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Polimerni materiali - Polipropilenski (PP) materiali za oblikovanje in ekstrudiranje - 2. del: Priprava preskušancev in ugotavljanje lastnosti (ISO/DIS 19069-2:2023)

Plastics - Polypropylene (PP) moulding and extrusion materials - Part2: Preparation of test specimens and determination of properties (ISO/DIS 19069-2:2023)

Kunststoffe - Polypropylen (PP)-Formmassen - Teil2: Herstellung von Probekörpern und Bestimmung von Eigenschaften (ISO/DIS 19069-2:2023)

Plastiques - Matériaux à base de polypropylène (PP) pour moulage et extrusion - Partie 2: Préparation des éprouvettes et détermination des propriétés (ISO/DIS 19069-2:2023)

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Plastics — Polypropylene (PP) moulding and extrusion materials —

Part 2:
Preparation of test specimens and determination of properties

Plastiques — Matériaux polypropylène (PP) pour moulage et extrusion —

Partie 2: Préparation des éprouvettes et détermination des propriétés

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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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT),see www.iso.org/iso/foreword.html.

This document was prepared by Technical CommitteeISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This second edition cancels and replaces the first edition (ISO 19069-2:2016), which has been technically revised.

The main changes compared to the previous edition are as follows:

— updated the Normative references;

— changed the NOTEs in Table 1of previous edition into text;

— added new the test condition of melt mass-flow rate and meltvolume-flowrate into Table 3;

— added two items of flexural strength and thermal oxidative stability in air into Table 3 and Table 4, respectively.

A list of all parts in the ISO 19069 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Plastics — Polypropylene (PP) moulding and extrusion materials —

Part 2: Preparation of test specimens and determination of properties

1 Scope

This document specifies the methods of preparation of test specimens and the test methods for determining the properties of polypropylene (PP) moulding and extrusion materials. It gives requirement for handling test material and for conditioning both the test material before moulding and the specimens before testing.

This document describes procedures and conditions for the preparation of test specimens, and procedures for measuring properties of the materials from which these specimens are made. Properties and test methods which are suitable and essential to characterize PP moulding and extrusion materials are listed.

The properties have been selected from the general test methods in ISO 10350-1. Other test methods in wide use for, or of particular significance to PP moulding and extrusion materials are also included in this document, as are the designatory properties specified in ISO 19069-1.

In order to obtain reproducible and comparable test results, it is desirable to use the methods of specimen preparation and conditioning, the specimen dimensions and the test procedures specified herein. Values determined will not necessarily be identical to those obtained using specimens of different dimensions or prepared using different procedures.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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 62, *Plastics — Determination of water absorption*

ISO 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite*

ISO 178, *Plastics — Determination of flexural properties*

ISO 179-1, *Plastics —Determination of Charpy impact properties —Part 1:Non-instrumented impact test*

ISO 179-2, *Plastics — Determination of Charpy impact properties — Part 2: Instrumented impact test*

ISO 293, *Plastics —Compression moulding of test specimens of thermoplastic materials*

ISO 294-1, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 1: General principles, and moulding of multipurpose and bar test specimens*

ISO 294-3, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 3: Small plates*

ISO 294-4, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 4: Determination of moulding shrinkage*

ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics*

ISO 899-1, *Plastics — Determination of creep behaviour — Part 1: Tensile creep*

ISO 1133-1, *Plastics — Determination of the melt mass-flow rate (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 1628-3, *Plastics — Determination of the viscosity of polymers in dilute solution using capillary viscometers — Part 3: Polyethylenes and polypropylenes*

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

ISO 4577, *Plastics — Polypropylene and propylene-copolymers — Determination of thermal oxidative stability in air — Oven method*

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

ISO 6603-2, *Plastics — Determination of puncture impact behaviour of rigid plastics — Part 2: Instrumented impact testing*

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

ISO 10350-1, *Plastics — Acquisition and presentation of comparable single-point data — Part 1: Moulding materials*

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

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

ISO 11359-2, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 16152, *Plastics — Determination of xylene-soluble matter in polypropylene*

ISO 20753, *Plastics — Test specimens*

IEC 60112, *Method for the determination of the proof and the comparative tracking indices of solid insulating materials*

IEC 60243-1, *Electrical strength of insulating materials — Test methods — Part 1: Tests at power frequencies*

IEC 60250, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths*

IEC 60296, *Fluids for electrotechnical applications — Unused mineral insulating oils for transformers and switchgear*

IEC 60695-11-10, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods*

IEC 62631-3-1, *Dielectric and resistive properties of solid insulating materials — Part 3-1: Determination of resistive properties (DC methods) — Volume resistance and volume resistivity — General method*

IEC 62631-3-2, *Dielectric and resistive properties of solid insulating materials — Part 3-2: Determination of resistive properties (DC methods) — Surface resistance and surface resistivity*

ASTM D 5420, *Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a falling Weight (Gardner Impact)*

3 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

4 Preparation of test specimens

4.1 General

It is essential that specimens are always prepared using the same procedure (either injection moulding or compression moulding), and under the same processing conditions.

The procedure to be used for each test method is indicated in Tables 3 and 4 (M = injection moulding, Q = compression moulding).

4.2 Treatment of the material before moulding

Pre-treatment of the material sample is normally not necessary before moulding.

4.3 Injection moulding

Injection-moulded specimens shall be prepared in accordance with ISO 294-1 or ISO 294-3, under the conditions specified in Table 1.

NOTE It has been found that machining from the central section of type A1 test specimens give better precision than those injection-moulded directly to their final dimensions.

An appropriate hold pressure, consistent with the production of blemish-free mouldings, shall be used.

The uniformity of the mouldings shall be checked by weighing. Their masses shall not differ by more than 1 % from each other.

Heat-sensitive polypropylenes may undergo molecular breakdown during moulding; therefore an increase in the melt flow rate (MFR) to > 1,5 times the original value shall be avoided with such materials. If the MFR increased by more than 1,5 times the original value, the melt temperature shall be lowered, 10°C at a time, until the increase in MFR is < 1,5 times the original value. This adjustment in melt temperature shall be reported.

Table 1 — Conditions for injection moulding of test specimens

Material	Melt temperature °C	Mould temperature °C	Average injection velocity[a] mm/s	Hold time s	Cycle time s
MFR < 1,5 g/10 min	255	40	200 ±20	40	60
1,5 ≤ MFR < 7 g/10 min	230	40	200 ±20	40	60
MFR ≥ 7 g/10 min	200	40	200 ±20	40	60
Hold time and cycle time of different polypropylene materials can vary in a small range, if suitable, the hold time may be determined in accordance with ISO 294-1.					
[a] Average injection velocity shall be calculated according to ISO 294-1.					

4.4 Compression moulding

Compression-moulded sheets shall be prepared in accordance with ISO 293 under the conditions specified in Table 2.

If necessary, like heat-sensitive polypropylenes, the moulding temperature should be lowered by 10°C or 20°C and this adjustment in moulding temperature shall be reported.

Table 2 — Conditions for compression moulding of test specimens

Material	Moulding temperature °C	Average cooling rate K/min	Demoulding temperature °C	Full pressure MPa	Full- pressure time min	Preheating pressure MPa	Preheating time min
All grades	210	15 ± 5	≤ 40	5 or 10[a]	5 ± 1	contact	5 to 15
NOTE Inconsistent cooling rates can lead to significant deviations in measured properties due to the effect on the crystallinity of the specimens. It is therefore desirable to use a moulding machine that is capable of maintaining a constant cooling rate.							
[a] Use 5 MPa for a frame mould and 10 MPa for a positive mould.							

If a frame mould is used, it is necessary to start cooling while simultaneously applying the full pressure. This avoids the melt being pressed out of the frame and also avoids sink marks.

With the frame mould, the full pressure is only applied to the frame, and thus the sheets produced can suffer from insufficient homogeneity and pellet boundaries can be preserved.

The test specimens required for the determination of the properties shall be machined or stamped from the compression-moulded sheets in accordance with ISO 2818.

NOTE Stamping is suitable for specimens of thicknesses up to 4 mm. Compared with milling or sawing, it gives less stress to the specimens and deforms them less.

5 Conditioning of test specimens

Unfilled test specimens shall be conditioned for a period of between 40 h and 96 h at (23 ± 2) °C, with no relative humidity requirement. Specimens containing fillers or additives that are susceptible to moisture uptake shall be conditioned in the same way but with an additional requirement for (50 ± 10) % relative humidity unless sufficient testing has been conducted that indicates that specific material properties are not affected by humidity.