
International Standard



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Information processing — Self-loading cartridges for 12,7 mm (0.5 in) wide magnetic tape

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Foreword

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Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 6098 was prepared by Technical Committee ISO/TC 97, *Information processing systems*.

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Information processing — Self-loading cartridges for 12,7 mm (0.5 in) wide magnetic tape

1 Scope and field of application

This International Standard specifies mechanical and functional interchangeability requirements for self-loading cartridges, to be used with reels of 12,7 mm (0.5 in) wide magnetic tape specified in ISO 1864.

Minimum dimensional and functional requirements of the cartridge are given, in order to ensure interchangeability of cartridges between tape drives designed for self-loading operation. Some dimensions and features, other than those strictly required for interchangeability, are also given but have to be considered as recommended or optional.

NOTE — The numeric values in the SI and Imperial measurement systems in this International Standard may have been rounded and, therefore, are consistent with, but not exactly equal to, each other. Either system may be used but the two should be neither intermixed nor reconverted. The original design was completed using the Imperial measurement system.

2 Reference

ISO 1864, *Information processing — Unrecorded 12,7 mm (0.5 in) wide magnetic tape for information interchange — 32 ftpmm (800 ftpi) NRZ1, 126 ftpmm (3 200 ftpi) phase encoded and 356 ftpmm (9 042 ftpi), NRZ1.*

3 Environment

3.1 Testing environment

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

temperature : 23 ± 2 °C (73 ± 5 °F)

relative humidity : 40 to 60 %

conditioning time before testing : 24 h

3.2 Operating environment

temperature : 16 to 32 °C (60 to 90 °F)

relative humidity : 20 to 80 %

wet bulb temperature : not greater than 25 °C (78 °F)

3.3 Storage environment

3.3.1 Cartridges loaded with unrecorded tape

temperature : 5 to 48 °C (40 to 120 °F)

relative humidity : 20 to 80 %

wet bulb temperature : not greater than 26 °C (80 °F)

3.3.2 Cartridges loaded with recorded tape

temperature : 5 to 32 °C (40 to 90 °F)

relative humidity : 20 to 80 %

wet bulb temperature : not greater than 25 °C (78 °F)

3.3.3 Cartridges without tape

Temperature and relative humidity of storage environment for cartridges without tape should be according to the recommendations of the manufacturers of the cartridge.

4 Description and operation

4.1 General

The self-loading cartridge is a collar which can be attached to the rim of a reel of magnetic tape and protect the tape against dust and contamination during storage and handling.

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The collar is provided with an opening mechanism which permits it to be opened by mechanical means, and is furthermore provided with a system of air distribution channels which will allow the tape to be driven out of the opening pneumatically for the purpose of automatic loading on a suitably designed tape transport.

4.1.1 Material

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

4.2 Types

There are two types of self-loading cartridges, type A and type B, having no functional differences.

However, they differ in some dimensional characteristics, in particular in their widths.

A tape drive should have provisions for accepting both types, but because of the dimensional differences existing between the two types, there might be tape drives which accept only type A or only type B.

4.3 Use of latch

The self-loading cartridge shall have a latch device for opening and closing. When opening the latch, the collar shall expand to such extent as to provide manual insertion and extraction of the reel. When the latch is closed, the inside surface of the collar moves radially and shall come into firm contact with the rims of the flanges of the reel.

4.4 Operation

4.4.1 Mounting

The cartridge, in the closed position, with reel and tape, shall be mounted on the tape drive.

Proper positioning of the cartridge shall be determined, in the direction of the axis of the reel, by the interface between the reel and the drive's hub, and, in the angular direction, by a tangential restraint key and a corresponding restraint of the drive.

4.4.2 Opening

By a circular movement of a pin from the tape drive engaging a slotted hole in the latch, the cartridge shall reach its open position.

In the open position, the cartridge shall be expanded so that the reel shall be free to rotate inside the collar, without touching it.

4.4.3 Restraint keys

In the open position, the cartridge shall be held in place by tangential and axial restraint keys and corresponding restraints of the drive.

4.4.4 Air intake and air exit

On the outside surface of the collar, there shall be an air intake area.

In the open position, this area shall come into contact with an air supply nozzle of the tape drive.

4.4.5 Tape exit

The collar shall be provided with a tape exit opening. In the closed position of the cartridge, this opening shall be shut. In the open position of the cartridge, this opening shall be open.

4.4.6 Tape loading

When the cartridge is in the open position, air applied to the air intake area shall be capable of detaching the free end of the tape from the tape pack, and, in combination with the rotating action of the reel, of leading the tape end through the tape exit.

4.4.7 Closing

After rewinding the tape completely back on to the reel, the cartridge is brought back from the open position to the closed position by a circular movement of the pin engaging the slotted hole in the latch.

The circular movement is exactly the reverse of the movement necessary for opening.

4.5 Figures

For ease of understanding the dimensional requirements, a typical construction is shown in the figures.

Figure 1 — Closed position (rear view) — shows the rear side of the cartridge in the closed position with partial view A.

Figure 2 — Open position (front view) — shows the front side of the cartridge in the open position.

Figure 3 — Closed position (rear view) — is an enlarged view of figure 1 with partial views A to G and sections K-K for types A and B.

Figure 4 — Open position (front view) — is an enlarged view of figure 2 with partial view A.

Figure 5 — Hook — is a view of the cartridge hook.

Figure 6 — Reference orifice — shows a reference orifice in cross-section.

5 Dimensions

The dimensions given for the cartridge in the closed position are referred to two perpendicular axes X and Y. The relative angular position of the cartridge with regard to these axes is defined by an angle

$$A_0 = 24^\circ \text{ nominal}$$

This being the angle between the vertical axis Y and the symmetry axis of the tangential restraint key. Unless otherwise stated, all dimensions apply to types A and B.

5.1 Outer radius (see figure 3 and sections K-K)

The outer radius shall be

$$R_1 = 137,2 \pm 0,4 \text{ mm (5.400} \pm 0.015 \text{ in)}$$

5.2 Width (see figure 3 and sections K-K)

The external width shall be

$$\text{for type A : } W_1 = 28,58 \pm 0,13 \text{ mm (1.125} \pm 0.005 \text{ in)}$$

$$\text{for type B : } W_1 = 22,73 \pm 0,13 \text{ mm (0.895} \pm 0.005 \text{ in)}$$

NOTE — In the case when stacking rings are provided, the dimensions in 7.2 are to be taken into account.

5.3 Radius of the front flange (see figure 3 and sections K-K)

The radius of the front flange shall be (see also 7.2.)

$$\text{for type A : } R_2 = 130,0 \pm 0,4 \text{ mm (5.117} \pm 0.015 \text{ in)}$$

$$\text{for type B : } R_2 = 130,0 \pm 1,0 \text{ mm (5.117} \pm 0.038 \text{ in)}$$

5.4 Radius of the rear flange (see figure 3 and sections K-K)

The radius of the rear flange shall be

$$\text{for type A : } R_3 = 125,73 \pm 0,25 \text{ mm (4.950} \pm 0.010 \text{ in)}$$

$$\text{for type B : } R_3 = 130,0 \pm 1,0 \text{ mm (5.117} \pm 0.038 \text{ in)}$$

5.5 Tangential restraint key (see figure 3 and views F and G)

5.5.1 Height

The radial height of this key shall be

$$H_1 = 6,35 \pm 0,25 \text{ mm (0.250} \pm 0.010 \text{ in)}$$

5.5.2 Width

The width of this key at its base shall be

$$W_2 = 12,50 \pm 0,13 \text{ mm (0.492} \pm 0.005 \text{ in)}$$

This key may be tapered up to 5° on both sides.

5.5.3 Length

The length of this key at its base shall be

$$\text{for type A : } L_1 = 28,58 \pm 0,13 \text{ mm (1.125} \pm 0.005 \text{ in)}$$

$$\text{for type B : } L_1 = 22,73 \pm 0,13 \text{ mm (0.895} \pm 0.005 \text{ in)}$$

5.5.4 Taper

This key shall be tapered at both ends for type A and only at the rear side end for type B.

Type A (see figure 3 and view F)

$$L_2 = 3,17 \pm 0,13 \text{ mm (0.125} \pm 0.005 \text{ in)}$$

$$L_3 = 6,35 \pm 0,25 \text{ mm (0.250} \pm 0.010 \text{ in)}$$

$$L_4 = 6,35 \pm 0,13 \text{ mm (0.250} \pm 0.005 \text{ in)}$$

Type B (see figure 3 and view G)

$$A_1 = 10^\circ \pm 30'$$

$$L_3 = 6,35 \pm 0,25 \text{ mm (0.250} \pm 0.010 \text{ in)}$$

5.5.5 Position (see note under clause 5)

The position of this key shall be

$$A_0 = 24^\circ \text{ nominal}$$

5.6 Axial restraint key (see figure 3 and views F and G)

This key is mandatory for type A and optional for type B.

5.6.1 Height

The radial height of this key shall be

$$H_1 = 6,35 \pm 0,25 \text{ mm (0.250} \pm 0.010 \text{ in)}$$

5.6.2 Width

The width of this key at its base shall be

$$W_2 = 12,50 \pm 0,13 \text{ mm (0.492} \pm 0.005 \text{ in)}$$

This key may be tapered up to 5° on both sides.

5.6.3 Length

The length of this key at its base shall be

$$\text{for type A : } L_1 = 28,58 \pm 0,13 \text{ mm (1.125} \pm 0.005 \text{ in)}$$

$$\text{for type B : } L_1 = 22,73 \pm 0,13 \text{ mm (0.895} \pm 0.005 \text{ in)}$$

5.6.4 Taper

This key shall be tapered at both ends for type A and only at the rear side end for type B.

Type A (see figure 3 and view F)

$$L_2 = 3,17 \pm 0,13 \text{ mm (0.125} \pm 0.005 \text{ in)}$$

$$L_3 = 6,35 \pm 0,25 \text{ mm (0.250} \pm 0.010 \text{ in)}$$

$$L_4 = 6,35 \pm 0,13 \text{ mm (0.250} \pm 0.005 \text{ in)}$$

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Type B (see figure 3 and view G)

$$A_1 = 10^\circ \pm 30'$$

$$L_3 = 6,35 \pm 0,25 \text{ mm } (0.250 \pm 0.010 \text{ in})$$

5.6.5 Position

The angular position of this key shall be

$$A_2 = 43^\circ \pm 30'$$

5.7 Upper restraint keys (see figure 3 and views A and B)

These four keys are mandatory for type B only. There shall be four such keys, two on each side of the rim, so as to leave between their slanted surfaces a free path centred about the symmetry plane of the cartridge.

5.7.1 Height

The height of these keys shall be

$$H_2 = 2,29 \pm 0,13 \text{ mm } (0.090 \pm 0.005 \text{ in})$$

5.7.2 Width

The width of these keys shall be

$$W_3 = 9,9 \text{ mm max. } (0.39 \text{ in max.})$$

5.7.3 Width of the free path

The width of the free path shall be

$$W_4 = 2,29 \pm 0,20 \text{ mm } (0.090 \pm 0.008 \text{ in})$$

5.7.4 Position

These keys shall be positioned within areas defined by

$$A_3 = 7^\circ 30' \pm 1^\circ$$

$$A_4 = 5^\circ 45' \pm 1^\circ$$

$$A_5 = 18^\circ \pm 1^\circ$$

$$A_6 = 29^\circ 21' \pm 1^\circ$$

5.8 Lower restraint keys (see figure 3 and views C and D)

These keys, in general two, are mandatory for type B only. Their base is centred about the symmetry plane of the cartridge within 0,13 mm (0.005 in).

5.8.1 Height

Their height shall be

$$H_3 = 1,52 \begin{matrix} + 0,00 \\ - 0,25 \end{matrix} \text{ mm } \left(0,060 \begin{matrix} + 0,000 \\ - 0,010 \end{matrix} \text{ in } \right)$$

5.8.2 Width

Their width at the base shall be

$$W_5 = 13,97 \begin{matrix} + 0,00 \\ - 0,25 \end{matrix} \text{ mm } \left(0,550 \begin{matrix} + 0,000 \\ - 0,010 \end{matrix} \text{ in } \right)$$

These keys may be tapered so as to facilitate insertion into the corresponding restraint of the drive.

5.8.3 Position

They shall be positioned within an area defined by

$$A_7 = 14^\circ$$

$$A_8 = 81^\circ$$

5.9 Air intake area (see figure 3 and view E)

5.9.1 Dimensions

The dimensions of the air intake area shall be

$$W_6 = 7,3 \text{ mm max. } (0.29 \text{ in max.})$$

$$L_5 = 15,2 \text{ mm max. } (0.60 \text{ in max.})$$

5.9.2 Position

The position of the air intake area shall be given by the position of its centre

$$A_9 = 63^\circ \pm 30'$$

6 Cartridge/drive interface

The dimensions given for the cartridge in the open position and for the relevant elements of the drive are referred to two axes XX, YY, which are the vertical and the horizontal axes through the centre of the driving shaft of the tape drive.

In the open position the cartridge shall be expanded so that its outer surface lies between two co-axial cylindrical surfaces of radius 141,03 mm (5.552 in) and 141,52 mm (5.572 in) respectively.

6.1 Latch device (see figure 4)

The latch device shall be actuated by a latch pin of the tape drive.

6.1.1 Co-ordinates of the centre of rotation of the latch pin

The co-ordinates of the centre of rotation of the latch pin shall be

$$L_6 = 121,67 \pm 0,25 \text{ mm } (4.790 \pm 0.010 \text{ in})$$

$$L_7 = 85,09 \pm 0,25 \text{ mm } (3.350 \pm 0.010 \text{ in})$$

6.1.2 Latch pin path

The latch pin shall travel within a semi circular path defined by :

$$R_4 = 28,3 \text{ mm (1.14 in)}$$

$$R_5 = 35,2 \text{ mm (1.383 in)}$$

$$L_8 = 139,0 \text{ mm (5.472 in)}$$

$$A_{10} = 193^\circ$$

6.1.3 Latch pin dimension

The latch pin shall extend beyond the tape path centreline toward the front side by $1,5 \pm 0,8 \text{ mm (0.06} \pm 0.03 \text{ in)}$.

6.1.4 Movement of the latch device

When actuated by the latch pin, no part of the latch device shall extend beyond a straight line parallel to the YY axis and defined by

$$L_9 = 43,2 \text{ mm min. (1.70 in min.)}$$

and beyond a composite line defined by

$$L_{10} = 123,5 \text{ mm min. (4.86 in min.)}$$

$$R_6 = 51 \text{ mm min. (2.00 in min.)}$$

6.2 Position of the tangential restraint key (see figure 4)

The position of the tangential restraint key shall be

$$A_0 = 24^\circ \text{ nominal}$$

6.3 Position of the air intake area (see figure 4)

The position of the air intake area shall be defined by the position of its centre

$$A_{11} = 56^\circ \pm 30'$$

6.4 Tape exit opening (see figure 4 and view A)**6.4.1 Length**

The tape exit opening shall extend over an angle

$$A_{12} = 10^\circ 20' \pm 10'$$

6.4.2 Width

The width of the tape exit opening shall be

$$W_7 = 15,88 \pm 0,13 \text{ mm (0.625} \pm 0.005 \text{ in)}$$

This opening is centred about the symmetry plane of the cartridge within $\pm 0,13 \text{ mm (0.005 in)}$.

6.4.3 Position

The position of the leading edge of the tape exit opening shall be

$$A_{13} = 4^\circ 25' \pm 10'$$

6.4.4 Profile of the tape exit opening

The profile of the tape exit opening is defined by two planes including the leading edge and the trailing edge respectively and tangential to circles defined respectively by

$$R_7 = 65 \text{ mm max. (2.56 in max.)}$$

$$R_8 = 128 \text{ mm max. (5.04 in max.)}$$

7 Optional features

Optional features are not required but, if provided, they shall conform to the dimensions given.

7.1 Tabs (see figure 3 and sections K-K)

All the rear side tabs regularly disposed around the inner flange may be provided. In the closed position their radius shall be

$$R_9 = 100 \text{ mm min. (4 in min.)}$$

7.2 Stacking rings (see figure 3 and sections K-K)**7.2.1 Type A**

At the rear side, stacking rings regularly disposed around the circumference may be provided. In the closed position their position shall be defined by

$$R_{10} = 128,0 \pm 1,0 \text{ mm (5.039} \pm 0.039 \text{ in)}$$

$$H_4 = 2,0 \text{ mm max. (0.078 in max.)}$$

7.2.2 Type B

Stacking rings at the rear side and a rim at the front side may be provided. They shall not extend over an angle of 40° centred on the tape exit opening. In the closed position their position shall be defined by

$$R_{10} = 134,6 \pm 0,4 \text{ mm (5.299} \pm 0.016 \text{ in)}$$

$$R_{11} = 135,6 \pm 0,4 \text{ mm (5.338} \pm 0.016 \text{ in)}$$

$$H_4 = 0,51 \pm 0,10 \text{ mm (0.020} \pm 0.003 \text{ 9 in)}$$

$$H_5 = 0,56 \pm 0,10 \text{ mm (0.022} \pm 0.003 \text{ 9 in)}$$

7.3 Hook (see figure 5)

The latch device may include a hook. Its dimensions are

$$L_{11} = 8,00 \pm 0,35 \text{ mm (0.315} \pm 0.014 \text{ in)}$$

$$L_{12} = 15,11 \pm 0,35 \text{ mm (0.595} \pm 0.014 \text{ in)}$$

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8 Functional characteristics**8.1 Mechanical characteristics****8.1.1 Unlatching torque**

The unlatching torque is the torque required to move the latch past detents.

The unlatching torque shall be

$$35 \times 10^{-3} \text{ N}\cdot\text{m min. (4.96 ozf}\cdot\text{in min.)}$$

$$254 \times 10^{-3} \text{ N}\cdot\text{m max. (36 ozf}\cdot\text{in max.)}$$

8.1.2 Latch opening torque

The latch opening torque is the torque required to operate the latch so as to bring the cartridge from the closed position to the open position.

The opening torque shall be

$$254 \times 10^{-3} \text{ N}\cdot\text{m max. (36 ozf}\cdot\text{in max.)}$$

8.1.3 Latch closing torque

The latch closing torque is the torque required to operate the latch so as to bring the cartridge from the open position to the closed position.

The closing torque shall be

$$254 \times 10^{-3} \text{ N}\cdot\text{m max. (36 ozf}\cdot\text{in max.)}$$

8.2 Pneumatic characteristics**8.2.1 Reference orifices** (see figure 6)

In order to determine the pneumatic characteristics described in the following sub-clauses, four reference orifices Z_1 , Z_2 , Z_3 and Z_4 are defined. Their dimensions shall be as follows :

Diameter

Reference orifice Z_1 : $2,083 \pm 0,013$ mm
(0.820 ± 0.0005 in)

Reference orifice Z_2 : $3,439 \pm 0,013$ mm
(0.1354 ± 0.0005 in)

Reference orifice Z_3 : $2,921 \pm 0,013$ mm
(0.1150 ± 0.0005 in)

Reference orifice Z_4 : $3,193 \pm 0,013$ mm
(0.1257 ± 0.0005 in)

Length

All reference orifices shall have the same length

$$L_{13} = 6,35 \pm 0,13 \text{ mm (0.250} \pm 0.005 \text{ in)}$$

Rounding radius

All reference orifices shall have the same rounding radius

$$R_{12} = 1,17 \pm 0,13 \text{ mm (0.046} \pm 0.005 \text{ in)}$$

8.2.2 Operating air pressure

The operating air pressure shall be the air pressure, which, when applied to the air intake area of the cartridge in the open position, shall provoke the detaching of the free end of the tape from the tape pack.

The operating air pressure shall have a value between 4,48 kPa and 7,97 kPa when the air flow is restricted by impedances equal to or less than Z_3 and equal to or greater than Z_2 . The pressures are measured upstream of test orifices Z_2 and Z_3 on the tape drive.

8.2.3 Pneumatic impedance

The pneumatic impedance of the cartridge is the resistance to the air flow offered by the cartridge, as seen at the air intake area.

The pneumatic impedance of the cartridge shall be equal to or greater than the impedance offered by reference orifice Z_2 , and equal to or less than the impedance offered by reference orifice Z_3 , when compared at a pressure between 4,48 kPa to 7,97 kPa and when measured in accordance with annex A.

9 Tape and reel requirements

The properties of the tape and reel shall be as specified in ISO 1864 with the following exceptions :

9.1 E value

The E value is the distance measured radially between the edge of the reel flange and the outside layer of tape, when the tape is wound at a tension between 2 N and 3,6 N (7 ozf and 13 ozf) on the specified reel. The value shall satisfy

$$6,3 \text{ mm} < E \text{ value} < 15,9 \text{ mm (0.25} < E < 0.62 \text{ in)}$$

9.2 End of the tape

Experience has shown that under some circumstances it is difficult to detach the end of tape from the pack in a cartridge, i.e. the end of tape remains with the pack. It has been found helpful to form the tape end to permit air to get under it, thus allowing it to lift off. It is therefore recommended that the tape end be trimmed to a regular shape and crimped longitudinally up to a maximum of 13 mm (0.5 in) from the tape end. (See annex B.)

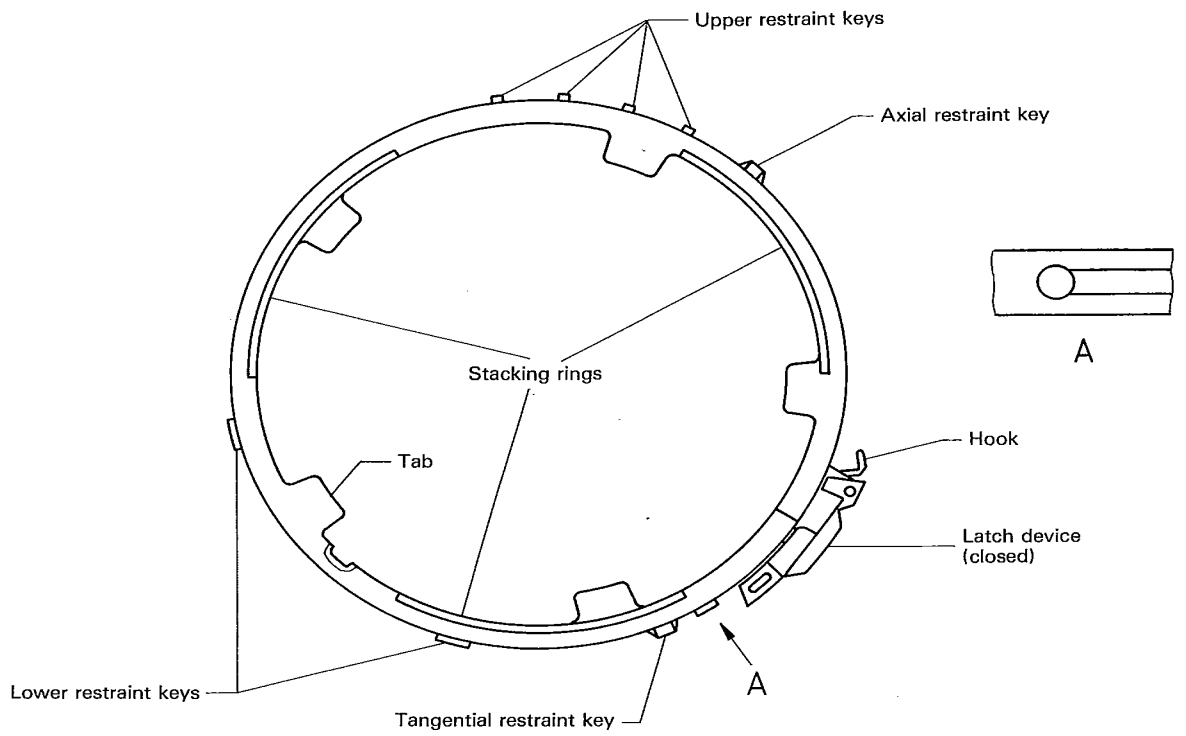


Figure 1 — Closed position (rear view)

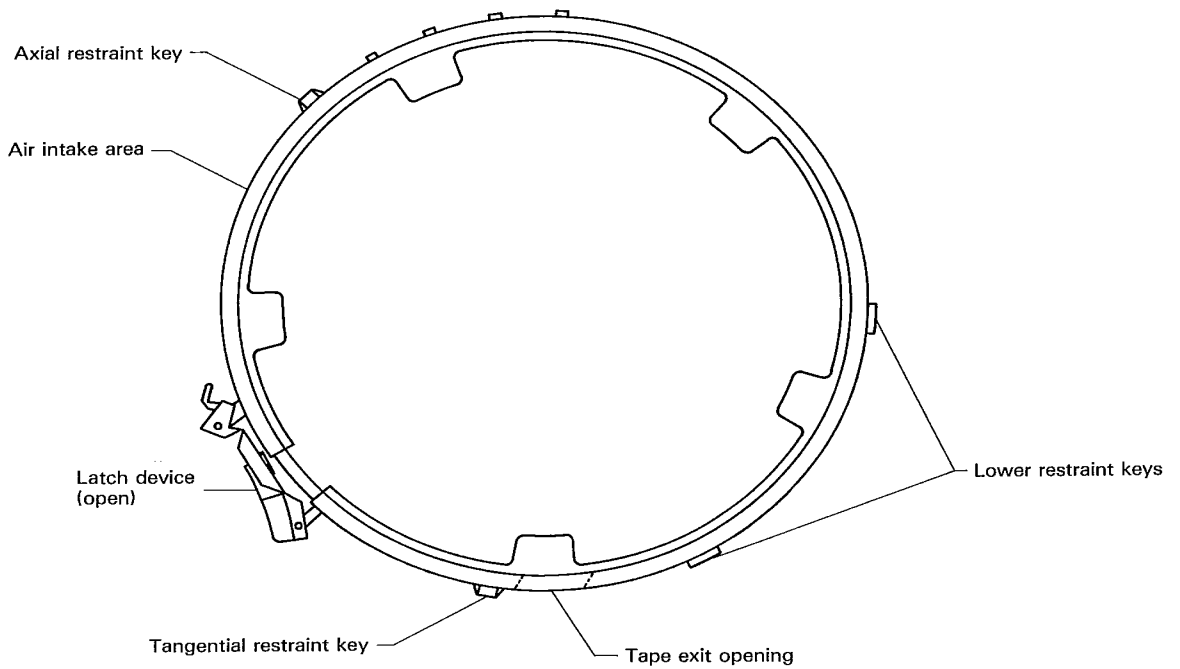


Figure 2 — Open position (front view)

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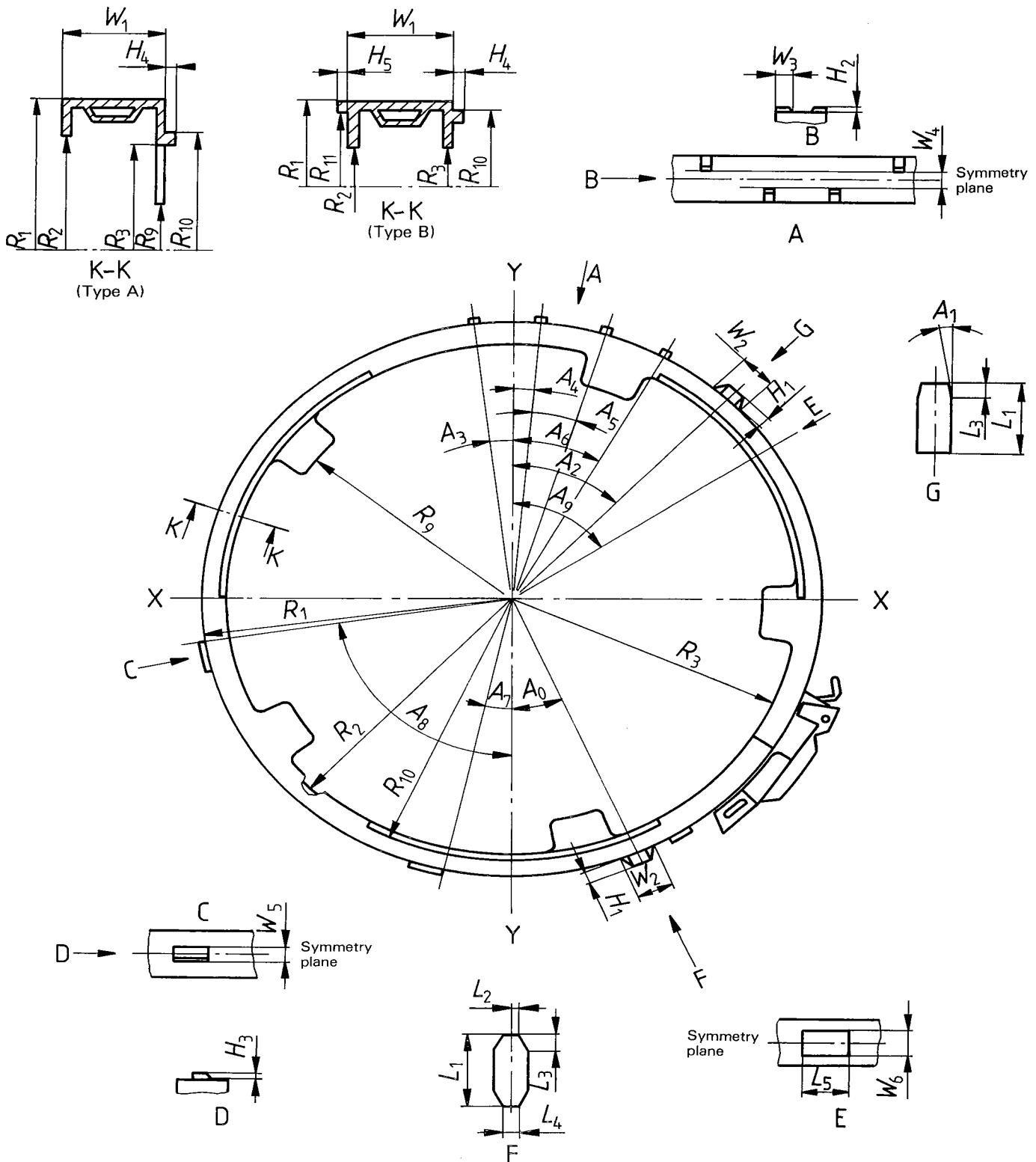


Figure 3 — Closed position (rear view)

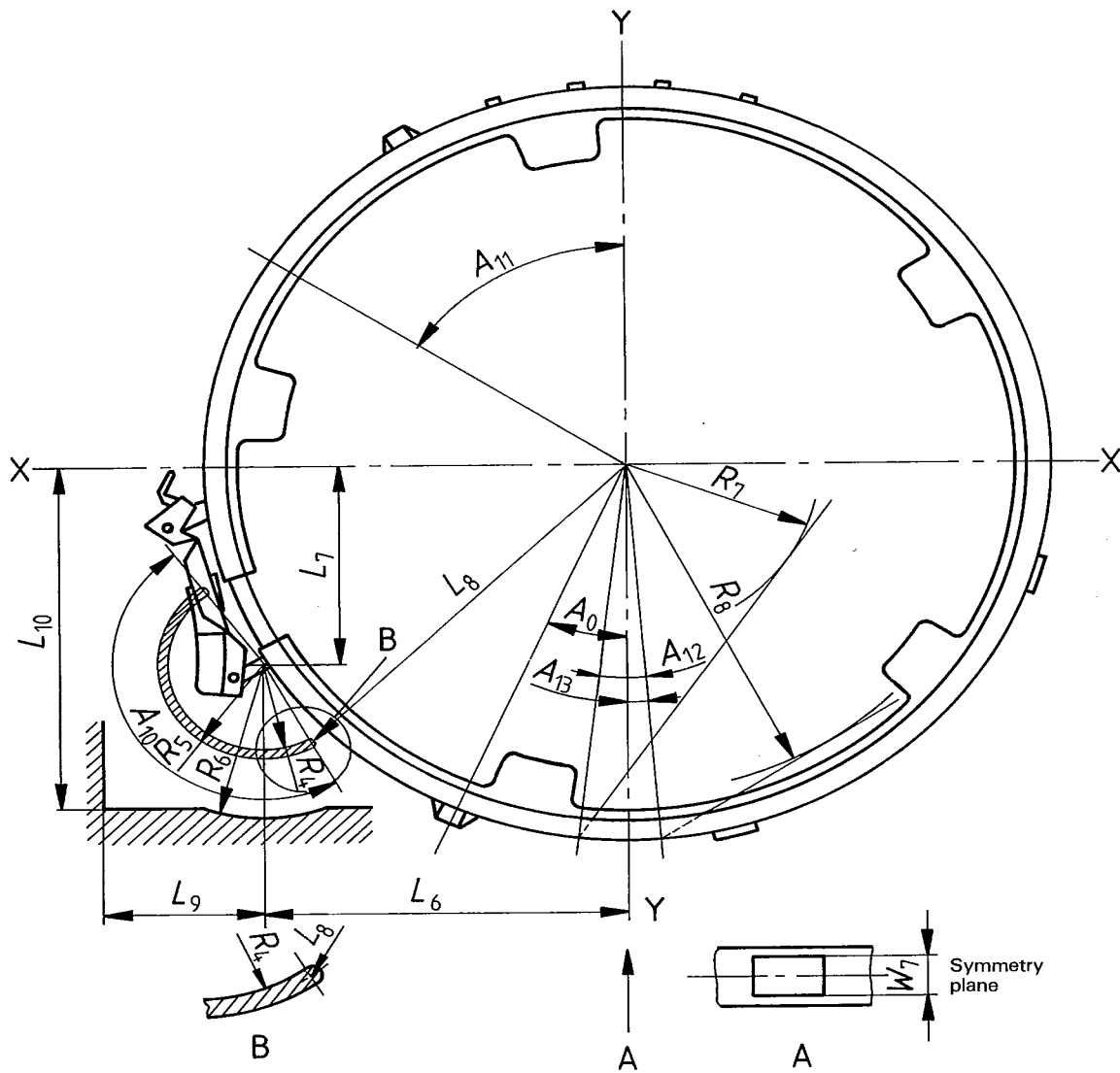


Figure 4 — Open position (front view)

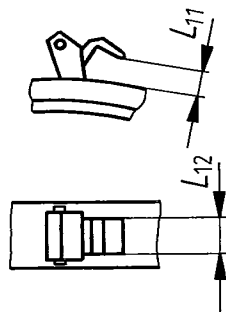


Figure 5 — Hook

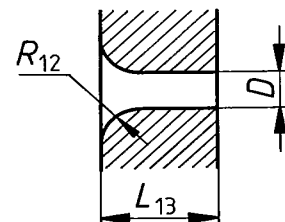


Figure 6 — Reference orifice

Annex A

Instrumentation for measuring the pneumatic impedance

(This annex forms part of the standard.)

Since it is the relative impedance which is of interest, there is no need for precision instruments reading absolute values. Pneumatic impedance is related to differential pressure and resulting air flow, and relative air flow in turn can be measured by measuring relative pressure differential across a fixed impedance.

The test set-up shown below consists of a tube, a throttle, reference orifice Z_1 and two pressure gauges G_1 , G_2 . Compressed air is applied to one end of the tube. The throttle is used to adjust the air flow through the tube. The other end of the tube is then applied to each of the reference orifices Z_2 , Z_3 , Z_4 and to the air intake area of the empty cartridge under test. The tube is divided into two sections by reference orifice Z_1 . A pressure gauge is connected to each section.

A.1 Test procedure

All readings shall be made with an accuracy of 1 % of the full scale reading.

- a) The test tube shall be applied to reference orifice Z_4 . The throttle shall be adjusted until gauge G_2 reads a pressure

$$P_4 = 5,98 \pm 0,06 \text{ kPa}$$

The reading P_s of gauge G_1 shall be noted.

- b) The throttle shall then remain in its position until the end of the test procedure.

- c) The test tube shall be applied to reference orifice Z_2 . The reading P_2 of gauge G_2 shall be noted.

- d) The test tube shall be applied to reference orifice Z_3 . The reading P_3 of gauge G_2 shall be noted.

- e) The test tube shall be applied to the air intake area of the cartridge under test. The reading P_c of gauge G_1 shall be noted.

- f) The test tube shall be applied again to reference orifice Z_4 . The reading P_s of gauge G_1 and P_4 of gauge G_2 shall be the same as in step a) above.

A.2 Requirement

The cartridge under test complies with 8.2.3 of this International Standard if

$$P_2 \leq P_c \leq P_3$$

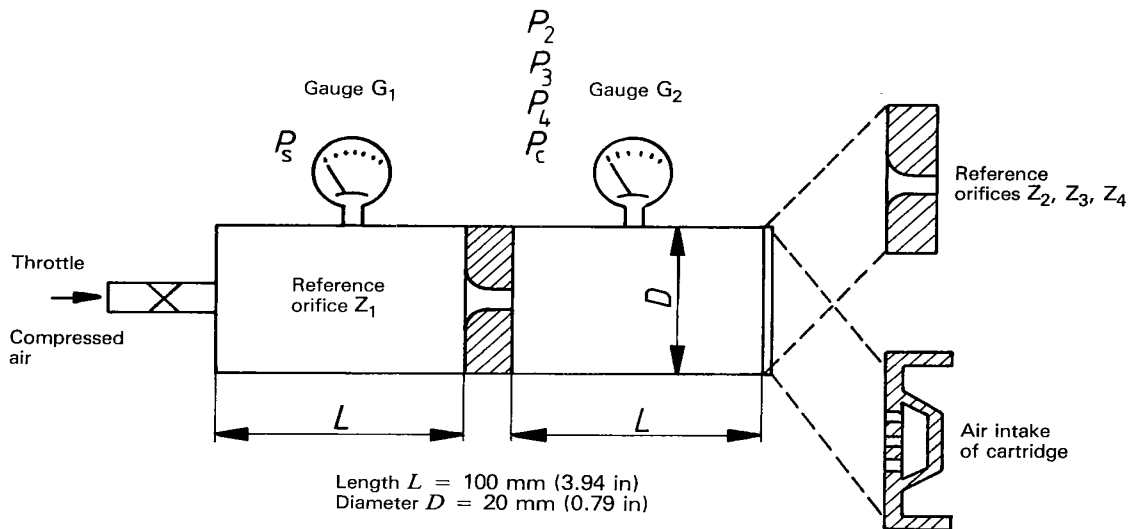
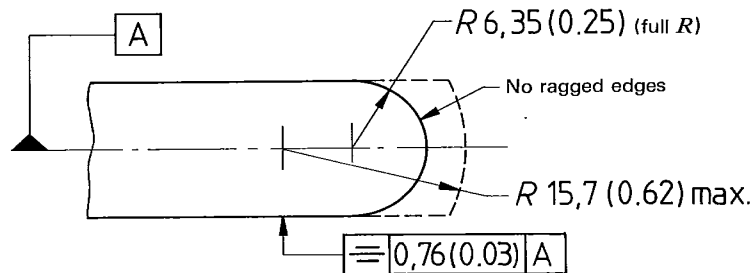


Figure 7 — Instrumentation for measuring the pneumatic impedance

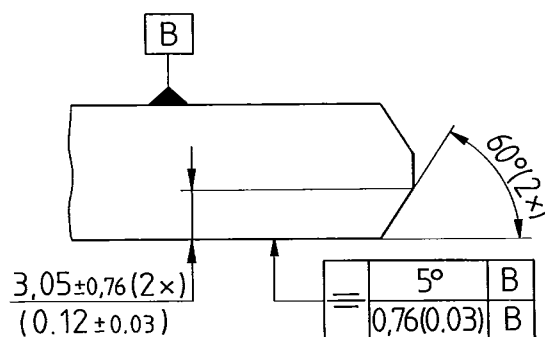
Annex B

Examples of tape leader configuration for use with self-loading cartridge

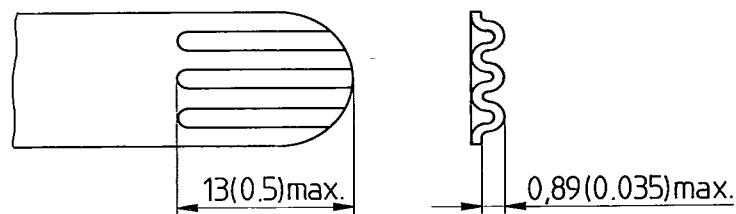
(This annex does not form part of the standard.)

Dimensions in millimetres
(inches in parentheses)

See note 1



See note 1



See note 2

NOTES

- 1 Optional end shapes.
- 2 Longitudinal crimps in first 13 mm (0.5 in) of tape are recommended.
- 3 Tape lying in a free state on a flat surface should conform to that surface, except for crimps as specified.

Figure 8 — Examples of tape leader configuration for use with self-loading cartridge