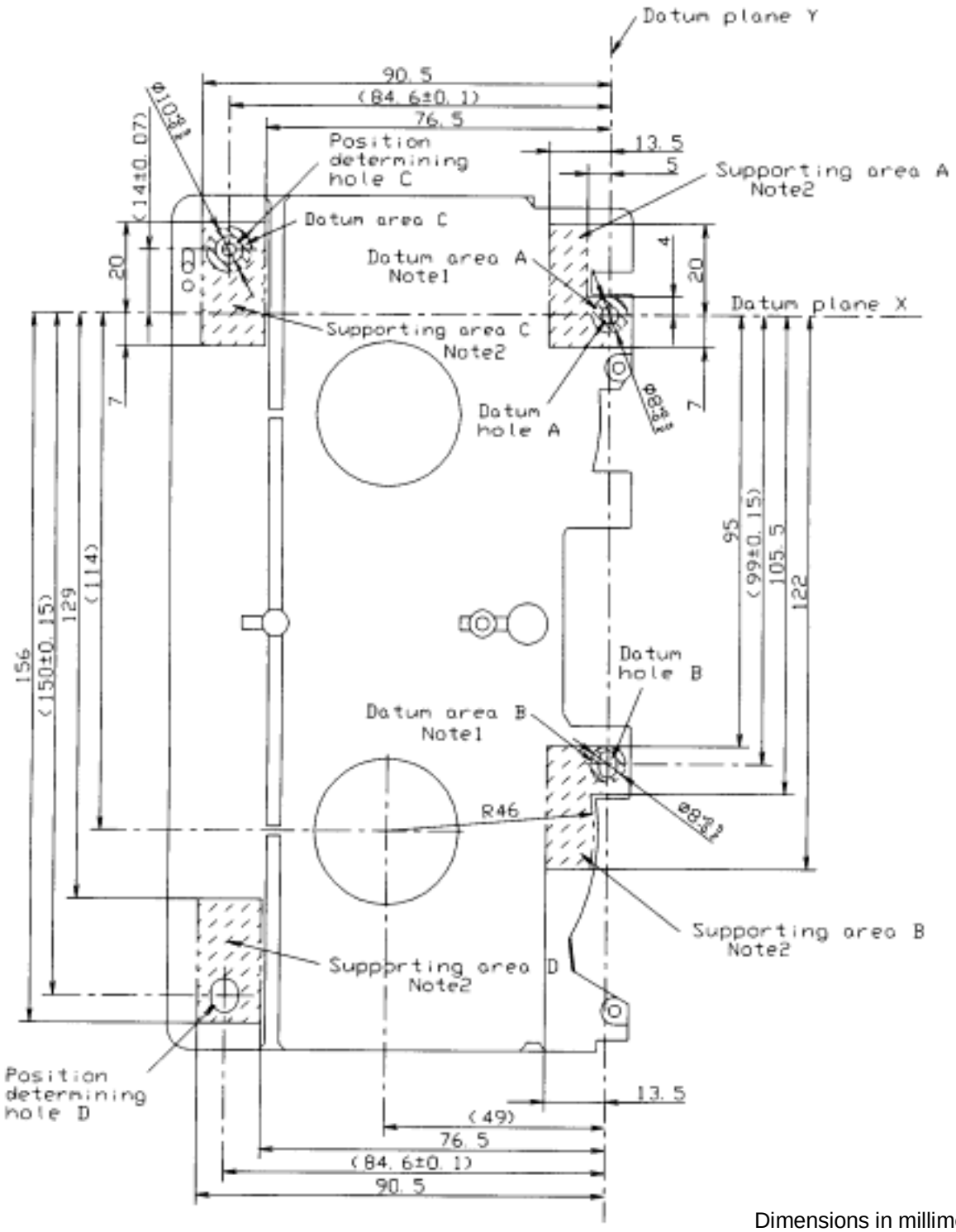
1 A and B respectively indicate the minimum room to accommodate VCR datum pins in datum holes A and B.
2 C and D respectively indicate the minimum room to accommodate VCR position determining pins, in position determining holes C and D. C and D also include screw holes for securing the top and bottom cassette halves.
3 Long direction insertion error prevention groove.
4 Front insertion error escape groove, depth: 2.5 mm + 0.5 mm – 0 mm.
5 Rear insertion error escape groove.
6 Sensor light source hole depth: More than 22 mm.
7 Sensor light path hole: Both left and right sensor hole position and shape are the same.
8 Reel brake release hole.
9 Changer grip: Both left and right changer grip position and shape are the same.
10 Front cover holding section: Raised portions can be provided at two locations in the bottom half.
11 Insertion error prevention wall shall fulfill the following:
Wall strength shall endure a force of 150 N.
Cassette pull out force shall be less than 20 N.
12 Long direction insertion error escape groove: Groove shall be in the range indicated in the figure.

Figure 5 – Cassette bottom and side view dimensions (2)



Dimensions in millimeters

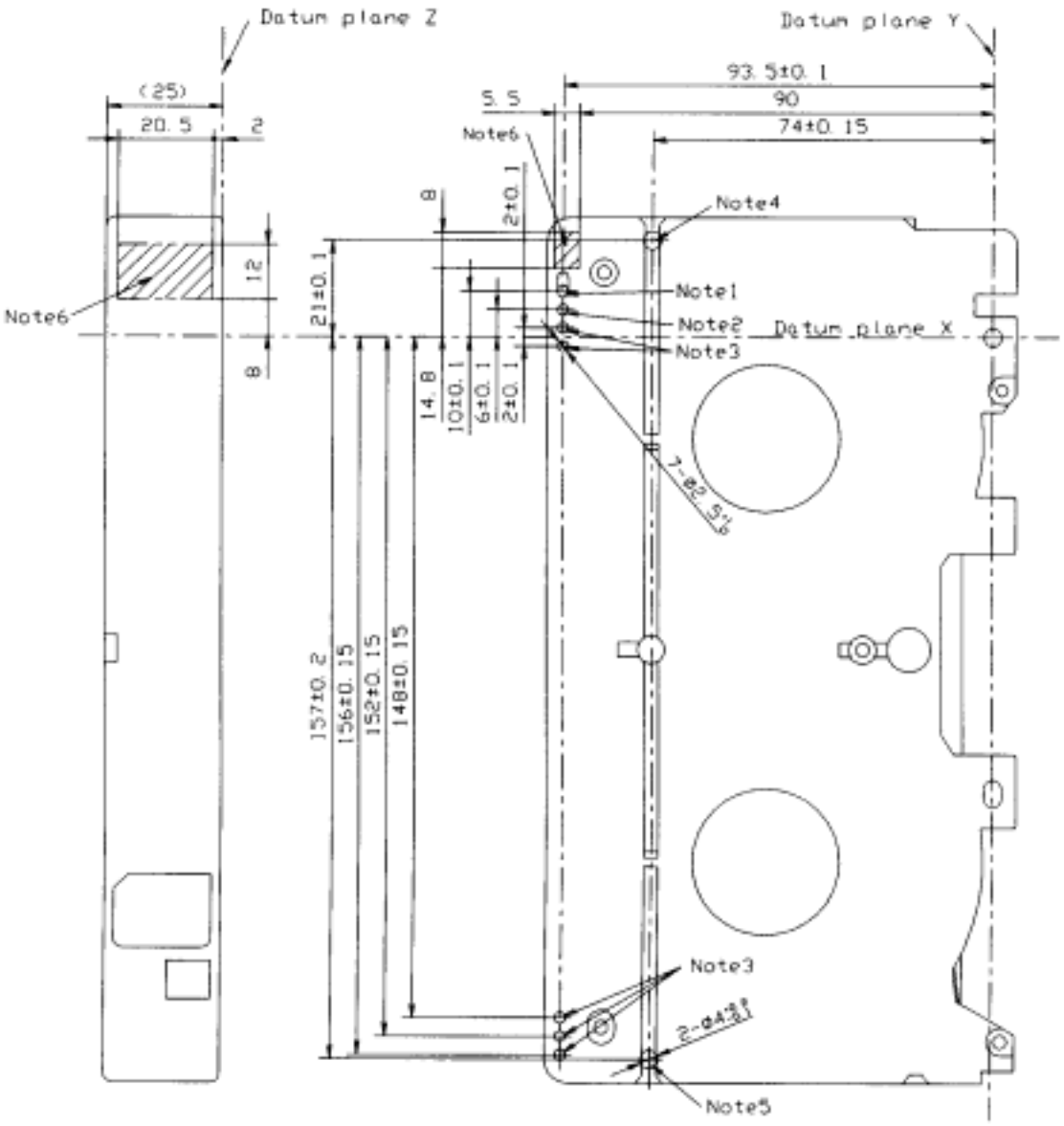
Figure 6 – Cassette bottom and side view dimensions (3)



Dimensions in millimeters

NOTES
1 Datum plane Z is determined by datum areas A, B, and C.
2 Supporting areas A, B, C, and D flatness shall be within 0.2 mm with respect to datum plane Z.

Figure 7 – Cassette datum plane Z and supporting areas

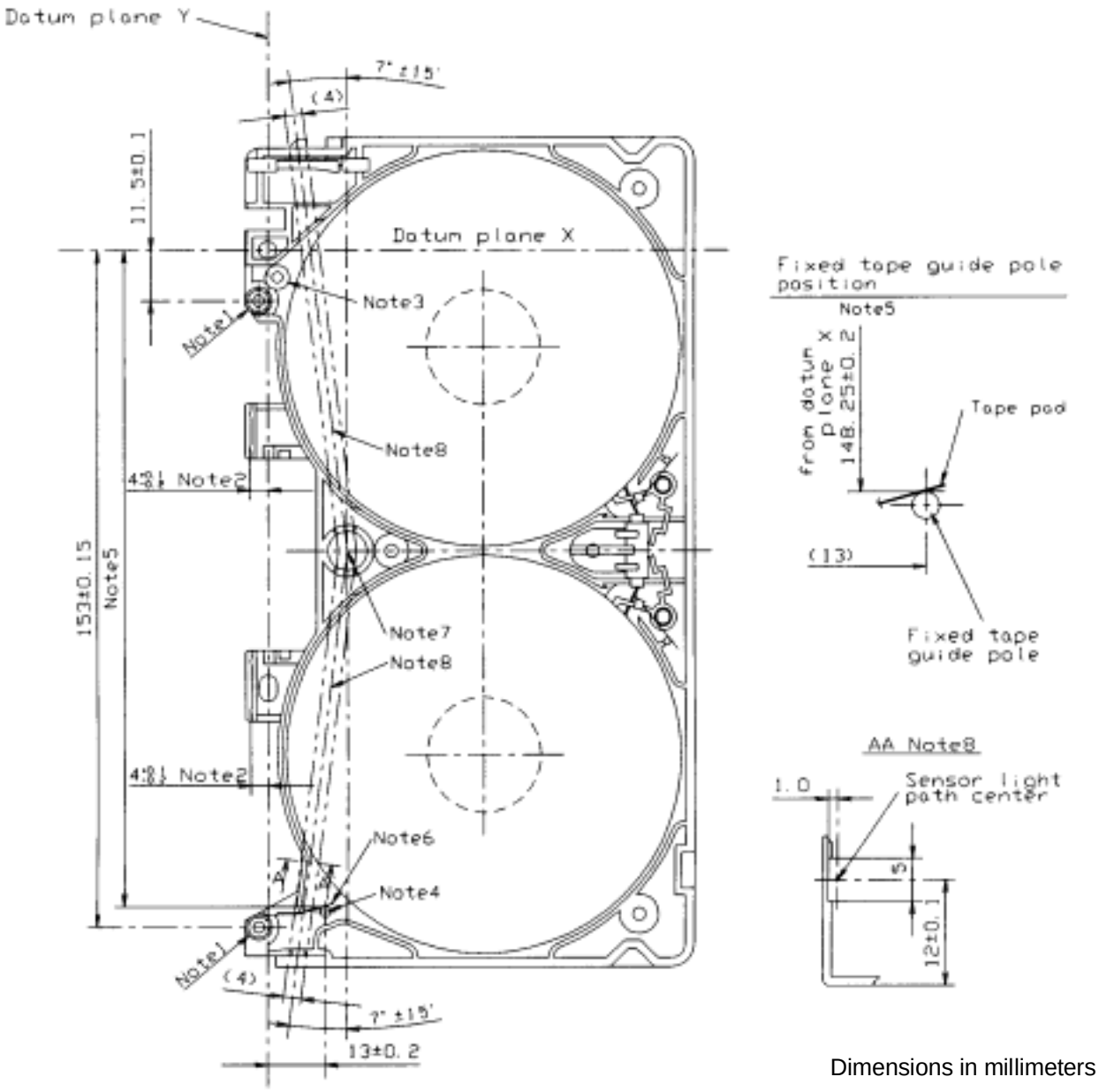


Dimensions in millimeters

NOTES

1 Erase prevention hole: Erase prevention hole can be opened and closed by the erase prevention selector tab. The erase prevention selector tab moving force is 5 N + 3 N – 2 N.
   Recording enabled: When closed, indentation shall be less than 0.2 mm under 1 N pressing force.
   Erase prevention: When open, hole depth shall be more than 3 mm.
2 D-9 cassette detector hole: Depth shall be more than 3 mm.
3 Spare hole A: Location for future expanded functions, currently no hole shall be provided. If providing indentation or lug, indentation shall be less than 0.2 mm and lug endurance force shall be 20 N.
4 Spare hole B: For future cassette adapter detection; currently no hole shall be provided.
5 Spare hole C: Location for future expanded functions; currently no hole or indentation shall be provided.
6 Erase prevention selector area: Provide erase prevention selector tab in this area. This can also be provided on cassette bottom plane or rear plane.

Figure 8 – Detector holes

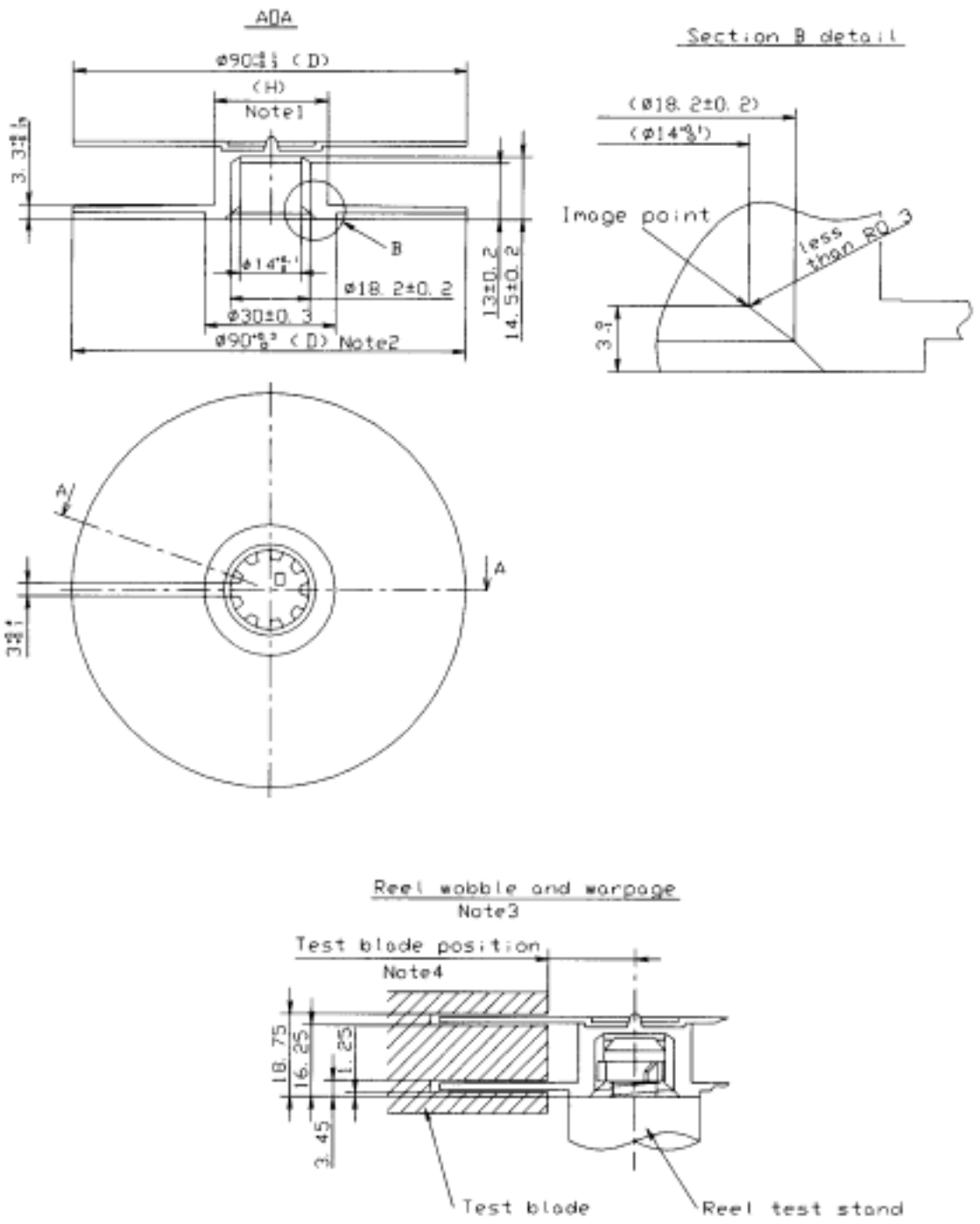


Dimensions in millimeters

NOTES

1 Fixed tape guide: Perpendicularity shall be within 27 minutes with respect to datum plane Z. Diameter and position along the Y axis shall be determined within the range to meet the specification of tape transport position (see figure 12, note 1).
2 Tape guide plane position: When the shape is altered to provide countermeasure to tape adhesion, the leading edge of the shape irregularity shall be specified.
3 Tape guide roller.
4 Fixed tape guide pole.
5 Fixed tape guide pole X washer position.
6 Tape pad.
7 Sensor light source center.
8 Sensor light path center: Light path center height from datum plane Z is 12 mm ± 0.1 mm.

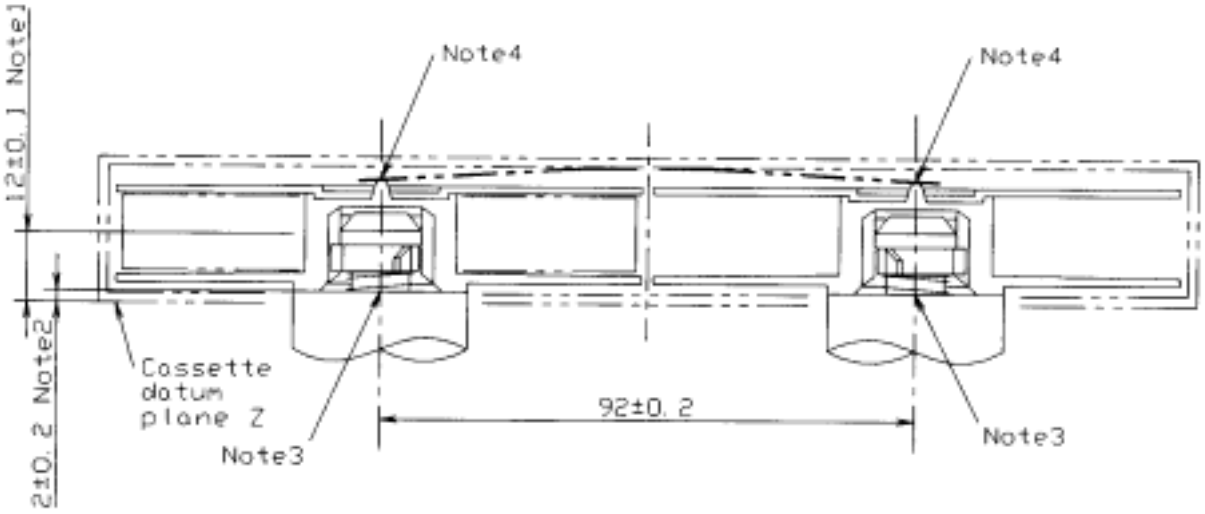
Figure 9 – Cassette internal construction



Dimensions in millimeters

NOTES
1 Hub diameter (H): ϕ 26 mm ± 0.15 mm.
2 Lower flange diameter (D): ϕ 90 mm + 0.3 mm – 0 mm.
3 Reel wobble and warpage: When set on test stand indicated in figure and rotated, test blades shall not contact.
4 Test blade position: 20 mm from reel center.

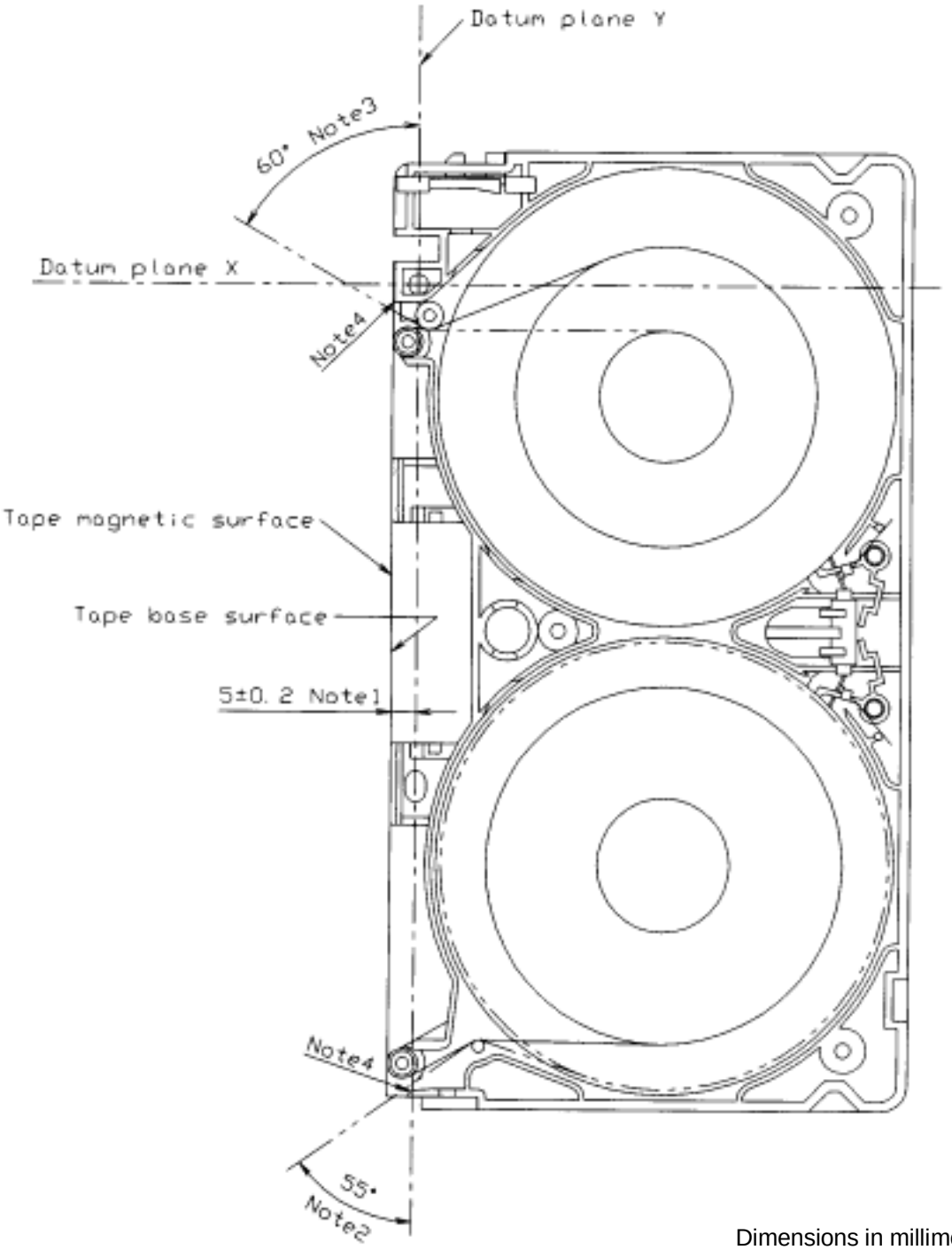
Figure 10 – Reel dimensions



Dimensions in millimeters

NOTES
1 Video tape center height.
2 Recorder reel disk height.
3 Reel standard operating position.
   1) When the reel is rotated in the range 2 mm + 0.8 mm – 0.7 mm from datum plane Z, the reel and cassette case shall not contact.
   2) When the recorder rotates the reel in the range 2 mm ± 0.4 mm from datum plane Z using the above cassette, the reel and cassette shall not contact.
4 The reels shall be pressed down and this pressure shall be 1.75 N + 0.4 N – 0.2 N, as measured at the standard operating position of the reel.

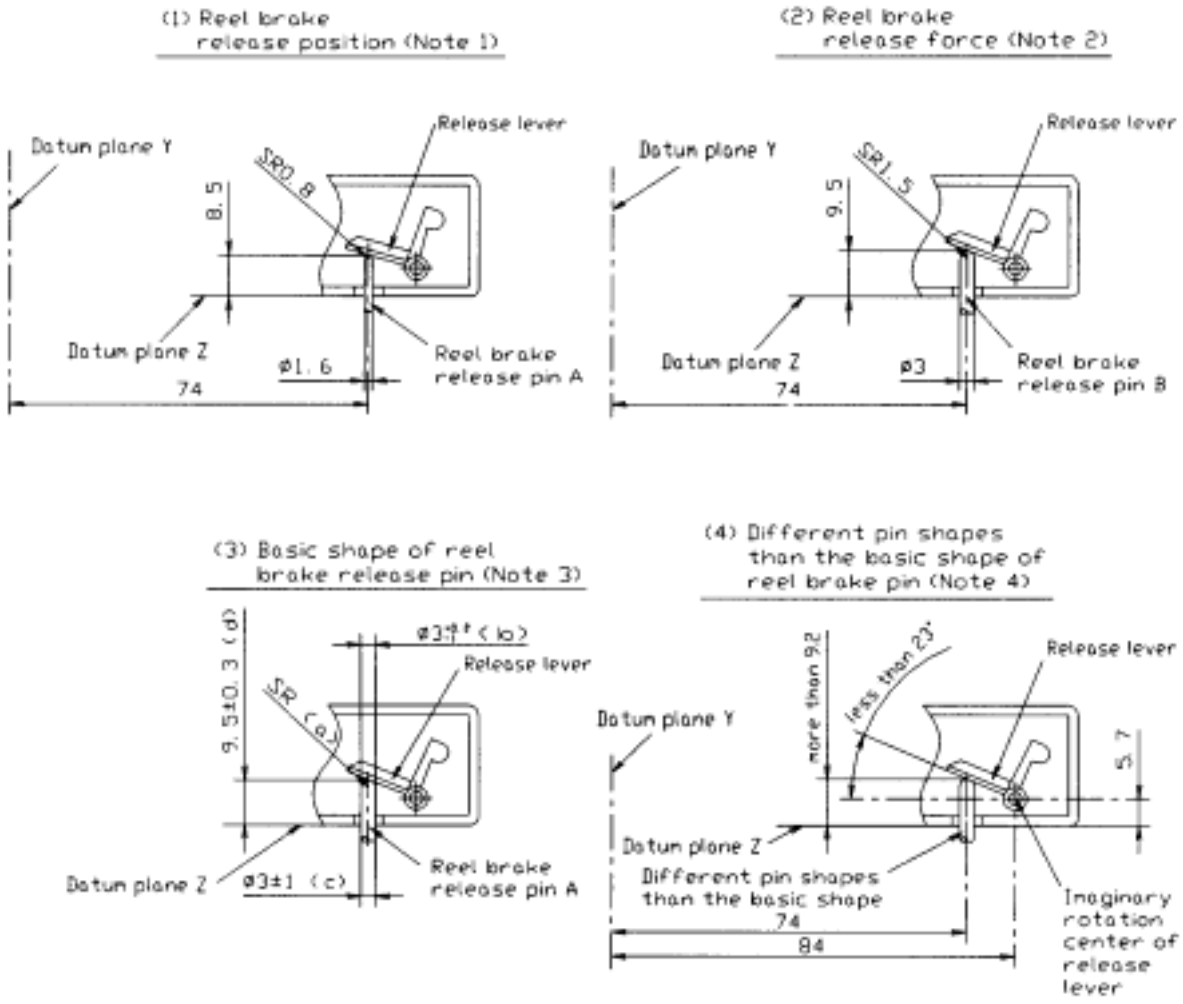
Figure 11 – Reel and reel disk relationship



Dimensions in millimeters

NOTES
1 Tape transport position.
2 Supply reel side minimum tape pull out angle.
3 Take-up reel side minimum tape pull out angle.
4 At the minimum tape pull out angle, the space between this edge and the tape shall be more than 1 mm. Chamfering (C or R) can be used for this edge.

Figure 12 – Tape winding and pull out angle



Dimensions in millimeters

NOTES

1 The reel brake shall be released when reel brake release pin A indicated in the figure is inserted 8.5 mm from datum plane Z.

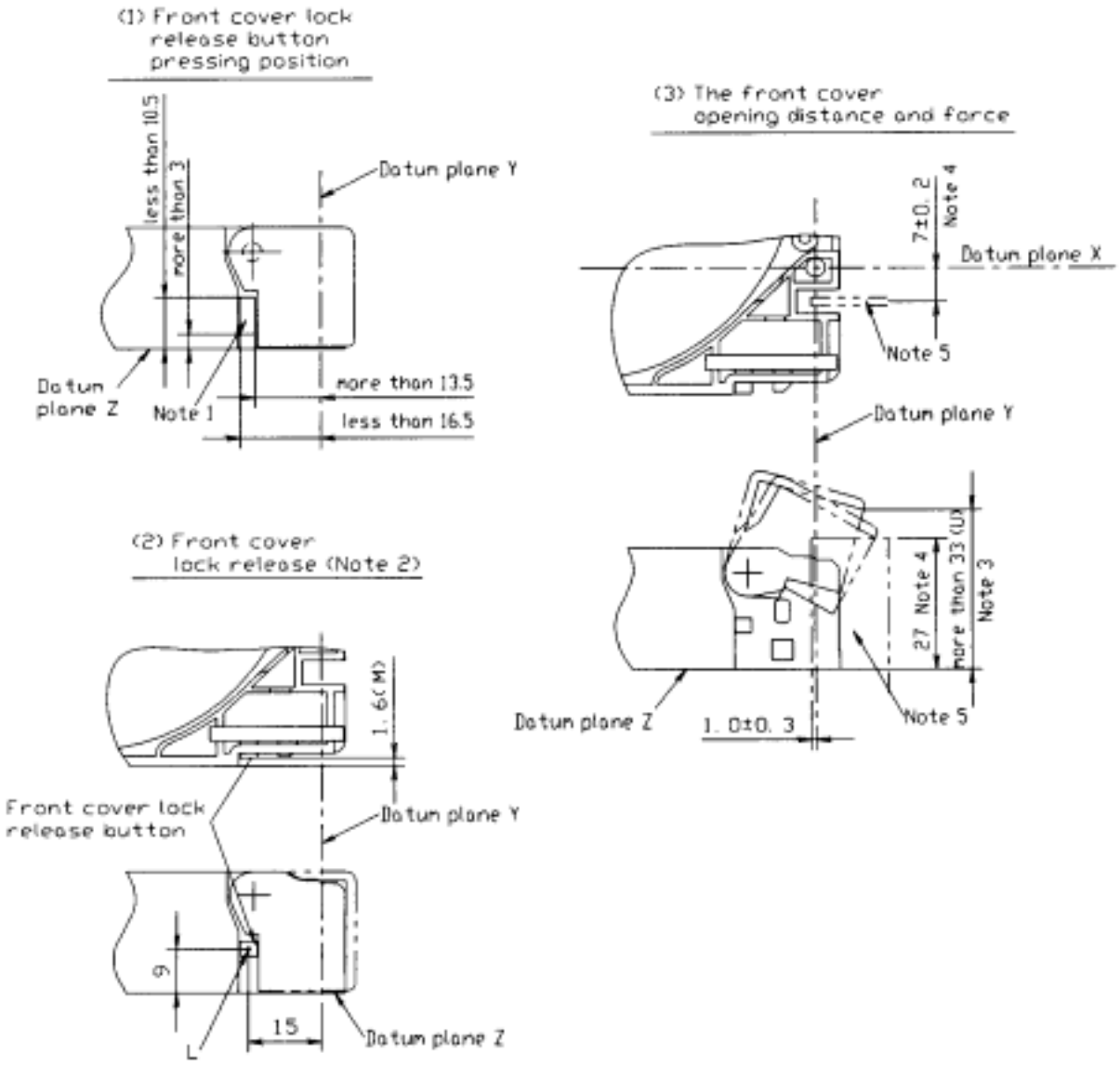
2 The reel brake release force shall be less than 0.7 N when reel brake release pin B indicated in the figure is inserted 9.5 mm from datum plane Z.

3 Basic shape of the recorder reel brake release pin:

a) Tip shape;
b) Tip section pin diameter;
c) Pin diameter at datum plane Z position;
d) Pin insertion from datum plane Z.

4 The release pin shape and insertion distance of a recorder using a reel brake pin with a tip shape differing from the basic shape shall be designed so that the release lever rotation angle centered on the imaginary rotation support point is less than 23°. The insertion distance shall be more than 9.2 mm.

Figure 13 – Reel brake release



Dimensions in millimeters

NOTES

1 Front cover lock release button pressing position.

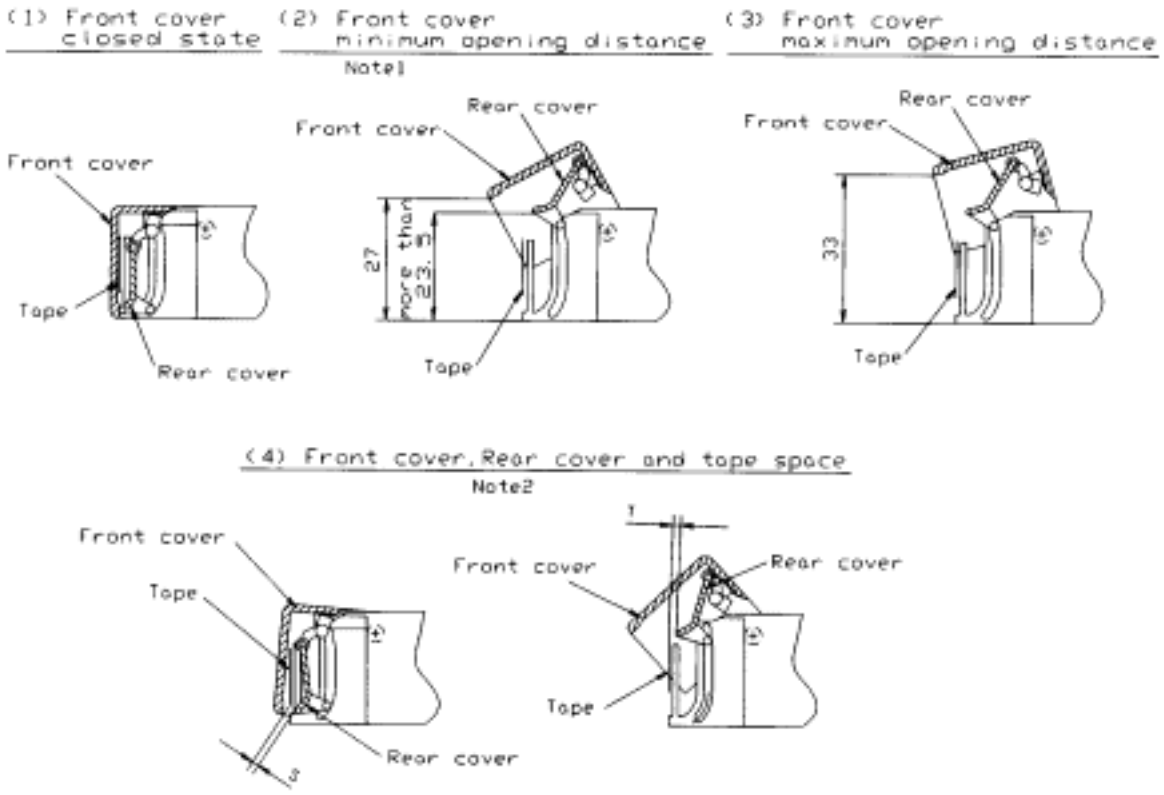
2 The front cover lock shall be released when the front cover lock release button is pressed to the 1.6-mm position (M) from the cassette shell. The release force shall be less than 0.15 N as measured at position L.

3 The front cover opening distance (U) shall be more than 33 mm from datum plane Z.

4 The front cover opening force shall be less than 1 N at the 27-mm opening distance. The opening force measuring position is 7 mm ± 0.2 mm from datum plane X.

5 Front cover opening section: Insertion height from datum plane Z shall be more than 27 mm and less than 33 mm.

Figure 14 – Front cover lock and open/close view



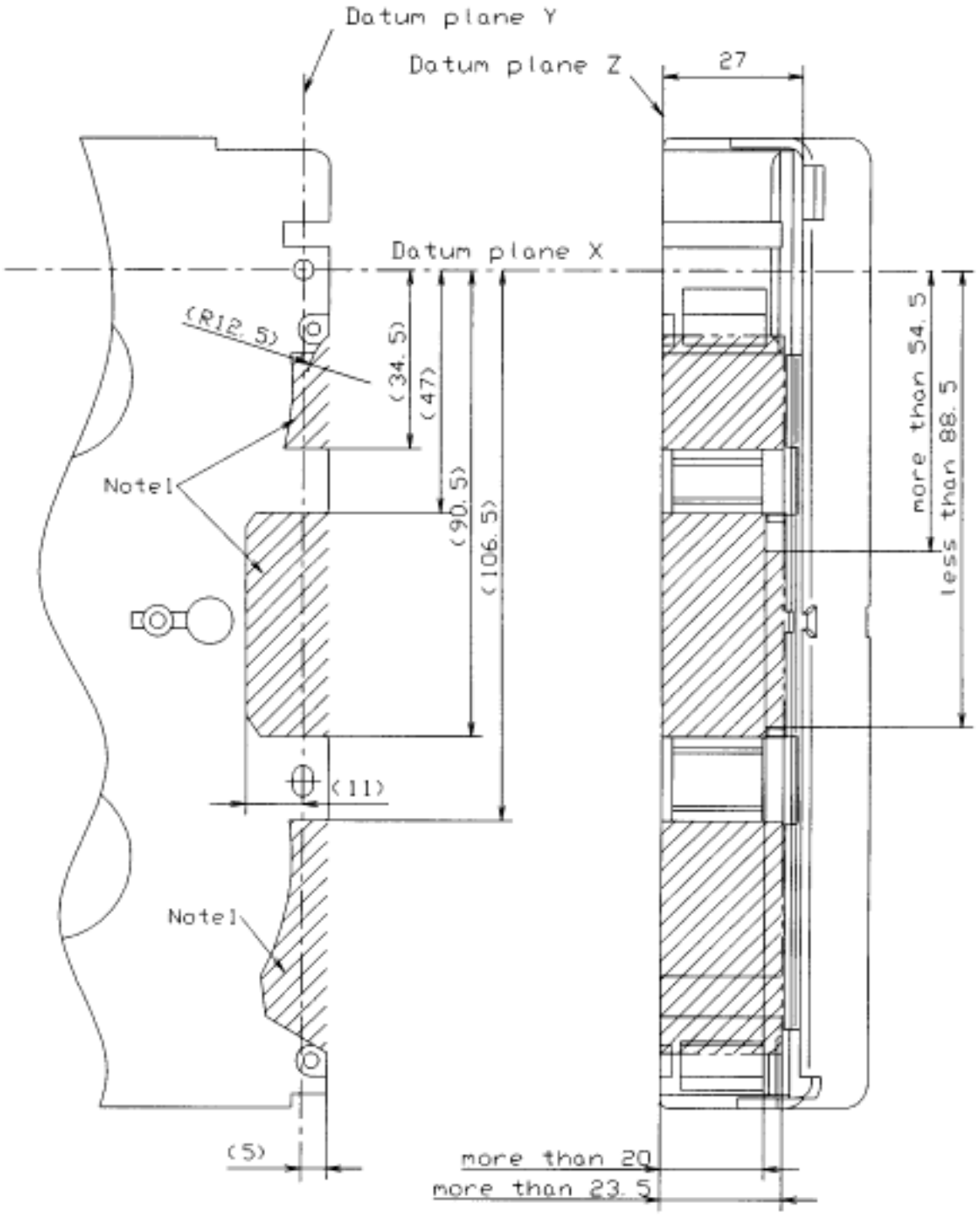
Dimensions in millimeters

NOTES

1 When the front cover opening distance is 27 mm, the rear cover opening distance shall be more than 23.5 mm.

2 Spaces S and T between the rear cover bottom edge and the tape edge shall be more than 1 mm.
S is the space between the rear cover bottom edge and the tape lower edge, which is measured when the tape lower edge is positioned at the same height as the bottom edge of the fixed tape guide.
T is the space between the rear cover bottom edge and the tape upper edge, which is measured when the tape upper edge is positioned at the same height as the top edge of the fixed tape guide.

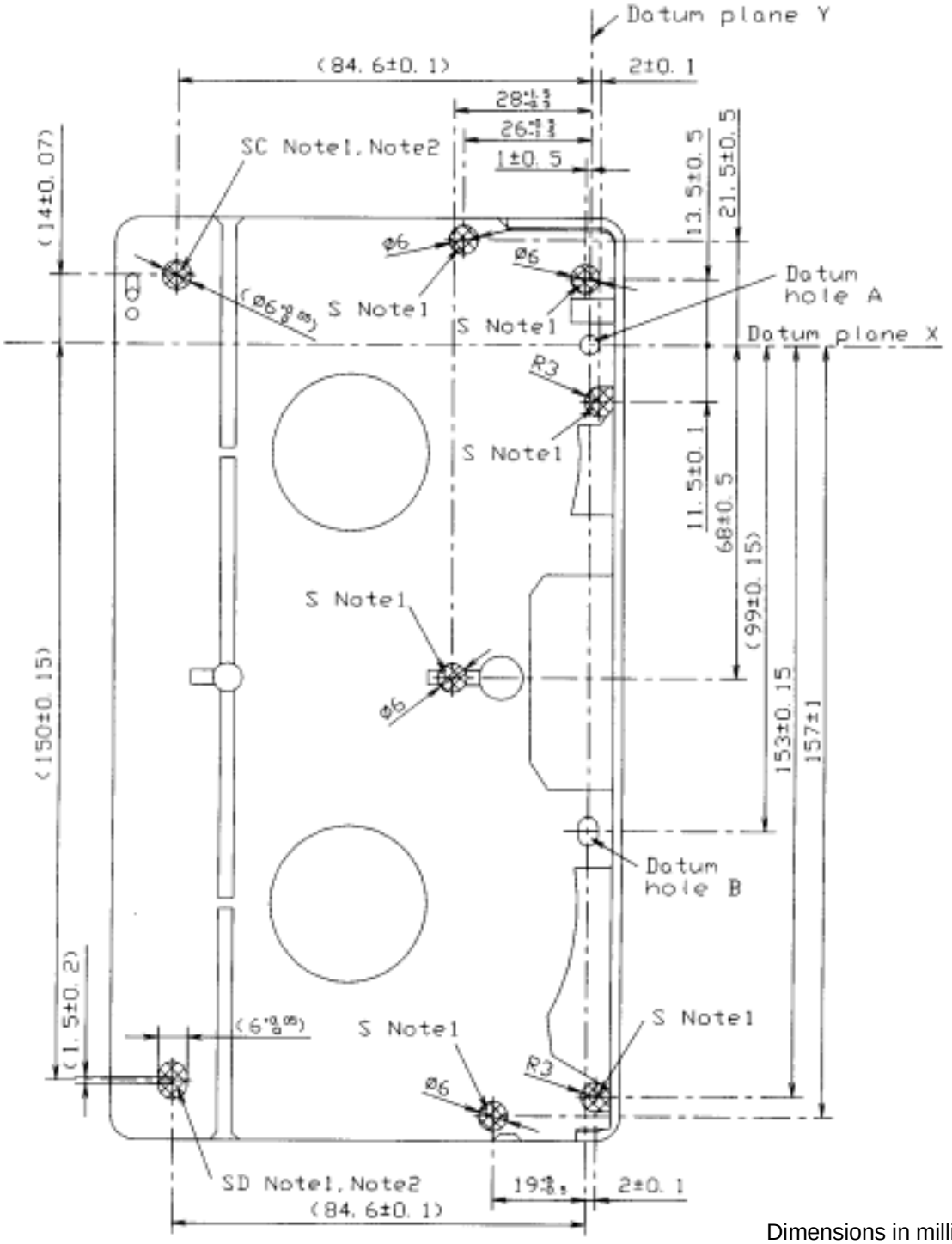
Figure 15 – Rear cover open/close view



Dimensions in millimeters

NOTE – Shaded portions indicate areas for the tape loading mechanism. Dimensions in parentheses are nominal values when the front cover opening distance is 27 mm.

Figure 16 – Area for tape loading mechanism



Dimensions in millimeters

NOTES
1 The eight locations (S, SC, and SD) indicate usable screw positions for securing cassette top and bottom halves. Screws can be located only at these designated positions.
2 Screw holes SC and SD are also used for position determining holes C and D.

Figure 17 – Screw positions for securing cassette top and bottom halves

4.5 Accidental erasure prevention hole

The dimensions and location of the accidental erasure prevention hole are shown in figure 8. The function shall be defined as follows:

Open: Total record lock out (audio, video, cue, time code, and control track)

Closed: Possible to record

4.6 Video tape

4.6.1 Length

Tape length and record time are shown in table 1.

Table 1 – Tape length and record time

Record time (min)	Length (m)
124	437^{+3}_{-0}
104	370^{+3}_{-0}
64	230^{+3}_{-0}
34	125^{+3}_{-0}

4.6.2 Width

The width of the video tape shall be 12.65 mm ± 0.01 mm.

4.6.3 Width fluctuation

The width fluctuation of the video tape shall be less than 6 μm.

4.6.4 Edge straightness

Maximum deviation of the reference edge straightness shall be 6 μm peak to peak. Edge straightness fluctuation is measured at the edge of a moving tape positioned by three guides all having contact on the same edge of the tape. The distance between guides is 85 mm from the first to second guide, and 85 mm from the second to third guide. Edge measurements are averaged over a 10-mm length of tape. Measurements are made at a point 5 mm in the direction toward the first guide from the midpoint between the first and second guides.

4.6.5 Thickness

The tape thickness shall be 14.4 μm ± 0.5 μm or 12.4 μm ± 0.4 μm.

4.6.6 Strength

Both conditions A and B shall be fulfilled:

(A) Dynamic collapse strength (Sd) shall be greater than 0.6 N.

(B) Young's modulus (E) shall be greater than 10.3×10^3 N/mm^2

E = El + Et

El: Longitudinal direction Young's modulus(N/mm^2)

Et: Transverse direction Young's modulus(N/mm^2)

Sd is the force in the tape transverse direction that can cause tape edge buckling when the tape is pressed against the flange of the VTR guide roller. Sd shall be measured with a measuring instrument that simulates such tape edge buckling and measures the force in the transverse direction.

4.7 Leader/trailer tape

4.7.1 The light path shall be as specified in figure 9.

4.7.2 The cassette shall include leader and trailer tape. When attached to the hub, the length between the splice point and the clamping point on the reel hub shall be 170 mm ± 20 mm.

4.7.3 The leader/trailer tape material shall be polyester or equivalent having transmission of at least 50 %. The light transmission shall be measured with a measuring instrument based on the following combination of devices:

– Light source: 2000 K halogen lamp
– Light sensor: Photo diode having maximum sensitivity at 940 nm

A tape optical tester that conforms to the above condition shall be used to measure the light transmission of the leader/trailer tape.

4.7.4 The width of the leader/trailer tape shall be 12.65 mm ± 0.03 mm.

4.7.5 The thickness of the leader/trailer tape shall be 40 μm + 5 μm – 25 μm. The splicing tape used to attach the leader/trailer tape shall be applied to the back side of the tape.

4.7.6 The length of the splicing tape shall be 12 mm to 19 mm.

4.7.7 The splicing gap shall be 0 mm to 70 μm.

4.7.8 When attached to the hub, the leader/trailer tape shall not separate when subjected to a force of 30 N or less.

4.8 Reels

4.8.1 The dimensions of the reels and the relationship between the reels and the reel disks shall be as specified in figures 10 and 11.

4.8.2 The reels shall be locked automatically when the cassette is removed from the recorder/player.

4.8.3 When a cassette is inserted into the recorder/player, the reels shall be unlocked automatically as specified in figure 13. The force needed to release the reel lock shall be 0.7 N or less when the reel brake release pin is inserted 9.5 mm from datum plane Z.

4.8.4 The reels shall be held in position by a reel spring with a force of 1.75 N + 0.4 N – 0.2 N as specified in figure 11.

4.9 Lid

4.9.1 The lid shall be unlocked and opened by the recorder/player when the cassette is inserted. The force needed to unlock the lid shall be less than 0.15 N as specified in figure 14.

4.9.2 The front cover opening force shall be less than 1 N at the 27-mm opening distance as specified in figure 14.

4.9.3 The front cover shall be lifted by the recorder/player to the position shown in figure 14.

4.9.4 The rear cover shall be lifted by the recorder/player to the position shown in figure 15.

4.9.5 The minimum space within the cassette for the VTR loading mechanism shall be as shown in figure 16. The shaded areas of figure 16 are intended to indicate the areas available for loading (threading) the tape. Note that the dimensions defining this space are not cassette dimensions.