INTERNATIONAL STANDARD

ISO 14546

First edition
2000-12-15

Photography — Aerial films and spools — Dimensions

Photographie — Films et bobines aériens — Dimensions

Reference number
ISO 14546:2000(E)

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.ch
Web www.iso.ch

Printed in Switzerland

Contents

Page

Figures

Tables

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established 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. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

Attention is drawn to the possibility that some of the elements of this International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 14546 was prepared by Technical Committee ISO/TC 42, *Photography*.

Introduction

This International Standard points out (for the benefit of equipment designers) that dimensions of spools should not be used for the design of magazine cassette internal clearances. Spools shipped from point to point may have lateral runout as much as three times those indicated in this International Standard.

Photography — Aerial films and spools — Dimensions

1 Scope

This International Standard specifies dimensions for films, leaders and trailers, perforations where applicable, and package marking for rolls of photographic film used in aerial applications.

This International Standard also includes the sizes and dimensions of steel or aluminium spools for appropriate sizes of film.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 1:1975, *Standard reference temperature for industrial length measurements*.

ISO 554:1976, *Standard atmospheres for conditioning and/or testing — Specifications*.

3 Terms and definitions

For the purposes of this International Standard, the following terms and definitions apply.

3.1
aerial film
film designed for taking photographs from the air

3.2
aim dimension
preferred dimension at which the manufacturing process should be aimed or designed

3.3
leader
material attached to the leading edge of the roll of film, not intended for recording of images, and usually to assist in winding

3.4
nominal size
size reference that appears on product labels and in catalogues

3.5
perforations
holes of particular shape and dimensions, punched near one or both edges of the film, to assist with winding

3.6
preferred sizes
industry standard sizes, determined by most frequent user demand (number of units) and product volume (square metres)

NOTE Designers of new equipment are encouraged to use preferred sizes whenever possible.

3.7
splice
union of two pieces of material, joined to form a single piece

3.8
spool
cylindrical device that has a rim or edge at each end and an axial hole for a pin or spindle, and on which a roll of film is wound

3.9
trailer
material attached to the trailing edge of the roll of film, not intended for recording of images, and usually to assist in winding

4 Conditions for measurement of dimensions

The dimensions and tolerances specified in this International Standard shall apply at the time of manufacture (except where specifically stated otherwise), when equilibrated and measured at atmospheric conditions of (23 ± 2) °C and (50 ± 5) % relative humidity, as specified in ISO 554.

All measuring instrument calibrations shall be conducted at a temperature of 20 °C (as specified in ISO 1) and a relative humidity of 50 %.

5 Film dimensions

Film dimensions shall be as shown in Figures 1 and 2 and as given in Tables 1 and 2, and apply to film at the time of cutting and perforating. Dimensions can be altered by a permanent ageing shrinkage and by temporary shrinkage or swelling due to changes in moisture content or temperature.

Dimensionally stable films are required for aerial products, and any departure from the dimensions specified in this International Standard shall be no more than + 0,2 % larger than the maximum tolerance, nor less than – 0,3 % smaller than the minimum tolerance at the time of package opening.

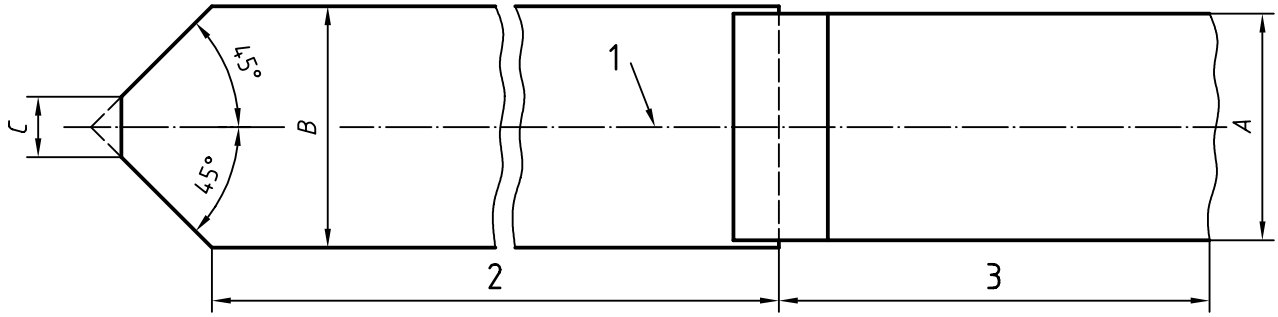
Dimension G (see Figure 2) is the offset of any given side-to-side perforation pair.

6 Film thickness

The film thickness, including support, emulsion and any protective coatings, shall conform to the values given in Table 3.

7 Roll lengths

Preferred roll lengths and tolerances shall conform to the values given in Table 4. Tolerances are $^{+0,6}_{0}$ m.



NOTE A tolerance of ±10° is permissible on each of the 45° angles in the tapered end of the leader or trailer, but the two angles should be approximately equal.

Key

1 Centreline of leader and trailer
2 Leader and trailer
3 Film

Figure 1 — Typical splice of leader/trailer and film (see Table 5)

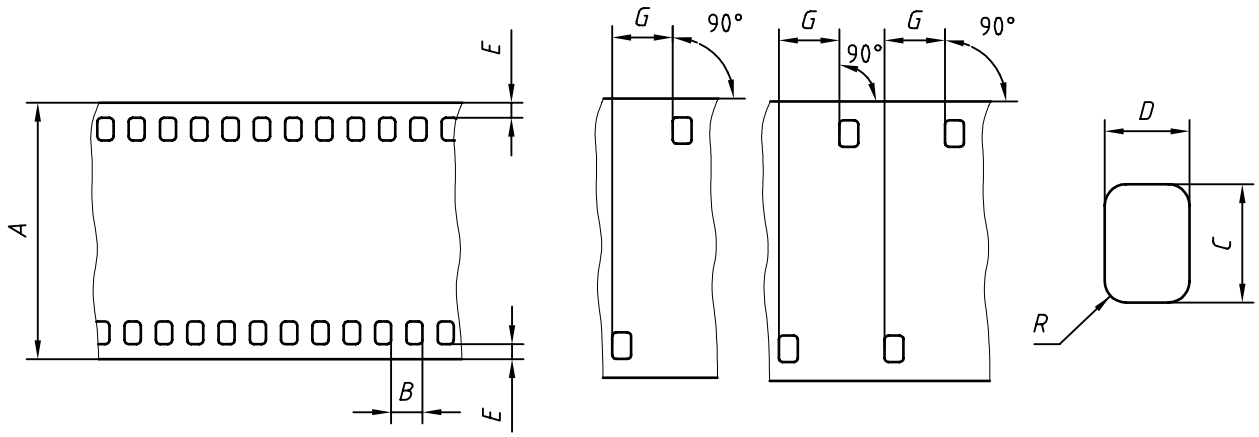


Figure 2 — Film perforations (see Table 2)

Table 1 — Aerial film widths (dimension A) (see Figures 1 and 2)

Dimensions in millimetres

Nominal film width	Aim film width	Tolerance
70	69,95	± 0,05
127	125,98	± 0,25
241	240,28	± 0,25

Table 2 — Perforation dimensions for aerial films (see Figure 2)

Dimensions in millimetres

Dimension	70 mm Aim	70 mm Tolerance	127 mm Aim	127 mm Tolerance
A	69,95	± 0,05	125,98	± 0,13
B	4,750	± 0,025	4,750	± 0,025
C	2,794	± 0,011	2,794	± 0,021
D	1,980	± 0,011	1,980	± 0,021
E	2,01	± 0,10	2,01	± 0,13
G		0,08 max.		0,25 max.
L	474,98	± 0,38	474,98	± 0,38
R	0,51	± 0,13	0,51	± 0,13

NOTE Dimension L is the length of any 100 consecutive perforation intervals.

Table 3 — Film thickness

Dimensions in millimetres

Nominal thickness	Minimum thickness	Maximum thickness
0,08	0,066	0,100
0,11	0,100	0,127
0,15	0,140	0,165
0,19	0,177	0,196

8 Leader and trailer requirements

Most sizes of aerial films are supplied without a leader or a trailer. However, some sizes of certain films may be supplied with either a spliced or integral leader and/or trailer.

Integral leaders/trailers shall be cut to standard film widths as given in Table 1.

Spliced leaders/trailers (dimension B, Figure 1) shall be as given in Table 5.

The thickness of the splices, attaching the leader and the trailer to the film, shall not exceed 0,43 mm. The tensile strength of the joint, per unit of film width, shall not be less than 35,0 N/cm.

Camera and magazine manufacturers shall provide at least 0,13 mm added clearance due to splice curvature from being wound in the roll.

Table 4 — Preferred lengths for aerial films in rolls

Dimensions in metres

Nominal length (Tolerance = $^{+0,6}_{0}$)
38,1
61
76,2
106,7
122
152,4
213,4
266,7
426,7
457,2
304,8
609,6

Table 5 — Spliced leader and trailer widths (see Figure 1)

Dimensions in millimetres

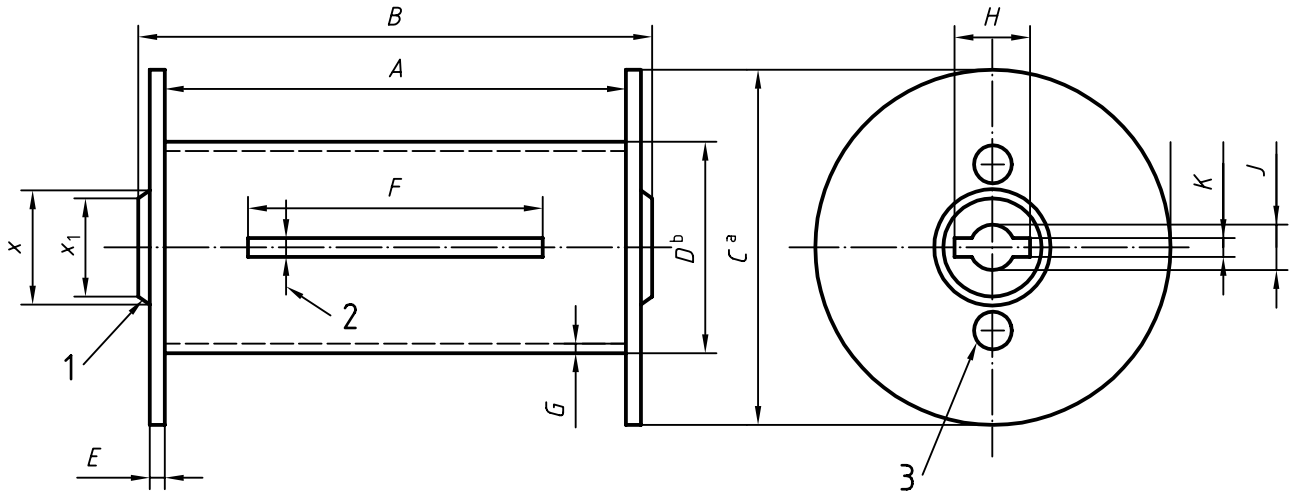
Nominal film width *A*	**Dimension** *B* **aim**	**Dimension** *B* **tolerance**	**Dimension** *C* **aim**	**Dimension** *C* **tolerance**
70	See note	See note	See note	See note
127	126,75	± 0,25	50,8	± 5,1
241	241,05	± 0,25	50,8	± 5,1
NOTE If the leader and trailer are used, they are integral and cut square with no taper.				

9 Film perforations

Perforated films covered by this International Standard shall have Type II perforations. The size and shape of Type II perforations are shown in Figure 2 and their dimensions are given in Table 2. All other dimensions for perforated aerial films shall be as given in Table 2.

10 Spool dimensions

Spool dimensions shall conform to the values shown in Figure 3 and given in Tables 6, 7 and 8.



Key

1 See note 1

2 N (Optional slot)

3 Two holes; Diameter = L; Between centres = M

If lugs are used to attach the flanges to the core, they shall not project above the flange surface by more than 0,50 mm.

NOTE 1 Dimension B is measured at the keyway openings in the centre of the flange. For spools with flange thicknesses of 1,27 mm or less, dimension B is kept within its tolerance by embossing the centre of each flange outward. The embossed centres are not used with spools that have flanges 2,06 mm thick because the thicker metal fills out the space that is obtained by the embossing.

Spools numbered 2 and 3 have embossed areas with outside diameters (dimension x) of 16,97 mm ± 0,40 mm and inside diameters (dimension x_1) of 14,27 mm ± 0,40 mm.

Spools numbered 4, 5, 7, 8, 9, 18 and 19 have embossed areas with outside diameters of 25,40 mm ± 0,40 mm and inside diameters of 22,22 mm ± 0,40 mm.

Spools numbered 14, 15, 16 and 17 have embossed areas with outside diameters of 26,97 mm ± 0,40 mm, and inside diameters of 25,10 mm ± 0,40 mm.

Spools numbered 6, 9A, 10, 11, 12, 20 and 22 are not embossed.

NOTE 2 For all spools listed in this International Standard, both flanges are identical.

[a] The concentricity of the spindle hole (dimension J) and the flange periphery (dimension C) shall be within 0,762 mm of the total indicator reading.

[b] The concentricity of the spindle hole (dimension J) and the core (dimension D) shall be within 0,762 mm of the total indicator reading.

Figure 3 — Aerial film spools (see Tables 6, 7 and 8)

Table 6 — Dimensions of aerial film spools (see Figure 3)

Dimensions in millimetres

Dimension	Aim	Tolerance
H	19,05	$\pm$ 0,40
J	9,78	$\pm$ 0,13
K	2,79	$\pm$ 0,13
L	9,63	$^{+0,13}_{0}$
M	38,10	$\pm$ 0,05
N	1,47	$\pm$ 0,91

Table 7 — Dimensions of spools – Preferred sizes

Dimensions in millimetres

Spool number	Nominal spool size	Nominal capacity [a] m				Type of metal	Number of drive holes	Width at core
		0,08 [b]	0,11 [b]	0,15 [b]	0,19 [b]		9,63 $^{+0,13}_{0}$	*A* ± 0,25
7	127 × 70	30	23	15	—	S [c]	0	127,00
9	127 × 150	150	105	75	60	A [d]	2	127,00
10	127 × 195	305	210	150	120	A	2	127,00
12	127 × 265	610	425	305	245	A	2	127,00
15	241 × 100	60	40	30	—	S	0	241,30
17	241 × 130	120	75	60	45	S	2	241,30
19	241 × 170	210	150	120	90	S	2	241,30

Spool number	Nominal spool size	Overall width at keyway *B* ± 0,50	Actual flange diameter *C* ± 0,40	Flange thickness *E* ± 0,13	Core diameter *D* ± 0,40	Core thick-ness *G* ± 0,13	Film slot length [e] *F* min.	Lateral runout [f]
7	127 × 70	131,10	69,85	1,27	31,75	0,76 [g]	98,42	0,38
9	127 × 150	131,10	150,83	1,27	53,98	1,65	98,42	0,76
10	127 × 195	131,10	193,68	2,06	53,98	1,65	98,42	0,76
12	127 × 265	131,10	266,70	2,06	53,98	1,65	98,42	0,76
15	241 × 100	245,40	101,60	1,27	53,98	0,76 [g]	98,42	0,76
17	241 × 130	245,40	131,78	1,27	53,98	0,76 [g]	98,42	0,76
19	241 × 170	245,40	168,28	1,27	53,98	0,76 [g]	98,42	0,76

[a] These nominal film capacities are not to be interpreted as product sales lengths. They are merely an indication of the approximate amount of film of a given thickness that, unless otherwise indicated, can be wound on each spool with 3,17 mm or more freeboard to the circumference of the flange.

[b] Nominal film thickness.

[c] Steel.

[d] Aluminium.

[e] The film slot is optional.

[f] The lateral runout tolerance applies to the flatness and accuracy of rotation of the internal surface of each flange at the time of manufacture. These tolerances represent the maximum deviation from the intended plane of rotation for any point on each flange when the spool is rotated on an accurate, tight-fitting spindle. For the inner surface of the flange, the plane shall be coincident with the surface adjacent to the core.

[g] If manufactured with aluminium cores, dimension *G* should be 1,65 mm instead of 0,76 mm.

Table 8 — Dimensions of spools – Recognized sizes

Dimensions in millimetres

Spool number	Nominal spool size	Nominal capacity [a]				Type of metal	Number of drive holes	Width at core
		0,08 [b]	0,11 [b]	0,15 [b]	0,19 [b]		9,63 $^{+0,13}_{0}$	*A* ± 0,25
2	70 × 65	30	23	15	—	A [c]	0	70,28
3	70 × 95	60	45	30	30	A	0	70,28
4	70 × 150	150	105	75	60	A	2	70,28
5	70 × 195	305	210	150	120	S [d]	2	70,28
6	70 × 265	610	425	305	245	S	2	70,28
8	127 × 95	60	45	30	—	S	0	127,00
9A	127 × 170	210	150	120	90	A	2	127,00
11	127 × 230	455	305	230	185	A	2	127,00
14	241 × 90	30	23	15	—	S	0	241,30
16	241 × 105	65	45	30	—	S	2	241,30
18	241 × 150	150	105	75	60	S	2	241,30
20	241 × 195	305	210	150	120	S	2	241,30
22	241 × 265	610	425	305	245	S	2	241,30

Spool number	Nominal spool size	Overall width at keyway	Actual flange diameter	Flange thickness	Core diameter	Core thick-ness	Film slot length [e]	Lateral runout [f]
		B ± 0,50	*C* ± 0,40	*E* ± 0,13	*D* ± 0,40	*G* ± 0,13	*F* min.	
2	70 × 65	74,40	66,68	1,02	24,61	1,14	47,62	0,38
3	70 × 95	74,40	95,25	1,02	24,61	1,14	47,62	0,38
4	70 × 150	74,40	150,83	1,27	53,98	1,65	47,62	0,76
5	70 × 195	74,40	193,68	1,27	53,98	0,76 [g]	47,62	0,76
6	70 × 265	74,40	266,70	2,06	53,98	1,65	47,62	0,76
8	127 × 95	131,10	95,25	1,27	31,75	0,76 [g]	98,42	0,76
9A	127 × 170	131,10	168,28	2,06	53,98	1,65	98,42	0,76
11	127 × 230	131,10	231,78	2,06	53,98	1,65	98,42	0,76
14	241 × 90	245,40	87,33	1,27	53,98	0,76 [g]	98,42	0,76
16	241 × 105	245,40	104,78	1,27	53,98	0,76 [g]	98,42	0,76
18	241 × 150	245,40	150,83	1,27	53,98	0,76 [g]	98,42	0,76
20	241 × 195	245,40	193,68	2,06	53,98	1,65	98,42	0,76
22	241 × 265	245,40	266,70	2,06	53,98	1,65	98,42	0,76

[a] These nominal film capacities are not to be interpreted as product sales lengths. They are merely an indication of the approximate amount of film of a given thickness that, unless otherwise indicated, can be wound on each spool with 3,17 mm or more freeboard to the circumference of the flange.

[b] Nominal film thickness.

[c] Aluminium.

[d] Steel.

[e] The film slot is optional.

[f] The lateral runout tolerance applies to the flatness and accuracy of rotation of the internal surface of each flange at the time of manufacture. These tolerances represent the maximum deviation from the intended plane of rotation for any point on each flange when the spool is rotated on an accurate, tight-fitting spindle. For the inner surface of the flange, the plane shall be coincident with the surface adjacent to the core.

[g] If manufactured with aluminium cores, dimension *G* should be 1,65 mm instead of 0,76 mm.

11 Package marking

Sufficient data shall be provided on the product's package to ensure correct usage of the product.

Packages shall be marked for the purpose of identifying

a) product name and format,

b) conditions of use (such as safelight), and

c) conditions of shipping and storage.

Any given level of packaging fulfils one or more of these functions and shall be identified accordingly, using the appropriate entries from the following list[1)]:

— product name or trade name[2)];

— name or trade mark of the manufacturer;

— manufacturer’s catalogue identification number;

— bar-code information, if applicable;

— quantity of units contained in the package;

— nominal width and length, in metric units, showing the width first;

— batch number and/or parent roll number;

— expiration date or “develop before” date or inventory control code;

— manufacturer’s recommended safelight conditions[3)];

— manufacturer’s recommended storage conditions[3)];

— indication of non-standard winding, if applicable[2) 3)];

— indication of attachment of film on core, if applicable[2) 3)];

— indication of perforated film, if applicable[2) 3)];

— information to assist recycling of waste packaging.

1) There can be legal requirements in certain countries for other data to be marked on the packages.

2) For unit packages, this item should be legible under recommended safelight conditions (other than total darkness).

3) This may be indicated by wording or by a code.

ICS 37.040.20

Price based on 10 pages