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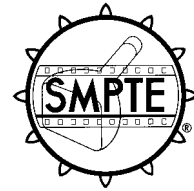
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SMPTE STANDARD

ANSI/SMPTE 160M-1995

Revision of
ANSI/SMPTE 160M-1990

for Motion-Picture Equipment (8-mm Type S) — Projection Reels — 100- to 312-mm Diameter



Page 1 of 6 pages

1 Scope

This standard specifies the dimensions of 8-mm type S motion-picture projection reels of 100- to 312-mm (3.94- to 12.28-in) diameter with nominal film capacities up to 360 m (1200 ft).

2 Dimensions

2.1 The dimensions shall be as given in the figures and tables.

2.2 The dimensions apply regardless of the material used for construction (see note 1).

2.3 Dimension H applies from the surface of the hub to the periphery of the flanges.

2.4 The minimum dimension K represents the diameter of the central portion of the reel centered on the spindle hole axis, over which the effective central thickness, J, of the reel is intended to apply (see 2.5).

2.5 Dimension J applies only within the maximum K diameter area and represents the distance or effective distance between the respective reference planes of rotation for each flange.

2.6 Selection of a value for dimension P is dependent upon the thickness of the material used for the flanges. According to the flange material thickness: 1) the K diameter area may be depressed (with P greater than zero); or 2) the outside surfaces of the flanges may be flat from the spindle hole area to the periphery (with P equal to zero); or 3) 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).

2.6.1 The P value for one flange should not differ from the corresponding P value for the other flange by more than 0.5 mm (0.02 in).

2.6.2 Any chosen flange thickness shall be maintained within ± 0.13 mm (0.005 in) from 5.0 mm (0.20 in) of the hub to within 5.0 mm of the periphery of the reel flange for reel size 10, and 10.0 mm (0.39 in) from the hub to within 10.0 mm of the periphery for reel size 13 and larger. Intentional special configurations, art work, depressions, or cutouts are excluded from this tolerance limitation.

2.7 If film attachment is provided by a slot in the reel hub, a minimum cutout in the hub is required for easy access to the film end, and to provide for insertion of a film-retention plug or clip for automatic rewind equipment. The area shown in figure 1 represents one type of cutout which might be used. The cutout area should be in both flanges so that a retaining clip of width J could be accommodated. The minimum cutout is outlined within the area and defined by dimensions R₂, S, and T (dimension S is perpendicular to dimension T). However, the manufacturer may provide an incorporated means of film retention in the design of the reel by use of a special retention plug or clip or other suitable means of film attachment. If a plug or clip is used, it shall not protrude beyond dimension J for reel-to-reel operation. The cutout area is not required when this is done; however, its supplemental inclusion is recommended when feasible (see note 2 for film attachment details).

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2.8 Dimension P_M for each flange is measured at the periphery of the flange and is the greatest distance measured outwardly from the flange reference plane of rotation when the reel is rotated on a test spindle and held against the reference K minimum zone surface (see figure 2.)

2.9 Dimension P_E for each flange applies anywhere between the K minimum zone and the point on the outside flange surface opposite the junction of the hub periphery and the flange, and is measured to the same reference plane of rotation used in measuring P_M . An angular envelope is defined by the conical surfaces joining the P_M (max) loci with the particular P_E (max) loci on the outside surfaces of the flanges

directly opposite the junction of the hub periphery and the flanges. All other points on the flanges (including rivets or other fastening devices, variations in flange thickness, flatness, and lateral runout) shall fall within the angular volume-of-rotation envelope.

2.10 The runout of the hub, dimension E, is specified by dimension U referenced from the axis through the center of the spindle hole, dimension C. A similar allowance is provided for the concentricity of the spindle hole and the flanges in the maximum volume-of-rotation diagram by having dimension V exceed dimension M maximum by 0.5 mm (0.02 in) for reel sizes up to and including No. 16, and by 0.8 mm (0.03 in) for larger reel sizes.

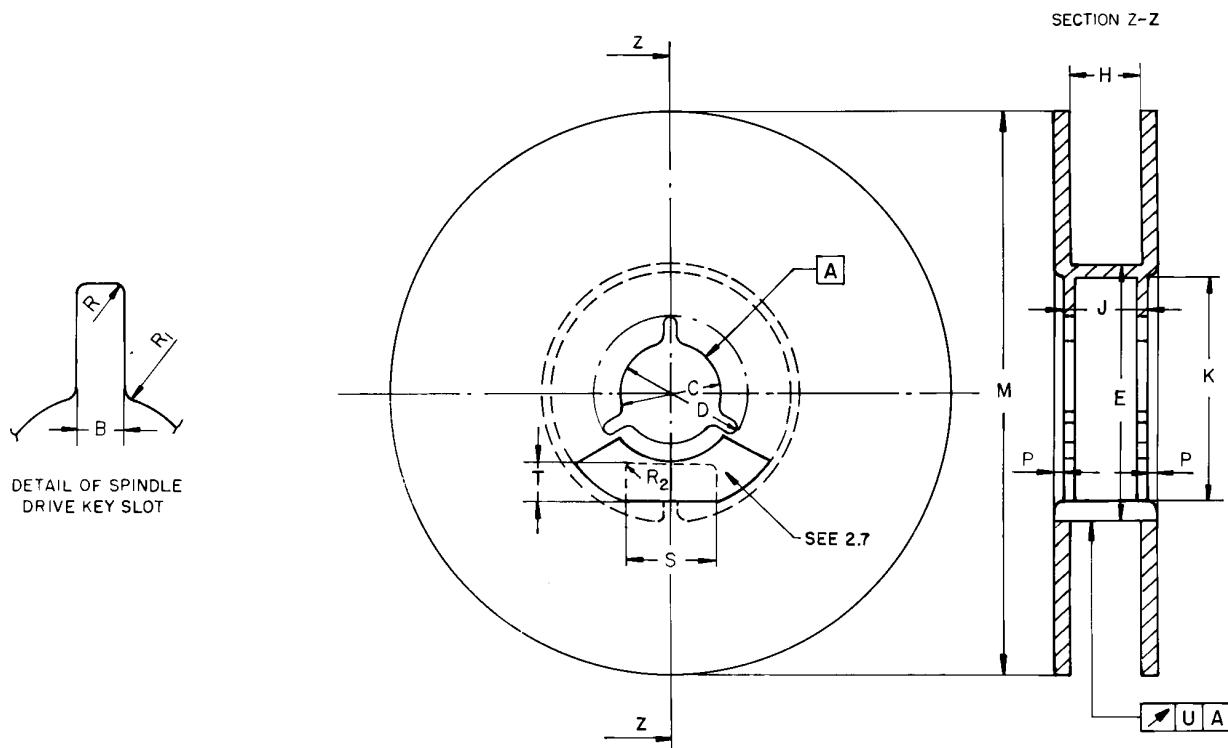


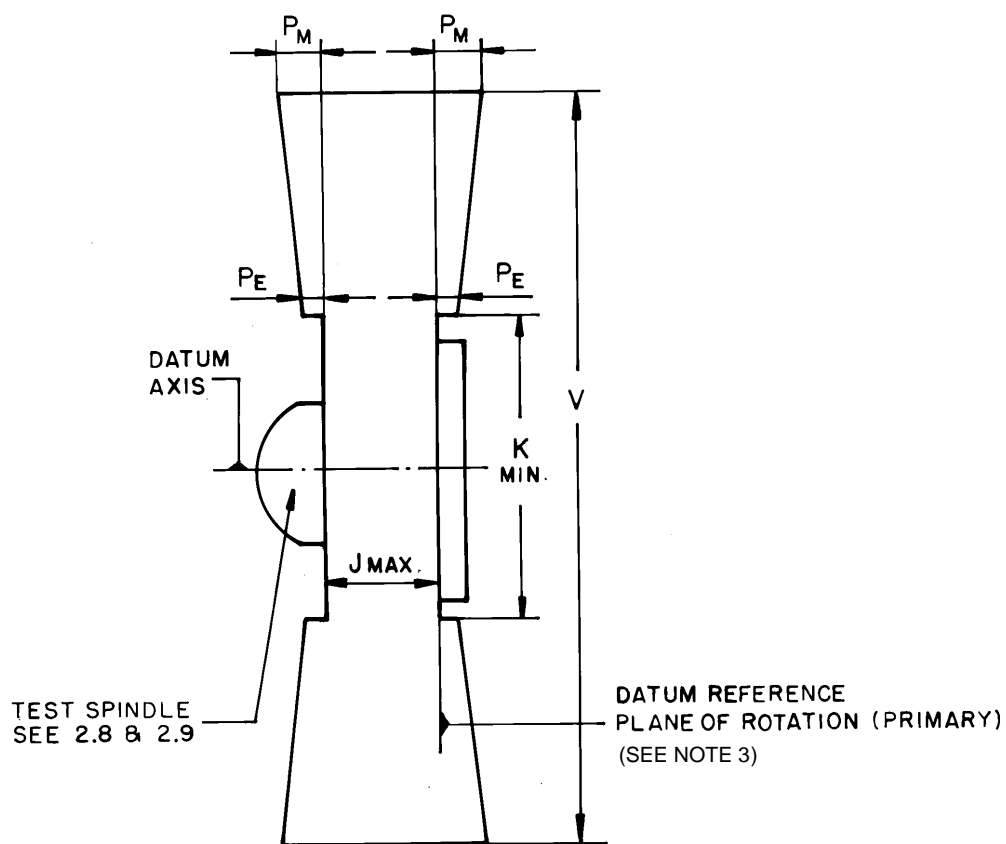
Figure 1 – Reel dimensions

Table 1 – Dimensions applicable to specific reel sizes

Reel size number ¹⁾	Nominal reel capacity		Dimensions	Millimeters		Inches	
	m	ft					
10	30	100	M	100.0	$0 - 1.0$	3.94	$0 - 0.04$
			E	46.0	max	1.81	max
			V	32.0	min	1.26	min
			P _M ²⁾	100.5		3.96	
13	60	200	M	128.0	$0 - 1.0$	5.04	$0 - 0.04$
			E	50.8	max	2.00	max
			V	45.0	min	1.77	min
			P _M	128.5		5.06	
16	90	300	M	159.0	$0 - 1.0$	6.26	$0 - 0.04$
			E	62.0	± 1.5	2.44	± 0.06
			V	159.5		6.28	
			P _M	2.3	max	0.09	max
18	120	400	M	180.0	$0 - 2.0$	7.09	$0 - 0.08$
			E	62.0	± 1.5	2.44	± 0.06
			V	180.8		7.12	
			P _M	2.3	max	0.09	max
21	180	600	M	209.0	$0 - 2.0$	8.23	$0 - 0.08$
			E	62.0	± 1.5	2.44	± 0.06
			V	209.8		8.26	
			P _M	2.6	max	0.10	max
24	180	600	M	237.0	$0 - 2.0$	9.33	$0 - 0.08$
			E	124.0	± 2.0	4.88	± 0.08
			V	237.8		9.36	
			P _M	2.6	max	0.10	max
253)	240	800	M	252.0	$0 - 2.0$	9.92	$0 - 0.08$
			E	80.0	± 1.5	3.15	± 0.06
			V	252.8		9.95	
			P _M	2.6	max	0.10	max
27	240	800	M	268.0	$0 - 2.0$	10.55	$0 - 0.08$
			E	124.0	± 2.0	4.88	± 0.08
			V	268.8		10.58	
			P _M	2.8	max	0.11	max
29	300	1000	M	292.0	$0 - 2.0$	11.50	$0 - 0.08$
			E	124.0	± 2.0	4.88	± 0.08
			V	292.8		11.53	
			P _M	3.0	max	0.12	max
31	360	1200	M	312.0	$0 - 2.0$	12.28	$0 - 0.08$
			E	124.0	± 2.0	4.88	± 0.08
			V	312.8		12.31	
			P _M	3.0	max	0.12	max

Table 2 – Dimensions common to all reel sizes

Dimensions	Millimeters	Inches
B	1.5 $\begin{smallmatrix} + 0.3 \\ 0 \end{smallmatrix}$	0.06 $\begin{smallmatrix} + 0.01 \\ 0 \end{smallmatrix}$
C	12.75 $\begin{smallmatrix} + 0.15 \\ 0 \end{smallmatrix}$	0.502 $\begin{smallmatrix} + 0.006 \\ 0 \end{smallmatrix}$
D	20.50 $\begin{smallmatrix} + 0.50 \\ 0 \end{smallmatrix}$	0.807 $\begin{smallmatrix} + 0.020 \\ 0 \end{smallmatrix}$
H	8.4 $\begin{smallmatrix} + 1.5 \\ 0 \end{smallmatrix}$	0.33 $\begin{smallmatrix} + 0.06 \\ 0 \end{smallmatrix}$
J	11.4 $\begin{smallmatrix} 0 \\ - 1.2 \end{smallmatrix}$	0.45 $\begin{smallmatrix} 0 \\ - 0.05 \end{smallmatrix}$
K	25.5 min	1.00 min
P	See 2.6 and 2.6.1	
P _E ¹⁾	1.5 max	0.06 max
R	1/2 dimension B	
R ₁	1/2 dimension B	
R ₂	1.5 max	0.06 max
S	12.0 min	0.47 min
T	6.0 min	0.24 min
U	0.8 max	0.03 max

**Figure 2 – Maximum volume of rotation**

NOTES

1 If the reel hub is made from plastic or other dimensionally unstable material, the spindle hole diameter, C, should be adjusted so that at least the minimum dimension, 12.75 mm (0.502 in), is maintained through the normal use range of temperature and relative humidity.

2 Means should be provided for securing the end of the film to the reel. Such provision should accept the full width of the film and freely release the film at the end of the run, except when used on automatic rewind equipment. (If film attachment is provided by a slot in the hub, see 2.7.)

3 A datum reference plane of rotation is defined for each flange of a reel by a plane coincident with the surface of a flat 25.00-mm (0.984-in) diameter support which is centered on the spindle hole datum axis of the flanges. The reference surface makes contact with the reel in the minimum K diameter area. The datum axis, which is perpendicular to the datum reference plane of rotation, does not necessarily

coincide with the axis from the center of the spindle holes (see figure 2).

4 The flanges of the reel should have three radial driving slots placed at $120^\circ \pm 2^\circ$ and conforming to dimensions B and D. The drive slots of both flanges are aligned. If properly aligned, the reel will fit on a test spindle (gauge) of 12.7-mm (0.50-in) diameter with a radial spindle drive key having an axial length from the spindle shoulder greater than width J of the reel, a thickness of 1.47 mm (0.058 in); and a height, measured as a radius from the spindle axis, of 9.1 mm (0.36 in).

5 It is recommended that No. 10 reels be designed with one solid flange with the exception of the hub area. The solid flange of the reel shall be opposite the film attachment opening.

Annex A (informative)

Additional data

A.1 Three drive slots are specified for the spindle hole of each flange to facilitate easy loading of the reel on the drive spindle, even though only one is normally used to drive the reel. However, spindles may have two or three drive keys.

A.2 A test spindle shoulder of 25.00-mm (0.984-in) diameter is required for the measurement of dimension P. Loose fit between a projector spindle and reel spindle hole can contribute to flange excursion not measured when determining dimension P. This can be minimized if a 25.5-mm (1.00-in) shoulder also is incorporated on the projector spindle and a device for locking the K diameter area of the reel against the support is provided. In any case, it is expected that projector manufacturers will incorporate a spindle shoulder of at least 16.0-mm (0.63-in) diameter on their equipment.

A.3 Take-up reels, which are uniquely a part of the manufacturer's projection equipment, may deviate from the provisions of this standard. As an example, it may be desirable to taper the flanges from the hub to the periphery or to provide for special film attachment mechanisms.

A.4 The usual winding of film on a reel with a solid flange is such that the film perforations are closest to the threading slot (i.e., opposite the solid flange).

A.5 The spindle hole may be formed by 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 designed to act against the full K dimension of the reel adjacent to the spindle hole.

A.6 The variety of needs for motion-picture films has resulted in products with a wide range of thicknesses. Because of this trend, the designation of reel sizes by a nominal capacity has lost significance and size designation by flange diameter has been introduced. However, to provide the film capacity information needed, tables A.1 and A.2 on usable film lengths have been prepared for the standard size reels. In deriving these values, three basic assumptions were made:

1) The thickness value (t) assumes the inclusion of any magnetic coating and a winding allowance (space between film layers) as well as film thickness. It should be noted that tightly wound uncoated film requires a winding allowance of 0.0025 mm (0.00010 in), while loosely wound film requires an allowance of three or more times this value.

2) The capacities shown are those which can be contained on a minimum capacity reel within the tolerances provided (except for the size 10 and 13 maximum values included). This was achieved by using the minimum allowable flange diameter and the maximum allowable hub diameter in the calculations.

3) Some protection from spilling over of the outer laps of film is needed. Therefore, to leave a space between the film and the periphery of the flange, an arbitrary value along the radius was chosen to derive the maximum film diameter: 3.5 mm (0.14 in) for size 10 reels; 5.0 mm (0.20 in) for size 13, 16, and 18 reels; and 6.5 mm (0.26 in) for larger reels.

A.7 Caution must be exercised when film is stored on reels intended for archival storage. It is strongly recommended that the reels used not be finished with paints or coatings that have a tendency to evaporate over a long period of time inasmuch as this will affect the stored material.

Table A.1 – Film capacities of reels in meters (L)¹⁾

Reel size	Flange diameter r	Hub diameter r E _{max}	Maximum film coil D	Film thickness (t) in millimeters									
				0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16	0.17	0.18
cm	mm	mm	mm										
10 min	99.0	46.0	92.0	55.4	49.9	45.3	41.5	38.4	35.6	33.2	31.2	29.3	27.7
1 0 max	100.0	32.0	93.0	66.5	59.9	54.4	49.9	46.1	42.8	39.9	37.4	35.2	33.3
13 min	127.0	50.8	117.0	96.9	87.2	79.3	72.7	67.1	62.3	58.2	54.5	51.3	48.5
1 3 max	128.0	45.0	118.0	103.8	93.5	85.0	77.9	71.9	66.8	62.3	58.4	55.0	51.9
16	158.0	63.5	148.0	156.0	140.4	127.6	117.0	108.0	100.3	93.6	87.7	82.6	78.0
18	178.0	63.5	168.0	211.1	190.0	172.7	158.3	146.2	135.7	126.7	118.8	111.8	105.6
21	207.0	63.5	194.0	293.2	263.9	239.9	219.9	203.0	188.5	175.9	165.0	155.2	146.6
24	235.0	126.0	222.0	291.5	262.4	238.5	218.7	201.8	187.4	174.9	164.0	154.3	145.8
25	250.0	81.5	237.0	432.2	389.0	353.6	324.2	299.2	277.8	259.3	243.1	228.8	216.1
27	266.0	126.0	253.0	420.0	378.0	343.7	315.0	290.8	270.0	252.0	263.3	222.4	210.0
29	290.0	126.0	277.0	531.0	477.9	434.5	398.3	367.6	341.4	318.6	298.7	281.1	265.5
31	310.0	126.0	297.0	631.2	568.1	516.5	473.4	437.0	405.8	378.7	355.1	334.2	315.6

Table A.2 – Film capacities of reels in feet

Reel Size	Film thickness in inches									
	0.0035	0.0040	0.0043	0.0047	0.0051	0.0055	0.0059	0.0063	0.0067	0.0071
cm										
10 min	182	164	149	136	126	117	109	102	96	91
10 max	218	197	179	164	152	140	131	123	116	109
13 min	318	286	260	239	220	204	191	179	168	159
13 max	341	307	279	256	236	219	204	192	180	170
16	512	461	419	384	354	329	307	288	271	256
18	693	623	567	519	480	445	416	390	367	347
21	962	866	787	721	666	618	577	541	509	481
24	956	861	783	718	662	615	574	538	506	478
25	1418	1276	1160	1064	982	911	851	798	751	709
27	1378	1240	1128	1034	954	886	827	775	730	689
29	1742	1568	1426	1307	1206	1120	1045	980	922	871
31	2071	1864	1695	1553	1434	1331	1242	1165	1096	1035