42

INTERNATIONAL STANDARD ISO 3029

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Photography — Dimensions of 126-size cartridges, film and backing paper

Photographie — Dimensions des chargeurs, du film et du papier protecteur pour le format 126

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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.

International Standard ISO 3029 was drawn up by Technical Committee ISO/TC 42, *Photography*, and circulated to the Member Bodies in February 1974.

It has been approved by the Member Bodies of the following countries :

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Bulgaria	Japan	Turkey
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Germany	Switzerland	U.S.S.R.

No Member Body expressed disapproval of the document.

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Eastman Kodak Company
Patent Department
343 State Street
Rochester
NEW YORK 14650
U.S.A.

Photography — Dimensions of 126-size cartridges, film and backing paper

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the dimensions of 126-size cartridges, film and backing paper. Most cartridge dimensions are given with respect to datum planes which are coincident with the surfaces that engage mating camera parts in such a way as to ensure proper alignment of the cartridge in the camera. The dimensions and characteristics of the cartridge and spool are specified in figure 1 and tables 1 and 2, while those for the film and backing paper are given in clause 5 and figures 3 and 4. Certain desirable camera characteristics are given, for guidance, in annex A.

This International Standard also specifies the dimensions and location of two sets of cartridge notches. One set of notches, referred to in figures 1 and 3 and table 2, enables the cartridge manufacturer to incorporate the specific notch which corresponds to the ISO speed or meter setting of the particular film in the cartridge. This notch automatically presets some cameras to this film speed. The other set of notches is referred to in clause 4, figure 2 and table 3. One or more of these notches in combination represent a notch combination code number of table 4 and may be incorporated by the cartridge manufacturer to provide a means for film processors to identify the film. Assignment of such a code number to a specific film product is made at the request of the film manufacturer.

Neither the assignment nor incorporation of film identification notches for particular film products is required by this International Standard. However, the procedure to be followed by film manufacturers in obtaining code numbers is given in annex B. The registration function is performed, under authorization from ISO, by the National Association of Photographic Manufacturers, whose address is :

National Association of Photographic Manufacturers, Inc.
600 Mamaroneck Avenue
Harrison
NEW YORK 10528
U.S.A.

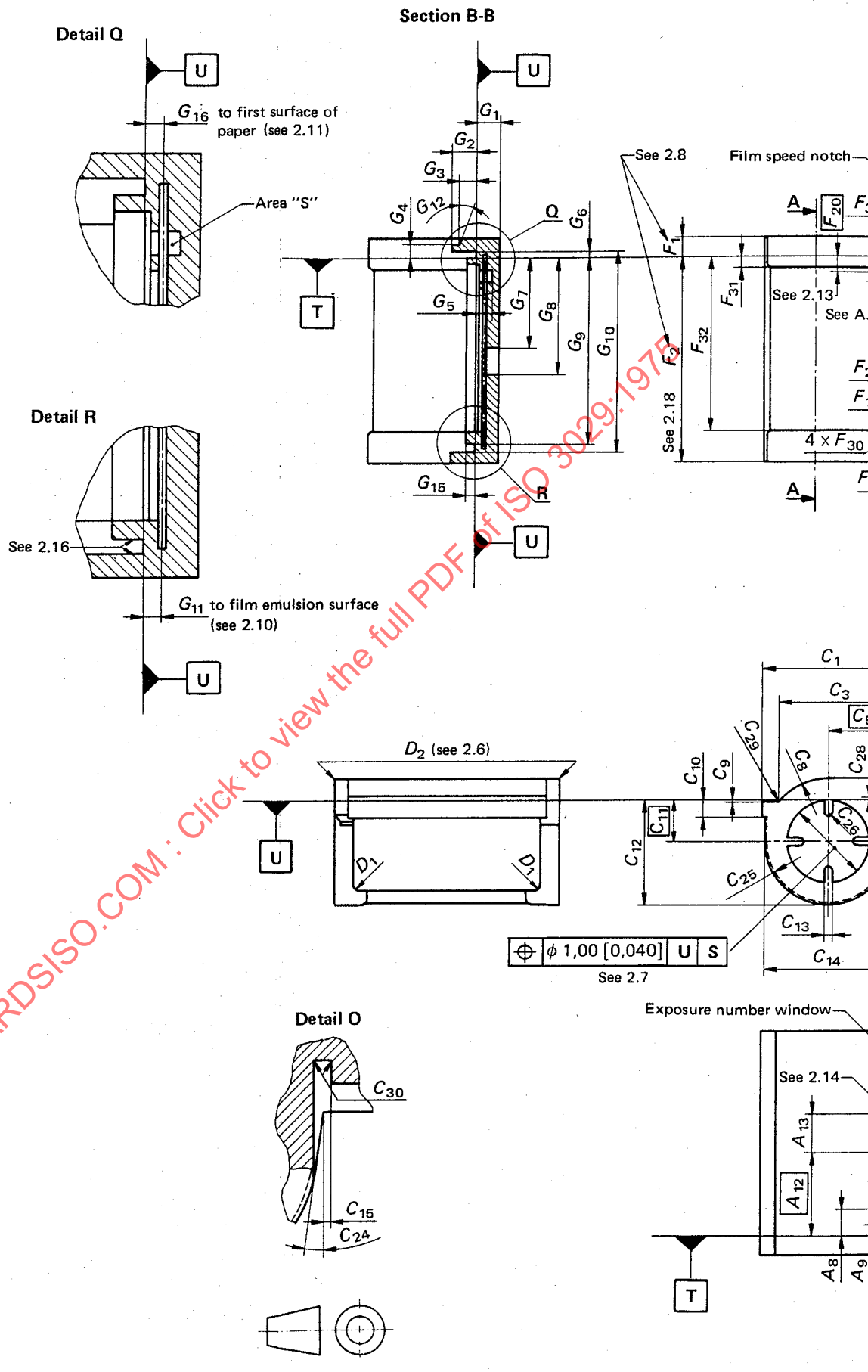


FIGURE 1 — **Cartridge and spool**

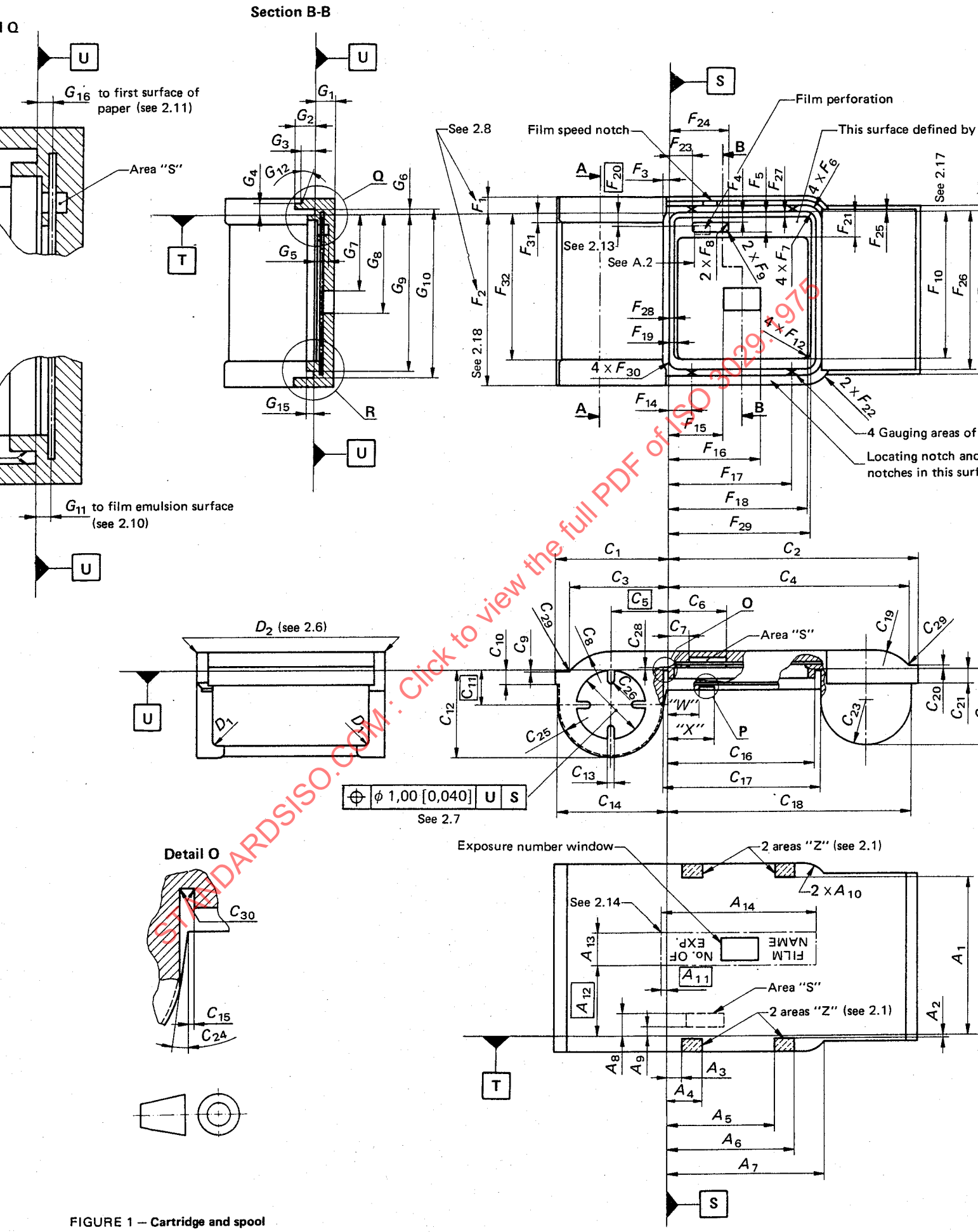
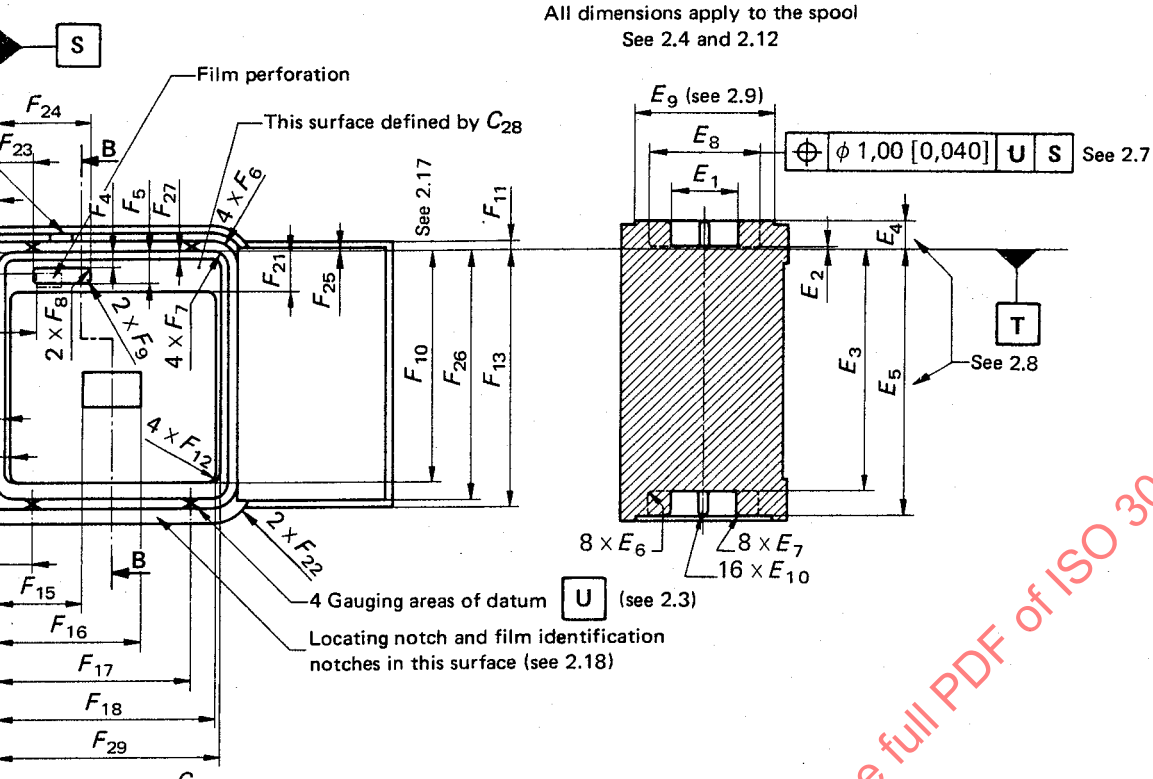
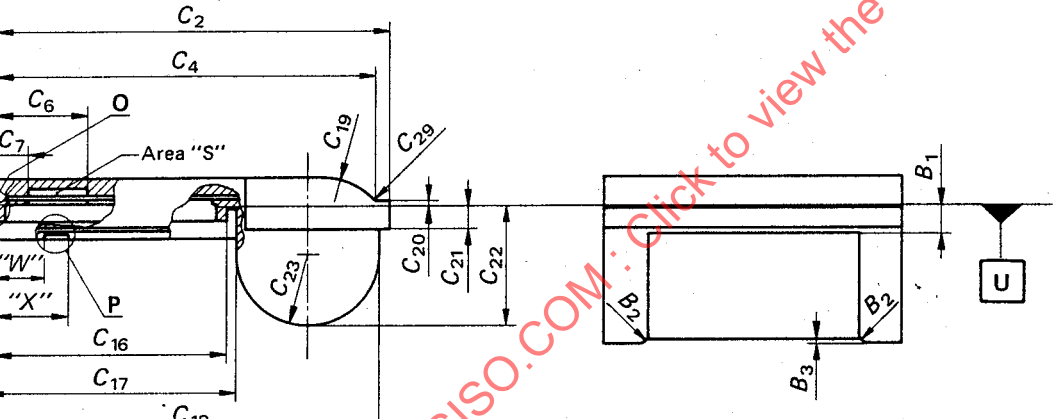


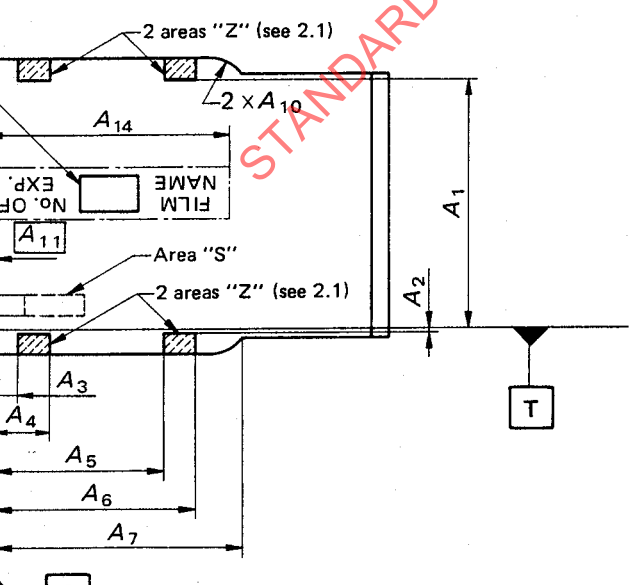
FIGURE 1 — **Cartridge and spool**

Section A-A

All dimensions apply to the spool
See 2.4 and 2.12







Detail P

Film speed notch

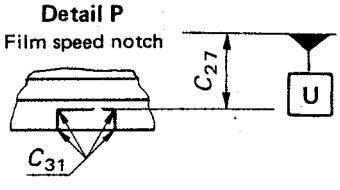


TABLE 1 — **Cartridge and spool dimensions**

Dimension	Millimetres		Inches	
	min.	max.	min.	max.
A_1	39,37		1.550	
A_2	1,78		0.070	
A_3		5,08		0.200
A_4	8,89		0.350	
A_5		26,16		1.030
A_6	30,73		1.210	
A_7		38,35		1.510
A_8	5,59		0.220	
A_9		3,30		0.130
A_{10} radius	6,48		0.255	
A_{11}*	1,14		0.045	
A_{12}*	17,91		0.705	
A_{13} see 2.14		7,11		0.280
A_{14} see 2.14		38,10		1.500
B_1		4,32		0.170
B_2 radius	0,51		0.020	
B_3	0,25		0.010	
C_1		27,33		1.076
C_2		60,96		2.400
C_3		25,15		0.990
C_4		58,42		2.300
C_5*	13,97		0.550	
C_6	14,30		0.563	
C_7		4,06		0.160
C_8 radius	12,45		0.490	
C_9	0.00		0.000	
C_{10}		3,81		0.150
C_{11}*	8,53		0.336	
C_{12}		21,46		0.845
C_{13}	1,14	1,40	0.045	0.055
C_{14}		26,92		1.060
C_{15}	0,89		0.035	
C_{16}	35,41	35,66	1.394	1.404
C_{17}	38,68		1.523	
C_{18}		59,79		2.354
C_{19} radius	10,80		0.425	
C_{20}		0,76		0.030
C_{21}		3,81		0.150
C_{22}		18,54		0.730
C_{23} radius	10,80		0.425	
C_{24} degrees	4°		4°	
C_{25}	see 2.5			
C_{26} radius		1/2 width		1/2 width
C_{27}		3,68		0.145
C_{28}	0,03		0.001	
C_{29} radius		1,52		0.060
C_{30} radius		0,08		0.003
C_{31} radius		0,25		0.010
D_1 radius	0,51		0.020	
D_2 radius see 2.6		1,52		0.060
E_1 diameter	10,29	10,64	0.405	0.419
E_2		0,76		0.030
E_3		38,10		1.500

Dimension	Millimetres		Inches	
	min.	max.	min.	max.
E_4	3,25	4,27	0.128	0.168
E_5	40,39	41,40	1.590	1.630
E_6 radius		0,38		0.015
E_7 radius		0,64		0.025
E_8 diameter	16,51		0.650	
E_9 diameter		2 X radius C_{25}		2 X radius C_{25}
E_{10} radius		0,25		0.010
F_1		3,81		0.150
F_2 see 2.18		41,40		1.630
F_3	1,37	1,47	0.054	0.058
F_4		2,41		0.095
F_5	5,18		0.204	
F_6 radius		4,44		0.175
F_7 radius	3,18		0.125	
F_8 radius		1,65		0.065
F_9 radius		0,13		0.005
F_{10} see 2.17	35,05	35,46	1.380	1.396
F_{11}		1,27		0.050
F_{12} radius		1,27		0.050
F_{13}		38,86		1.530
F_{14}	4,88	5,89	0.192	0.232
F_{15}		13,84		0.545
F_{16}	21,72		0.855	
F_{17}	30,05	30,81	1.183	1.213
F_{18}	33,60	33,96	1.323	1.337
F_{19}	1,90	2,16	0.075	0.085
F_{20}* see 2.13	3,18		0.125	
F_{21}	6,20	6,60	0.244	0.260
F_{22} radius		0,76		0.030
F_{23}		4,06		0.160
F_{24}	14,30		0.563	
F_{25}		0,51		0.020
F_{26}		37,85		1.490
F_{27}		1,52		0.060
F_{28}		1,52		0.060
F_{29}	34,29		1.350	
F_{30} radius		1,27		0.050
F_{31}		2,29		0.090
F_{32}	35,05		1.380	
G_1	4,32	4,83	0.170	0.190
G_2	4,57	4,83	0.180	0.190
G_3	3,30	3,81	0.130	0.150
G_4	2,54	3,05	0.100	0.120
G_5	3,56		0.140	
G_6	1,37	1,47	0.054	0.058
G_7		19,30		0.760
G_8	23,62		0.930	
G_9	36,93	37,19	1.454	1.464
G_{10}	40,26		1.585	
G_{11} nominal	1,45		0.057	
G_{12} degrees	20°		20°	
G_{15}	1,40	1,65	0.055	0.065
G_{16}		1,98		0.078

* Basic or true position dimension.

2 DIMENSIONS AND CHARACTERISTICS OF CARTRIDGE AND SPOOL

2.1 All dimensions apply when the cartridge, assembled with a film load, is seated on datum U and loaded with a force of 2,224 N (227 gf; 8 ozf) applied to each of the areas "Z". These four areas are camera-pressure areas and gauging-pressure areas. They do not represent the physical dimensions of pads which may be moulded in the cartridge.

2.2 As a help in visualizing the minimum space with needs to be reserved in cameras for the cartridge, all cartridge diagrams have been drawn employing the particular contours which result in a cartridge of maximum profile (see also 2.8).

2.3 For quality control purposes, the four areas of datum U are used for gauging the dimensions of the cartridge.

2.4 Figure 1 shows the spool or core, on which the film is wound, pushed to the uppermost limit in the cartridge.

2.5 The radius C_{25} should be a single radius tangential to each of two planes, determined respectively by C_{14} maximum and C_{12} maximum, and the intersection of two other planes, determined respectively by G_2 maximum and the sum of C_{15} minimum and C_{24} minimum.

2.6 The radius D_2 applies only at the four areas "Z".

2.7 The axis of diameter E_8 (see figure 1) should be capable of meeting its true position (as defined by C_5 and C_{11}).

2.8 Although the spool may extend beyond the cartridge housing when pushed in either direction, the sum of E_4 and E_5 should be so selected that the total spool length will be capable of being completely contained within the cartridge housing dimension $F_1 + F_2$. It is important that the spool can shift freely to be contained in the cartridge housing.

2.9 Dimension E_9 represents the theoretical maximum spool flange diameter.

2.10 G_{11}, 1,45 mm (0.057 in), is a nominal dimension from the gauging area of datum U to the film emulsion surface plane and 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 customers. Throughout the expected useful life of the film, the dimension G_{11} represents the aim value for the film emulsion surface throughout the cartridge aperture. 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 by manufacturers of film-loaded cartridges is an important quality consideration.

2.11 G_{16}, 1,98 mm (0.078 in), is the maximum dimension from the gauging area of datum U to the non-deflected first surface (black side, i.e. side contiguous with the film surface opposite the emulsion surface) of the backing paper within "Area S."

2.12 The take-up core diameter should be 11,81 mm (0.465 in) minimum.

2.13 "Film weave" should not exceed ± 0,51 mm (± 0.020 in) of the true position measured at a perforation as shown.

2.14 If film data, such as film name and number of exposures in load, are to be provided, they should be within the area shown.

2.15 Film-loaded cartridges should require no more than 50×10^{-3} N·m[1] (7 ozf·in) of torque to sustain film advance and no more than 85×10^{-3} N·m (12 ozf·in) of torque to overcome momentary torque peaks; torques specified refer to measurements at the cartridge spool. Torque peaks may occur as a leading or trailing end of the film leaves the supply chamber of a cartridge and at each initiation of film movement. It is also important to note that torque measurement may be significantly affected by the age of the film and by severe jarring of the cartridge which might tend to clockspring the scroll of film against the cavity wall. Thus, simulated customer conditions should be taken into account when checking maximum torque (see also annex A).

2.16 The two sets of dimensions, C_{16} and C_{17} together with G_9 and G_{10}, describe the sides or walls of a rectangular channel which mates with a rail in the camera. Although the surfaces are shown as completely planar, they may be slightly depressed or relieved except in the four gauging areas. The tops of the resulting kinematic pips, or protrusions, however, should observe the dimensional limits.

2.17 Dimension F_{10} designates the wall nearest datum T of one side of a rectangular rail whose surface, although shown completely planar, may be stepped or chamfered, if desired.

2.18 The outside edge or wall of the rail containing the film-locating notch and identification notches is described by dimension F_2. This surface, although shown completely planar, may be stepped or chamfered similar to the cross-section of the film speed rail, if desired.

1) The newton metre (N·m) is a derived unit of the SI system of measurement used to express torque.

3 LOCATION OF FILM SPEED NOTCHES

A film speed notch corresponding to the ISO speed or meter setting of the film in the cartridge shall be incorporated and located in the cartridge as specified in figure 1 and table 2.

TABLE 2 – **Film speed notches**

Notch position	Dimension "*W*" ± 0,33 mm (± 0.013 in)		Dimension "*X*" ± 0,33 mm (± 0.013 in)		ISO speed in 1/3 stop increments	
	mm	in	mm	in	ASA	
1	1,45	0.057	5,41	0.213		8
2	2,39	0.094	6,35	0.250	10	
3	3,33	0.131	7,29	0.287		12
4	4,27	0.168	8,23	0.324		16
5	5,21	0.205	9,17	0.361	20	
6	6,15	0.242	10,11	0.398		25
7	7,09	0.279	11,05	0.435		32
8	8,03	0.316	11,99	0.472	40	
9	8,97	0.353	12,93	0.509		50
10	9,91	0.390	13,87	0.546		64
11	10,85	0.427	14,81	0.583	80	
12	11,79	0.464	15,75	0.620		100
13	12,73	0.501	16,69	0.657		125
14	13,67	0.538	17,63	0.694	160	
15	14,60	0.575	18,57	0.731		200
16	15,54	0.612	19,51	0.768		250
17	16,48	0.649	20,45	0.805	320	
18	17,42	0.686	21,39	0.842		400
19	18,36	0.723	22,33	0.879		500
20	19,30	0.760	23,27	0.916	650	
21	20,24	0.797	24,21	0.953		800
22	21,18	0.834	25,15	0.990		1 000
23	22,12	0.871	26,09	1.027	1 250	
24	23,06	0.908	27,03	1.064		1 600
25	24,00	0.945	27,97	1.101		2 000
26	24,94	0.982	28,91	1.138	2 500	
27	25,88	1.019	29,84	1.175		3 200
28	26,82	1.056	30,78	1.212		4 000
29	27,76	1.093	31,72	1.249	5 000	
30	28,70	1.130	32,66	1.286		6 500
31	29,64	1.167	33,60	1.323		8 000

4 LOCATION AND NUMBERING OF FILM IDENTIFICATION NOTCHES AND ASSIGNMENT OF NOTCH COMBINATION CODE NUMBERS

Film identification notches, if utilized, shall be located in accordance with figure 2 and table 3, but only in accordance with the specific notch combination code number of table 4 assigned to the film product under the procedure specified in annex B.

4.1 The dimensions of the film identification notches are measured from a reference edge of a locating notch (see dimension *Z*), 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. The reference edge of the location notch, in turn, is measured (dimension *X*) from datum S.

4.2 The minimum notch depth, dimension *Y*, applies to all film identification notch locations and to the locating notch.

4.3 The dimensions 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 intentionally is not restricted by the dimensions given in table 3, but attention is called to the fact than any partition should be of sufficient width to withstand normal handling without breaking.

4.4 The film identification notch locations are numbered 1 to 8 from the locating notch for convenience in assigning combinations of notches.

4.5 For convenience in referring to the 255 possible notch combinations, they are systematically arranged by code number, as shown in table 4.

TABLE 3 — **Film identification notches**

Dimension	Millimetres		Inches	
	min.	max.	min.	max.
A	2,06	2,82	0.081	0.111
B	4,09	5,00	0.161	0.197
C	5,00	5,92	1.197	0.233
D	7,19	8,10	0.283	0.319
E	8,10	9,02	0.319	0.355
F	10,29	11,20	0.405	0.441
G	11,20	12,12	0.441	0.477
H	13,39	14,30	0.527	0.563
I	14,30	15,21	0.563	0.599
J	16,48	17,40	0.649	0.685
K	17,40	18,31	0.685	0.721
L	19,58	20,50	0.771	0.807
M	20,50	21,41	0.807	0.843
N	22,68	23,60	0.893	0.929
O	23,60	24,51	0.929	0.965
P	25,78	26,54	1.015	1.045
X	27,20	28,73	1.071	1.131
Y	0,76	—	0.030	—
Z	2,54	3,30	0.100	0.130

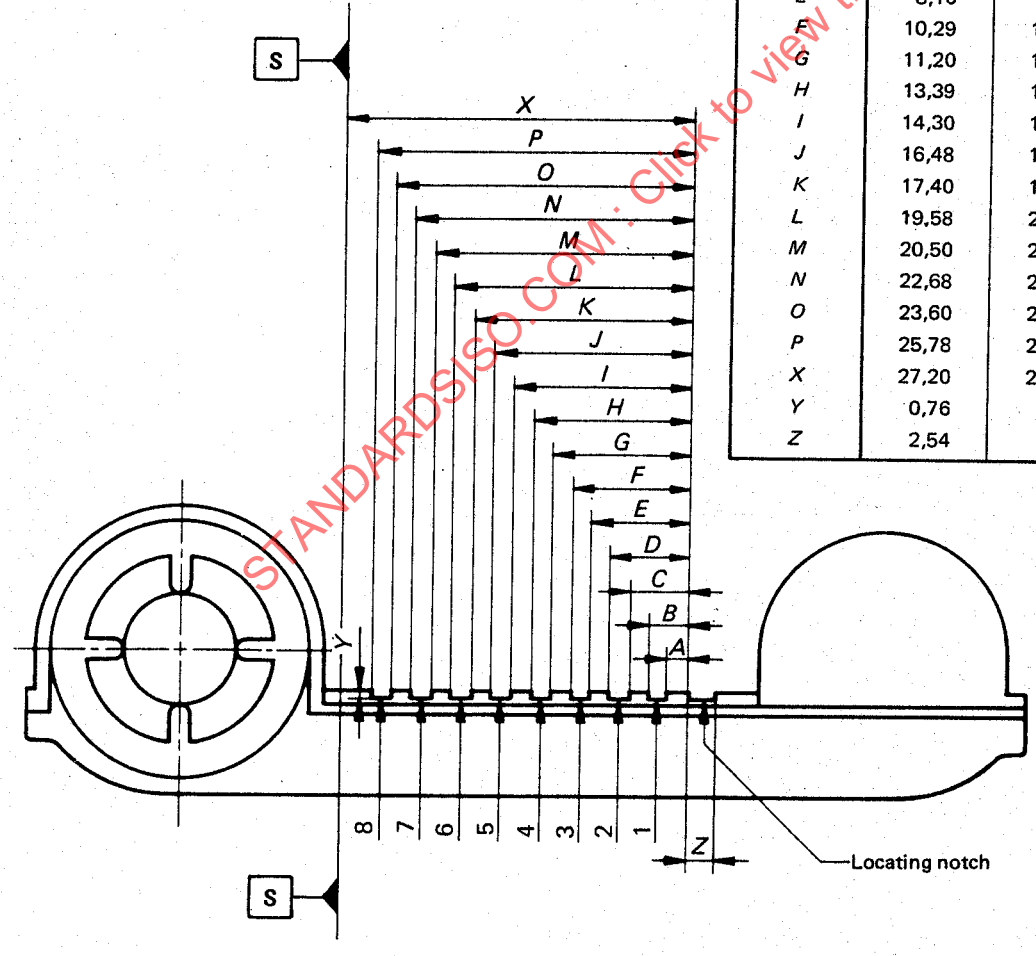


FIGURE 2 — **Film identification notches**

TABLE 4 — Film identification notch combinations

Notch combination code number	Notch location number 12345678
1*	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	12
10	23
11	34
12	45
13	56
14	67
15	78
16	1 3
17	2 4
18	3 5
19	4 6
20	5 7
21	6 8
22	1 4
23	2 5
24	3 6
25	4 7
26	5 8
27	1 5
28	2 6
29	3 7
30	4 8
31	1 6
32	2 7
33	3 8
34	1 7
35	2 8
36	1 8
37	123
38	234
39	345
40	456
41	567
42	678
43	12 4
44	23 5
45	34 6
46	45 7
47	56 8
48	12 5
49	23 6
50	34 7
51	45 8
52	12 6
53	23 7
54	34 8
55	12 7
56	23 8
57	12 8
58	1 34
59	2 45
60	3 56
61	4 67
62	5 78
63	1 3 5
64	2 4 6
65	3 5 7
66	4 6 8
67	1 3 6
68	2 4 7
69	3 5 8
70	1 3 7
71	2 4 8
72	1 3 8
73	1 45
74	2 56
75	3 67
76	4 78
77	1 4 6
78	2 5 7
79	3 6 8
80	1 4 7
81	2 5 8
82	1 4 8
83	1 56
84	2 67
85	3 78
86	1 5 7
87	2 6 8
88	1 5 8
89	1 67
90	2 78
91	1 6 8
92	1 78
93	1234
94	2345
95	3456
96	4567
97	5678
98	123 5
99	234 6
100	345 7
101	456 8
102	123 6
103	234 7
104	345 8
105	123 7
106	234 8
107	123 8
108	12 45
109	23 56
110	34 67
111	45 78
112	12 4 6
113	23 5 7
114	34 6 8
115	12 4 7
116	23 5 8
117	12 4 8
118	12 56
119	23 67
120	34 78
121	12 5 7
122	23 6 8
123	12 5 8
124	12 67
125	23 78
126	12 6 8
127	12 78
128	1 345
129	2 456
130	3 567
131	4 678
132	1 34 6
133	2 45 7
134	3 56 8
135	1 34 7
136	2 45 8
137	1 34 8
138	1 3 56
139	2 4 67
140	3 5 78
141	1 3 5 7
142	2 4 6 8
143	1 3 5 8
144	1 3 67
145	2 4 78
146	1 3 6 8
147	1 3 78
148	1 456
149	2 567
150	3 678
151	1 45 7
152	2 56 8
153	1 45 8
154	1 4 67
155	2 5 78
156	1 4 6 8
157	1 4 78
158	1 567
159	2 678
160	1 56 8
161	1 5 78
162	1 678
163	12345
164	23456
165	34567
166	45678
167	1234 6
168	2345 7
169	3456 8
170	1234 7
171	2345 8
172	1234 8
173	123 56
174	234 67
175	345 78
176	123 5 7
177	234 6 8
178	123 5 8
179	123 67
180	234 78
181	123 6 8
182	123 78
183	12 456
184	23 567
185	34 678
186	12 45 7
187	23 56 8
188	12 45 8
189	12 4 67
190	23 5 78
191	12 4 6 8
192	12 4 78
193	12 567
194	23 678
195	12 56 8
196	12 5 78
197	12 678
198	1 3456
199	2 4567
200	3 5678
201	1 345 7
202	2 456 8
203	1 345 8
204	1 34 67
205	2 45 78
206	1 34 6 8
207	1 34 78
208	1 3 567
209	2 4 678
210	1 3 56 8
211	1 3 5 78
212	1 3 678
213	1 4567
214	2 5678
215	1 456 8
216	1 45 78
217	1 4 678
218	1 5678
219	123456
220	234567
221	345678
222	12345 7
223	23456 8
224	12345 8
225	1234 67
226	2345 78
227	1234 6 8
228	1234 78
229	123 567
230	234 678
231	123 56 8
232	123 5 78
233	123 678
234	12 4567
235	23 5678
236	12 456 8
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238	12 4 678
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240	1 34567
241	2 45678
242	1 3456 8
243	1 345 78
244	1 34 678
245	1 3 5678
246	1 45678
247	1234567
248	2345678
249	123456 8
250	12345 78
251	1234 678
252	123 5678
253	12 45678
254	1 345678
255	12345678

* Code number 1 is available for use, without registration, to identify general purpose black-and-white negative films which can be processed satisfactorily in a universal process (see annex B).

5 DIMENSIONS AND CHARACTERISTICS OF FILM AND BACKING PAPER

5.1 Dimensions shown in figure 4 apply at time of manufacture.

5.2 The centre line of the paper perforation or equivalent hole should align in the cartridge gate with the centre line of the film perforation within ± 3,18 mm (± 0.125 in).

5.3 A greater range in the 14,2 mm (0.56 in)/15,2 mm (0.60 in) dimension (location of backing paper number's centre line) necessitates a reduction in the 4,1 mm (0.16 in) maximum numeral height.

5.4 Observe the film and backing paper leader and trailer dimensions plus the desired multiple of the film frame pitch dimension.

5.5 The preferred range for the width of the backing paper is 35,03 mm (1.379 in)/35,18 mm (1.385 in).

5.6 Deflection of backing paper. When held in such a way as to simulate the manner in which it would normally be held and restricted in the throat of a cartridge, unperforated backing paper should not deflect from the reference surface of the test cavity shown in figure 3 more than 0,89 mm (0.035 in) when a load of 1,4 N (142 gf; 5 ozf) is applied for 1 min by a pawl having a cross-section of 0,76 mm (0.030 in) by 3,18 mm (0.125 in) (see figure 3) under the conditions of 32 °C (90 °F) and 90 % relative humidity.

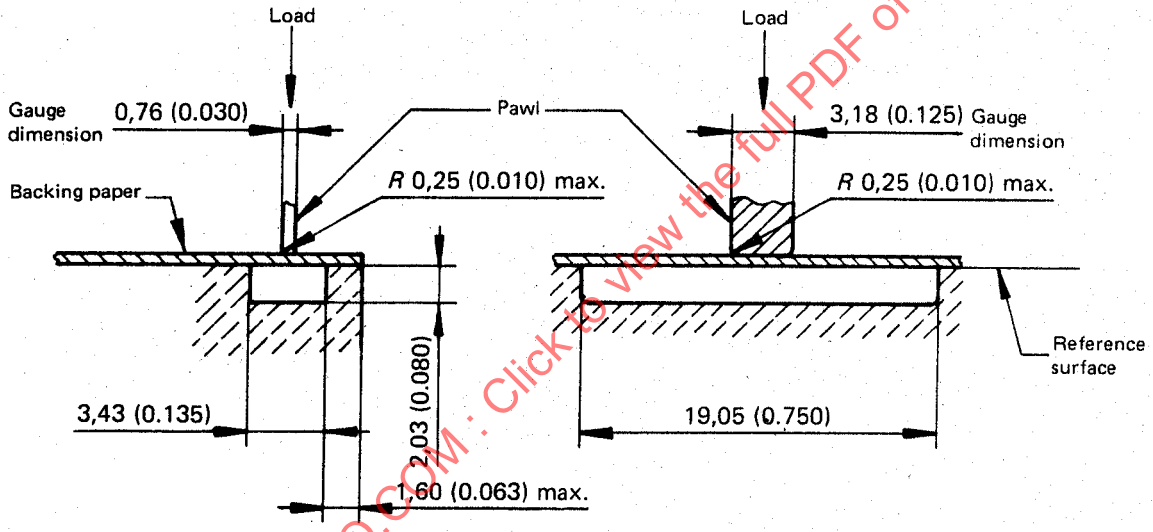
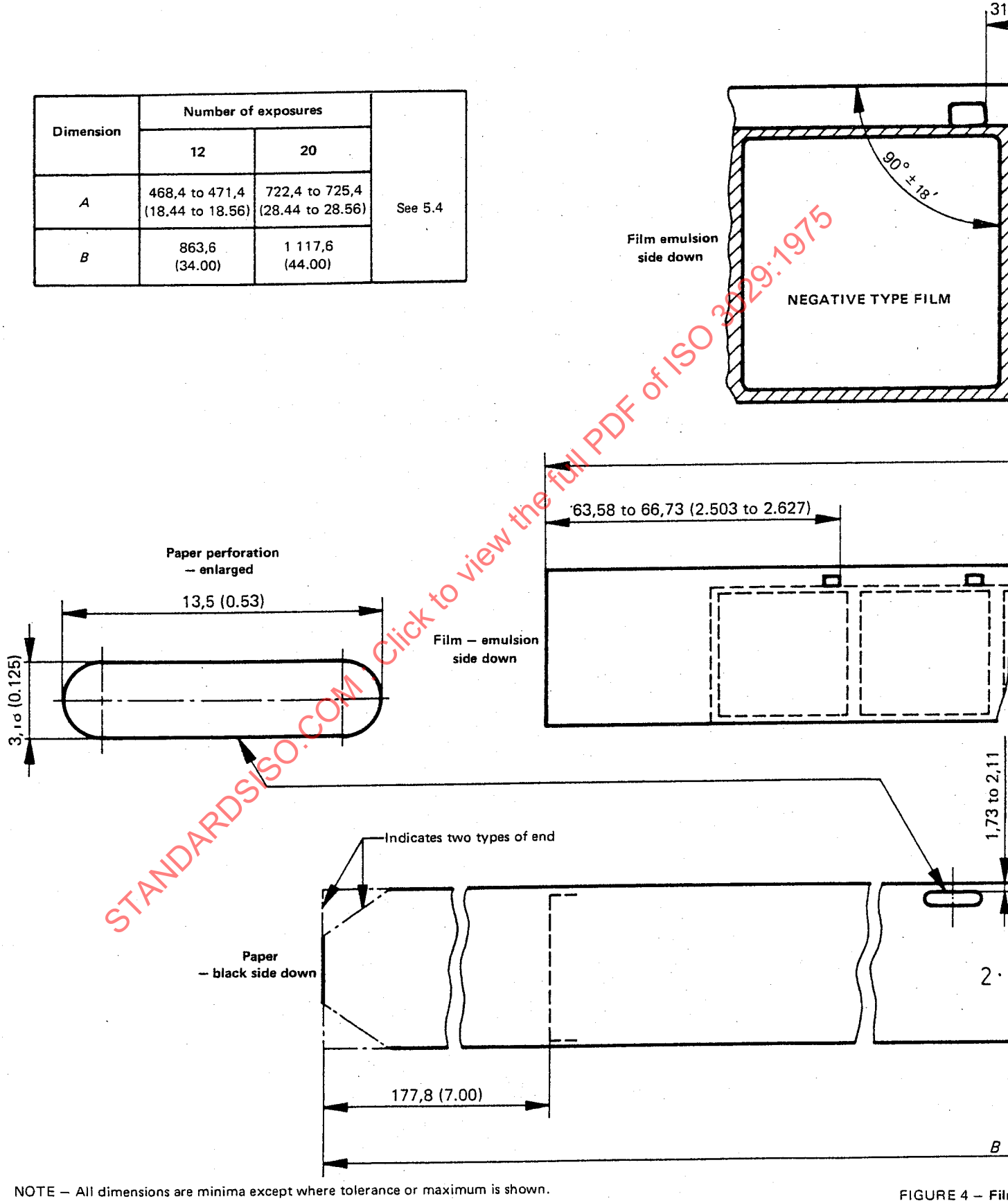


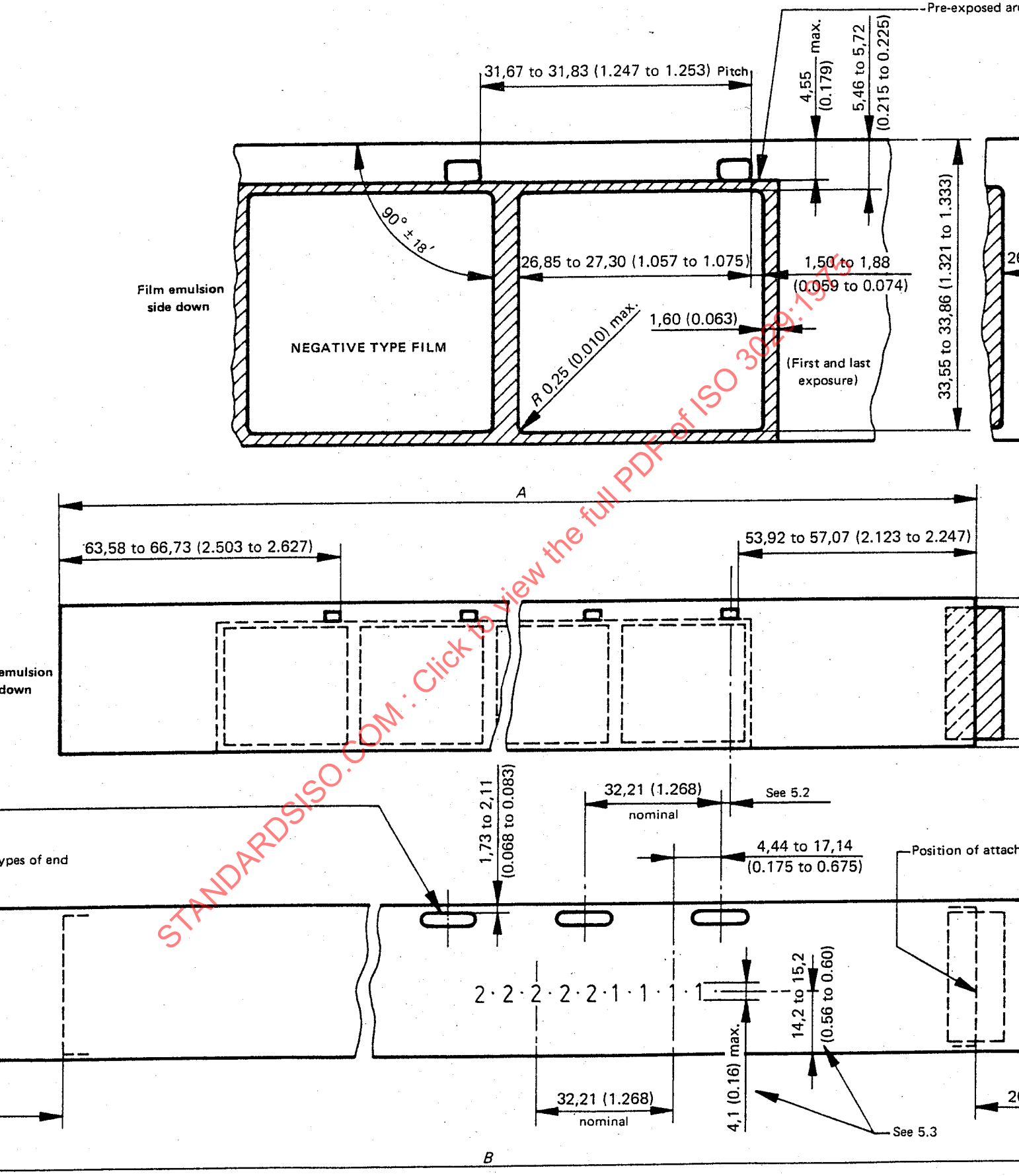
FIGURE 3 — **Test cavity**

Dimension	Number of exposures		
	12	20	
A	468,4 to 471,4 (18.44 to 18.56)	722,4 to 725,4 (28.44 to 28.56)	See 5.4
B	863,6 (34.00)	1 117,6 (44.00)	



NOTE – All dimensions are minima except where tolerance or maximum is shown.

FIGURE 4 – Fil



is shown.

FIGURE 4 — Film and backing paper