International Standard 3639

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION•МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ•ORGANISATION INTERNATIONALE DE NORMALISATION

Cinematography — Projection reels/spools 75 to 312 mm diameter for 8 mm Type S motion-picture film — Dimensions and specifications

Cinématographie — Bobines de projection pour film cinématographique 8 mm, type S, de diamètre 75 à 312 mm — Dimensions et spécifications

First edition — 1981-10-01

UDC 778.553.4 : 771.531.352 **Ref. No. ISO 3639-1981 (E)**

Descriptors : cinematography, projection reels/spools 75 to 312 mm diameter for 8 mm Type S motion-picture film, dimensions and specifications.

Price based on 5 pages

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO member bodies). The work of developing International Standards is carried out through ISO technical committees. Every member body interested in a subject for which a technical committee has been set up has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work.

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 3639 was developed by Technical Committee ISO/TC 36, *Cinematography*, and was circulated to the member bodies in March 1978.

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

Austria	Germany, F.R.	Sweden
Belgium	India	Switzerland
Canada	Italy	Turkey
Czechoslovakia	Japan	United Kingdom
Denmark	Netherlands	USA
France	Spain	USSR

No member body expressed disapproval of the document.

Printed in Switzerland

Cinematography — Projection reels/spools 75 to 312 mm diameter for 8 mm Type S motion-picture film — Dimensions and specifications

1 Scope and field of application

This International Standard specifies the dimensions for 8 mm Type S motion-picture projection reels/spools of 75 to 312 mm diameter (with the exception of the 75 mm Type No. 7) that are interchangeable on all types of reel-to-reel projection equipment.

NOTE — The No. 7 reel (75 mm), although temporarily recognized, will be superseded by that specified in ISO 6033. It is recommended that new projection equipment and reel/spool manufacturing capacity should comply with the requirements of ISO 6033.

2 Reference

ISO 6033, *Cinematography — Projection reels for 8 mm Type S projector cassette — Dimensions and specifications.*[1]

3 Dimensions

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

NOTE — A datum reference plane of rotation is defined for each flange of a reel/spool by a plane coincident with the surface of a flat 25,00 mm diameter support which is centred on the spindle hole datum axis of the flanges. The reference surface makes contact with the reel/spool 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 derived from the centre of the spindle holes. (See figure 2.)

3.2 These dimensions apply regardless of the material used for construction. (See 4.4.)

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

3.4 The minimum dimension K represents the diameter of the central portion of the reel/spool centred on the spindle hole axis, over which the effective central thickness J of the reel/spool is intended to apply. (See 3.5.)

3.5 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.

3.6 Selection of dimension P value 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 spindle hole area to 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).

3.6.1 The P value for one flange should not differ from the corresponding P value for the other flange by more than 0,5 mm.

3.6.2 Any chosen flange thickness shall be maintained within ± 0,13 mm from 5 mm of the hub to within 5 mm of the periphery of the reel flange for reel size 10, and 10 mm from the hub to within 10 mm of the periphery of reel size 13 and larger. Intentional special configurations, art work, depressions or cut-out are excluded from this tolerance limitation.

3.7 If film attachment is provided by a slot in the reel/spool hub, a minimum cut-out in the hub is required for easy access to the film end, and to provide for insertion of a film retention plug or clip, if desired for automatic rewind equipment. The stippled area shown in the figure represents one type of cut-out which might be used. The cut-out area should be in both flanges so that a retaining clip of width J could be accommodated. The minimum cut-out area is outlined within the

1) At present at the stage of draft.

stippled area and defined by dimensions R_2, S and T. Dimension S is perpendicular to dimension T. However, if the manufacturer desires, he may provide an incorporated means of film retention in the design of his reel/spool 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 universal cut-out area is not required when this is done; however, its supplemental inclusion is recommended when feasible. (See 4.3 for film attachment details.)

3.8 Referring to the volume of rotation diagram (figure 2), 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/spool is rotated on a test spindle and held against the reference K minimum zone surface.

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 run-out) shall fall within the angular volume-of-rotation envelope, so defined.

3.9 The run-out of the hub, E, is specified by dimension U referenced from the axis through the centres of 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 for reel/spool sizes up to and including 16, and by 0,8 mm for reel/spool sizes larger than 16.

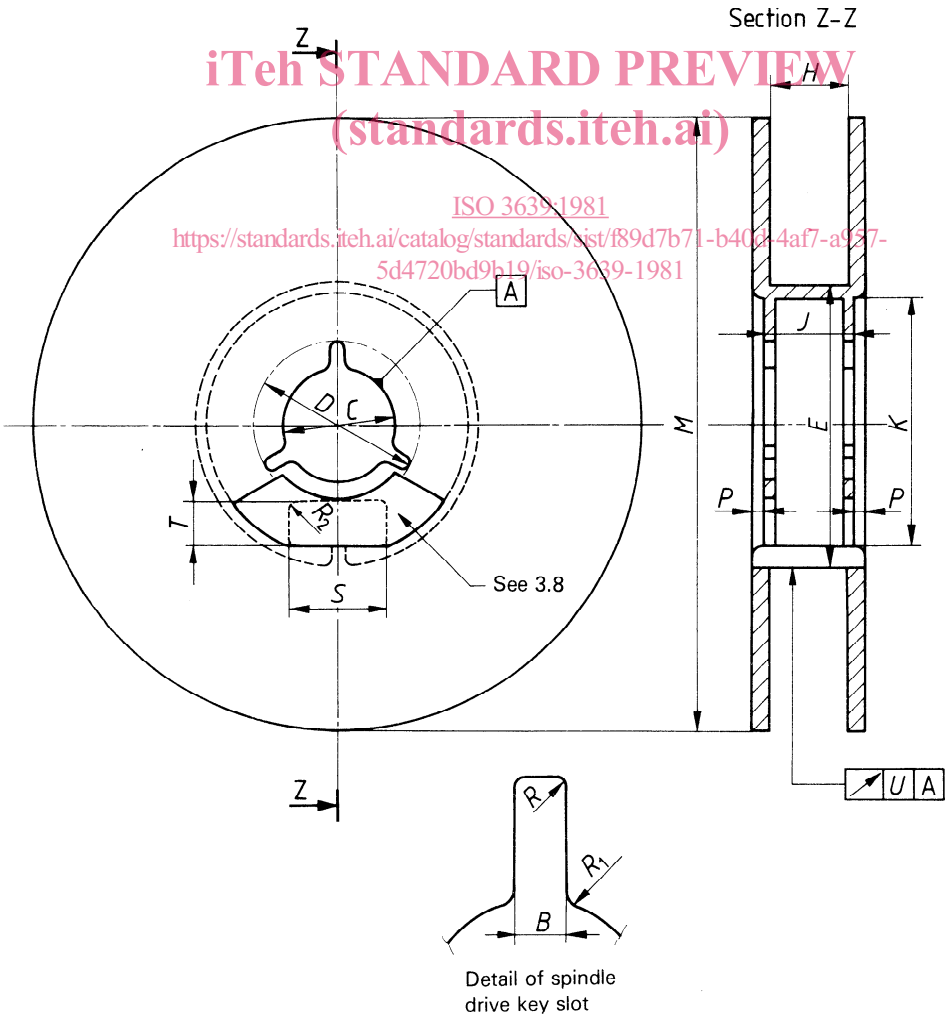

Figure 1 — Reel/spool dimensions

Table 1

Reel/spool size number*	Nominal reel/spool capacity m	ft	Dimension	mm	in
7**	15	50	M	$75{,}0\ ^{0}_{-1{,}0}$	$2.95\ ^{0}_{-0.04}$
			E	$32{,}5 \pm 0{,}5$	1.28 ± 0.02
			V	75,5	2.97
			P_m	1,9 max.	0.07 max.
10	30	100	M	$100{,}0\ ^{0}_{-1{,}0}$	$3.94\ ^{0}_{-0.04}$
			E	46,0 max. 32,0 min.	1.81 max. 1.26 min.
			V	100,5	3.96
			P_m	1,9 max.	0.07 max.
13	60	200	M	$128{,}0\ ^{0}_{-1{,}0}$	$5.04\ ^{0}_{-0.04}$
			E	50,8 max. 45,0 min.	2.00 max. 1.77 min.
			V	128,5	5.06
			P_m	2,0 max.	0.08 max.
16	90	300	M	$159{,}0\ ^{0}_{-1{,}0}$	$6.26\ ^{0}_{-0.04}$
			E	$62{,}0 \pm 1{,}5$	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	$62{,}0 \pm 1{,}5$	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	$62{,}0 \pm 1{,}5$	2.44 ± 0.06
			V	209,8	8.26
			P_m	2,6 max.	0.10 max.
25***	240	800	M	$252{,}0\ ^{0}_{-2{,}0}$	$9.92\ ^{0}_{-0.08}$
			E	$80{,}0 \pm 1{,}5$	3.15 ± 0.06
			V	252,8	9.55
			P_m	2,6 max.	0.10 max.
27	240	800	M	$268{,}0\ ^{0}_{-2{,}0}$	$10.55\ ^{0}_{-0.08}$
			E	$124{,}0 \pm 2{,}0$	4.88 ± 0.08
			V	268,8	10.58
			P_m	2,8 max.	0.11 max.
29	300	1 000	M	$292{,}0\ ^{0}_{-2{,}0}$	$11.50\ ^{0}_{-0.08}$
			E	$124{,}0 \pm 2{,}0$	4.88 ± 0.08
			V	292,8	11.53
			P_m	3,0 max.	0.12 max.
31	360	1 200	M	$312{,}0\ ^{0}_{-2{,}0}$	$12.28\ ^{0}_{-0.08}$
			E	$124{,}0 \pm 2{,}0$	4.88 ± 0.08
			V	312,8	12.31
			P_m	3,0 max.	0.12 max.

* The nominal reel/spool capacities in table 1 are based on a film thickness of 0,16 mm. For an evaluation of capacities for various film thicknesses, see clause A.6. The reel/spool size is the nominal flange diameter in centimetres or inches. Only the centimetre size is shown and is preferred. The corresponding inch sizes are recognized and are Nos. 3, 4, 5, 6, 7, 8, 9, 10, 11 and 12 respectively.

** See the note to clause 1.

*** The No. 27 reel/spool with the higher hub-to-flange ratio is preferred due to minimization of film damage.

Table 2

Dimension	mm	in
B	$1{,}5\ ^{+0{,}3}_{0}$	$0.06\ ^{+0.01}_{0}$
C	$12{,}75\ ^{+0{,}15}_{0}$	$0.502\ ^{+0.006}_{0}$
D	$20{,}5\ ^{+0{,}5}_{0}$	$0.807\ ^{+0.02}_{0}$
H	$8{,}4\ ^{+1{,}5}_{0}$	$0.33\ ^{+0.06}_{0}$
J	$11{,}4\ ^{0}_{-1{,}2}$	$0.45\ ^{0}_{-0.05}$
K	25,5 min.	1.0 min.
P_e	1,5 max.	0.06 max.
R	Maximum is 1/2 of value used for dimension B	
R_1	Maximum is 1/2 of value used for 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.

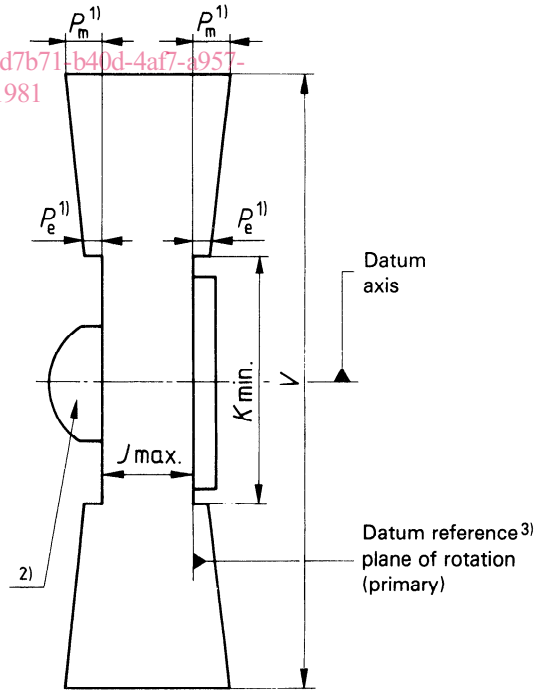

Figure 2 — Maximum volume of rotation 4)

1) See 3.8.

2) Test spindle (with flat support) used in measuring P_e and P_m.

3) See 3.1, note.

4) Not intended as a true view or section figure.

4 Notes

4.1 The flanges of the reel/spool should have three radial driving slots placed at 120 ± 2° 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 diameter with a radial spindle drive key having an axial length from the spindle shoulder greater than the width J of the reel/spool; a thickness of 1,47 mm; and a height, measured as a radius from the spindle axis, of 9,1 mm.

4.2 It is recommended that reel/spool designated as 10 be designed with one solid flange with the exception of the hub area. The solid flange side of the reel should be opposite to the opening for access for film attachment.

4.3 Means should be provided for securing the end of the film to the reel/spool. 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 3.7.)

4.4 If the reel/spool or its hub is made from plastic or other dimensionally unstable material, the spindle hole diameter C should be so adjusted that at least the minimum dimension 12,75 mm is maintained through the normal use range of temperature and relative humidities.

Annex

(The annex is not an integral part of this International Standard.)

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

A.2 A test spindle shoulder of 25,0 mm (0.984 in) diameter is required for the measurement of dimension P. Loose fit between a projector spindle and reel/spool spindle hole can contribute to flange excursion not measured when determining the P dimension. This can be minimized if a 25,5 mm (1.0 in) shoulder also is incorporated on the projector spindle and a device for locking the K diameter area of the reel/spool 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/spools which are uniquely a part of the manufacturer's projection equipment may deviate from the provisions of this International 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/spool with a solid flange is such that the film perforations are closest to the flange with 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/spool on the projector spindle should be designed to act against the full K dimension of the reel/spool 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/spool 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, table 3 of usable film lengths has been prepared for the standard size reels/spools. 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 will need a winding allowance of 0,002 5 mm (0.000 1 in), while loosely wound film will need an allowance of three or more times this value.

2) The capacities shown are those which can be contained on a minimum capacity reel/spool 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 as 3,5 mm (0.14 in) for the size 10 reel/spool, 5,0 mm (0.20 in) for the size 13, 16 and 18 reels/spools and 6,5 mm (0.26 in) for the larger reels/spools to derive the maximum film diameter.

Table 3 — Metric units

Reel/spool size	Flange diameter	Hub diameter E_{max}	Maximum film coil D	Film capacities, in metres Length L calculated for each value of thickness t [1] (mm)									
cm	mm	mm	mm	0,09	0,10	0,11	0,12	0,13	0,14	0,15	0,16	0,17	0,18
7	74,0	33,0	67,0	29,7	26,7	24,3	22,3	20,5	19,1	17,8	16,7	15,7	14,8
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
10 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
13 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
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

1) The formula used for the calculation of film capacity is :

$$L = \frac{\pi\left(D^2 - E_{max}^2\right)}{4\,000\,t}$$

t = film thickness including any magnetic striping and winding allowance — see clause A.6.

Table 3a — Inch units

Reel/spool size	Film capacities, in feet t [1] (inches)									
cm	0.0035	0.0040	0.0043	0.0047	0.0051	0.0055	0.0059	0.0063	0.0067	0.0071
7	97	88	80	73	67	63	58	55	52	49
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
25	1 418	1 276	1 160	1 064	982	911	851	798	751	709
27	1 378	1 240	1 128	1 034	954	886	827	775	730	689
29	1 742	1 568	1 426	1 307	1 206	1 120	1 045	980	922	871
31	2 071	1 864	1 695	1 553	1 434	1 331	1 242	1 165	1 096	1 035

1) t = film thickness including any magnetic striping and winding allowance — see clause A.6.

This page intentionally left blank