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# Plastics - Film and sheeting - Guidance on the testing of thermoplastic films

塑料制品 薄膜和薄片 热塑性塑料薄膜试验指南

(ISO 23559:2011, IDT)

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Safety statement: Personnel using this document shall be familiar with normal laboratory practice, if applicable. This document is not intended to address all safety concerns related to its use. If so, it is related to its use. It is the user's responsibility to establish appropriate safety and health practices and ensure compliance with relevant regulatory requirements.

## 1 Scope

This document gives producers and users test procedures for selecting and characterizing single or multilayer thermoplastic films. The purpose is to provide guidance for testing of films for which there are no existing standards or specifications.

**NOTE:** This document does not cover sample preparation.

This document is intended to provide general guidance. If a standard exists for a particular film product, the requirements of that document take precedence over this document. It does not involve specific application-specific requirements stipulated by a country, region, or industry.

The importance and suitability of the data is determined by the user.

## 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 307, *Plastics - Polyamides - Determination of viscosity number*

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

ISO 1133-1, *Plastics - Determination of the melt mass-flowrate (MFR) and melt volume-flow rate (MVR) of thermoplastics - Part 1: Standard method*

ISO 1183-1, *Plastics - Methods for determining the density of non-cellular plastics - Part 1: Immersion method, liquid pycnometer method and titration method*

ISO 1183-2, *Plastics - Methods for determining the density of non-cellular plastics*

*- Part 2: Density gradient column method*

ISO 1183-3, *Plastics - Methods for determining the density of non-cellular plastics - Part 3: Gas pyknometer method*

ISO 2813, *Paints and varnishes - Determination of specular gloss of non-metallic paint film at 20°,60° and 85°*

ISO 4589-1, *Plastics - Determination of burning behaviour by oxygen index - Part 1: Guidance*

ISO 4589-2, *Plastics - Determination of burning behaviour by oxygen index - Part 2: Ambient-temperature test*

ISO 4592, *Plastics - Film and sheeting - Determination of length and width*

ISO 4593, *Plastics - Film and sheeting - Determination of thickness by mechanical scanning*

ISO 6383-1, *Plastics - Film and sheeting - Determination of tear resistance - Part 1: Trouser tear method*

ISO 6383-2, *Plastics - Film and sheeting - Determination of tear resistance - Part 2: Elmendorf method*

ISO 7765-1, *Plastics - Film and sheeting - Determination of impact resistance by the free-falling dart method - Part 1: Staircase methods*

ISO 7765-2, *Plastics film and sheeting - Determination of impact resistance by the free-falling dart method - Part 2: Instrumented puncture test*

ISO 8256, *Plastics - Determination of tensile-impact strength*

ISO 8295, *Plastics - Film and sheeting - Determination of the coefficients of friction*

ISO 8296, *Plastics - Film and sheeting - Determination of wetting tension*

ISO 9773, *Plastics - Determination of burning behaviour of thin flexible vertical specimens in contact with a small-flame ignition source*

ISO 11357-2, *Plastics - Differential scanning calorimetry (DSC) - Part 2: Determination of glass transition temperature*

ISO 11357-3, *Plastics - Differential scanning calorimetry (DSC) - Part 3: Determination of temperature and enthalpy of melting and crystallization*

ISO 11443, *Plastics - Determination of the fluidity of plastics using capillary and slit-die rheometers*

*Permanent Deformation and Stress Retention of Stretch Wrap Film*

ASTM D 5748, *Standard Test Method for Protrusion Puncture Resistance of Stretch Wrap Film*

ASTM F 88, *Standard Test Method for Seal Strength of Flexible Barrier Materials*

ASTM F 1921, *Standard Test Methods for Hot Seal Strength (Hot Tack) of Thermoplastic Polymers and Blends Comprising the Sealing Surfaces of Flexible Webs*

# 3 Terms and definitions

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

### 3.1 film

Sheets with a nominal thickness not greater than 0.25mm.

**NOTE 1:** Although ISO 472 does not clearly stipulate, it mentions the limit of the nominal thickness of the film to 0.25mm. ASTM D883 clearly stipulates that the nominal thickness of the film is ≤0.25mm.

**NOTE 2:** Since the sheet with a nominal thickness greater than 0.25mm is too rigid, it is not suitable for the test method for testing thinner films.

# 4 Sample preparation and state conditioning

### 4.1 Polymer properties

Many polymer properties are related to the processability and yield of products, so they are concerned by producers and users of film products. These properties include density, flow characteristics and thermal properties.

The above properties shall follow the sample preparation and state conditioning requirements specified in the material standard. If there is no material standard, the requirements specified in this document shall be followed.

### 4.2 Sample preparation

This document does not contain standards for film preparation. Table 1 describes the preparation methods of some common films of different materials and structures.

**Table 1 -- Typical preparation methods for producing plastic films**

| |
|---|
| Cold roll casting |
| Sink chilling |

| |
|---|
| Blow molding - standard |
| Blow molding - blowing up and cooling |
| Blow molding - blowing down and cooling |
| Stretching method (biaxially stretching film) |
| Double bubble method (biaxially stretching film) |
| Calendering |

The films used for testing and characterization shall be produced in accordance with the requirements of the corresponding product standards. If a product standard does not exist or does not address film fabrication, the same basic process as for commercial application of films shall be used. Typical processing conditions shall be used. The specific process, equipment and materials used are optimized. No device or technique shall be employed which would not be used during accepted manufacturing practice. If special conditions or equipment are used, it shall be indicated in the test report.

Key process variables shall be recorded. Keep records for a reasonable period of time for future reference in the event of a dispute or disagreement.

### 4.3 Sample state conditioning

For the properties described in Table 2, the preparation and conditioning requirements specified in the material or product standard shall apply. In the absence of material standards or product standards, the requirements specified in this document shall be followed.

## 5 Test requirements

In the absence of material or product standards, the test methods, test conditions and units specified in Table 2 shall be used when determining the data. The number of specimens shall be determined according to the requirements of specific test standards.

All tests in Table 2 need not be performed in every case. The specific test part depends on the film type, intended use and test objectives. That is, research and development, manufacturing, quality control, may be negotiated by the relevant parties.

## 6 Result report

The type of film suitable for testing, its use and any agreement between the supplier and the purchaser, the report shall normally include the following. In addition, any other information and data of a non-proprietary nature considered suitable for the intended purpose of the test shall be included:

a) Description of the film, for example, type, material, formulation components (if it is a blended material), structure (if it is co-extruded or compounded);

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