

American National Standard for motion-picture equipment (16-mm) — projection reels — 200- to 2300-ft capacity

Approved August 3, 1987

Sponsor: Society of Motion Picture and Television Engineers

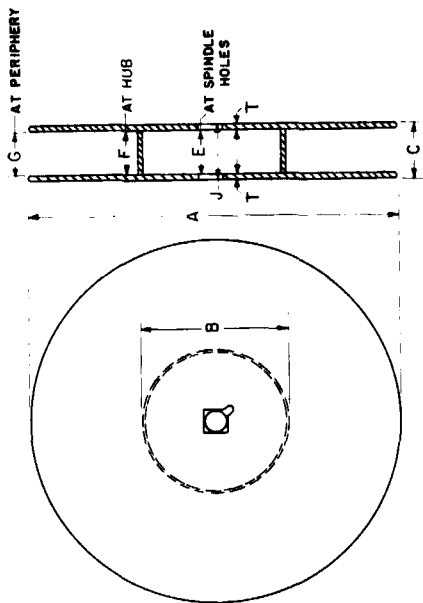
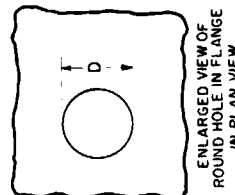
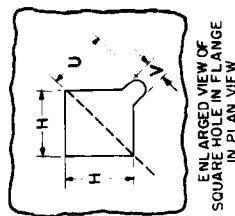
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1. Scope

This standard specifies the dimensions for 16-mm motion-picture projection reels having capacities from 200 to 2300 ft (60 to 700 m) of film inclusive.

2. Dimensions

The dimensions shall be as specified in the figure and tables.



Plan View and Cross Section of Reel

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Table 1

Nominal Capacity	Dimension A		Dimensions B		Lateral Runout	
	Inches	Millimeters	Inches	Millimeters	Inches	Millimeters
200 ft (60 m)	5.031 + 0.000 - 0.031	127.79 + 0.00 - 0.79	1.750 ± 0.250	44.45 ± 6.35	0.057 max	1.45 max
400 ft (120 m)	7.000 + 0.000 - 0.031	177.80 + 0.00 - 0.79	2.500 ± 0.075	63.50 ± 1.90	0.080 max	2.03 max
600 ft (180 m)	9.225 + 0.000 - 0.010	234.32 + 0.00 - 0.25	4.875 ± 0.250	123.82 ± 6.35	0.080 max	2.03 max
800 ft (240 m)	10.500 + 0.000 - 0.031	266.70 + 0.00 - 0.79	4.875 ± 0.375	123.82 ± 9.52	0.120 max	3.05 max
1200 ft (370 m)	12.250 + 0.000 - 0.125	311.15 + 0.00 - 3.18	4.875 ± 0.250	123.82 ± 6.35	0.140 max	3.56 max
1600 ft (490 m)	14.000 + 0.000 - 0.275	355.60 + 0.00 - 6.98	4.875 ± 0.250	123.82 ± 6.35	0.160 max	4.06 max
2000 ft (610 m)	15.000 + 0.000 - 0.031	381.00 + 0.00 - 0.79	4.875 ± 0.250	123.82 ± 6.35	0.171 max	4.34 max
2300 ft (700 m)	14.975 + 0.000 - 0.025	380.36 + 0.00 - 0.64	3.550 ± 0.000 - 0.015	90.17 ± 0.38	0.175 max	4.44 max

Table 2

Dimensions	Inches		Millimeters	
	Inches	Millimeters	Inches	Millimeters
C Total thickness (including flared, rolled, or beveled edges, if any)	0.962 max	24.43 max		
D Spindle hole diameter	0.319 + 0.000 - 0.003	8.10 ± 0.08		
E Distance between flanges at spindle holes	0.660 ± 0.015	16.76 ± 0.38		
F At hub	0.660 + 0.075 - 0.000	16.76 ± 1.90		
G At periphery	0.660 + 0.000 - 0.000	16.76 ± 0.00		
H Side of square spindle hole	0.319 + 0.000 - 0.003	8.10 ± 0.08		
J Overall thickness at spindle holes	0.790 max	20.07 max		
T Flange thickness (adjacent to spindle holes)	0.105 max 0.027 min	2.67 max 0.69 min		
U Keyway depth	0.330 + 0.000 - 0.020	8.38 ± 0.51		
V Keyway width	0.125 + 0.005 - 0.000	3.18 ± 0.13		
Flange and hub eccentricity	0.031 max	0.79 max		

NOTES:

- The outer surfaces of the flanges shall be flat out to a diameter of at least 1.250 in (31.75 mm). Dimension J is the thickness of the reel over the area described by this diameter.
- Rivets or other fastening members shall not extend beyond the outside surfaces of the flanges more than 0.03 in (0.8 mm) and shall not extend beyond the overall thickness indicated by Dimension C.
- Except at embossings, rolled edges, and rounded corners, the limits shown shall not be exceeded at the periphery of the flanges, nor at any other distance from the center of the reel.
- If spring fingers are used to engage the edges of the film, Dimension F shall be measured between the fingers when they are pressed outward to the limit of their operating range.

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reel for a distance of 0.12 in (3.0 mm) radially. Apply a load of 1/2 pound (2.2 N) over a central area not greater than 1.25 in (31.8 mm) in diameter. Measure the vertical location of this area with a dial indicator. Add 1 pound (4.4 N) and measure again. Repeat the process on the other flange. The additional deflection caused by the 1-pound load over that given by the 1/2-pound load should be less than 0.035 in (0.89 mm).

7. Lateral runout shall be measured with respect to the common axis established by the round and square holes.

Appendix

(This Appendix is not part of the American National Standard, but is included for information only.)

A1. For regular projection, a reel with a round hole in one flange is generally preferred. When this hole is present, the projectionist can tell at a glance whether or not the film needs rewinding. Furthermore, this type of reel helps the projectionist place the film correctly on the projector and thread it so that the picture is properly oriented with respect to the right and left sides.

It is common practice to use reels with square holes on both flanges. In such a case, the alignment of the square holes must be such that a test bar 0.316 in (8.02 mm) in diameter shall pass completely through the reel.

However, if both flanges have square holes, they and the opening in the corner should be aligned so that the reel will fit on a square spindle and rewinds with a long key. Such reels may not be suitable for use on some projector spindles. This is true if the spindle has a shoulder that a flange must touch in order to supply lateral positioning for the reel.

A2. Nominal values for Dimensions E, F, and G were chosen to provide lateral clearance for the film, which has a maximum width of 0.630 in (16.00 mm). However, a channel of the indicated width is narrow enough so that the film cannot wander laterally too much as it is wound. If the channel is too wide, it is likely to cause loose winding of the film with resultant excessively large rolls.

At the hub, the tolerances applied to Dimension F are least because it is possible to control the separation fairly easily in that zone. At the region near the holes for the spindles, these tolerances are somewhat larger to allow

1. Scope

This standard specifies the dimensions for 8-mm Type R motion-picture reels used for projection having film capacities of 50, 100, 200, 400, 600, 800 and 1200 ft (15, 30, 60, 120, 180, 240 and 360 m).

2. Dimensions

2.1 The dimensions shall be as specified in the figure and tables.

2.2 The dimensions apply regardless of the material used for construction (See Note 3).

2.3 Dimensions C and K apply from the core to the periphery of the reel except for the area of Dimension J. All points of the outside surface of the flanges, including the rim, lettering, lugs, and all other protrusions, shall fall between planes as defined by Dimension K. If spring fingers are used to engage the edges of the film, Dimension C shall be measured with the fingers fully expanded.

2.4 Dimension A applies to both flanges.

2.5 Dimension J shall apply within a circle of 1.0-in (25-mm) diameter or larger, centered on the spindle hole axis.

2.6 Dimension L in Table 1 is the total indicator reading on the flanges of the reel at any distance from the reel axis (datum line Z), measured through a complete revolution of the reel. The reel is to be rotated about its axis while being held against a 1-in (25-mm) diameter circular reference support or flange of a horizontal spindle. An exception is made and the restricted run-out does not apply over the small zone of transition from Dimension J to Dimension K.

2.7 The surface of the core and the periphery of the flanges shall be concentric with the spindle holes to within 0.020 in (0.51 mm) total indicator reading.

2.8 For reels of increasing radius or capacity, progressively smaller tolerances for Dimension D are specified in Table 2. This is done because the potential for greater runout and the masses involved increase with diameter, and larger reels require more precise and positive alignment on the spindle.

2.9 Dimensions P and P' have been established to ensure symmetry of the recessed area represented by Dimension J. They apply only when Dimension K exceeds Dimension J. They should be measured at the point of departure of Dimension J to the larger Dimension K.

REFERENCES:

- VILBRANDT, C.F. The projection life of 16mm film. *Jour. SMPTE*, vol 48, no. 6, June 1947, pp 521-542.
- CHANDLER, J. S. Projecting 16mm film with large reels. *Jour. SMPTE*, vol 65, no. 6, June 1956, pp 320-327.

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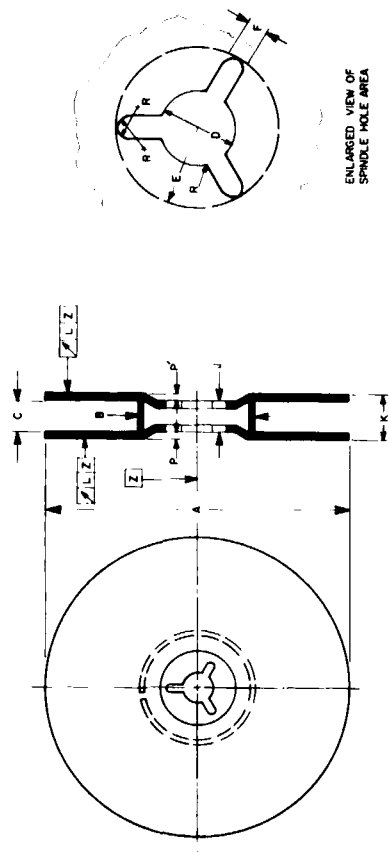


Table 1

Nominal Reel Capacity Feet	Nominal Reel Capacity Meters	Dimensions		Inches		Millimeters	
		Min	Max	Min	Max	Min	Max
50	15	A	2.95	7.49	73.9	74.9	
		B	1.30	33.0	31.7	33.0	
		L	0.04	1.0		1.0	
100	30	A	3.90	100.1	99.1	100.1	
		B	1.81	46.0	45.0	46.0	
		L	1.77	0.04		1.0	
200	60	A	5.00	128.0	127.0	128.0	
		B	2.00	50.8	45.0	50.8	
		L	1.77	0.06		1.5	
400	120	A	7.00	180.1	177.8	180.1	
		B	2.36	63.5	59.9	63.5	
		L	0.08	2.0		2.0	
600*	180	A	9.25	236.5	235.0	236.5	
		B	4.85	124.7	123.2	124.7	
		L	0.10	2.5		2.5	
800*	240	A	10.47	268.0	265.9	268.0	
		B	4.85	124.7	123.2	124.7	
		L	0.12	3.0		3.0	
1200*	360	A	12.23	311.7	310.6	311.7	
		B	4.85	124.7	123.2	124.7	
		L	0.12	3.0		3.0	

*See Appendix A.5.

Table 2

Dimensions	Inches	Millimeters
C	0.33 + 0.06 - 0.00	8.4 + 1.5 - 0.0
D (100 ft or less)	0.316 + 0.010 - 0.000	8.03 + 0.25 - 0.00
(200 ft)	0.316 + 0.004 - 0.000	8.03 + 0.10 - 0.00
(400 ft or more)	0.316 + 0.003 - 0.000	8.03 + 0.08 - 0.00
E	0.312 ± 0.005	7.92 ± 0.13
F	0.06 + 0.01 - 0.00	1.5 + 0.3 - 0.0
J	0.490 + 0.00 - 0.00	12.45 + 0.0 - 0.0
K	0.56 max	14.2 max
P = P'	0.020 max	0.51 max
R	Maximum is 1/2 value used for Dimension F	

NOTE 1: For future construction, it is preferred that the flanges of the reel shall have three radial driving slots spaced approximately 120° and conforming to Dimensions E and F, and that the drive slots of each flange shall be aligned. If properly aligned, the reel will fit on a test spindle (gauge) of 0.314-in (7.98-mm) diameter with a radial spindle drive key having a length from the spindle shoulder greater than the width of the reel, Dimension J; a thickness of 0.058 in (1.47 mm) and a height, measured as a radius from the spindle axis, of 0.27 in (6.9 mm). Existing reels with drive slots in only one flange are recognized temporarily.

Appendix

(This Appendix is not part of the American National Standard, but is included for information only.)

A1. Although the standard specifies three drive slots on each flange, only one is normally used to drive the reel. Three slots are specified to facilitate easy loading of the reel on the drive spindle.

A2. As noted, a spindle shoulder of 1.0 in (25 mm) in diameter is required for the measurement of lateral runout. The wobble of the reel on the projector will be less if a shoulder of this diameter is also incorporated on the projector spindle and provision made to fit the reel tightly to this shoulder. It is expected that projector manufacturers will incorporate a spindle shoulder of at least 0.50 in (12.7 mm) in diameter.

The arrow in the symbol for runout, shown in the figure, indicates runout of the referenced surface with respect to Datum axis Z and to the limits listed for Dimension L in Table 1.

NOTE 2: Provision should be made for securing the end of the film so that the reel accepts the full width of the end film, and that the film will be freely released at the end of its run. If film attachment is provided by a slot in the core, a suitable cutout in the core may be included to allow free access to the film end and to provide for attachment of a film end retention clip or plug when the reel is used on automatic rewind equipment.

NOTE 3: The dimensions were determined for reels made from a dimensionally stable material such as metal. If the reel or reel hub is made of plastic or other dimensionally unstable material, the spindle hole diameter, Dimension D, should be adjusted so that at least the minimum dimension (0.316 in, 8.03 mm) is maintained throughout the normal use range of temperature and relative humidity.

NOTE 4: The International Organization for Standardization has established the minimum diameter of the spindle hole, Dimension D, as 0.317 in (8.05 mm) to ensure satisfactory fit on internationally available 8-mm projector spindles, and to provide for compatibility of the minimum spindle hole diameter for 8-, 16- and 35-mm camera and projector spools and reels. It is, therefore, recommended that USA manufacturers direct future production to the 0.317 in minimum.

NOTE 5: The spindle hole may be a sleeve or there may be an air space between the spindle holes in the flanges, depending upon the type of construction. Because of this, the means of retaining the reel on the projector spindle should be outboard of the reel, as defined by Dimension J.

A3. This standard applies to reels used for projection which are considered to be interchangeable on all types of projection equipment. Take-up reels, which may be considered an integral part of the manufacturer's projection equipment, may deviate from the dimensions in this standard. For example, it may be desirable to taper the flanges from the core to the periphery or to provide for special film attachment mechanisms.

A4. The nominal reel capacity stipulated in Table 1 is based on a total film thickness (including any magnetic stripping or winding allowance) not exceeding 0.006 in (0.15 mm).

A5. Reels of 600-, 800- and 1200-ft capacity are not in common use at this time. Specifications are provided so that a standard will be available should these reels come into use.