International Standard 1007

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Photography — 135-size film and magazine — Specification

Photographie — Film et cartouche de format 135 — Spécifications

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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 1007 was developed by Technical Committee ISO/TC 42, *Photography*, and was circulated to the member bodies in July 1977.

It has been approved by the member bodies of the following countries :

Australia	Germany F.R.	Poland
Austria	Italy	Spain
Belgium	Japan	Switzerland
Canada	Korea, Rep. of	U.S.A.
Czechoslovakia	Mexico	U.S.S.R.
France	Netherlands	Yugoslavia

The member body of the following country expressed disapproval of the document on technical grounds :

United Kingdom

This International Standard cancels and replaces ISO Recommendation R 1007-1969, of which it constitutes a technical revision.

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Photography — 135-size film and magazine — Specification

0 INTRODUCTION

This International Standard is a revision and expansion of ISO/R 1007 and now includes dimensions, configurations and tests applicable to both the film magazine and the film, whereas the previous edition dealt only with the magazine dimensions, film position and test for film pullout force.

Magazine dimensions remain unchanged with the exception that an optional split rewind spline in the short hub has been added. Inch dimensions have been rounded off. Film and perforating dimensions and their relationship to the edge numbering of the film for both full- and half-frame exposures, and usage of either short or long tongue film are included. A new annex on measurement of film-spool attachment strength has been added.

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies the following characteristics for 135-size film and magazine :

- dimensions of four standard film lengths normally supplied in these magazines; the film lengths provide, respectively, a minimum number of thirty-six, twenty-four, twenty, or twelve 24 mm × 36 mm exposure or seventy-two, forty-eight, forty, or twenty-four 18 mm × 24 mm exposures;
- film edge numbering;
- dimensions of daylight-loading film magazines for use in still-picture cameras;
- film position;
- film pullout force.

NOTE — It is not intended in this International Standard to specify the actual location of photographic images on the film.

2 REFERENCE

ISO 897, *Photography — Edge-marked roll film — Identification of the emulsion side.*

3 FILM AND PERFORATING DIMENSIONS

3.1 Film dimensions

The film shall have a cutting width of $35{,}00\ ^{0}_{-0{,}10}$ mm ($1.378\ ^{0}_{-0.004}$ in) and shall conform to the dimensions as defined below and as specified in figure 1 and table 1.

3.1.1 *Tongue*

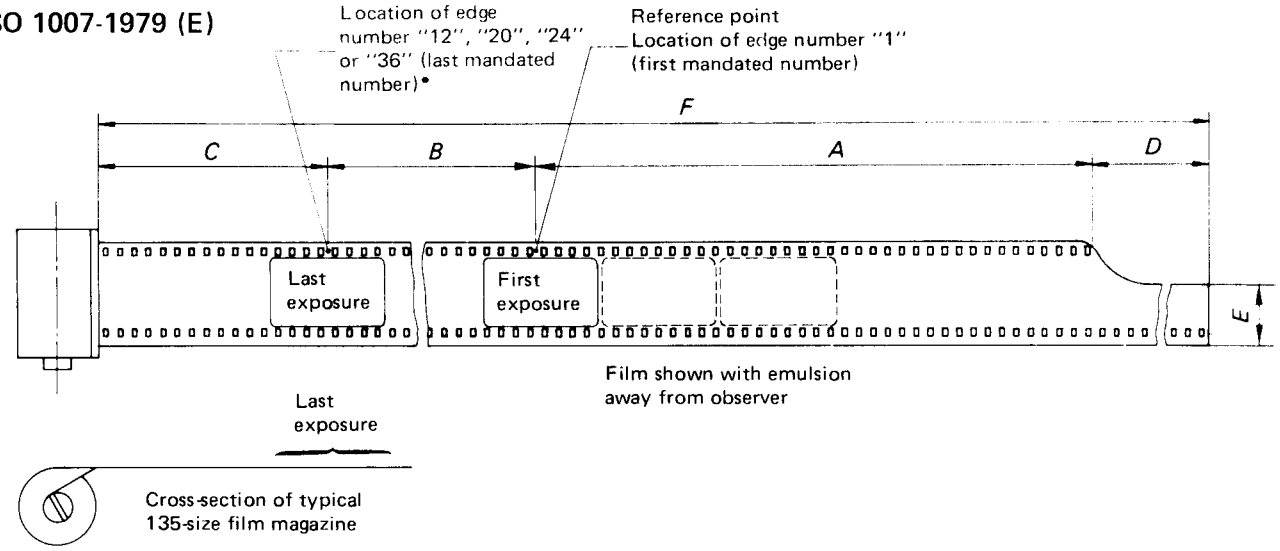
The tongue, dimension *E* in width and dimension *D* in length, is the narrow part of the film that precedes dimension *A*. It is shaped to facilitate threading the camera.

3.1.2 *Dimension A*

Dimension *A* is the length of full width film starting at the reference point, number 1 (first mandated number), to the tongue. It is used both for threading the camera and for protecting the picture area from unintentional exposure.

3.1.3 *Dimension C*

Dimension *C* is the length of the film from the last mandated full-frame number (or its equivalent half-frame number) (see footnote of figure 1) to the lip of the magazine when the film has been pulled as far as possible from the magazine.



• The edge numbers, 12, 20, 24 and 36 may be replaced by their equivalents 23, 39, 47 and 71 of the permissible half-frame series.

FIGURE 1 — **Dimensions for 135-size film**

TABLE 1 — **Dimensions for 135-size film**

Dimension		Number of perforation pitches	mm[1]	in
A	A_1[2)3)]	$36\ ^{+3}_{-2}$	$171{,}0\ ^{+14{,}2}_{-\ 9{,}5}$	$6.73\ ^{+0.56}_{-0.37}$
	A_2[2)4)]	$24\ ^{+3}_{-2}$	$114{,}0\ ^{+14{,}2}_{-\ 9{,}5}$	$4.49\ ^{+0.56}_{-0.37}$
B	B[2)5)] 12 exposures	8 × 11 = 88	418,0	16.46
	B[2)5)] 20 exposures	8 × 19 = 152	722,0	28.43
	B[2)5)] 24 exposures	8 × 23 = 184	874,0	34.41
	B[2)5)] 36 exposures	8 × 35 = 280	1 330,0	52.36
C	C[6)]	16 min.	76,0 min.	2.99 min.
D	D_1[7)]	$10\ ^{0}_{-2}$	$47{,}5\ ^{0}_{-9{,}5}$	$1.87\ ^{0}_{-0.37}$
	D_2[8)]	$22\ ^{0}_{-2}$	$104{,}5\ ^{0}_{-9{,}5}$	$4.11\ ^{0}_{-0.37}$
E	E[9)]		$23{,}0\ ^{0}_{-5{,}0}$	$0.91\ ^{0}_{-0.20}$
F	F[10)] 12 exposures	146 min.	693,5 min.	27.30 min.
	F[10)] 20 exposures	210 min.	997,5 min.	39.27 min.
	F[10)] 24 exposures	242 min.	1 149,5 min.	45.26 min.
	F[10)] 36 exposures	338 min.	1 605,5 min.	63.20 min.

1) Calculated on the basis of the conversion factor, one perforation pitch equals 4,75 mm.

2) Reference point for dimensioning will be the number "1" of the edge numbering (i.e. the first mandated number).

3) Distance from reference point to preferred tongue length, D_1.

4) Distance from reference point to recognized tongue length, D_2.

5) Distance from the first designated edge number to the last designated edge number.

6) Distance from the last designated edge number to the outside edge of the magazine lip. (See figure 1.)

7) D_1 — Short : Preferred tongue length. All future cameras should be designed to this tongue length.

8) D_2 — Long : Recognized because cameras exist which require this long tongue.

9) The shape of the tongue is optional, but the effective tongue width, E, should be held for at least 20 mm from the start of the film.

10) Minimum total film length from tongue end to the outside edge of the magazine lip.

3.2 Perforating dimensions

The film shall have perforations and be perforated conforming to the dimensions specified in figure 2 and table 2.

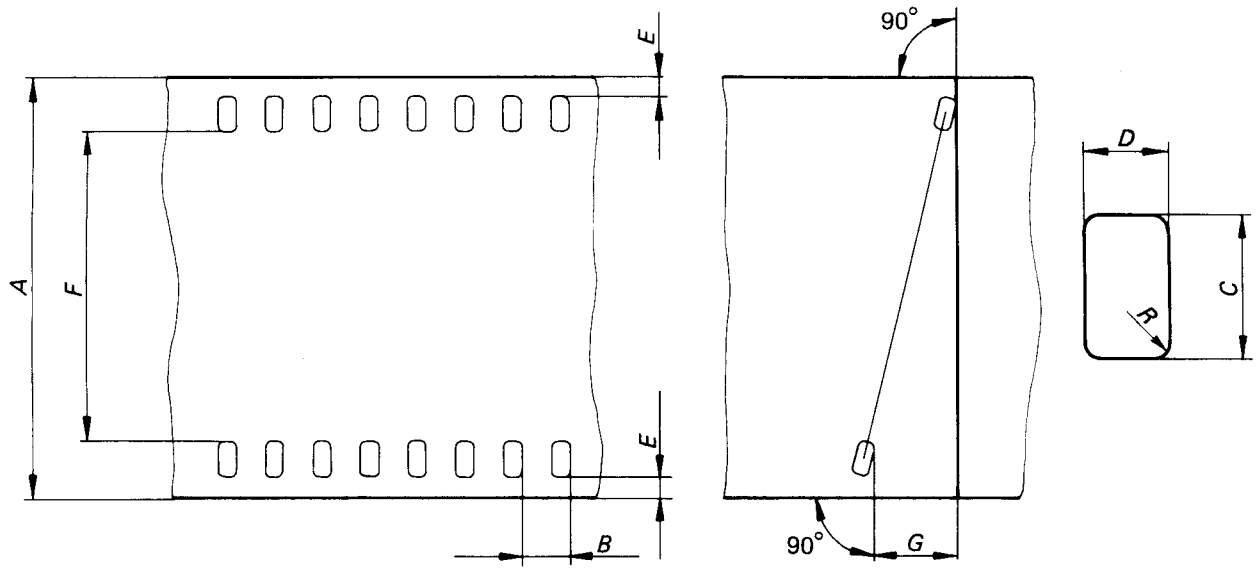


FIGURE 2 — **Perforating dimensions for 135-size film**

TABLE 2 — **Perforating dimensions for 135-size film**

Dimension	mm	in
A	$35{,}00\ ^{0}_{-0{,}10}$	$1.378\ ^{0}_{-0.004}$
B	4,75 ± 0,03	0.187 ± 0.001
C	2,80 ± 0,02	0.110 ± 0.001
D	1,98 ± 0,02	0.078 ± 0.001
E	2,00 ± 0,15	0.079 ± 0.006
F [1]		
G	0,10 max.	0.004 max.
R	0,50 nominal	0.020 nominal
L [2]	475,0 ± 0,4	18.701 ± 0.016

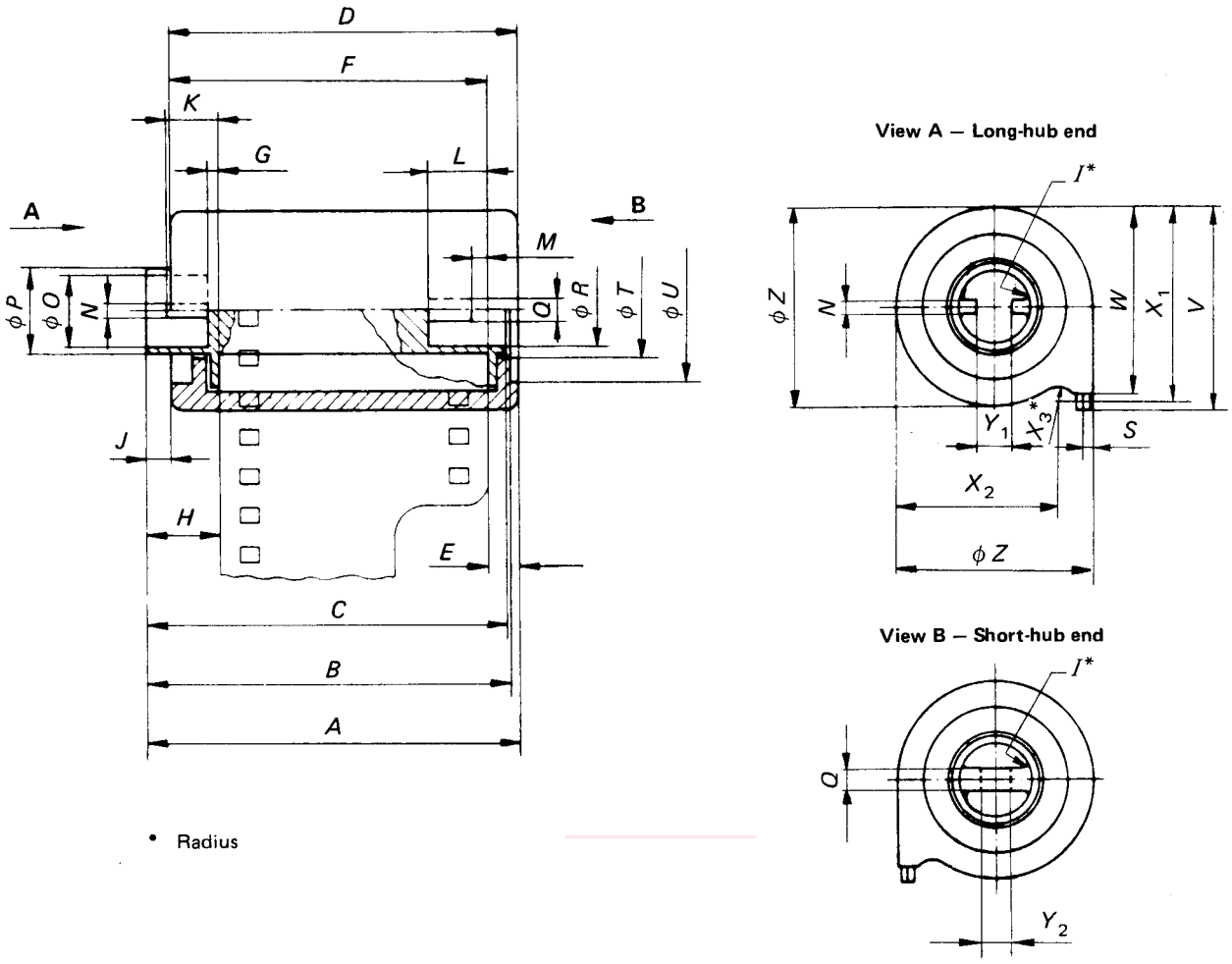
1) To be calculated : $F = A - 2\,(C + E)$.

2) Dimension *L* represents the length of any 100 consecutive perforation intervals.

4 EDGE NUMBERING (see figure 1)

Latent-image or ink-printed edge numbers shall be provided on either edge in the area between the perforations and the edge of the film. The numbers shall increase in sequence from 1 through 12 (or 20 or 24 or 36) at intervals of 8 perforation pitches (full frame). It is also permissible to number at 4-perforation (half-frame) average intervals using the series 1, 2, 3, 4, . . ., 72; or 1, 1A, 2, 2A, ... Even numbers (in the 1 to 72 system) or A numbers (in the other permissible system) may be spaced at 4 ± 1 perforation pitches after the numbers which designate full-frame intervals. Other portions of the film may be identified at 4-(average) or 8-perforation increments at the manufacturer's discretion. The numerals shall read correctly from the side opposite the emulsion as described in ISO 897.

5 MAGAZINE DIMENSIONS



• Radius

FIGURE 3 — **Dimensions for 135-size film magazine**

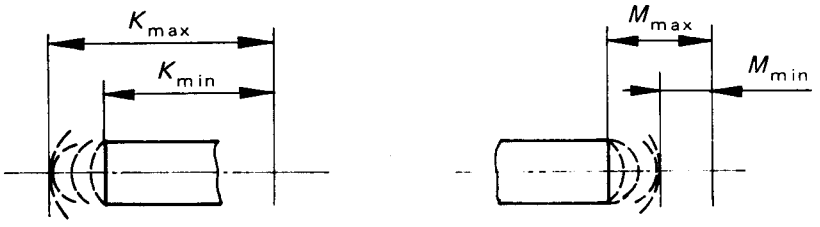


FIGURE 4 — **Rounded spool splines**

TABLE 3 – **Dimensions for 135-size film magazine**

Dimension	mm		in		Dimension	mm		in	
	max.	min.	max.	min.		max.	min.	max.	min.
A [1)7)]	48,0	46,9	1.89	1.85	O		9,2		0.36
B [1)]	46,6		1.83		P	11,4		0.45	
C [6)]	46,1		1.81		Q	3,0		0.12	
D [7)]	44,4	42,4	1.75	1.67	R		9,2		0.36
E [1)5)]	3,9		0.15		S [9)]	2,4		0.09	
F	40,5		1.59		T		11,5		0.45
G [5)]	1,0		0.04		U		18,2		0.72
H [5)8)]	9,1	8,3	0.36	0.33	V	25,4		1.00	
I	0,4		0.02		W	23,5	21,4	0.93	0.84
J [1)7)8)]		3,1		0.12	X_1 [10)]				
K [3)4)5)]	6,3	4,9	0.25	0.19	X_2 [10)]				
L [5)]		7,5		0.30	X_3 [10)]				
M [4)5)]	3,4	2,0	0.13	0.08	Y_1	5,0	4,5	0.20	0.18
N [3)]	2,1		0.08		Y_2 [11)]	3,9	3,4	0.15	0.13
					Z [2)]	25,3	24,9	1.00	0.98

1) These dimensions should be measured when the magazine and spool are assembled and the spool is pushed so that the short-hub end is against the magazine end, i.e. towards the right-hand end. This spool position should be used when, for example, dimensioning the camera key.

2) This dimension needs to be observed strictly only at both ends of the magazine, in order to guarantee a radial guidance inside the camera. In the other area of the magazine wall, a smaller dimension than the one given is allowed.

3) At the long-hub end of the spool, splines are included for an alternative camera key.

4) In order to facilitate engagement with the camera key, the ends of the spool splines may be rounded. However, such rounding should be accomplished within the maxima and minima established for K and M (see figure 4).

5) These dimensions refer to the film edges, when the film is wound tightly on the spool and the portion of the film projecting from the magazine is perpendicular to the axis of the magazine barrel. See annex, clause A.2, for a suitable method of measurement of these dimensions.

6) The short hub of the spool is optional and, if omitted, such spools remain in compliance with this International Standard.

7) It should be noted that J_{min} (3,1 mm or 0.12 in) precludes the simultaneous occurrence of A_{min} (46,9 mm or 1.85 in) and D_{max} (44,4 mm or 1.75 in).

8) It should be noted that when J is less than 3,6 mm (0.14 in), H is unable to achieve the maximum of 9,1 mm (0.36 in).

9) The dimension S is measured to the emulsion side of the film.

10) The radius X_3 can only be specified in terms of the maximum profile, in which case the centre of this radius is at the intersection of two perpendicular planes the positions of which are defined by dimensions $X_1 = 23{,}8$ mm (0.94 in) and $X_2 = 20.5$ mm (0.81 in); X_3 is then equal to 1,0 mm (0.04 in).

11) The rewind spline in the short-hub end of the spool may be either a solid spline or a split spline with the two members separated by the distance Y_2, as shown in view B of figure 3.

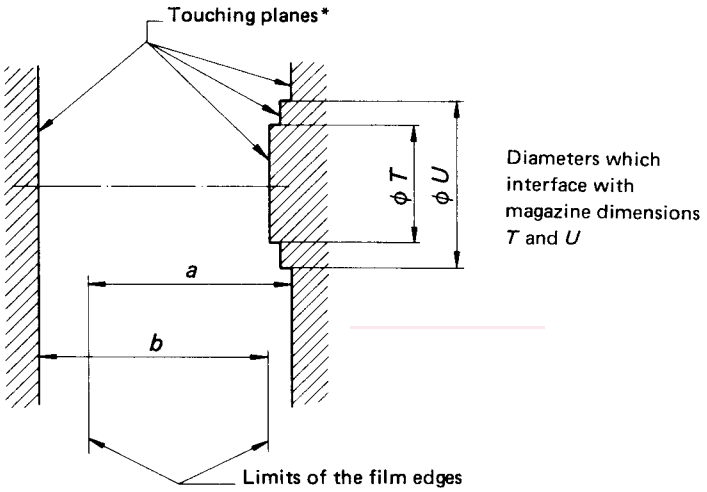
6 FILM POSITION

Since complete interchangeability of all makes of spools and magazines has been found impossible, the spool is shown only in combination with the magazine, and its dimensions refer only to the camera rewind key which engages the spool. The thickness of the spool flanges as well as the wall thickness of the magazine depend on the material used; thus, they are not dimensioned. The position of the film is related to the spool splines and to the camera-magazine chamber touching planes in order that the camera designer can calculate on fixed dimensions from the film guides as shown in figure 5.

7 FILM PULLOUT FORCE

It shall be possible to pull the film out of the magazine lip with a maximum force of 2,50 N (0.56 lbf) after pulling out the first 100 mm (approximately 4 in) of full width film. For the test, it is recommended that the magazine, with its lip vertically upwards, be attached to a weight having a mass of 0,25 kg (0.550 lb), not including the mass of the magazine itself (see the annex, clause A.3). It shall then be possible to pull the film out of the magazine in a vertical direction at a rate of approximately 40 mm (1.6 in) per second without raising the weight.

The test shall be carried out on a freshly loaded magazine (within one week of loading) at a relative humidity of 40 to 60 %, and a temperature in the range of 10 to 30 °C (50 to 86 °F).



a = 35,0 + 3,9 mm (1.38 + 0.15 in) = 38,9 mm (1.53 in) min.
b = 9,1 + 35,0 mm (0.36 + 1.38 in) = 44,1 mm (1.74 in) min.

* These are the touching planes of the camera-magazine chamber and correspond to the features described by the dimensions A and B at diameter U, and C at diameter T.

FIGURE 5 — **Position of film edges relative to camera-magazine chamber touching planes**

ANNEX

SUGGESTED METHODS FOR MEASUREMENT OF DIMENSIONS RELATED TO THE EDGES OF THE FILM OF 135-SIZE FILM MAGAZINES FOR STILL-PICTURE USE, AND MEASUREMENT OF PULLOUT FORCE

A.1 SCOPE

This International Standard, in order to be of most value to camera designers, indicates a number of dimensions of the 135-size magazine relative to the edges of the film. It also indicates a maximum pullout force, i.e. the maximum force required to pull the film from the magazine. It is the purpose of this annex to record, solely for information purposes, how such dimensions and forces could be measured in practice. Two methods of measuring film-spool attachment strength are also given.

A.2 MEASUREMENT OF DIMENSIONS RELATED TO THE EDGES OF THE FILM

The need for consideration of methods of measurement arises because, unless a suitable jig is used, it is not possible to know the correct position of the film protruding from the lips of the magazine. The film is free to move in the direction of measurement and, if not tightly wound on the spool, does not necessarily come out of the magazine lips perpendicular to the axis of the magazine shell.

The specification of dimensions in relation to the edges of the film has been adopted to give better practical information to camera designers, who need to be able to determine the boundary of the magazine chamber relative to the film guides in the camera.

It has been found convenient and practical to place the magazine in a V-groove with the film perforations engaged on full fitting pins, set so that the axis of the film is at 90° to the axis of the V-groove, as shown in figure 6. The V-groove and pins are formed in a metal block whose edges are parallel to these axes.

Measurements are made relative to an edge face of the block. For example, the block can be placed on a surface plate with the axes of the spool and magazine vertical. Measurements are then made with a comparator gauge or a micrometer depth gauge. Either device will yield measurements reproducible up to 0,10 mm (0.004 in).

The film should be wound tightly on the spool during measurement; otherwise, there may be excessive end movement of the magazine shell and spool relative to the film.

Dimensions in millimetres

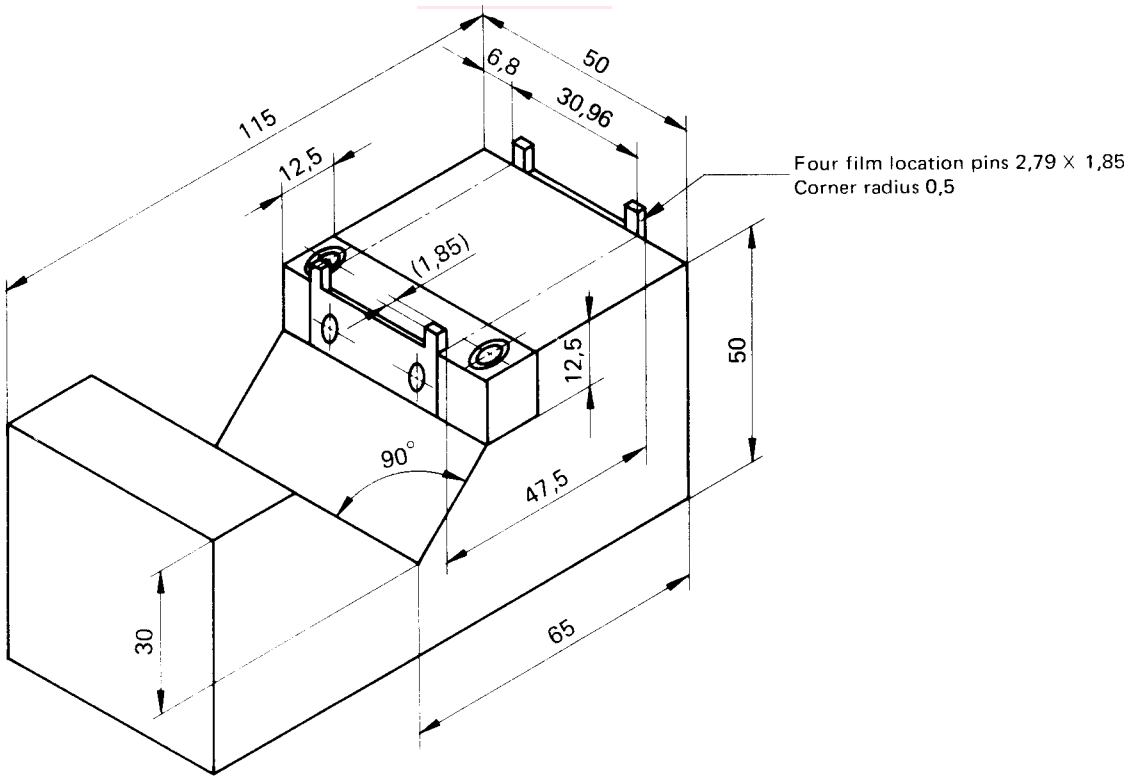


FIGURE 6 — **Gauging jig for measurement of film magazine dimensions relative to edge of film in 135-size film magazine**

A.3 MEASUREMENT OF PULLOUT FORCE

Various methods of measurement of the force required to pull the film from the magazine are in use by manufacturers and have been considered. Several of these methods provide a continuous record or scale-reading of the actual force required as the film is drawn from the magazine.

However, for the purpose of this International Standard, it is only necessary to determine whether the force required to pull the film from the magazine is less than the specified value. It has been found convenient, therefore, to attach the magazine to a suitable weight and to observe if the film can be pulled from the magazine without lifting the magazine and weight from the bench by so doing.

Figure 7 gives the dimensions of such a suitable weight, i.e. a block of steel into which the magazine is inserted. The lips of the magazine are vertical and the centre of gravity is so positioned that the lips remain vertical when the block is lifted.

It should be noted that if the block lifts from the bench, the pullout force exceeds the specified value and the magazine does not conform to this International Standard. Therefore, the balance of the gauge block and magazine need only be approximate.

To avoid having different gauge blocks for each type of magazine tested, a mass of 0,25 kg (0.550 lb) has been specified in this International Standard. The mass of the magazine and film are additional to this.

The exact mass of the gauge block can be adjusted in manufacture by machining either the underside or one of the end faces of the block.

The stipulation that the force be observed after 100 mm (approximately 4 in) of full width film have been pulled from the magazine ensures that the pile of velvet used for the lips of some magazines is oriented in the outward direction and that any set in the film at the lips of the magazine, arising during storage, does not interfere with the indication obtained.

The approximate speed of withdrawing the film is specified in clause 7 to avoid the risk of rapidly stripping the film.

A.4 MEASUREMENT OF FILM-SPOOL ATTACHMENT STRENGTH

Both the static and dynamic methods of measurement should be used.

A.4.1 Static method

Measurement of static film-spool attachment strength requires five samples. The ends of five 12, 20, 24 or 36 exposure film samples should be attached to 135-film spools using the manufacturer's normal method of attachment. Wind the film samples on the spools. Place the spools in 135-size magazines. Store each loaded magazine in an individual sealed container for three days at 68 to 72 °C (154 to 162 °F) and a relative humidity of 48 to 52 %. After removing the magazine from the conditioning chamber and the sealed container, recondition the sample for 4 h at 21 to 24 °C (70 to 75 °F) and a relative humidity of 48 to 52 %. Hold the magazine in the gauge block shown in figure 7, pull the film from the magazine, and apply a force of 25 N (5.6 lbf) to the free end of the film for 1 min. In no case should the film separate completely from the spool. In addition, in the case of tape attachment, the average slippage of the five samples should not exceed 2,5 mm (0.10 in).

A.4.2 Dynamic method

Measurement of dynamic film-spool attachment strength requires five samples. The ends of five 12, 20, 24 or 36 exposure film samples should be attached to 135-film spools using the manufacturer's normal method of attachment. Wind the film samples on the spools. Place the spools in 135-size magazines. Condition the samples at 21 to 24 °C (70 to 75 °F) and a relative humidity of 48 to 52 %. Pull the full length of film from the magazine, being careful not to disturb the film-spool attachment. Remove and discard all but 230 mm (approximately 9 in), measured from the magazine lip, of the film sample. Rewind 200 mm (approximately 8 in) of the remaining film into the magazine. Hold the magazine in the guage block shown in figure 7. Attach a tensile tester, set to advance at a rate of 100 mm (approximately 4 in) per minute, to the free end of the film. Pull the 200 mm (approximately 8 in) of film from the magazine. The average breaking strength of the five samples should be 40 N (9 lbf) minimum.