standards and recommended practices

Approved American National Standards

On January 27, 1970, the American National Standards Institute approved a new American National Standard Specifications for 16mm 3-kHz Flutter Test Film, Photographic Type, PH22.43-1970, which is published here for your information. It is a reaffirmation of the technical content of the previous issue but has been editorially modified to facilitate its use.

Inasmuch as compliance with American National Standards is purely voluntary, these Standards will become truly effective only when broad publicity is given to their existence. ANSI and SMPTE would appreciate any personal influence to promote the use of these Standards where such action is appropriate. Copies of the Standards may be obtained for a nominal fee from the American National Standards Institute, 1430 Broadway, NY 10018.

Draft American National Standard

Draft American National Standard Dimensions for Photographic Sound Record on Super 8 Motion-Picture Prints, PH22.182, is published here for a trial period and public review. Comments should be addressed to Alex E. Alden, Staff Engineer, at Society Headquarters before June 15, 1970. The proposal has also been submitted to the PH22 Committee. Consequently, all comments received through the Journal publication will be reviewed prior to the conclusion of action by the Committee.

Withdrawal of SMPTE Recommended Practice

On January 29, 1970, the SMPTE Board of Governors approved the withdrawal of SMPTE Recommended Practice RP 28-1968, Dimensions for 35mm Motion-Picture Film Perforated 8mm, 5R-1500. Withdrawal has been approved because the specifications were not being followed. RP 28 was published in the *SMPTE Journal* of March 1968.

International Standardization

The International Organization for Standardization (ISO), whose activities in the field of cinematography were described in the November 1967 *Journal* (pp. 1113–1115), approved in December 1968 Recommendation R 892, Dimensions of Projection Reels for 8mm Motion-Picture Film (Other Than Type S). This ISO Recommendation is in agreement with American National Standard Dimensions for Projection Reels for 8mm Motion-Picture Film, PH22.23-1969.

In March 1969 three additional Recommendations were approved. Recommendation R 1019, Dimensions of Daylight Loading Spools for 16mm Motion-Picture Film, is in agreement with American National Standard Dimensions for 16mm Daylight-Loading Motion-Picture Camera Spools (50- to 400-ft Capacity), PH22.174–1969. Recommendation R 1020, Dimensions of Daylight Loading Spools for Double 8mm Motion-Picture Film, is in agreement with American National Standard Dimensions of 8mm Motion-Picture Spools (25-ft Capacity), PH.107-1964 (Reaffirmed 1969). Recommendation R 1039, Dimensions of Cores for Motion-Picture and Magnetic Films, is in agreement with two American National Standards: Dimensions of Raw Stock Cores for 35mm Motion-Picture Film, PH22.37-1963 (Reaffirmed 1969) and Dimensions of Raw Stock Cores for 16mm Motion-Picture Film, PH22.38-1964 (Reaffirmed 1969).

Attention is directed to the fact that only the technical content is published here. Copies of the complete Recommendations are available from the American National Standards Institute, 1430 Broadway, NY 10018. — A.E.A.

Proposed Standardization of 8mm Projector Cartridge

The SMPTE has been requested to consider for standardization a particular type of 8mm projector cartridge proposal by one manufacturer.

The SMPTE 16mm and 8mm Committee at its last meeting in Chicago, April 28, 1970, organized a subcommittee to consider proposals for standardization of 8mm projector cartridges. Anyone who wishes to participate in the work should contact A. E. Alden at Society Headquarters as soon as possible.

Draft American National Standard

Dimensions for Photographic Sound Record on Super 8 Motion-Picture Prints

PH22.182

1. Scope

1.1 This standard specifies the lateral location and dimensions of the photographic sound record on super 8 motion-picture prints (See Appendix).

1.2 This standard also specifies the picture-sound separation.

1.3 This standard also specifies the location and width of the scanned area.

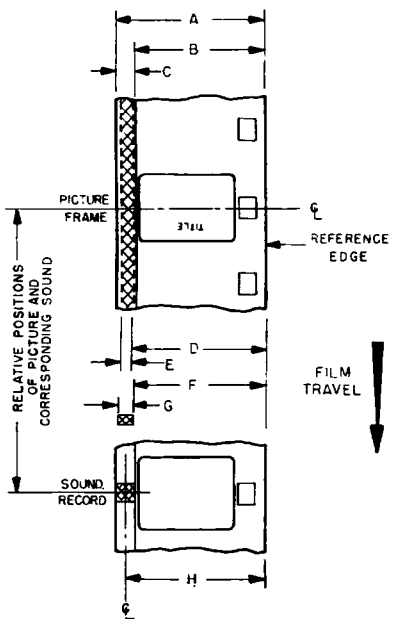
2. Sound Record

The lateral location and dimensions of the photographic sound record shall be as given in the figure and table.

3. Picture-Sound Separation

The photographic sound record on the film shall precede the center of the corresponding picture by a distance of 22 frames ± ½ frame.

NOTE 1: The area between the printed photographic sound record and the printed photographic picture record should be equal to the sound record print density. The presence of a clear area, which does not encroach on the minimum tolerances for the printed picture, shall not be the basis for rejection of prints. Usually, the area between the printed photographic sound record and the edge of the film will also be maximum density.



	Dimensions	Inches	Millimeters
A	Film Width	0.314 ref	7.98 ref
B		0.283 ± 0.001	7.19 ± 0.03
C	Printed Width	0.028 min	0.71 min
D		0.288 ± 0.001	7.32 ± 0.03
E	Modulated Width (100%)	0.020 max	0.51 max
F		0.285 ± 0.001	7.24 ± 0.03
G	Scanned Width	0.025 ± 0.001	0.64 ± 0.03
H	Sound Record Centerline	0.298 nom	7.57 nom

NOTE 2: To prevent clear septum areas when the film is slit larger than its nominal width of 0.314 in., it may be necessary to have a printed width, Dimension C, of 0.032 in., when Dimension B is at its minimum, to provide for a possible slit width of 0.315 in. (the maximum permitted for photographic sound use). The minimum specification for Dimension B will allow the picture and sound track to have a common edge during printing.

NOTE 3: It is anticipated that the printed width, Dimension C, will be utilized in the production of variable-density sound records.

NOTE 4: The dimensions and specifications do not provide for anticipated projector weave allowance and the tolerances should not be mutually exclusive.

NOTE 5: Motion-picture prints conforming to this standard are usually made on film made in accordance with the following:

American National Standard Dimensions for 16mm Motion-Picture Film, Perforated Super 8, 2R-1667 (1-3), PH22.150-1967

Draft American National Standard Dimensions for 35mm Motion-Picture Film Perforated Super 8, 5R-1667 (1-3-5-7-0), PH22.165

Draft American National Standard Dimensions for 16mm Motion-Picture Film Perforated Super 8, 2R-1667 (1-4), PH22.167

and projected in accordance with

American National Standard Specifications for Projector Usage of Super 8 Motion-Picture Film, PH22.155-1967.

Appendix

(The Appendix is not a part of this American National Standard, but is included to facilitate its use.)

The slit width of super 8 film containing a photographic sound record must be held to tighter tolerances than are necessary for other uses. These recommendations are specified in the appropriate film dimensions standards for the film width and perforation format used.

ISO Recommendation | R 892 | December 1968

DIMENSIONS OF PROJECTION REELS FOR 8 mm MOTION-PICTURE FILM (OTHER THAN TYPE S)

1. SCOPE

This ISO Recommendation specifies the recommended sizes and dimensions of projection reels for 8 mm motion-picture film (other than type S).

2. DIMENSIONS

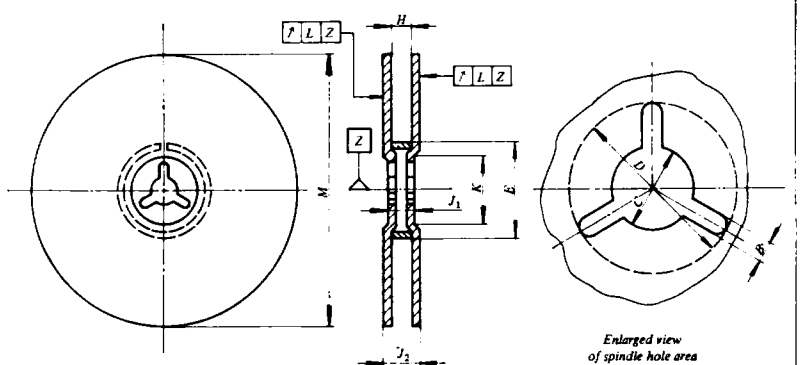


FIGURE – **Projection reel for 8 mm motion-picture film**

TABLE 1 – **Size-dependent dimensions of 8 mm motion-picture projection reels**

Nominal Reel Capacity*		Dimension	millimetres	inches
metres	feet			
15/20	50/66	*M*	$75\ ^{0}_{-1}$	$2.95\ ^{0}_{-0.04}$
		E	32.5 ± 0.5	1.28 ± 0.02
		*L***	0.9 max.	0.035 max.
30	100	*M*	$100\ ^{0}_{-1}$	$3.94\ ^{0}_{-0.04}$
		E	45.5 ± 0.5	1.79 ± 0.02
		*L***	1.1 max.	0.04 max.
60	200	*M*	$128\ ^{0}_{-1}$	$5.04\ ^{0}_{-0.04}$
		E	45.5 ± 0.5	1.79 ± 0.02
		*L***	1.5 max.	0.06 max.
90	300	*M*	$159\ ^{0}_{-1}$	$6.26\ ^{0}_{-0.04}$
		E	60.5 ± 0.5	2.38 ± 0.02
		*L***	1.5 max.	0.06 max.
120	400	*M*	$180\ ^{0}_{-3}$	$7.09\ ^{0}_{-0.12}$
		E	60.5 ± 0.5	2.38 ± 0.02
		*L***	2.0 max.	0.08 max.

TABLE 2 – **Dimensions common to all sizes of 8 mm motion-picture projection reels**

Dimension	millimetres	inches
B	$1.6\ ^{+0.3}_{0}$	$0.06\ ^{+0.01}_{0}$
C	$8.05\ ^{+0.10}_{0}$	$0.317\ ^{+0.004}_{0}$
*D****	$15.5\ ^{+1.0}_{0}$	$0.61\ ^{+0.04}_{0}$
H	$8.5\ ^{+1.0}_{0}$	$0.33\ ^{+0.04}_{0}$
J_1 (see Notes 3 and 4, page 5)	$12.5\ ^{0}_{-1.5}$	$0.49\ ^{0}_{-0.06}$
J_2	14.3 max.	0.56 max.
K	25.5 min.	1.00 min.

* The nominal reel capacities are based on a total film thickness (including any magnetic striping or winding allowance) in the order of 0.165 to 0.175 mm (0.0065 to 0.0069 in). The nominal reel capacities for other film thicknesses can be calculated by multiplying the nominal reel capacity by a factor. For example, the nominal reel capacities for a film thickness of 0.102 mm (0.004 in nominal) is obtained by multiplying by a factor 1.5.

** See Note 5 and Figure.

*** There may be a little older equipment which requires a slightly larger *D* minimum value of 16.0 mm. However, the values shown in Table 2 are compatible with recommendations for future construction of 8 mm projector spindles as given in ISO Recommendation R ..., *Spindles for double 8 mm and 16 mm cameras and for 8 mm and 16 mm projectors* (at present at the stage of a draft proposal).

ISO Recommendation | R 1019 | March 1969

CINEMATOGRAPHY

DIMENSIONS OF DAYLIGHT LOADING SPOOLS FOR 16 mm MOTION-PICTURE FILM

1. SCOPE

1.1 This ISO Recommendation specifies the dimensions and characteristics of general purpose spools of nominal capacities 15 m (50 feet), 30 m (100 feet), 60 m (200 feet), and 120 m (400 feet) for 16 mm motion-picture film.

The dimensions specified are in substantial agreement with those given for microfilm camera supply and take-up spools in ISO Recommendation R . . .*, *35 mm and 16 mm microfilms, spools and reels.* (See Annex.)

1.2 Spools for some high-speed cameras should be carefully balanced and are not necessarily covered by this ISO Recommendation.

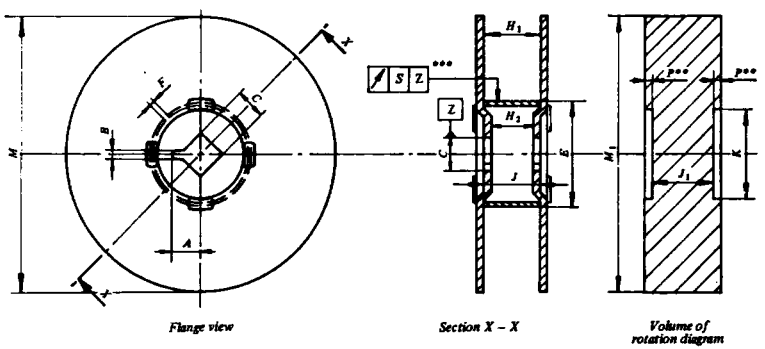


FIGURE – Daylight loading spools for 16 mm motion-picture film

* At present, at the stage of a draft proposal.

** See clause 2.5 for explanation of *P*.

*** See clause 2.7. This symbol signifies the runout of the cylindrical surface of the core with respect to the Z axis in the manner prescribed in ISO Recommendation R 1101, *Tolerances of form and of position – Part I : Generalities, symbols, indications on drawings.*

TABLE – Dimensions for daylight loading spools for 16 mm motion-picture film

Dimension	Nominal spool size				millimeters	inches
A	15 m	30 m	60 m	120 m	7.6 $^{+1.0}_{0}$	0.30 $^{+0.04}_{0}$
B	15 m	30 m	60 m	120 m	3.1 $^{+0.4}_{0}$	0.12 $^{+0.02}_{0}$
C (see clause 2.1)	15 m	30 m	60 m	120 m	8.05 $^{+0.15}_{0}$	0.317 $^{+0.006}_{0}$
E	15 m	30 m	60 m		32.0 ±0.5	1.26 ±0.02
				120 m	54.0 ±0.5	2.12 ±0.02
F	15 m	30 m	60 m	120 m	0.7 $^{+0.8}_{0}$	0.03 $^{+0.03}_{0}$
H_1	15 m	30 m	60 m	120 m	16.05 $^{+0.35}_{0}$	0.632 $^{+0.014}_{0}$
H_2	15 m	30 m	60 m	120 m	16.00 min.	0.630 min.
J and J_1	15 m	30 m	60 m	120 m	18.5 $^{0}_{-0.4}$	0.73 $^{0}_{-0.02}$
K	15 m	30 m	60 m		25.5 min.	1.00 min.
				120 m	38 min.	1.5 min.
M and M_1	15 m				71.5 $^{0}_{-1.0}$	2.81 $^{0}_{-0.04}$
		30 m			92.0 $^{0}_{-1.0}$	3.62 $^{0}_{-0.04}$
			60 m		126.0 $^{0}_{-1.0}$	4.96 $^{0}_{-0.04}$
				120 m	169.0 $^{0}_{-1.0}$	6.65 $^{0}_{-0.04}$
P (see clause 2.5)	15 m	30 m	60 m	120 m	0.50 max.	0.020 max.
S (see clause 2.7)	15 m	30 m	60 m	120 m	0.8	0.03

2. DIMENSIONS AND CHARACTERISTICS

2.1 The spindle and keyway holes shown in the Figure should be incorporated in both flanges* and should be aligned. (Some laboratories use 35 mm rewind equipment for winding 16 mm film; often the spindles on this equipment have long keys.) A second keyway, in the corner of the spindle hole opposite the required keyway, is optional, but if used, should be incorporated in both flanges.

2.2 If rivet heads or other fastening devices extend beyond the outer surfaces of the flanges, they should lie at a diameter larger than the minimum *K* diameter and should be within the boundaries defined by other portions of the volume of rotation diagram.

* Some spools exist which have one flange with the construction recommended in clause 2.1, but the other flange with a round hole which has a diameter equal to dimension *C*. This older design is recognized temporarily, but is not recommended for future construction.

2.3 Dimension *F* refers to a slot in the spool core for attaching the film. The slot sides, starting immediately adjacent to each flange and running a minimum distance 6.0 mm (0.24 in) from each flange toward the other, should be straight, parallel and 0.7 to 1.5 mm (0.03 to 0.06 in) apart. The slot sides may diverge over remaining (central) portions of the slot.

2.4 Dimensions *J* and J_1 represent the thickness and effective thickness respectively of the spool within a *K* diameter area which is centered on the spindle hole axis of each flange.

2.5 A reference plane of rotation for each flange is defined by a plane perpendicular to the axis of the spindle and coincident with the surface of a flat 15.0 mm (0.59 in) diameter support which is in *contact with the flange and centered on the spindle hole axis of the flange.*

The dimension *P* is the distance measured outwardly from this reference plane* of rotation to the plane of rotation generated by the thickest and/or most eccentric point on the flange outside the *K* diameter area when the spool is rotated on an accurate, tight-fitting spindle. This includes rivets or other fastening devices, variations in flange thickness, flatness, and lateral runout of the flanges.

Selection of a dimension *P* value is dependent upon the thickness of the material used for the flanges. According to the flange material thickness

(*a*) the *K* diameter area may be depressed (with *P* greater than zero), or

(*b*) the outside surfaces of the flanges may be flat from spindle hole area to periphery (with *P* equal to zero), or

(*c*) in the case of flanges made of very thin material, the *K* diameter area may be raised rather than recessed (effectively, *P* less than zero).

2.6 The maximum effective thickness of spools (including all the characteristics mentioned in clause 2.5) outside the *K* diameter area has not been stated because it is a function of a spool's specific J_1 value between the 15.0 mm (0.59 in) diameter reference zones on each flange. The largest overall effective thickness, however, will be J_1 max. + 2 × *P* max. = 19.5 mm (0.77 in).

2.7 The eccentricity of the core with respect to the spindle hole axis, Z, should not exceed a *total* radius variation (total indicator reading) of 0.8 mm (0.03 in) for all spool sizes.

2.8 Flanges should be opaque and their surfaces should have low reflectance characteristics.

NOTE. – When the loaded camera is viewed from the side, with the lens to the left and the bottom of the housing downward (regardless of whether or not the spool loading mechanism is visible from that side), both the supply and take-up spools rotate in a clockwise direction.

* The reference plane from which *P* is measured is not necessarily coincident with all points within the *K* diameter area but only needs to be coincident with those which are in contact with the reference support which has a diameter smaller than *K*.

ISO Recommendation | R 1020 | March 1969

CINEMATOGRAPHY

DIMENSIONS OF DAYLIGHT LOADING SPOOLS FOR DOUBLE-8 mm MOTION-PICTURE FILM

1. SCOPE

This ISO Recommendation specifies the dimensions of daylight loading spools for double-8 mm motion-picture film.

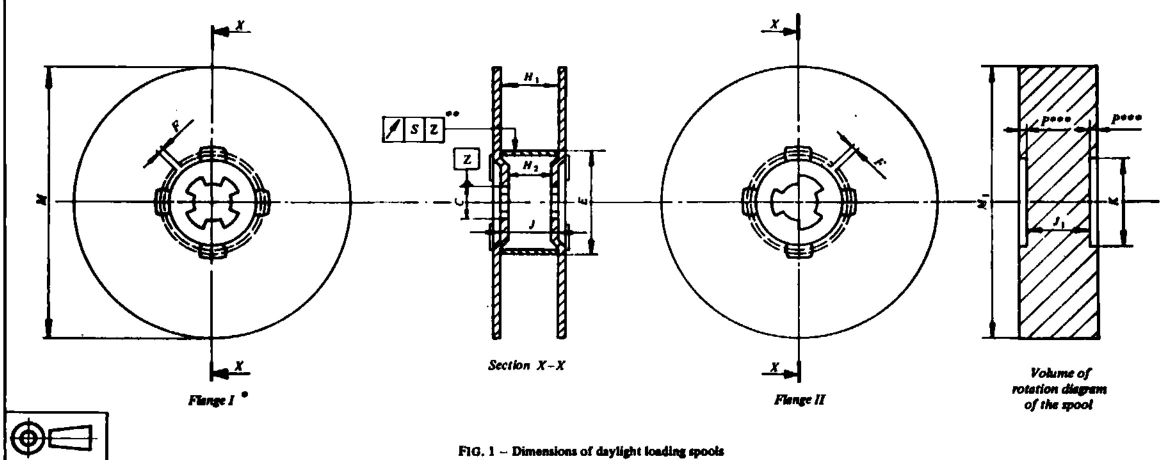


FIG. 1 – Dimensions of daylight loading spools for double-8 mm motion-picture

* Flange I is provided on the side which engages the take-up spindle.

** See clause 2.8. This symbol signifies the runout of the cylindrical surface of the core with respect of the Z axis in the manner prescribed in ISO Recommendation R 1101, *Tolerances of form and of position – Part I : Generalities, symbols, indications on drawings.*

*** See clause 2.6 for an explanation of *P*.

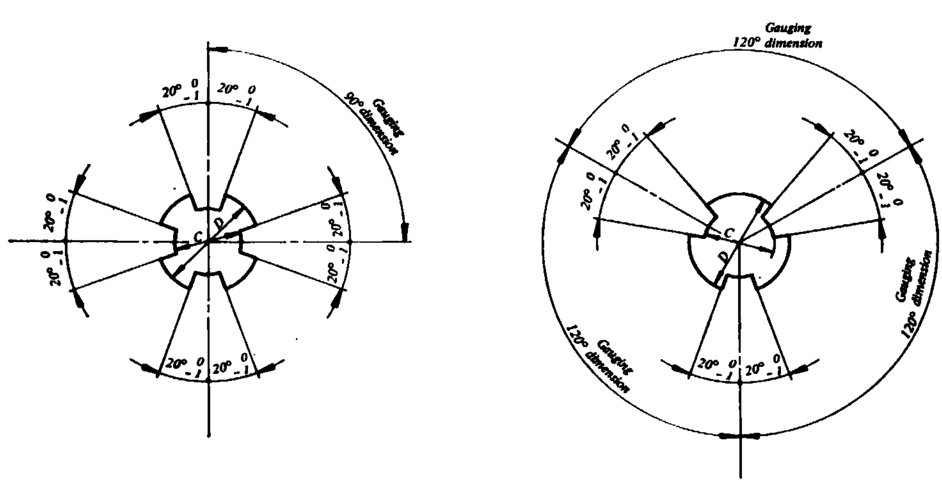


FIG. 2 – Enlarged views of 3 and 4-splined spindle holes

TABLE – Dimensions of double-8 mm nominal spool sizes

Dimension	Nominal spool size	millimetres	inches
C	7.5 m, 15 m, 30 m	$7.30\ ^{\phi 0.20}_{0}$	$0.287\ ^{\phi 0.008}_{0}$
D	7.5 m, 15 m, 30 m	$9.8\ ^{+0.2}_{0}$	$0.38\ ^{\phi 0.01}_{0}$
E	7.5 m	19.0 ± 0.3	0.75 ± 0.01
	15 m, 30 m	32.0 ± 0.5	1.26 ± 0.02
F	7.5 m, 15 m, 30 m	see clause 2.3	
H_1	7.5 m, 15 m, 30 m	$16.05\ ^{+0.35}_{0}$	$0.632\ ^{\phi 0.014}_{0}$
H_2	7.5 m, 15 m, 30 m	16.00 min.	0.630 min.
J and J_1	7.5 m, 15 m, 30 m	$18.5\ ^{0}_{-0.4}$	$0.73\ ^{0}_{-0.02}$
K	7.5 m	15.6 min.	0.61 min.
	15 m, 30 m	25.5 min.	1.00 min.
M and M_1	7.5 m	$52.0\ ^{0}_{-0.8}$	$2.05\ ^{0}_{-0.03}$
	15 m	$71.5\ ^{0}_{-1.0}$	$2.81\ ^{0}_{-0.04}$
	30 m	$92.0\ ^{0}_{-1.0}$	$3.62\ ^{0}_{-0.04}$
P (See clause 2.6)	7.5 m	0.40 max.	0.016 max.
	15 m, 30 m	0.50 max.	0.020 max.
S	7.5 m	0.5	0.02
	15 m, 30 m	0.8	0.03

2. DIMENSIONS AND CHARACTERISTICS

2.1 The dimensions given above are for general purpose double-8 mm motion-picture film spools with nominal capacities of 7.5 metres (25 feet), 15 metres (50 feet), and 30 metres (100 feet). Spools for high-speed cameras generally should be more carefully balanced and are not necessarily covered by this ISO Recommendation.

2.2 If rivet heads, or other fastening devices, extend beyond the outer surfaces of the flanges, they should lie at a diameter larger than the minimum K diameter and should be within the boundaries defined by other portions of the volume of rotation diagram.

2.3 Dimension F represents a slot in the spool core for attaching the film. Its design and dimensions are critical if a spool is to operate satisfactorily, both in self-threading cameras and cassette-loaded cameras. In self-threading cameras the film should, without fail, seek out and easily slide into the slot, but for cassette-loaded cameras the slot should resist extraction of the film by action of the clock-spring at the end of the first camera exposure run.

Starting at a point adjacent to the four-splined flange and running at least one-half the core width, the slot should be designed to meet manual-threading, self-threading, and cassette-loading requirements. Slot sides may diverge over the remaining one-half of the core width. One way of accomplishing this is to design the slot in the form of a weaving channel with an effective separation of 0.15 to 0.25 mm (0.006 to 0.010 in) between the teeth on one side of the slot and the teeth on the other side of the slot as measured with a wide, stiff blade-gauge which should slip easily into this zone.

2.4 Dimension H_2 is the space between the flanges inside the core, but outside the D diameter zone.

2.5 Dimensions J and J_1 represent the thickness or effective thickness, respectively, of the spool within the K diameter area which is centered on the spindle hole axis of each flange.

2.6 A reference plane of rotation for each flange is defined by a plane perpendicular to the axis of the spindle and coincident with the surface of a flat 15.0 mm (0.59 in) diameter support which is in contact with the flange and centered on the spindle hole axis of the flange.

The dimension P is the distance measured outwardly from this reference plane* of rotation to the farthest plane of rotation described by any point on the flange outside the K diameter area when the spool is rotated on an accurate, thight-fitting spindle. This includes rivets or other fastening devices, variations in flange thickness, flatness, and lateral runout of the flanges.

Selection of a dimension P value is dependent upon the thickness of the material used for the flanges. According to the flange material thickness :

(*a*) the K diameter area may be depressed (with P greater than zero), or

(*b*) the outside surfaces of the flanges may be flat from spindle hole area to periphery (with P equal to zero), or

(*c*) in the case of flanges made of very thin material, the K diameter area may be raised rather than recessed (effectively, P less than zero).

2.7 The maximum effective thickness of spools (including all the characteristics mentioned in clause 2.6) outside the K diameter area has not been stated because it is a function of a spool's specific J_1 value between the 15.0 mm diameter reference zones on each flange. The largest over-all effective thickness, however, will be J_1 max. + 2 × P max. = 19.5 mm (0.77 in).

* The reference plane from which P is measured is not necessarily coincident with all points within the K diameter area but should only be coincident with those which are in contact with the reference support which has a diameter smaller than K.

2.8 The eccentricity of the core with respect to the spindle hole axis, Z, should not exceed a *total* radius variation (total indicator reading) of

7.5 mm spool ..... 0.5 mm (0.2 in)
15 mm spool ..... 0.8 mm (0.3 in)
30 mm spool ..... 0.8 mm (0.3 in)

2.9 When a thin flange material is used for flanges, Annexes B and C should be taken into account.

NOTES

1. When the loaded camera is viewed from the side, with the lens to the left, and the bottom of the housing downward (regardless of whether or not the spool loading mechanism is visible from that side), both the supply and the take-up spools rotate in a clockwise direction.

2. Flanges should be opaque and their surfaces should have low reflectance characteristics.

3. To facilitate distinguishing between a roll of film which has been exposed along the first side (one-half width) only and one which has not been exposed at all or has been exposed along both the first and second sides (both one-half widths), it is recommended the flanges of spools be marked prominently as follows :

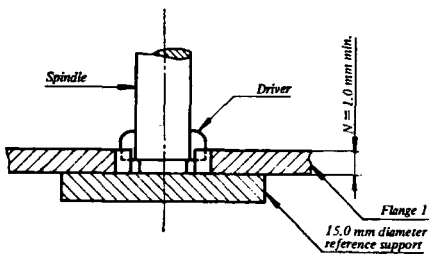
RECOMMENDED MARKINGS

Film manufacturers' raw stock spools		Camera accessory spools	
	Numeral	Numeral and/or phrase	
Flange with 4-splined spindle hole	1	2	No phrase (or numeral) necessary if phrase shown below is included on other flange.
Flange with 3-splined spindle hole	2	1	Phrase as follows or equivalent : *film when on this spool is half exposed.*

Attention is called to the fact that if a camera accessory spool wound with the first exposure run of film is removed from the camera, identification of the film exposure status is more obvious if the spool has been marked with a phrase instead of (or in addition to) numerals. Some camera accessory spools have identical 4-spline holes in each flange. (Supply spindles of such cameras have one small lug or none at all.) Both flanges of such accessory spools should be marked with the phrase suggested above; to insure proper orientation for the second exposure in this case, in addition to the phrase, it is helpful to have the numeral 1 on one flange and the numeral 2 on the other.

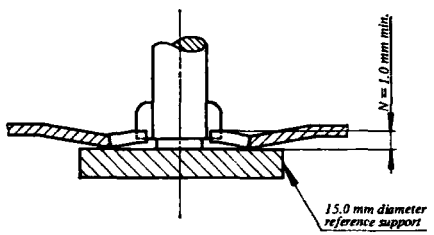
ANNEX A

Some cameras have spindle drive lugs which do not extend to the base of the spindle. For this reason, it is recommended that a minimum distance, *N*, of 1.0 mm (0.04 in) be maintained between the inside surface of each spline (at least in Flange J) and the surface of the same 15.0 mm (0.59 in) diameter reference support described in clause 2.6.



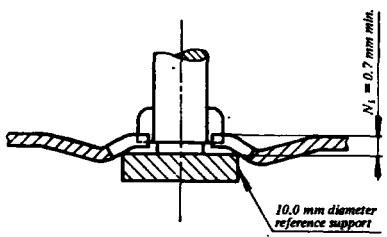
ANNEX B

If very thin flange materials are used for spools, *N* and *J* might be maintained by embossing somewhat as illustrated below :



ANNEX C

Some cameras have spool support washers as small as 10.0 mm in diameter. Such small washers are not recommended for future construction, since they lie almost entirely within the *D* diameter zone and provide too little support. This is especially serious if the camera also has short spindle drive lugs (explained in Annex A) and is used with a spool embossed as explained in Annex B. To protect such old cameras, it is recommended that embossed spools observe, in addition to *N*, a minimum dimension N_1 of 0.7 mm (0.03 in) measured in the same manner as *N* but to a reference support 10.0 mm in diameter.



ISO Recommendation R 1039 March 1969

DIMENSIONS OF CORES

FOR MOTION-PICTURE AND MAGNETIC FILMS

1. SCOPE

This ISO Recommendation specifies the sizes and dimensions of cores for motion-picture and magnetic films.

2. SIMPLE CORES FOR 8, 16, 17.5, 32, 35, 65 AND 70 mm FILMS

Dimensions in millimetres (inches)

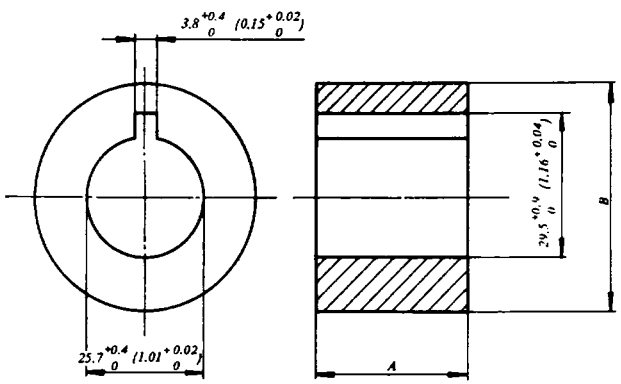


FIG. 1 – Dimensions common to all simple cores

TABLE – Variable dimensions of simple cores

Nominal core size mm	Dimension*	millimetres	inches
8 X 50	*A*	$7.9\ ^{0}_{-0.5}$	$0.31\ ^{0}_{-0.02}$
	B	50.0 ±0.5	1.97 ±0.02
16 X 50	*A*	$15.9\ ^{0}_{-0.5}$	$0.62\ ^{0}_{-0.02}$
	B	50.0 ±0.5	1.97 ±0.02
16 X 75	*A*	$15.9\ ^{0}_{-0.5}$	$0.62\ ^{0}_{-0.02}$
	B	75.0 ±1.0	2.95 ±0.04
16 X 100	*A*	$15.9\ ^{0}_{-0.5}$	$0.62\ ^{0}_{-0.02}$
	B	100.0 ±1.0	3.94 ±0.04
17.5 X 100	*A*	$17.4\ ^{0}_{-0.5}$	$0.68\ ^{0}_{-0.02}$
	B	100.0 ±1.0	3.94 ±0.04
32 X 50	*A*	$31.8\ ^{0}_{-1.0}$	$1.26\ ^{0}_{-0.04}$
	B	50.0 ±0.5	1.97 ±0.02
35 X 50	*A*	$34.9\ ^{0}_{-1.0}$	$1.37\ ^{0}_{-0.04}$
	B	50.0 ±0.5	1.97 ±0.02
35 X 75	*A*	$34.9\ ^{0}_{-1.0}$	$1.37\ ^{0}_{-0.04}$
	B	75.0 ±1.0	2.95 ±0.04
35 X 100	*A*	$34.9\ ^{0}_{-1.0}$	$1.37\ ^{0}_{-0.04}$
	B	100.0 ±1.0	3.94 ±0.04
65 X 75	*A*	$64.9\ ^{0}_{-1.0}$	$2.56\ ^{0}_{-0.04}$
	B	75.0 ±1.0	2.95 ±0.04
70 X 75	*A*	$69.9\ ^{0}_{-1.0}$	$2.75\ ^{0}_{-0.04}$
	B	75.0 ±1.0	2.95 ±0.04

* see Figure 1, page 3

4. "60 mm x 78 mm" CORE WITH LIGHT LOCK GROOVES AND SPRING DETENTS FOR 35 mm FILM

Dimensions in millimetres (inches)

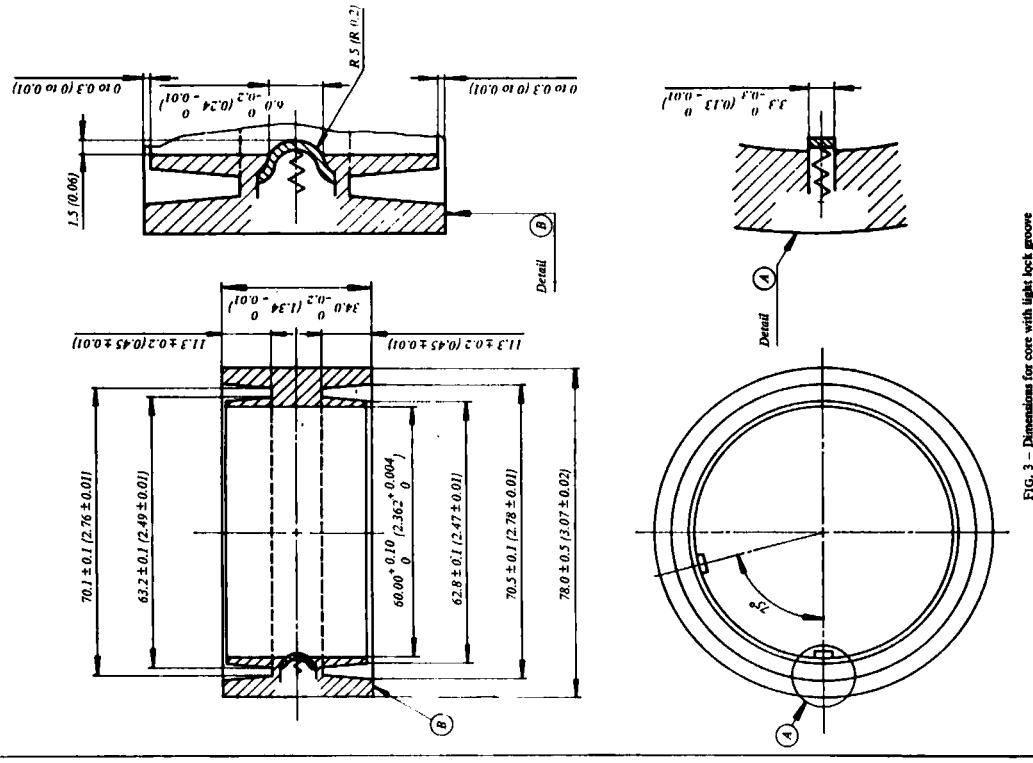


FIG. 3 – Dimensions for core with light lock groove

3. INTERMEDIATE CORE FOR "60 mm x 78 mm" CORES (FOR REDUCING SPINDLE HOLE SIZE)

Dimensions in millimetres (inches)

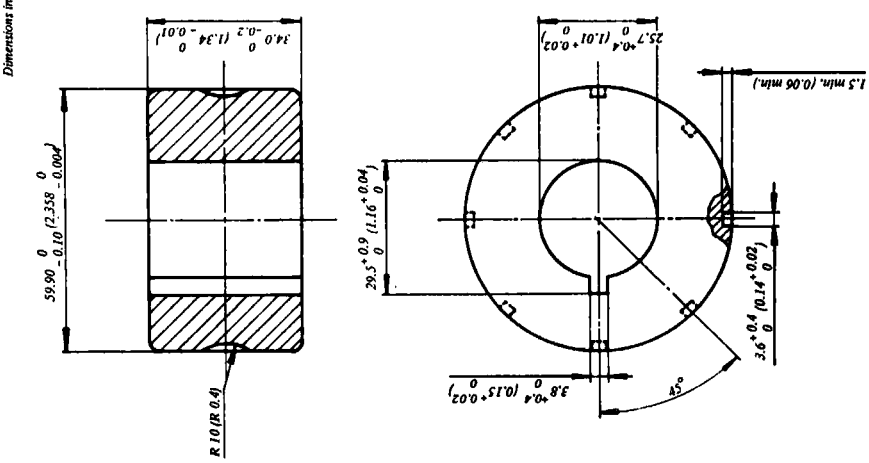


FIG. 2 – Dimensions for intermediate cores

American National Standard
specifications for 16mm 3-kHz flutter test film photographic type

Approved January 27, 1970 Sponsor: Society of Motion Picture and Television Engineers, Inc.

1. Scope

This standard specifies a 3-kHz sound test film for use in determining the presence of flutter in 16mm sound motion-picture projectors.

2. Test Film

2.1 The test film shall have an originally-recorded, direct-playback positive variable-area sound record in accordance with American National Standard Dimensions of Photographic Sound Record on 16mm Prints, PH22.41-1969, and developed in a high-contrast developer to a minimum density of 1.20.

2.2 The recorded frequency shall be 3 kHz ± 25 Hz with a film rate of 24 perforations per second (approximately 36 ft per minute).

2.3 The modulation of the recording shall be 80 ± 5 percent. The output level of the film shall be constant within ± 0.25 dB. (This is equivalent to an amplitude tolerance of ± 0.0015 in. when recording variable-area sound records with a nominal amplitude of 0.055 in.)

2.4 The total rms flutter of the sound recorder shall not exceed 0.07 percent and the flutter amplitude at any single flutter rate shall not exceed 0.05 percent (as defined in American National Standard Method for Determining Flutter Content of Sound Recorders and Reproducers, Z57.1-1954).

3. Film Stock

The film stock shall be of the low-shrinkage safety type, cut and perforated in accordance with American National Standard Dimensions for 16mm Motion-Picture Film, 1R-3000, PH22.12-1964 (Reaffirmed 1969).

4. Identification

Each film shall be marked "PH22.43-3kHz." This marking shall be printed lengthwise in the picture area and the spacing between consecutive titles shall be approximately 12 in.

5. Film Length

The film shall be supplied in 100-ft lengths.

NOTE: A test film made in accordance with this standard is available from the Society of Motion Picture and Television Engineers.

NOTES

1. Inch system dimensions shown in sections 2, 3 and 4 have been rounded to show acceptable inch system practice. In a few such cases, particularly in section 4, the rounding *direction* differs from customary rules applied in converting millimetres to inches.

2. The direction and magnitude of the difference between dimension *A* values in section 2 and the *nominal* width of the cores has been fixed intentionally to encourage a common manufacturing practice of keeping the maximum widths of cores very slightly less than the minimum widths of corresponding films.

3. For dimension *B* of the 16 mm X 100 mm and 35 mm X 75 mm simple core sizes, countries using the inch system have worked to some round inch nominal values, 4.00 (± 0.02) inches and $3.00\ (^{+\ 0.12}_{-\ 0.02})$ inches respectively, which are significantly different from the round nominal millimetre figures used by metric system countries. In the case of the 35 mm X 75 mm core size, some manufacturers have preferred a dimension even larger than a nominal 3 inch value. The *B* dimension has not been critical in the past and no conflicts are known with respect to interchangeability in equipment. Nevertheless, *the millimetre or inch equivalent values shown in the Table for dimension B should be observed as tools* and dies are replaced, although the existing inch system values are recognized temporarily as acceptable.

4. It is recognized that a 70 mm X 50 mm size simple core exists with dimensions as shown in Figure 1 and with *A* and *B* dimensions of $69.9\ ^{0}_{-1.0}$ mm ($2.75\ ^{0}_{-0.04}$ in) and 50.0 ± 0.05 mm (1.97 ± 0.02 in) respectively. This core has not been included in section 2 in order to encourage its replacement in practice with a simple core of 70 mm X 75 mm size. The latter represents a better engineering design for the weights of film usually involved.

5. Attention is drawn to the fact that some cores exist with a bore-plus-keyway dimension of 29.2 mm (1.15 in) minimum and that care should be taken when designing spindles to avoid interference.

6. Means of attaching film to all cores are optional. Commonly used are cores having one anchoring slot or two anchoring slots facing in opposite directions. The latter facilitates film attachment whichever way the core is placed on its spindle. It is recommended that the edges of any slot, if used, be depressed slightly to minimize pressure marks in the first few convolutions of the film.

7. The rather large tolerances on dimension *B* are necessary to encompass the satisfactory existing practices of many different manufacturers. It is expected, however, that cores made by any one manufacturer would be held to a considerably smaller tolerance range. This will help prevent large variations, including undue tapering of the core from one side to the other, of any manufacturer's product.