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INTERNATIONAL STANDARD



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:

Belgium	Italy	Thailand
Bulgaria	Japan	Turkey
Canada	Poland	United Kingdom
France	South Africa, Rep. of	U.S.A.
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.

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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.

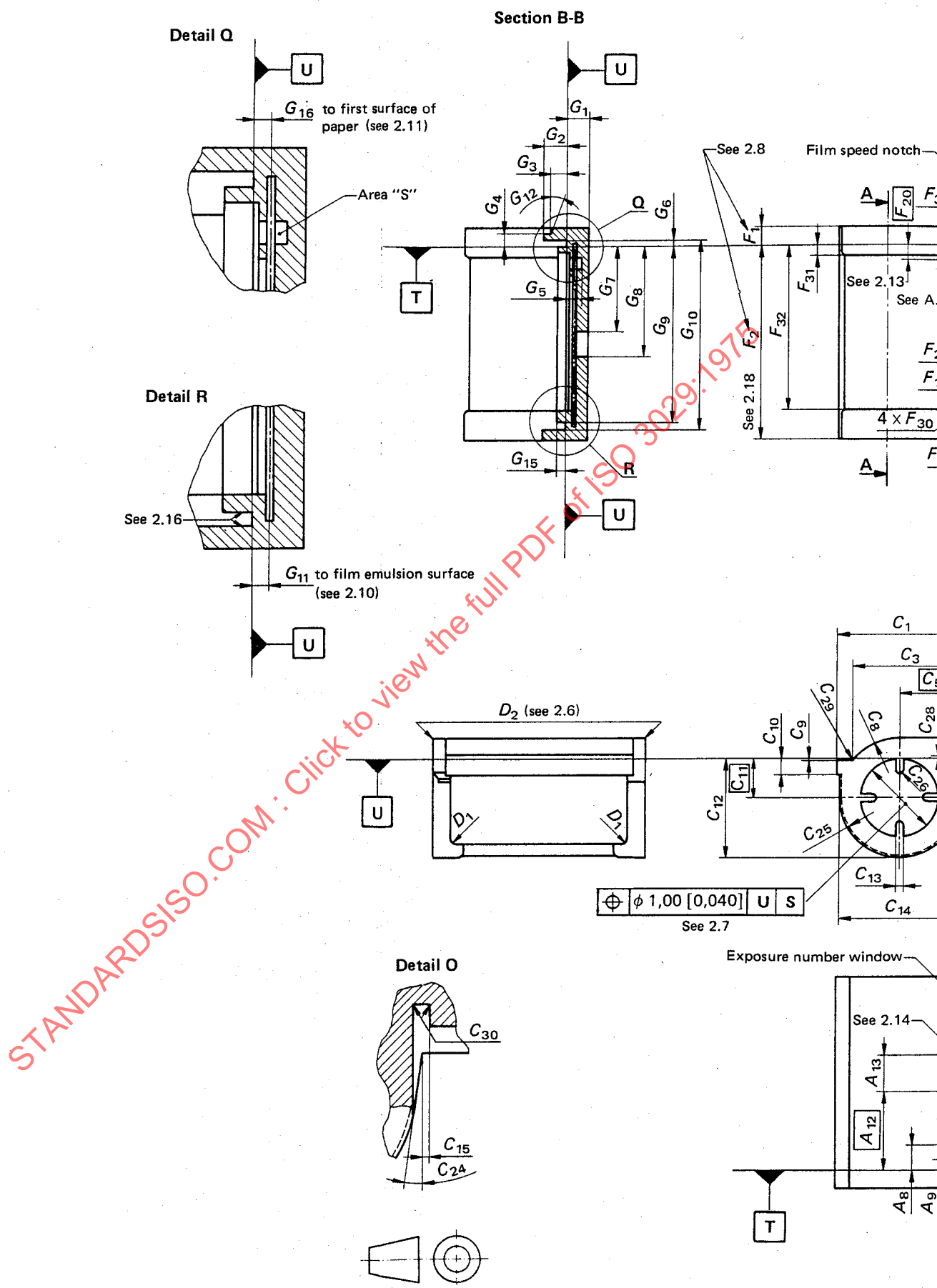


FIGURE 1 — Cartridge and spool

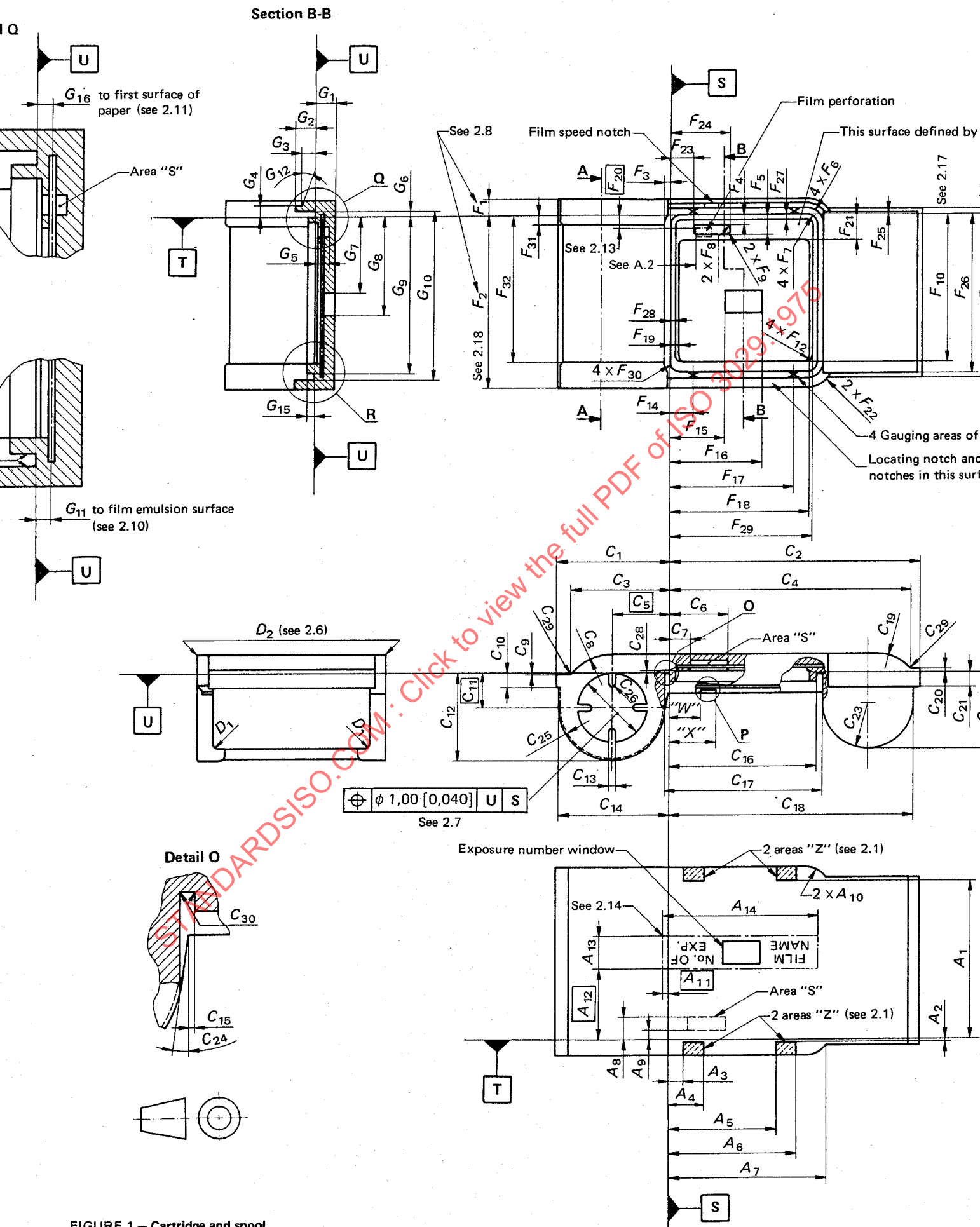


FIGURE 1 — Cartridge and spool

Section A-A

All dimensions apply to the spool
See 2.4 and 2.12

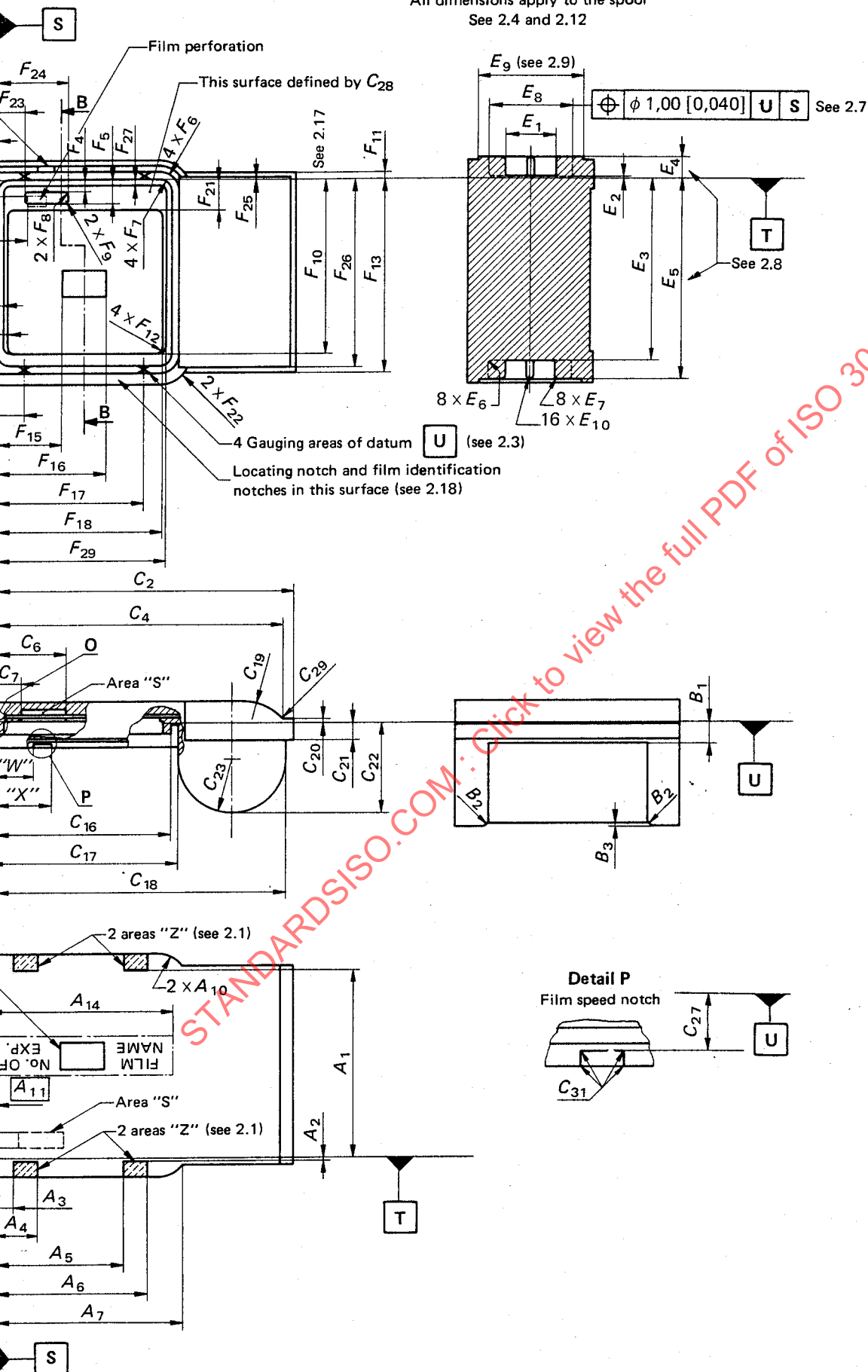


TABLE 1 — Cartridge and spool dimensions

Dimension	Millimetres		Inches		Dimension	Millimetres		Inches	
	min.	max.	min.	max.		min.	max.	min.	max.
A ₁	39,37		1.550		E ₄	3,25	4,27	0.128	0.168
A ₂	1,78		0.070		E ₅	40,39	41,40	1.590	1.630
A ₃		5,08		0.200	E ₆ radius		0,38		0.015
A ₄	8,89		0.350		E ₇ radius		0,64		0.025
A ₅		26,16		1.030	E ₈ diameter	16,51		0.650	
A ₆	30,73		1.210		E ₉ diameter		2 X radius		2 X radius
A ₇		38,35		1.510			C ₂₅		C ₂₅
A ₈	5,59		0.220		E ₁₀ radius		0,25		0.010
A ₉		3,30		0.130	F ₁		3,81		0.150
A ₁₀ radius	6,48		0.255		F ₂ see 2.18		41,40		1.630
A ₁₁ *		1,14		0.045	F ₃	1,37	1,47	0.054	0.058
A ₁₂ *		17,91		0.705	F ₄		2,41		0.095
A ₁₃ see 2.14		7,11		0.280	F ₅	5,18		0.204	
A ₁₄ see 2.14		38,10		1.500	F ₆ radius		4,44		0.175
B ₁		4,32		0.170	F ₇ radius		3,18	0.125	
B ₂ radius	0,51		0.020		F ₈ radius		1,65		0.065
B ₃	0,25		0.010		F ₉ radius		0,13		0.005
C ₁		27,33		1.076	F ₁₀ see 2.17	35,05	35,46	1.380	1.396
C ₂		60,96		2.400	F ₁₁		1,27		0.050
C ₃		25,15		0.990	F ₁₂ radius		1,27		0.050
C ₄		58,42		2.300	F ₁₃		38,86		1.530
C ₅ *		13,97		0.550	F ₁₄	4,88	5,89	0.192	0.232
C ₆	14,30		0.563		F ₁₅		13,84		0.545
C ₇		4,06		0.160	F ₁₆	21,72		0.855	
C ₈ radius	12,45		0.490		F ₁₇	30,05	30,81	1.183	1.213
C ₉	0,00		0.000		F ₁₈	33,60	33,96	1.323	1.337
C ₁₀		3,81		0.150	F ₁₉	1,90	2,16	0.075	0.085
C ₁₁ *		8,53		0.336	F ₂₀ * see 2.13		3,18		0.125
C ₁₂		21,46		0.845	F ₂₁	6,20	6,60	0.244	0.260
C ₁₃	1,14	1,40	0.045	0.055	F ₂₂ radius		0,76		0.030
C ₁₄		26,92		1.060	F ₂₃		4,06		0.160
C ₁₅	0,89		0.035		F ₂₄	14,30		0.563	
C ₁₆	35,41	35,66	1.394	1.404	F ₂₅		0,51		0.020
C ₁₇	38,68		1.523		F ₂₆		37,85		1.490
C ₁₈		59,79		2.354	F ₂₇		1,52		0.060
C ₁₉ radius	10,80		0.425		F ₂₈		1,52		0.060
C ₂₀		0,76		0.030	F ₂₉	34,29		1.350	
C ₂₁		3,81		0.150	F ₃₀ radius		1,27		0.050
C ₂₂		18,54		0.730	F ₃₁		2,29		0.090
C ₂₃ radius	10,80		0.425		F ₃₂	35,05		1.380	
C ₂₄ degrees	4°		4°		G ₁	4,32	4,83	0.170	0.190
C ₂₅		see 2.5			G ₂	4,57	4,83	0.180	0.190
C ₂₆ radius		1/2 width		1/2 width	G ₃	3,30	3,81	0.130	0.150
C ₂₇		3,68		0.145	G ₄	2,54	3,05	0.100	0.120
C ₂₈	0,03		0.001		G ₅	3,56		0.140	
C ₂₉ radius		1,52		0.060	G ₆	1,37	1,47	0.054	0.058
C ₃₀ radius		0,08		0.003	G ₇		19,30		0.760
C ₃₁ radius		0,25		0.010	G ₈	23,62		0.930	
D ₁ radius	0,51		0.020		G ₉	36,93	37,19	1.454	1.464
D ₂ radius		1,52		0.060	G ₁₀	40,26		1.585	
see 2.6					G ₁₁ nominal		1,45		0.057
E ₁ diameter	10,29	10,64	0.405	0.419	G ₁₂ degrees	20°		20°	
E ₂		0,76		0.030	G ₁₅	1,40	1,65	0.055	0.065
E ₃		38,10		1.500	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 $\pm 0,51$ 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 (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 that 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

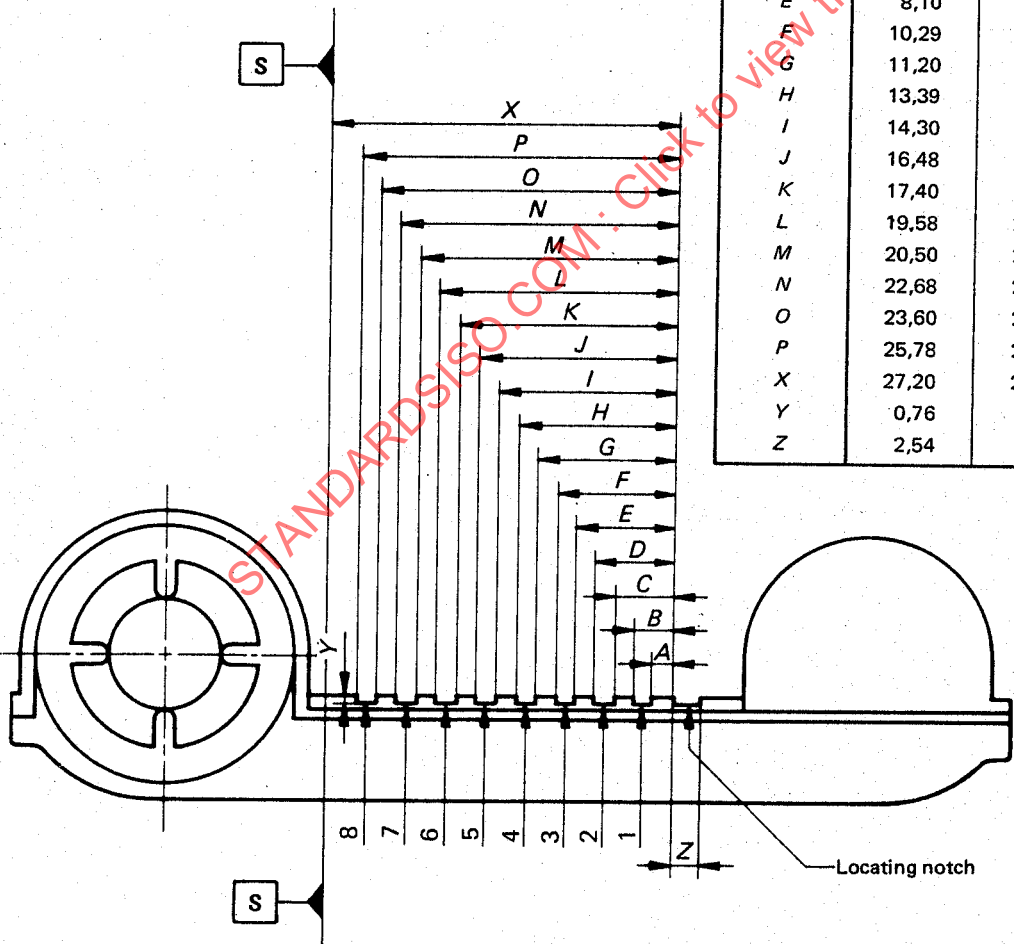


FIGURE 2 — Film identification notches

TABLE 4 — Film identification notch combinations

Notch combi- nation code number	Notch location number	Notch combi- nation code number	Notch location number	Notch combi- nation code number	Notch location number	Notch combi- nation code number	Notch location number	Notch combi- nation code number	Notch location number
	12345678		12345678		12345678		12345678		12345678
1*	1	52	12 6	103	234 7	154	1 4 67	205	2 45 78
2	2	53	23 7	104	345 8	155	2 5 78	206	1 34 6 8
3	3	54	34 8	105	123 7	156	1 4 6 8	207	1 34 78
4	4	55	12 7	106	234 8	157	1 4 78	208	1 3 567
5	5	56	23 8	107	123 8	158	1 567	209	2 4 678
6	6	57	12 8	108	12 45	159	2 678	210	1 3 56 8
7	7	58	1 34	109	23 56	160	1 56 8	211	1 3 5 78
8	8	59	2 45	110	34 67	161	1 5 78	212	1 3 678
9	12	60	3 56	111	45 78	162	1 678	213	1 4567
10	23	61	4 67	112	12 4 6	163	12345	214	2 5678
11	34	62	5 78	113	23 5 7	164	23456	215	1 456 8
12	45	63	1 3 5	114	34 6 8	165	34567	216	1 45 78
13	56	64	2 4 6	115	12 4 7	166	45678	217	1 4 678
14	67	65	3 5 7	116	23 5 8	167	1234 6	218	1 5678
15	78	66	4 6 8	117	12 4 8	168	2345 7	219	123456
16	1 3	67	1 3 6	118	12 56	169	3456 8	220	234567
17	2 4	68	2 4 7	119	23 67	170	1234 7	221	345678
18	3 5	69	3 5 8	120	34 78	171	2345 8	222	12345 7
19	4 6	70	1 3 7	121	12 5 7	172	1234 8	223	23456 8
20	5 7	71	2 4 8	122	23 6 8	173	123 56	224	12345 8
21	6 8	72	1 3 8	123	12 5 8	174	234 67	225	1234 67
22	1 4	73	1 45	124	12 67	175	345 78	226	2345 78
23	2 5	74	2 56	125	23 78	176	123 5 7	227	1234 6 8
24	3 6	75	3 67	126	12 6 8	177	234 6 8	228	1234 78
25	4 7	76	4 78	127	12 78	178	123 5 8	229	123 567
26	5 8	77	1 4 6	128	1 345	179	123 67	230	234 678
27	1 5	78	2 5 7	129	2 456	180	234 78	231	123 56 8
28	2 6	79	3 6 8	130	3 567	181	123 6 8	232	123 5 78
29	3 7	80	1 4 7	131	4 678	182	123 78	233	123 678
30	4 8	81	2 5 8	132	1 34 6	183	12 456	234	12 4567
31	1 6	82	1 4 8	133	2 45 7	184	23 567	235	23 5678
32	2 7	83	1 56	134	3 56 8	185	34 678	236	12 456 8
33	3 8	84	2 67	135	1 34 7	186	12 45 7	237	12 45 78
34	1 7	85	3 78	136	2 45 8	187	23 56 8	238	12 4 678
35	2 8	86	1 5 7	137	1 34 8	188	12 45 8	239	12 5678
36	1 8	87	2 6 8	138	1 3 56	189	12 4 67	240	1 34567
37	123	88	1 5 8	139	2 4 67	190	23 5 78	241	2 45678
38	234	89	1 67	140	3 5 78	191	12 4 6 8	242	1 3456 8
39	345	90	2 78	141	1 3 5 7	192	12 4 78	243	1 345 78
40	456	91	1 6 8	142	2 4 6 8	193	12 567	244	1 34 678
41	567	92	1 78	143	1 3 5 8	194	23 678	245	1 3 5678
42	678	93	1234	144	1 3 67	195	12 56 8	246	1 45678
43	12 4	94	2345	145	2 4 78	196	12 5 78	247	1234567
44	23 5	95	3456	146	1 3 6 8	197	12 6 78	248	2345678
45	34 6	96	4567	147	1 3 78	198	1 3456	249	123456 8
46	45 7	97	5678	148	1 456	199	2 4567	250	12345 78
47	56 8	98	123 5	149	2 567	200	3 5678	251	1234 678
48	12 5	99	234 6	150	3 678	201	1 345 7	252	123 5678
49	23 6	100	345 7	151	1 45 7	202	2 456 8	253	12 45678
50	34 7	101	456 8	152	2 56 8	203	1 345 8	254	1 345678
51	45 8	102	123 6	153	1 45 8	204	1 34 67	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 $\pm 3,18 \text{ mm}$ ($\pm 0.125 \text{ in}$).

5.3 A greater range in the $14,2 \text{ mm}$ (0.56 in)/ $15,2 \text{ mm}$ (0.60 in) dimension (location of backing paper number's centre line) necessitates a reduction in the $4,1 \text{ mm}$ (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 $35,03 \text{ mm}$ (1.379 in)/ $35,18 \text{ mm}$ (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 $0,89 \text{ mm}$ (0.035 in) when a load of $1,4 \text{ N}$ (142 gf ; 5 ozf) is applied for 1 min by a pawl having a cross-section of $0,76 \text{ mm}$ (0.030 in) by $3,18 \text{ mm}$ (0.125 in) (see figure 3) under the conditions of 32°C (90°F) and 90 % relative humidity.

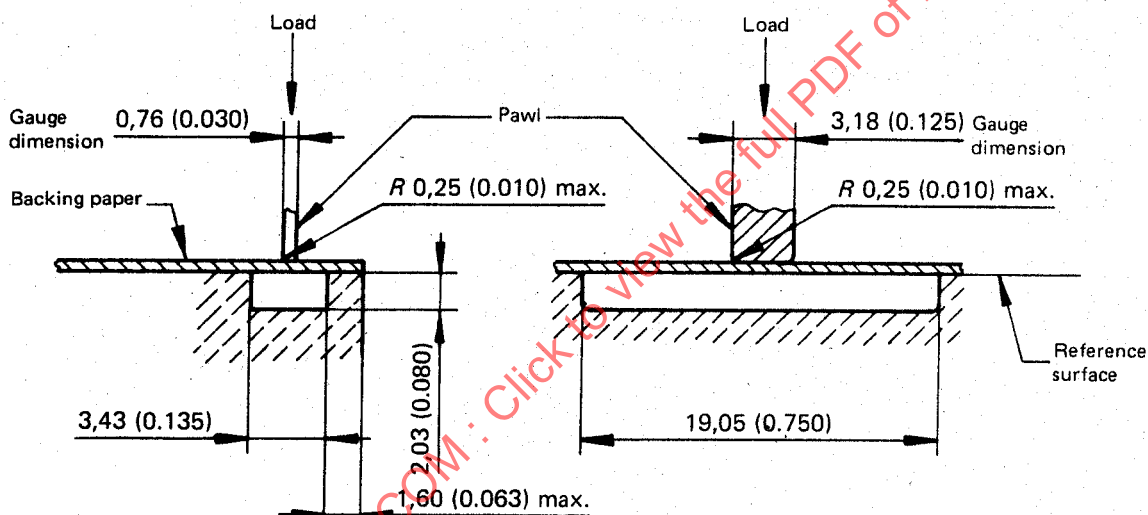
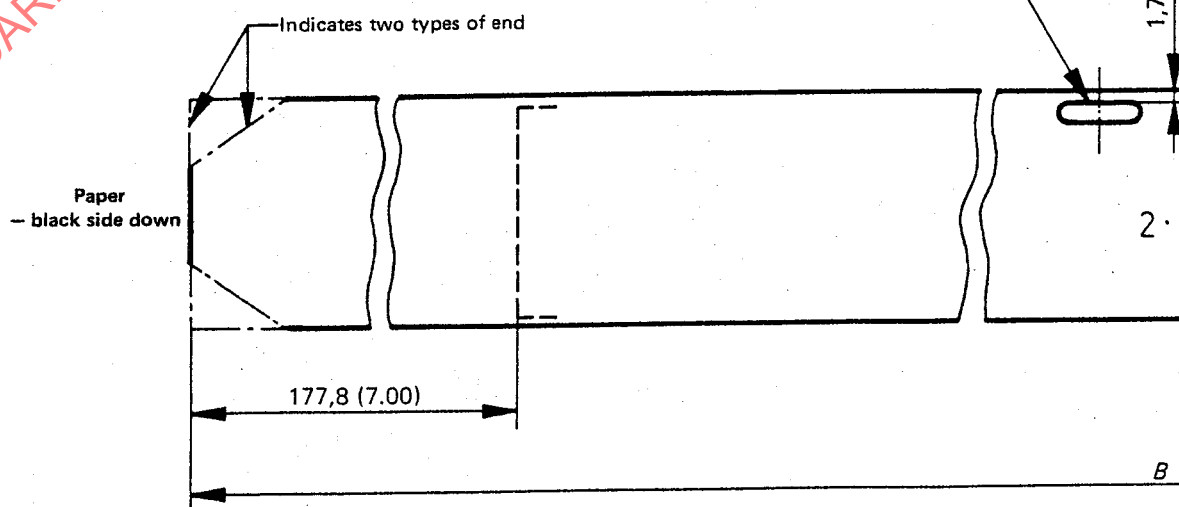
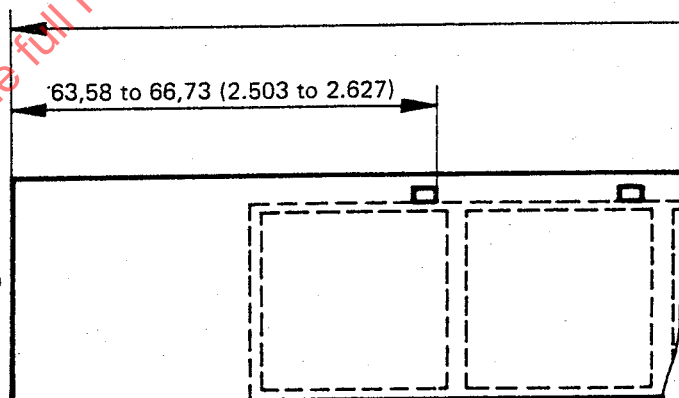
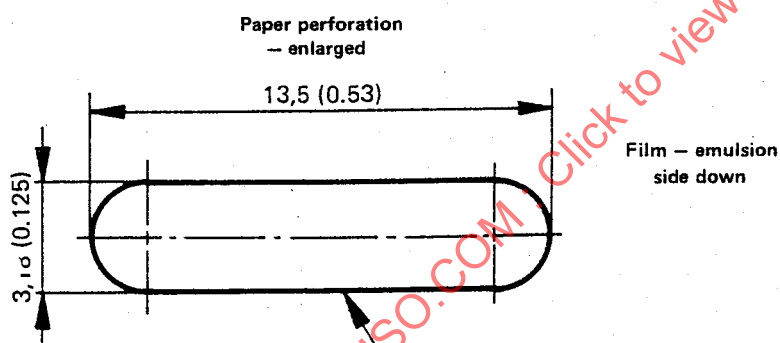
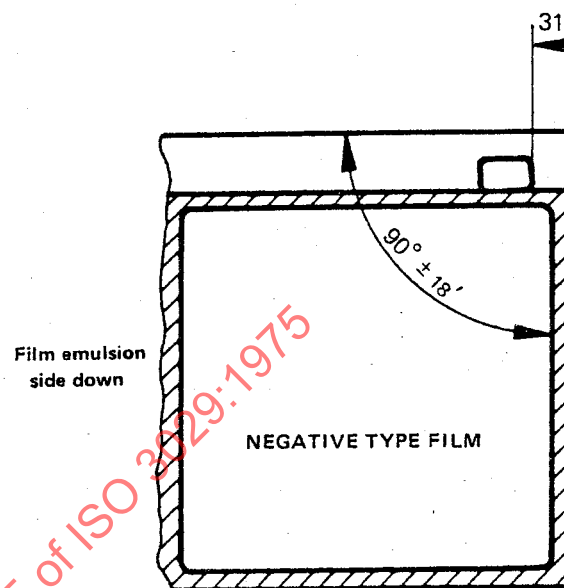


FIGURE 3 — Test cavity

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 — Film

