INTERNATIONAL STANDARD

ISO 17555

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Plastics — Film and sheeting — Biaxially oriented polypropylene (PP) films

Plastiques — Film et feuille — Films en polypropylène (PP) bi-orientés

Reference number
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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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 17555 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

It is based on Japanese Standard JIS Z 1712:1997.

Plastics — Film and sheeting — Biaxially oriented polypropylene (PP) films

1 Scope

This International Standard specifies the requirements for biaxially oriented polypropylene (PP) films, which are mainly used for packaging. The film may be used alone or in laminates with other films.

This International Standard applies only to films composed of more than 95 % (by mass) of polypropylene.

2 Normative references

The following referenced documents are indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 291:1997, *Plastics — Standard atmospheres for conditioning and testing*

ISO 527-3:1995, *Plastics — Determination of tensile properties — Part 3: Test conditions for films and sheets*

ISO 4593:1993, *Plastics — Film and sheeting — Determination of thickness by mechanical scanning*

ISO 8296:1987, *Plastics — Film and sheeting — Determination of wetting tension*

ISO 14782:1999, *Plastics — Determination of haze for transparent materials*

ISO 15106-1:2003, *Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 1: Humidity detection sensor method*

ISO 15106-2:2003, *Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 2: Infrared detection sensor method*

ISO 15106-3:2003, *Plastics — Film and sheeting — Determination of water vapour transmission rate — Part 3: Electrolytic detection sensor method*

3 Classification

Films are classified into two types as shown in Table 1.

Table 1 — Classification of films

Type 1	Film subjected to corona discharge, flame or plasma treatment
Type 2	Film not subjected to corona discharge, flame or plasma treatment

4 Requirements

4.1 Appearance

Films shall be visibly free of flaws, slackness, wrinkles, stains, foreign matter or marks which could impair their serviceability.

The splicing of two films in a roll should preferably be prominently marked to provide a visible indication when the roll is viewed from the end. The method of marking the splice should be agreed upon between the interested parties.

NOTE One acceptable method of doing this is to use coloured adhesive tape.

4.2 Dimensions

4.2.1 General

For any individual film selected at random from any delivery, the following dimensions, including their nominal values, shall be as agreed upon between the interested parties.

4.2.2 Width

The film width shall lie between the nominal width and a value 4 mm wider than the nominal width.

Examples of possible widths are shown in Table 2.

Table 2 — Examples of nominal widths of films and associated tolerances

Nominal width mm	Tolerance on width mm
$500 + 40n$	$^{+4}_{0}$
NOTE n is an integer, 0, 1, 2, …, giving width steps of 40 mm.	

4.2.3 Length of film in roll

The length of film in a roll shall lie between the nominal length and a value 1 % longer than the nominal length.

Examples of possible lengths are shown in Table 3.

Table 3 — Examples of nominal lengths of film in a roll and associated tolerances

Nominal length m	Length in roll km	Tolerance m
1 000	1	$^{+10}_{0}$
2 000	2	$^{+20}_{0}$
4 000	4	$^{+40}_{0}$
6 000	6	$^{+60}_{0}$
8 000	8	$^{+80}_{0}$
$>$ 8 000	$>$ 8	+ 1 % of nominal length

4.2.4 Inside diameter of core of roll

The inside diameter of the core of the roll should preferably be 76 $^{+2}_{0}$ mm or 152 $^{+2}_{0}$ mm.

4.2.5 Thickness

The average film thickness shall be within ± 10 % of the nominal value.

Examples of possible thicknesses are shown in Table 4.

Table 4 — Examples of thicknesses and associated tolerances

Nominal thickness μm	Thickness of film μm	Tolerance μm
12	12	± 1,2
15	15	± 1,5
20	20	± 2,0
25	25	± 2,5
30	30	± 3
40	40	± 4
50	50	± 5
60	60	± 6

4.3 Properties

The properties of films shall meet the requirements specified in Table 5 and Table 6.

Table 5 — Properties of film dependent on direction

Property		Unit	Requirements		Testing in accordance with Subclause
			Longitudinal[a]	Transverse[b]	
Tensile strength at break		MPa	⩾ 100	⩾ 100	5.4
Tensile strain at break		%	⩽ 270	⩽ 150	5.4
Dimensional change on heating	120 °C for 15 min	%	⩽ 10,0	⩽ 8,0	5.5
	130 °C for 5 min	%	⩽ 10,0	⩽ 8,0	5.5
Coefficient of water vapour transmission[c]		g/100 μm/(m^2·d)	⩽ 2,0		5.6

[a] Longitudinal: direction parallel to extrusion direction.

[b] Transverse: direction perpendicular to extrusion direction.

[c] At 40 °C, 90 % relative humidity.

Table 6 — Properties of film dependent on type of film

Property	Unit	Requirements		Testing in accordance with Subclause
		Type 1	Type 2	
Haze[a]	%	⩽ 5,0	⩽ 4,0	5.7
Wetting tension	mN/m	⩾ 36	< 35	5.8

[a] Only relevant to transparent films.

4.4 Physiological behaviour

For applications involving food contact, the film shall conform to all applicable regulatory requirements.

5 Test methods

5.1 Conditioning of specimens and test conditions

Determine the tensile properties, haze and wetting tension at (23 ± 2) °C and (50 ± 5) % R.H. in accordance with ISO 291, after conditioning the specimens for at least 4 h under the same conditions. Condition specimens for the determination of dimensional change on heating under the same conditions.

5.2 Appearance examination

Check the appearance of the film with the naked eye.

5.3 Dimensions

5.3.1 Width

Measure the width of the film using a graduated metal ruler.

5.3.2 Inside diameter of core of roll

Measure the inside diameter of the core of a roll using vernier calipers.

5.3.3 Thickness

Measure the thickness of the film in accordance with ISO 4593 at ten equidistant points across the width of the film, using a dial gauge or equivalent. Report the thickness as the arithmetic mean of the ten measurements, to the nearest 1 μm.

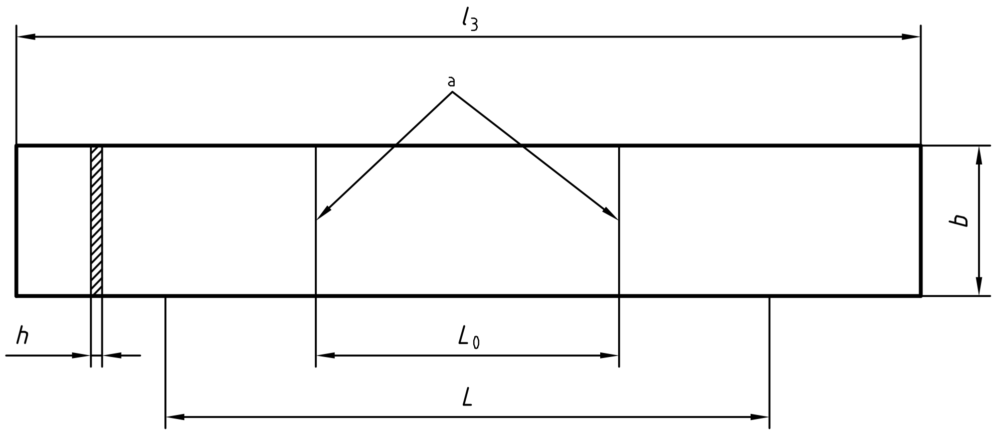
5.4 Tensile strength and tensile strain at break

Determine the tensile strength and tensile strain at break in accordance with ISO 527-3. Test five specimens of dimensions as shown in Figure 1. The test speed shall be (100 ± 10) mm/min, (200 ± 20) mm/min or (300 ± 30) mm/min.

5.5 Dimensional change on heating

5.5.1 Preparation of specimens

Prepare five specimens of 20 mm in width and 150 mm in length for both the longitudinal direction and the transverse direction. Mark off a 100 mm gauge length in the central portion of the specimen, each mark being approximately 25 mm from the end.



Key

b width: 10 mm to 25 mm
h thickness: $\leqslant$ 1 mm
L_0 gauge length: (50 $\pm$ 0,5) mm
L initial distance between grips: (100 $\pm$ 5) mm
l_3 overall length: $\geqslant$ 150 mm
[a] Gauge marks.

Figure 1 — Specimen for tensile testing

5.5.2 Procedure

Suspend the specimens vertically in a circulating-air oven kept at (120 $\pm$ 3) °C for 15 min or (130 $\pm$ 3) °C for 5 min. After removal from the oven, allow the specimens to cool for 30 min to room temperature. Measure the length between the marks. Calculate the dimensional change of each of the five specimens using the following equation:

$$S = \frac{L_1 - L_2}{L_1} \times 100$$

where

S is the dimensional change on heating, in percent;

L_1 the length between the marks before heating, in millimetres;

L_2 is the length between the marks after heating, in millimetres.

Report the arithmetic mean of the five results.