

INTERNATIONAL
STANDARD

ISO
13450

First edition
1996-05-01

**Photography — 110-size cartridge, film and
backing paper — Dimensions**

*Photographie — Chargeur de format 110, film et papier protecteur —
Dimensions*



Reference number
ISO 13450:1996(E)

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

International Standard ISO 13450 was prepared by Technical Committee ISO/TC 42, *Photography*.

This first edition of ISO 13450 cancels and replaces ISO 7374:1988, which dealt with dimensions and format of 110-size film and backing paper, ISO 7330:1987, which dealt with location and dimensions of 110-size film exposure and film identification notches, and ISO 7261:1987, which dealt with 110-size cartridge dimensions.

Annexes A, B and C of this International Standard are for information only.

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Photography — 110-size cartridge, film and backing paper — Dimensions

1 Scope

This International Standard specifies

- a) dimensions of 110-size cartridges;
- b) dimensions and locations of two sets of notches for 110-size cartridges:
 - film exposure notches which preset certain cameras to an exposure setting,
 - film identification notches which indicate, by a code, the name of the film and the number of exposures;
- c) dimensions of 110-size film and backing paper.

2 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 5-2:1991, *Photography — Density measurements — Part 2: Geometric conditions for transmission density*.

ISO 5-3:1995, *Photography — Density measurements — Part 3: Spectral conditions*.

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*.

ANSI/AGMA 115.01-1989, *Basic Gear Geometry*.

3 Datum referencing

3.1 Principle

The principle of datum referencing is used to relate the cartridge to a set of three mutually perpendicular datum planes in contact with the cartridge surfaces which engage mating camera parts so as to ensure proper alignment of the cartridge in the camera.

3.2 Primary datum, S

The S plane, or seated datum plane, is the plane of a simulated camera aperture frame and is in contact with the four "A" pads of the cartridge (see figures 1 and 2).

3.3 Secondary datum, R

The R plane, or rail datum plane, is perpendicular to the S plane and is in contact with the two "B" pads located on the film identification rail (see figures 1, 2 and 4).

3.4 Tertiary datum, T

The T plane, or take-up datum, is mutually perpendicular to the S and R planes and is in contact with the T-plane rib moulded into the cartridge take-up chamber near the gear cover (see figures 1 and 2).

4 Conditions for measurement of dimensions

The dimensions specified in this International Standard apply at the time of manufacture, measured under atmospheric conditions of $(23 \pm 2)^\circ\text{C}$ and $(50 \pm 5)\%$ relative humidity as specified in ISO 554¹⁾.

1) All measuring equipment calibration should be referred to a temperature of 20°C (as specified in ISO 1:1975, *Standard reference temperature for industrial length measurements*) and a relative humidity of 50 %.

5 Dimensions and characteristics of cartridge and spool

5.1 Dimensions and characteristics apply to an assembled cartridge when the four "A" pads of the cartridge are seated with a force of 1,1 N to 2,2 N per camera contact area against the fixture that simulates the S plane or camera aperture frame (see figure 2, note 8).

5.2 The dimensions shall be as given in table 1 and figure 2. The term "basic" is a theoretically exact dimension used to describe location of a feature from which permissible variations are established by tolerance on other dimensions or notes.

5.3 Film-loaded cameras shall require no more than 35×10^{-3} N·m of torque to sustain film advance, and no more than 53×10^{-3} N·m of torque to overcome momentary torque peaks in the picture area. Torque peaks at leading and trailing ends of the film shall require no more than 75×10^{-3} N·m of torque. After the trailer has been wound off, paper shall remain in the cartridge aperture under an applied torque of 100×10^{-3} N·m. (The specified torques refer to torques measured as defined in annex A.)

5.4 Nominally the film emulsion surface plane is $(0,10 \pm 0,05)$ mm to the rear of the datum plane S. This applies only to a film load which has acquired scroll set at least equivalent to that expected at the earliest time it is anticipated it would be exposed by users. This dimension, measured at five cartridge film-plane measuring points, applies throughout the useful life of the film (see figure 3). Since the design and adjustment of camera lenses, with respect to focal plane and depth of field, will be based on this value, control of this dimension within narrow limits is an important quality consideration.

6 Cartridge notching dimensions

6.1 General

Dimensions apply to an assembled cartridge.

6.2 Dimensions of notches

Notch dimensions shall be as given in figures 4 and 5 and tables 2 to 5.

6.3 Film exposure notches

The location of film exposure notches in 110-size cartridges is mandatory. Their location shall be as given in figure 4 and table 2.

6.4 Film identification notches

6.4.1 The use of film identification notches is optional. If used, their dimensions shall be as given in figure 5 and tables 3 and 4. They are measured from datum T, which is intended to serve as a rapid means of positioning the cartridge in a fixed location with respect to the devices which will detect the film identification notches.

NOTE 1 The assignment of film identification notches to the particular film products is not within the scope of this International Standard. However, the code system is described and the method which the National Association of Photographic Manufacturers will use is indicated in annex C.

6.4.2 The notch dimensions apply to all film identification notch locations.

6.4.3 The dimensions for film identification notches have been established in a manner which permits the forming of two or more adjacent notches with or without a partition between them. When a partition is left between adjacent notches, its minimum width is intentionally not restricted by the dimensions shown in figure 5, but attention is called to the fact that any partition should be of sufficient width to withstand normal handling without breaking.

6.4.4 The film identification notch locations are numbered 1 through 8 from datum T for convenience in assigning combinations of notches.

7 Dimensions and format of film and backing paper

7.1 General

Dimensions apply at the time of cartridge manufacture.

7.2 Paper format

The format and dimensions of paper shall be as given in figure 6.

7.3 Film format

The format and dimensions of film shall be as given in figure 7.

7.4 Format of negative films

The format and dimensions of negative films shall be as given in figure 8.

7.5 Format of reversal films

The format and dimensions of reversal films shall be as given in figure 9.

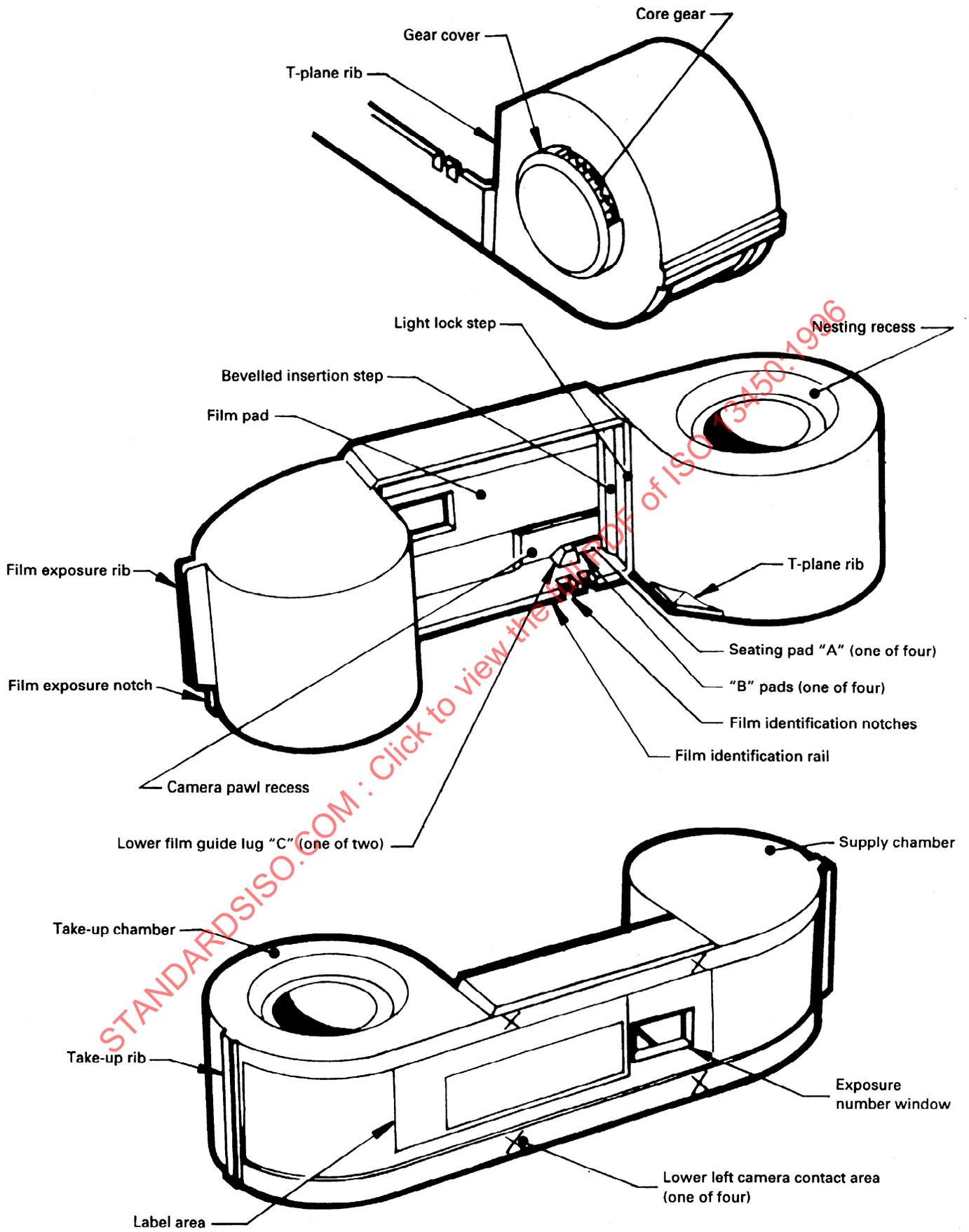


Figure 1 — 110-size cartridge nomenclature

Table 1 — Cartridge dimensions (see figure 2)

Dimensions in millimetres except for angles

Symbol	Dimensions			
	min.	aim	max.	basic
A ₁	28,70	28,90	29,10	
A ₂	5,74	5,92	6,10	
A ₃	3,28	3,38	3,48	
A ₄ (angle)	30°			
A ₅	1,55	1,65	1,75	
A ₆	0,66	0,76	0,86	
A ₇			0,12	
A ₈	28,73	28,83	28,93	
A ₉	29,62	29,72	29,82	
A ₁₀	30,35			
A ₁₁	30,38	30,48	30,58	
A ₁₂ (angle)				50° nom.
A ₁₃ (angle)				20° nom.
A ₁₄ (angle)				50° nom.
A ₁₅ (radius)			38,10	
A ₁₆		11,35		See note 6 of figure 2
A ₁₇		13,08		See note 6 of figure 2
A ₁₈	10,70	10,80	10,90	
B ₁	30,33	30,43	30,53	
B ₂	2,74	2,79	2,84	
B ₃	0,97	1,02	1,07	
B ₄	5,36	5,46	5,56	
B ₅	30,74	30,94	31,14	
B ₆ (angle)				30° ref.
B ₇	1,12	1,32	1,52	
B ₈	0,10	0,30	0,50	
C ₁	53,72	53,98	54,24	
C ₂	51,87	52,07	52,27	
C ₃	51,38	51,61	51,84	
C ₄				41,02
C ₅				39,12
C ₆				35,56
C ₇ (radius)	10,34	10,54	10,74	
C ₈	23,30	23,50	23,70	
C ₉				16,64
C ₁₀				12,95
C ₁₁	10,27	10,52	10,77	
C ₁₂	8,82	9,02	9,22	
C ₁₃	7,62			
C ₁₄ (radius)	13,01	13,21	13,41	
C ₁₅ (radius)	18,14	18,34	18,54	
C ₁₆	5,03	5,23	5,43	
C ₁₇ (radius)	13,57	13,77	13,97	
C ₁₈	2,21	2,41	2,61	
C ₁₉	7,62			
C ₂₀	10,14	10,47	10,80	

Table 1 (continued)

Dimensions in millimetres except for angles

Symbol	Dimensions			
	min.	aim	max.	basic
C_{21}				11,35
C_{22}	24,16	24,36	24,56	
C_{23} (radius)	12,80	13,00	13,20	
C_{24} (angle)	10°			
C_{25}	26,92	27,18	27,44	
C_{26}	25,88	27,18	27,44	
C_{27}				13,08
D_1	35,56			
D_2	27,23	27,43	27,63	
D_3	19,28	19,48	19,68	
D_4				17,98 nom.
D_5	18,75	18,95	19,15	
D_6	17,53	17,73	17,93	
D_7	0,86	0,96	1,06	
D_8	11,20	11,40	11,60	
D_9				9,40 nom.
D_{10}	6,43	6,63	6,83	
D_{11} (angle)				45° nom.
D_{12}	1,25	1,65	2,05	
D_{13}	5,11	5,51	5,91	
D_{14}	24,57	24,97	25,37	
D_{15}	28,43	28,83	29,23	
D_{16}	14,12	14,22	14,32	diameter
D_{17}			3,00	
D_{18}	2,03			
D_{19}			0,40	
D_{20}			16,00	
D_{21}	18,01	18,24	18,47	
D_{22}				9,02 nom.
D_{23}	6,35			
D_{24}			19,30	
D_{25} (angle)	34°	37°	40°	
D_{26}			2,25	
E_1	1,04	1,09	1,14	
E_2	17,17	17,22	17,27	
E_3	0,78	0,81	0,84	
E_4 (angle)			45°	
E_5	3,20	3,30	3,40	
F_1	0,66	0,76	0,86	
F_2	0,66	0,76	0,86	
F_3	0,88	0,91	0,94	
F_4	0,88	0,91	0,94	
F_5 (angle)			45°	
F_6			0,18	
F_7 (angle)				0,75° nom.
F_8	17,91	18,03	18,15	
F_9	0,59	0,69	0,79	

Table 1 (concluded)

Dimensions in millimetres except for angles

Symbol	Dimensions			
	min.	aim	max.	basic
F_{10} (angle)				0,75° nom.
F_{11}			0,18	
F_{12}			4,83	
F_{13}	13,20			
F_{14} (angle)			45°	
G_1	24,65	24,85	25,05	
G_2 (radius)	1,37	1,57	1,77	
H_1			0,40	
H_2	2,16			

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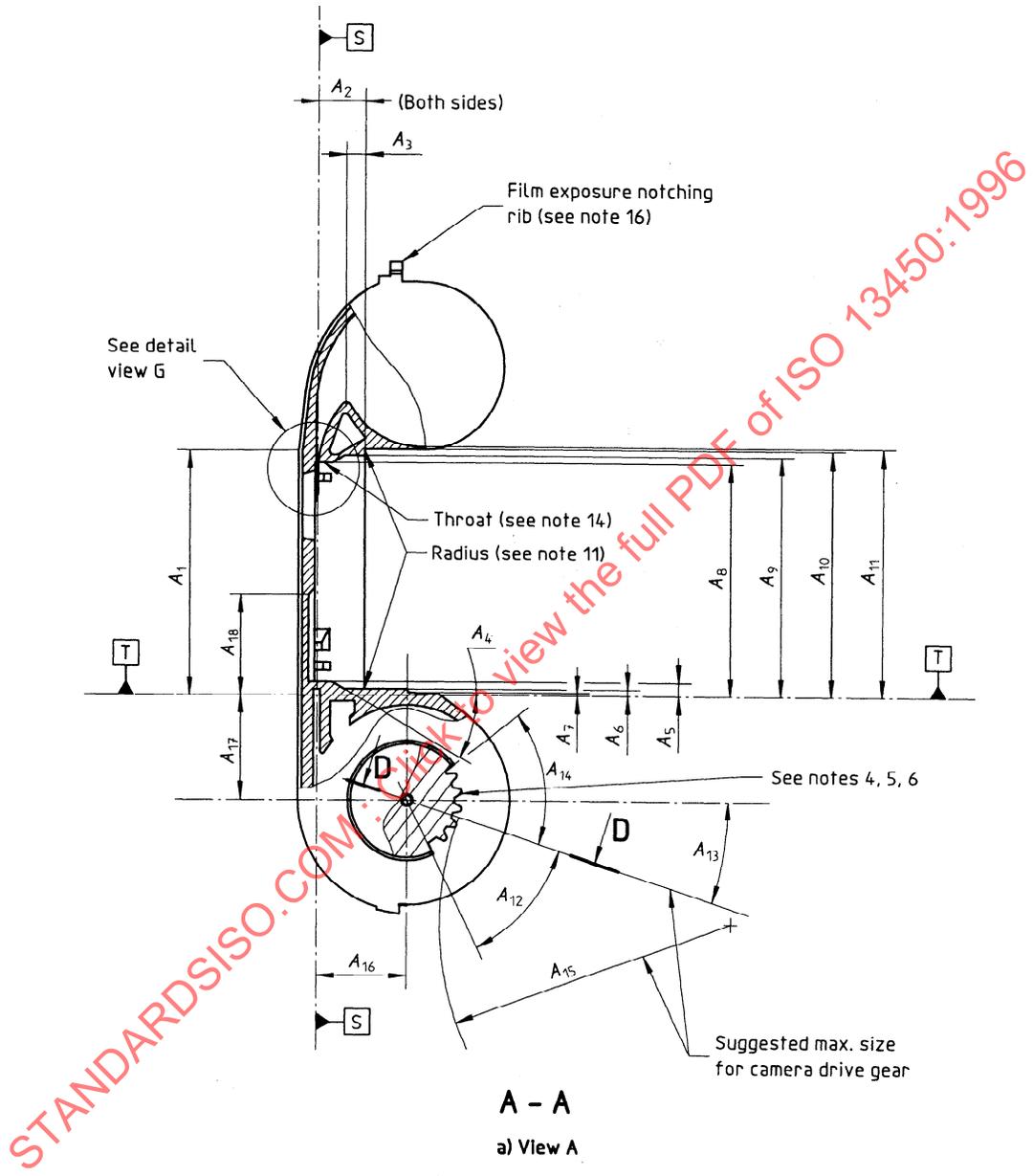


Figure 2 — 110-size cartridge dimensions

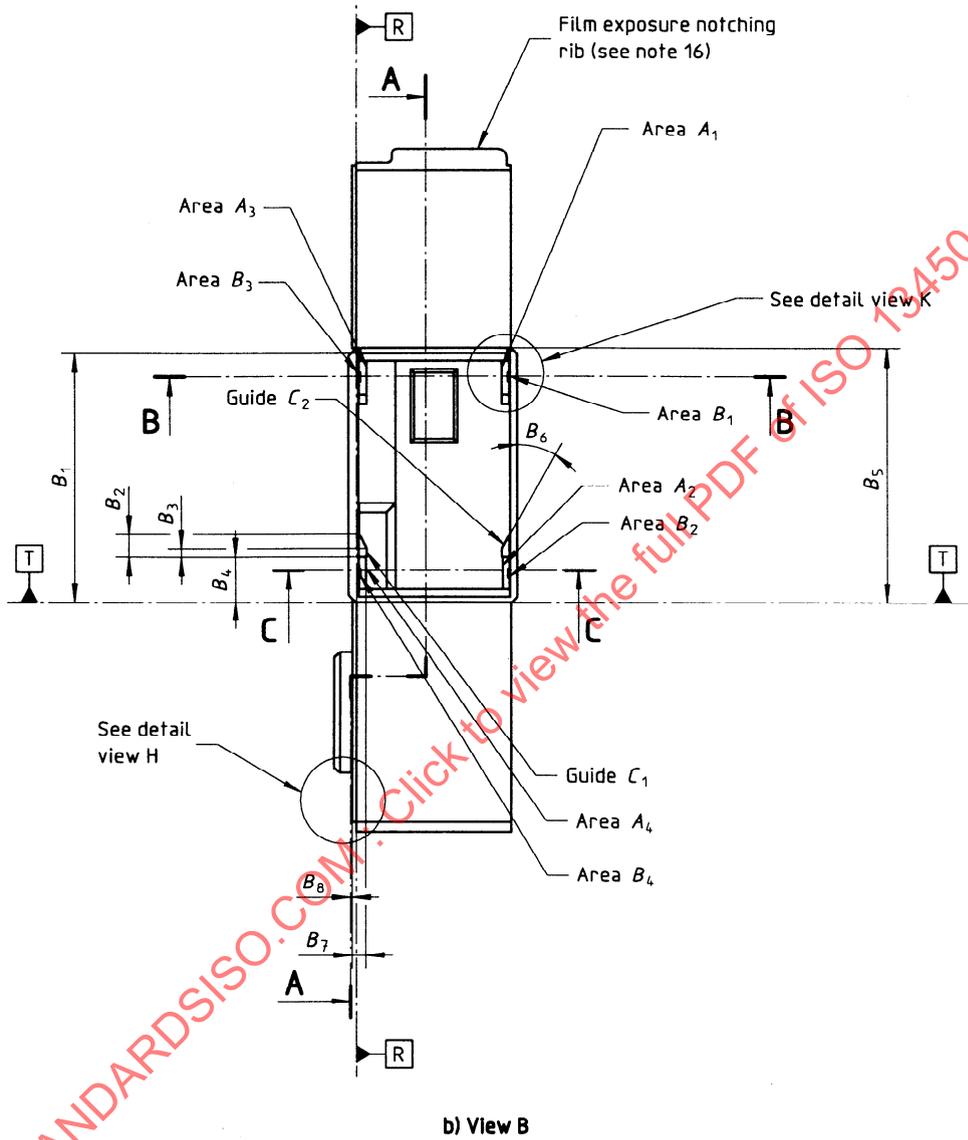


Figure 2 — 110-size cartridge dimensions (continued)

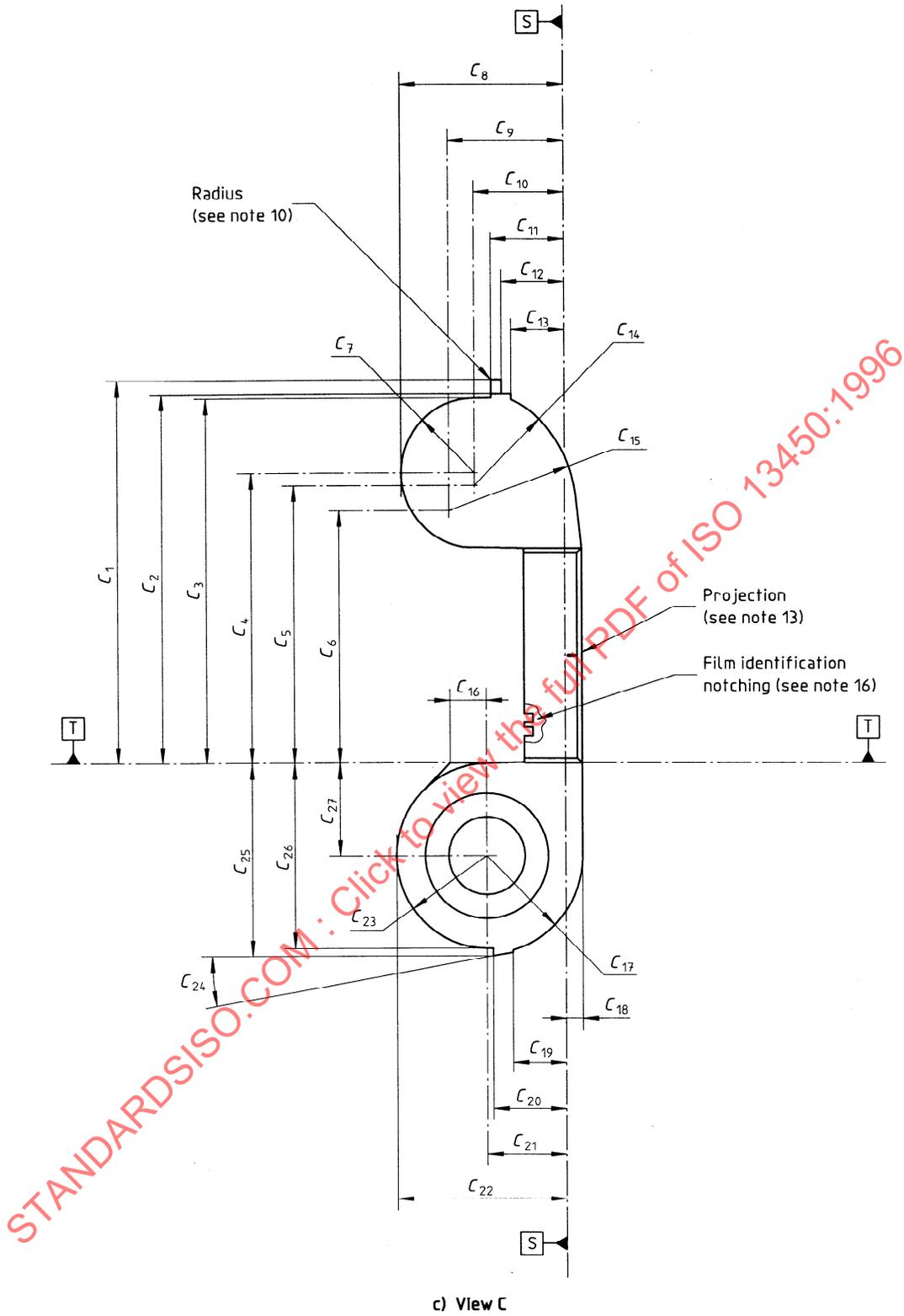


Figure 2 — 110-size cartridge dimensions (continued)

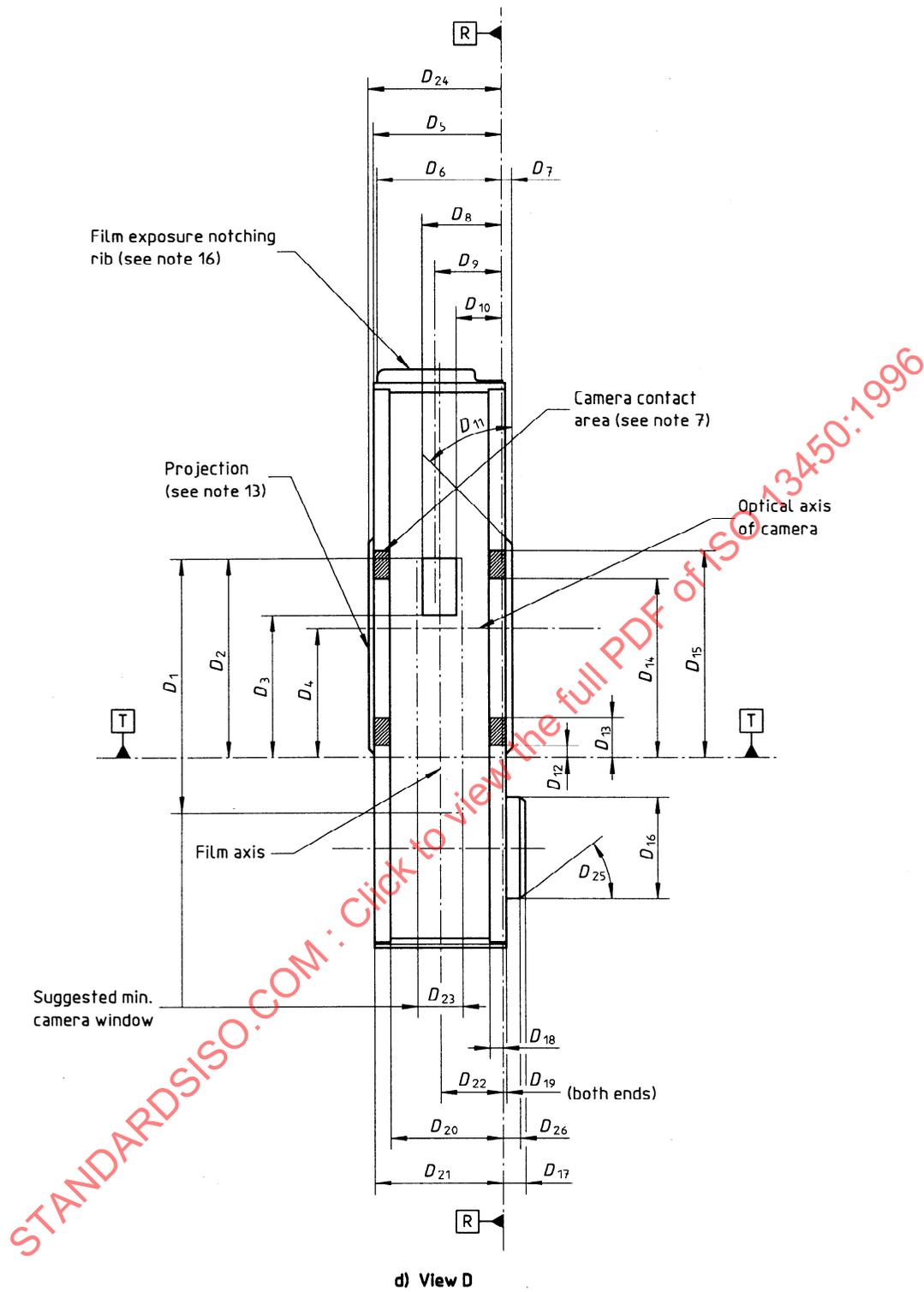
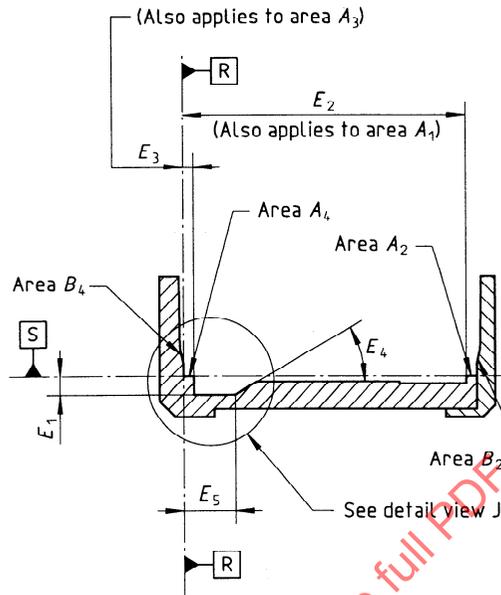
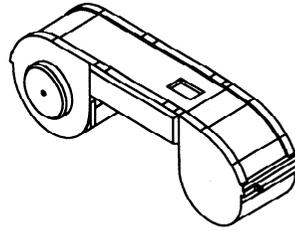
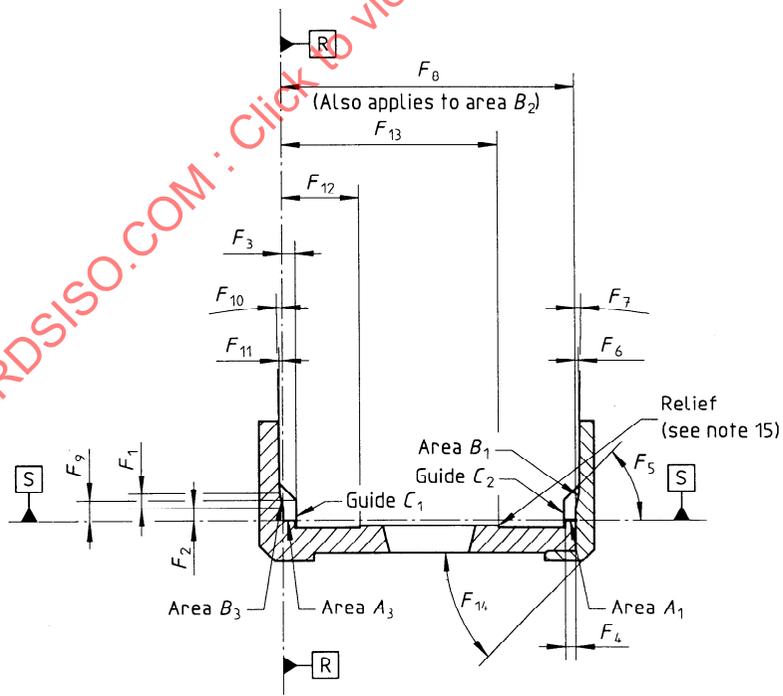


Figure 2 — 110-size cartridge dimensions (continued)



C - C
e) View E



B - B
f) View F

Figure 2 — 110-size cartridge dimensions (continued)

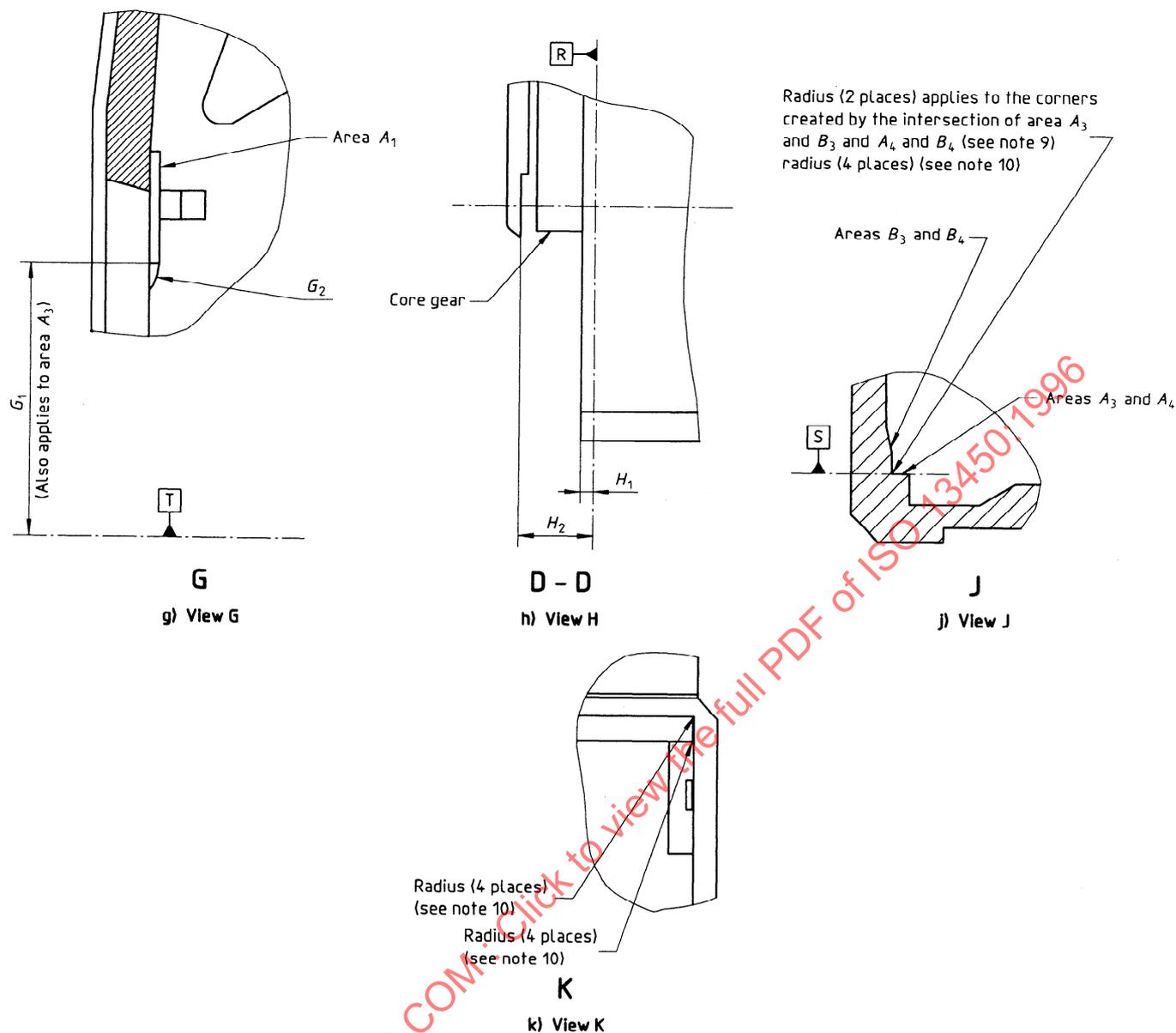


Figure 2 — 110-size cartridge dimensions (continued)

Key

- R Rail datum plane (perpendicular to S and in contact with two "B" pads on film identification rail)
- S Seated datum plane (in contact with four "A" pads)
- T Take-up datum plane (perpendicular to S and R and in contact with T-plane rib)

NOTES

- 1 Seated datum plane, S, in contact with areas A_1 , A_2 , A_3 and A_4 .
- 2 Rail datum plane, R, in contact with areas B_3 and B_4 .
- 3 Guides C_1 and C_2 determine the film channel width [$F_8 - (F_3 + F_4)$].
- 4 Take-up core gear data (designed in inches):
 - spur gear: 20 teeth
 - tooth form per ANSI/AGMA 115.01
 - diametral pitch: 48
 - pitch diameter: 10,59 mm
 - pressure angle: 20°
 - test radius with basic rack: 5,26 mm $-0,15$ mm.
- 5 Take-up core OD: 17,68 mm min.
- 6 Core gear axis located on the true position shown to within 0,30 mm diameter.
- 7 Force per camera contact area equals 1,1 N to 2,2 N (see subclause 5.1).
- 8 Dimensions shown apply when cartridge is seated against camera aperture frame with force as stated in note 7.
- 9 The radii shown shall be a maximum of 0,12 mm.
- 10 The radii shown shall be a maximum of 0,20 mm.
- 11 The radii shown shall be a maximum of 0,30 mm.
- 12 Corners not otherwise specified have a maximum radius of 0,50 mm.
- 13 Maximum diameter of allowable projection to be 3,0 mm.
- 14 The throat gap should be such that light-tightness is assured.
- 15 A relief is suggested.
- 16 For notching information, see clause 6.

Figure 2 — 110-size cartridge dimensions (concluded)

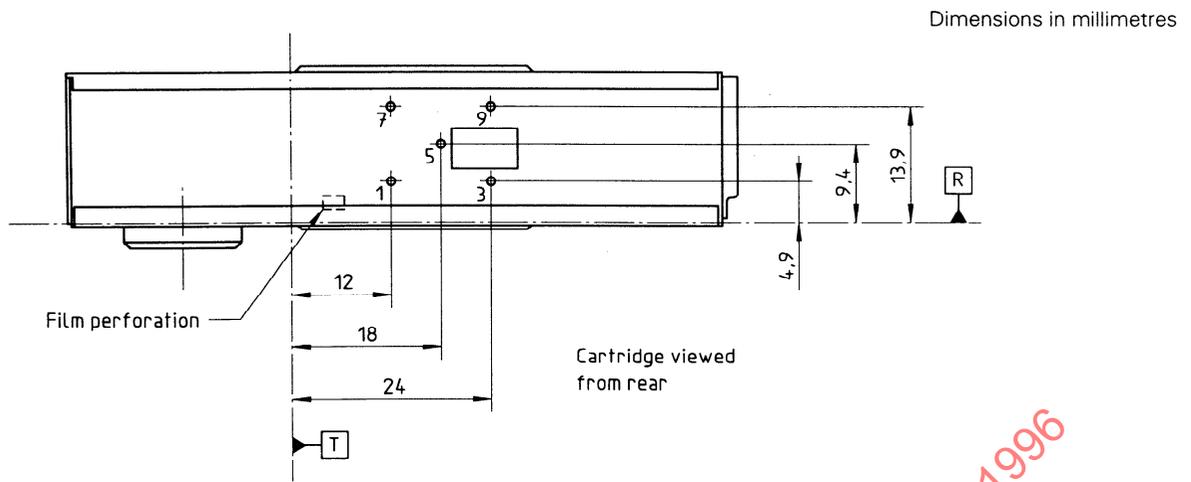
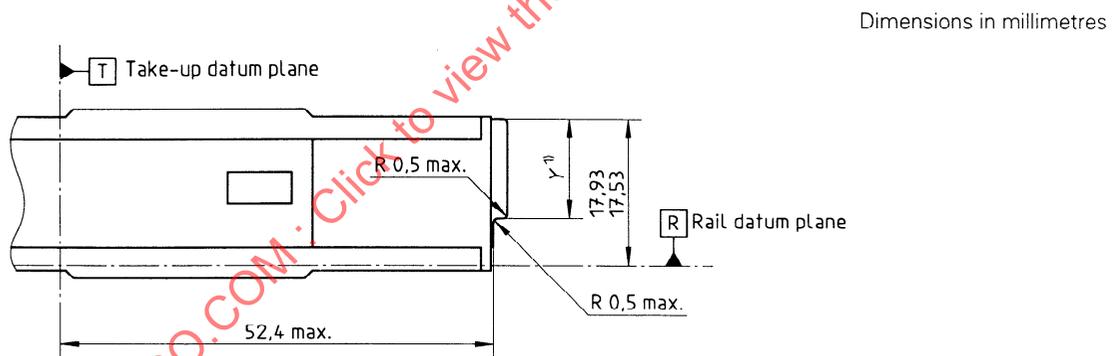


Figure 3 — 110-size cartridge film plane measuring points



1) Notching may produce 0,12 mm max. burr (in excess of dimensions shown in table 2).

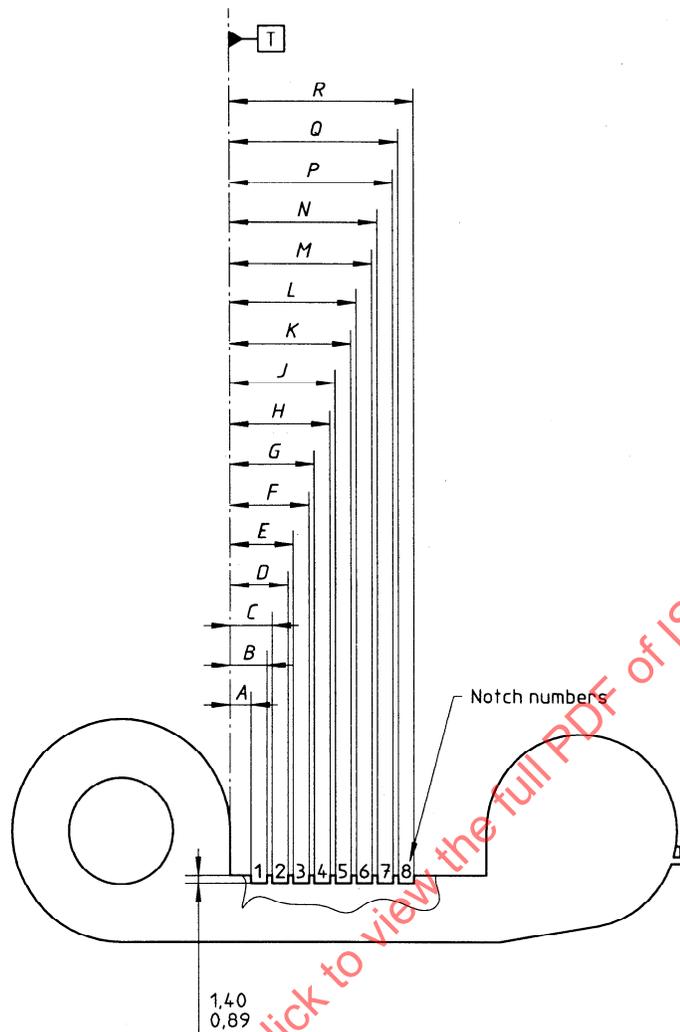
Figure 4 — Film exposure notching — 110-size cartridges

Table 2 — Film exposure notches (see figure 4)

ISO speed		Rib Y mm
Arithmetic	Logarithmic	
64	19°	15,33 ± 0,2
80	20°	14,53 ± 0,2
100	21°	13,73 ± 0,2
125	22°	12,93 ± 0,2
160	23°	12,13 ± 0,2
200	24°	11,33 ± 0,2
250	25°	10,53 ± 0,2
320	26°	9,73 ± 0,2
400	27°	8,93 ± 0,2
500	28°	8,13 ± 0,2
640	29°	7,33 ± 0,2
800	30°	6,53 ± 0,2
1 000	31°	5,73 ± 0,2
1 200	32°	4,93 ± 0,2
1 600	33°	4,13 ± 0,2
2 000	34°	3,33 ± 0,2
2 500	35°	2,53 ± 0,2
3 200*)	36°	—

*) Rib completely removed.

Dimensions in millimetres



NOTES

- 1 Notched rail is adjacent to the cartridge windup gear.
- 2 Presence of notch 1 indicates 20 exposures.
Presence of notch 8 indicates 12 exposures.
Absence of notches 1 and 8 indicates other than 12 or 20 exposures.
Refer to cartridge label (use for 24 exposures).
- 3 See table 4 for listing of film identification notch codes.
- 4 Notching may produce 0,12 mm max. burr (in excess of dimensions shown in table 3).

Figure 5 — Film identification notching — 110-size cartridges

Table 3 — Identification notches (see figure 5)

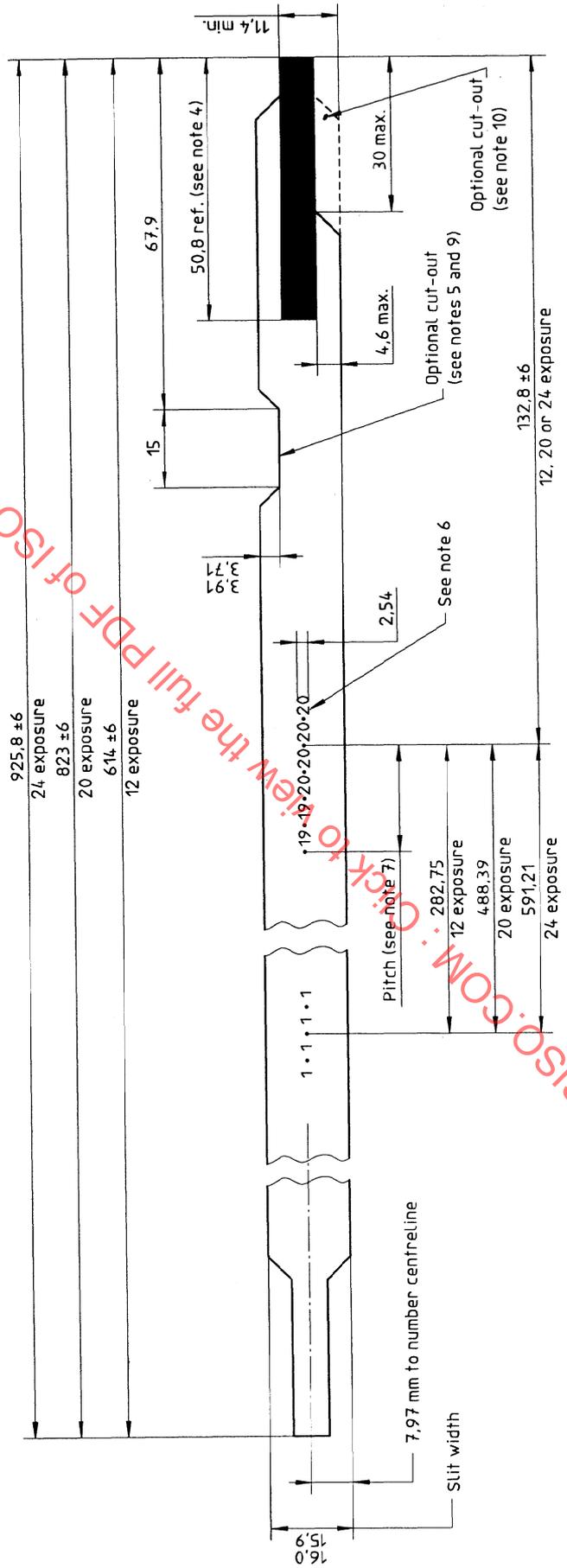
Symbol	Dimensions mm	
	min.	max.
<i>A</i>	2,54	3,18
<i>B</i>	4,45	5,08
<i>C</i>	5,08	5,72
<i>D</i>	6,98	7,62
<i>E</i>	7,62	8,26
<i>F</i>	9,52	10,16
<i>G</i>	10,16	10,80
<i>H</i>	12,06	12,70
<i>J</i>	12,70	13,34
<i>K</i>	14,60	15,24
<i>L</i>	15,24	15,88
<i>M</i>	17,14	17,78
<i>N</i>	17,78	18,42
<i>P</i>	19,68	20,32
<i>Q</i>	20,32	20,96
<i>R</i>	22,22	22,86

Table 4 — Centreline of film identification notches
(see figure 5)

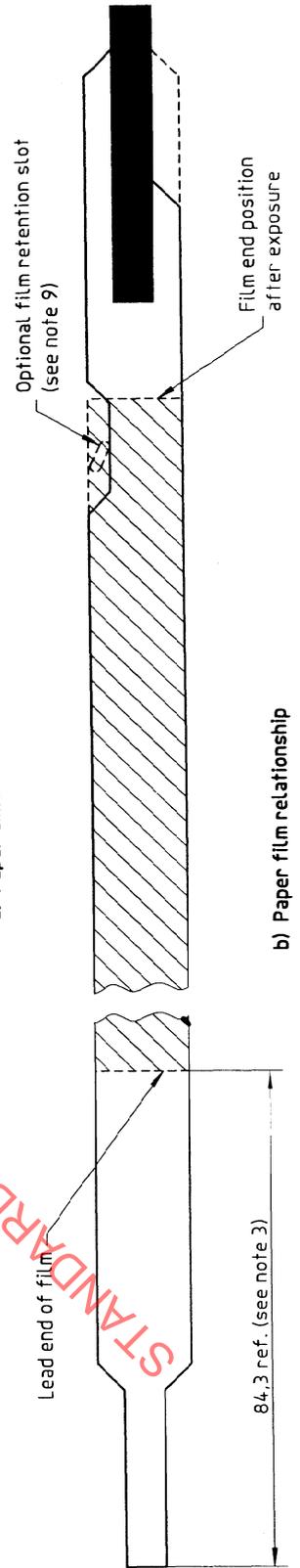
Notch	Centreline (nom.) mm
1	3,81
2	6,35
3	8,89
4	11,43
5	13,97
6	16,51
7	19,05
8	21,59

Dimensions in millimetres

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a) Paper dimensions



b) Paper film relationship

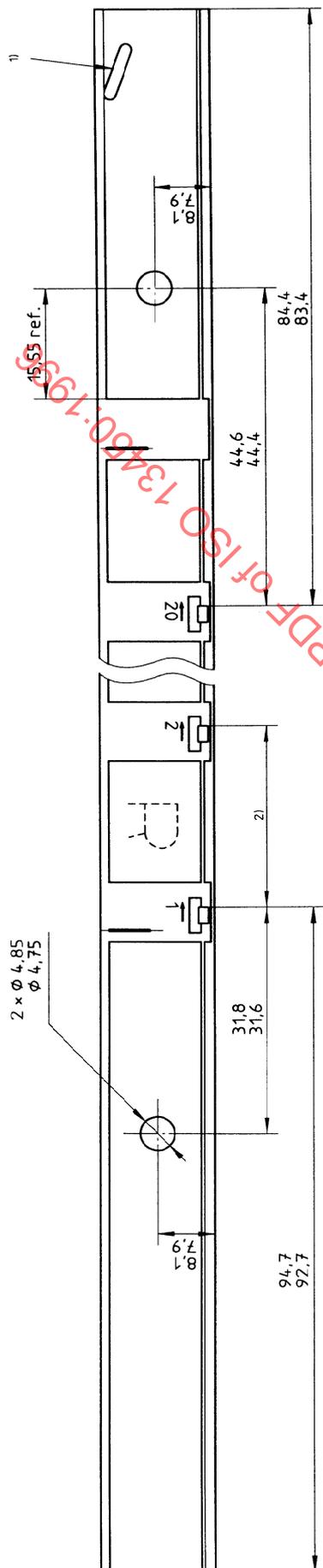
NOTES

- 1 Viewed from rear of camera.
- 2 Tolerance $\pm 1,0$ unless stated otherwise.
- 3 Frame number corresponding to exposure number shall appear in the camera window.
- 4 A black band or other identifier in the cartridge window indicates when the film is fully wound into the cartridge take-up chamber.
- 5 Optional cut-out provides access to film retention device if used (see note 9).
- 6 Number of numerals is optional.
- 7 Pitch 25,704 8 ref. based upon film thickness of 0,10 mm.
- 8 Paper tear strength shall be sufficient to permit removal of paper and film from the take-up chamber (by pulling on the paper trailer).
- 9 Film retention slot, if used, shall fall within optional cut-out after exposure.
- 10 Optional cut-out reduces incidence of camera metering by paper trailer.

Figure 6 — Paper format

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Dimensions in millimetres



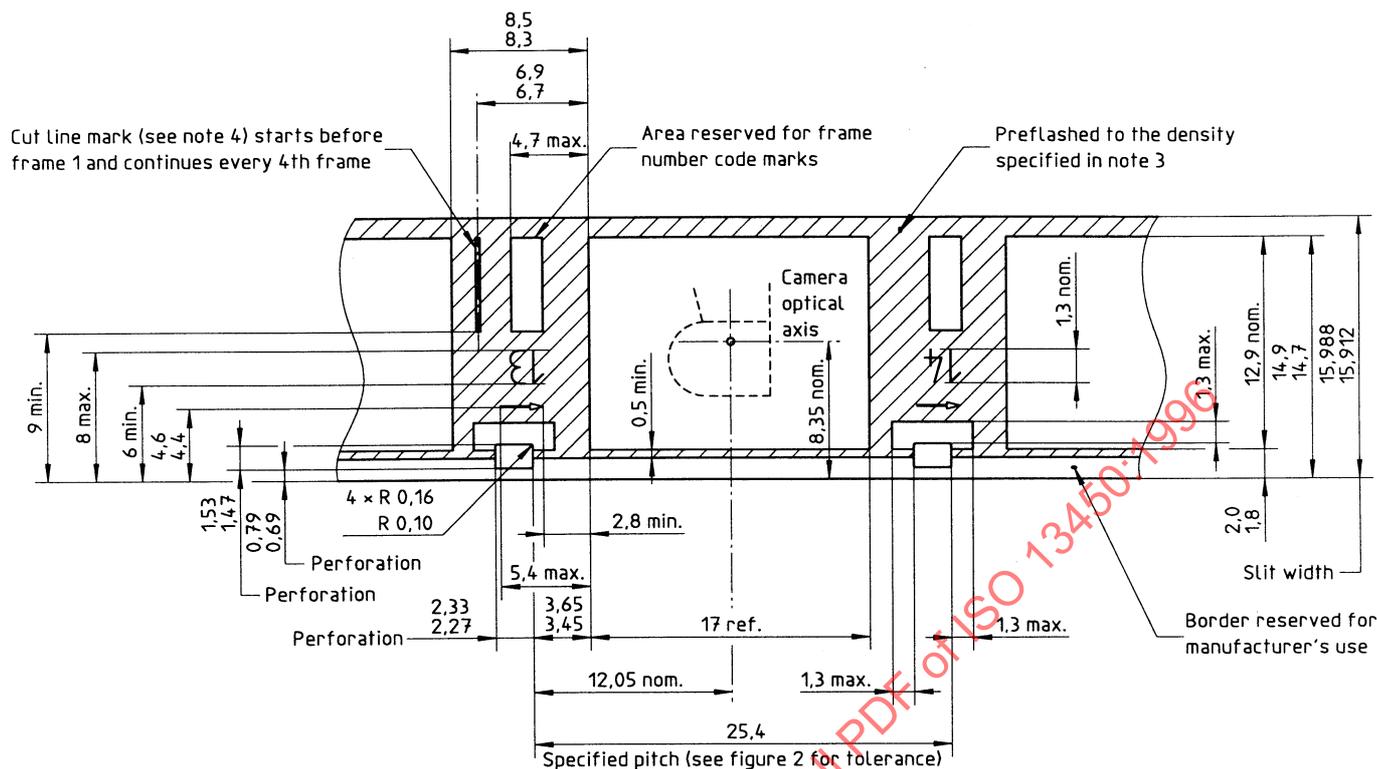
- 1) Optional for film retention:
Perforation at 20° angle nom.
Width 1,7 mm to 1,9 mm
Length 8,2 mm to 8,4 mm
- 2) The specified pitch is 25,4 mm. Pitch measurements over any number of pitches shall be within 0,1 mm of the specified pitch when measured at time of perforating.

NOTES

- 1 Viewed from support side as film goes through camera.
- 2 Negative format illustrated.
- 3 Total film length for 24 exposures 760 mm to 764 mm.
Total film length for 20 exposures 658 mm to 662 mm.
Total film length for 12 exposures 455 mm to 459 mm.
- 4 A path throughout the entire length of film 4,85 mm wide and in line with 4,80 mm diameter holes should not be violated with other holes of any type.

Figure 7 — Film format

Dimensions in millimetres



NOTES

- 1 Viewed from support side of film.
- 2 Image area shall be projected through printing mask and show on print: 15,80 mm by 12,00 mm based upon camera 19,30 mm by 13,50 mm and camera positioning tol. $\pm 1,15$ mm.
- 3 Film is preflashed to ISO status M diffuse blue, green and red densities not less than 0,8 above D_{\min} , measured with a densitometer complying with the geometric conditions specified in ISO 5-2 for diffuse density and with spectral conditions specified in ISO 5-3 for status M densities.
- 4 Cut line width 0,075 mm to 0,175 mm.

Figure 8 — Negative film format