
**Plastics — Film and sheeting —
Non-oriented poly(ethylene
terephthalate) (PET) sheets**

*Plastiques — Film et feuille — Films en poly(éthylène téréphtalate)
(PET) non-orientés*

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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.org
Web www.iso.org

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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 13636 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 11, *Products*.

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Introduction

Oriented and non-oriented films and sheets are both made from polyethylene terephthalate (PET). ISO 15988:2003^[2] covers only oriented PET films and sheets which have crystalline structure. Non-oriented PET (APET) films and sheets show quite different properties because of their non-crystalline structure and require a separate International Standard.

This International Standard is based on JIS Z 1716:2004,^[4] in which, however, only virgin PET resin is allowed to be used as the raw material.

Additional features of this International Standard are:

- a) recycled PET resin can also be used under controlled specified conditions;
- b) the structure and classification of film and sheet, such as single, double or triple layer, are specified in conjunction with applications;
- c) applications for food packaging are described in conjunction with food and sanitary laws or regulations of each country or region.

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Plastics — Film and sheeting — Non-oriented poly(ethylene terephthalate) (PET) sheets

1 Scope

This International Standard specifies the requirements and test methods for non-oriented polyethylene terephthalate (PET) or copolymer sheets made from virgin PET resin or recycled PET resin or combinations thereof. It applies only to sheets of thickness less than 2,0 mm. It excludes foamed sheets and shrinkable films.

2 Normative references

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

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

ISO 472, *Plastics — Vocabulary*

ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles*

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

ISO 1628-5, *Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 5: Thermoplastic polyester (TP) homopolymers and copolymers*

ISO 2818, *Plastics — Preparation of test specimens by machining*

ISO 7792-1, *Plastics — Thermoplastic polyester (TP) moulding and extrusion materials — Part 1: Designation system and basis for specifications*

ISO 11501, *Plastics — Film and sheeting — Determination of dimensional change on heating*

ISO 12418-1:2012, *Plastics — Post-consumer poly(ethylene terephthalate) (PET) bottle recyclates — Part 1: Designation system and basis for specifications*

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

ISO 15105-1, *Plastics — Film and sheeting — Determination of gas-transmission rate — Part 1: Differential-pressure methods*

ISO 15105-2, *Plastics — Film and sheeting — Determination of gas-transmission rate — Part 2: Equal-pressure method*

ISO 15270, *Plastics — Guidelines for the recovery and recycling of plastics waste*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 472 and ISO 15270 apply.

4 Material

Sheets shall be made of virgin polyethylene terephthalate (PET) or copolymer or combination thereof mainly polymerized from ethylene glycol and terephthalic acid as defined in ISO 7792-1. Sheets can also

be made of recycled PET defined in ISO 12418-1. PET materials can be classified in terms of food contact criteria as shown in Table 1.

Table 1 — Classification of PET material in terms of food contact criteria^a

Code	Description	Condition for use
V	PET virgin material	Acceptable for direct food contact ^a
MRP-FD	PET recyclates for direct food contact (FD) made by the process of general mechanical recycling plus additional treatment (MRP) as described in ISO 12418-1	Acceptable for direct food contact ^a
MRG-FI orMRA-FI	PET recyclates for indirect food contact (FI) made by the process of general mechanical recycling (MRG) or mechanical recycling with alkaline treatment (MRA) as described in ISO 12418-1	Acceptable for indirect food contact as an outside layer or as an encapsulated interior layer (e.g. middle layer of three layers) ^a
MRG-NF orMRA-NF	PET recyclates for non-food (NF) applications made by the process of general mechanical recycling (MRG) or mechanical recycling with alkaline treatment (MRA) as described in ISO 12418-1	Unacceptable for any food contact application

^a Food packaging shall meet the legal requirements for direct and indirect food contact of the country or region where it is to be used.

NOTE Designation codes of materials are as defined in ISO 12418-1:2012, Tables 1 and 2.

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5 Classification of sheet

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5.1 General

Sheets shall be classified according to the criteria in Tables 2, 3, and 4. Packaging for food contact applications is restricted in its usage according to classification. Such usage conditions shall meet the legislative or regulative requirements of the country or region where the sheet is to be used.

5.2 Classification by sheet layer

Sheets are classified according to the composition of the layers given in Table 2.

Table 2 — Classification by sheet layers

Composition of layer(s)	Sheet designation
Single layer	A
Two layers composed of two different raw materials	A/B (outside)
Three layers composed of two different raw materials	A/B (interior layer)/A

5.3 Classification by food contact

Sheets are classified in terms of food contact criteria as given in Table 3 in combination with the classification of PET raw materials shown in Table 1.

Table 3 — Classification by food contact

Class	Composition of layer	Condition for use
SF1	A and/or B layer(s) in Table 2 is made from V or MRP-FD as defined in Table 1	Acceptable for direct food contact ^a
SF2	A layer(s) in Table 2 is made from V or MRP-FD as defined in Table 1 and B layer in Table 2 is made from MRG-FI or MRA-FI as defined in Table 1	Acceptable for direct food contact ^a only to A layer(s) and indirect food contact ^a to B(outside or interior) layer
SN	A and/or B layers in Table 2 containing MRG-NF or MRA-NF as defined in Table 1	Unacceptable for any food contact application

^a Food packaging shall meet the legal requirements for direct and indirect food contact of the country or region where it is to be used.

5.4 Classification by intrinsic viscosity of the sheet

Sheets are further classified into four groups given in Table 4, according to the intrinsic viscosity (IV) specified in 8.3. Intrinsic viscosity can be converted from the melt flow volume ratio (MVR) measured by ISO 12418-2.^[1]

Table 4 — Classification according to intrinsic viscosity of the sheet

Class	Range of intrinsic viscosity (IV) dl/g	Examples of application
1	<0,60	Packaging not requiring high mechanical strength
2	≥0,60 to <0,70	Packaging made by general thermoforming process
3	≥0,70 to <0,80	Packaging for thick wall and deep drawing
4	≥0,80	Heat-resistant container (CPET)

6 Requirements

6.1 Appearance

Sheet shall be visually free from defects, such as flaws, cracking, slackness, wrinkles, stains, foreign matter, irregular colour, surface irregularities, blocking, and/or any marks that impair its serviceability.

6.2 Properties

The performance of sheets shall conform to the requirements given in Table 5, when determined in accordance with Clause 8.