
**Plastics — Styrene-acrylonitrile (SAN)
moulding and extrusion materials —**

**Part 2:
Preparation of test specimens and
determination of properties**

*Plastiques — Matériaux à base de styrène-acrylonitrile (SAN) pour
moulage et extrusion —*

Partie 2: Préparation des éprouvettes et détermination des propriétés

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Published in Switzerland

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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).

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For an explanation on 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 the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 249, *Plastics*, in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This first edition of ISO 19064-2 cancels and replaces ISO 4894-2:1995, which has been technically revised.

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

- the normative references in [Clause 2](#) have been updated;
- ISO 3167 has been replaced by ISO 20753;
- IEC 60093 has been replaced by IEC 62631-3-1 and IEC 62631-3-2;
- IEC 60250 has been replaced by IEC 62631-2-1;
- ISO 1183 has been replaced by ISO 1183-1, ISO 1183-2 and ISO 1183-3.

A list of all parts in the ISO 19064 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.

Introduction

There are many methods for testing properties of plastics. For some, the data obtained by different standards are not comparable. Even when the same standards have been used, they often allow the adoption of a wide range of alternative test conditions, and the data obtained are not necessarily comparable. The purpose of this document is to specify methods and conditions of test to be used for the acquisition and presentation of data to ensure that valid comparisons between Styrene-acrylonitrile (SAN) materials can be made.

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Plastics — Styrene-acrylonitrile (SAN) 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 to be used in determining the properties of styrene-acrylonitrile (SAN) moulding and extrusion materials. It gives the requirements for handling the test material and for conditioning both the test material before moulding and the specimens before testing.

This document gives procedures and conditions for the preparation of test specimens and procedures for measuring properties of the materials from which these specimens are made. It lists properties and test methods which are suitable and necessary to characterize SAN moulding and extrusion materials.

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, these moulding and extrusion materials are also included in this document, as are the designatory properties specified in ISO 19064-1.

The methods of specimen preparation and conditioning, the specimen dimensions and the test procedures specified in this document are used in order to obtain reproducible and comparable test results. Values determined are not always 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 75-1, *Plastics — Determination of temperature of deflection under load — Part 1: General test method*

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 180, *Plastics — Determination of Izod impact strength*

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 306, *Plastics — Thermoplastic materials — Determination of Vicat softening temperature (VST)*

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

ISO 527-4, *Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites*

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 pycnometer method*

ISO 1656, *Rubber, raw natural, and rubber latex, natural — Determination of nitrogen content*

ISO 2561, *Plastics — Determination of residual styrene monomer in polystyrene (PS) and impact-resistant polystyrene (PS-I) by gas chromatography*

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

ISO 4581, *Plastics — Styrene/acrylonitrile copolymers — Determination of residual acrylonitrile monomer content — Gas chromatography method*

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

ISO 4589-3, *Plastics — Determination of burning behaviour by oxygen index — Part 3: Elevated-temperature test*

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 11357-1, *Plastics — Differential scanning calorimetry (DSC) — Part 1: General principles*

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

ISO 19064-1, *Plastics — Styrene/acrylonitrile (SAN) moulding and extrusion materials — Part 1: Designation system and basis for specifications*

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 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 62631-2-1, *Dielectric and resistive properties of solid insulating materials-Part 2-1:Relative permittivity and dissipation factor-Technical frequencies (0,1 Hz to 10 MHz)-AC 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*

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 <http://www.electropedia.org/>

4 Preparation of test specimens

4.1 General

It is essential that specimens always be prepared by the same procedure (either injection moulding or compression moulding), using the same processing conditions. The procedure to be used for each test method is indicated in [Tables 3](#) and [4](#).

The material shall be kept in moisture-proof containers until it is required for use. The moisture content of filled or reinforced materials shall be expressed as a percentage of the total mass of the compound.

4.2 Treatment of the material before moulding

Before processing, the material shall be dried under appropriate conditions to produce samples without surface defects such as spray marks.

4.3 Injection moulding

Injection-moulded specimens shall be prepared in accordance with ISO 294-1 or ISO 294-3, using the conditions specified in [Table 1](#), in which the temperature values given are target values (see ISO 294-1 or ISO 294-3 for tolerances).

Table 1 — Conditions for injection moulding of test specimens

Material	Melt temperature °C	Mould temperature °C	Injection velocity mm/s
All grades	240 ± 3	60 ± 3	200 ± 100

4.4 Compression moulding

Compression-moulded sheets shall be prepared in accordance with ISO 293, using the conditions specified in [Table 2](#), in which the moulding temperatures given are target values (see ISO 293 for tolerances).

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

Table 2 — Conditions for compression moulding of test specimens

Material	Moulding temperature °C	Average cooling rate °C/min	Demoulding temperature °C	Full pressure MPa	Full pressure time min	Preheating time min
All grades	200 ± 5	10 ± 5	≤ 60	4 ± 0,5	5 ± 1	5 ± 1

5 Conditioning of test specimens

Test specimens for determination of the melt mass-flow rate shall be conditioned for 4 h at (80 ± 2) °C and then stored in a desiccator according to ISO 19064-1. Test specimens for electric strength shall be conditioned for not less than 24 h at (23 ± 2) °C and (50 ± 5) % relative humidity according to IEC 60243-1. Test specimens for oxygen index shall be conditioned for 24 h at (23 ± 2) °C and (50 ± 5) % relative humidity. After 24 h conditioning, if the mass change of the specimen is equal to or below 0,1 %, the test is allowed to be conducted. Otherwise, keep the specimen at (23 ± 2) °C and (50 ± 5) % relative humidity for at least 88 h in conditioning chamber according to ISO 4589-2. Test specimens for other properties shall be conditioned for at least 16 h at (23 ± 2) °C and (50 ± 10) % relative humidity.

6 Determination of properties

In the determination of properties and the presentation of data, the standards, supplementary instructions given in ISO 10350-1 shall be applied. All tests shall be carried out in the standard atmosphere of (23 ± 2) °C and (50 ± 10) % relative humidity unless specifically stated otherwise in [Tables 3](#) and [4](#).

Notes in ISO 10350-1 shall be taken into account.

[Table 3](#) is compiled from ISO 10350-1, and the properties listed are those which are appropriate to SAN moulding and extrusion materials. These properties are those considered useful for comparisons of data generated for different thermoplastics.

[Table 4](#) contains those properties, not found specifically in [Table 3](#), which are in wide use or of particular significance in the practical characterization of SAN moulding and extrusion materials.

Table 3 — General properties and test conditions (selected from ISO 10350-1)

Property	Symbol	Unit	Test method	Specimen type (dimensions in mm)	Specimen preparation	Test conditions and supplementary instructions
Rheological properties						
Melt mass-flow rate	MFR	g/10 min	ISO 1133-1	Moulding material	—	220 °C, load 10 kg ^a
Melt volume-flow rate	MVR	cm ³ /10 min				
^a 240 °C at 10 kg load is recommended for high-heat grades with a low content of <i>N</i> -phenylmaleimide when polymer residue adheres to the cylinder wall or MFR/MVR value is not reproducible at 220 °C, 10 kg load. Likewise, 265 °C, 10 kg load is recommended for high-heat grades with a high content of <i>N</i> -phenylmaleimide when polymer residue adheres to the cylinder wall or MFR/MVR value is not reproducible at 240 °C, 10 kg load.						

Table 3 (continued)

Property	Symbol	Unit	Test method	Specimen type (dimensions in mm)	Specimen preparation	Test conditions and supplementary instructions
Mechanical properties						
Tensile modulus	E_t	MPa	ISO 527-2 ISO 527-4	ISO 20753	Injection moulding	Test speed 1 mm/min.
Yield stress	σ_y					Test speed 50 mm/min.
Yield strain	ε_y	%				Test speed 50 mm/min.
Strain at break	ε_b					Test speed 50 mm/min. Failure without yielding, test speed, according to ISO 10350-1
Stress at 50 % strain	σ_{50}	MPa				Test speed 50 mm/min. Only to be quoted if no yielding is observed up to 50 % nominal strain.
Tensile creep modulus	$E_{tc}1$	MPa	ISO 899-1			At 1 h
	$E_{tc}10^3$					At 1 000 h
Flexural modulus	E_f	MPa	ISO 178	80 × 10 × 4		Test speed 2 mm/min.
Flexural strength	σ_{fM}					
Charpy impact strength	a_{cU}	kJ/m ²	ISO 179-1 ISO 179-2	80 × 10 × 4		Edgewise impact. Also record type of failure. r is notch tip radius.
Charpy notched impact strength	a_{cN}			80 × 10 × 4 V-notch, r = 0,25		
Tensile notched impact strength	a_{tN}		ISO 8256	80 × 10 × 4 double V-notch, r = 1		Only to be quoted if fracture cannot be obtained with notched Charpy impact test. r is notch tip radius.
Thermal properties						
Glass transition temperature	T_g	°C	ISO 11357-2	In any form ISO 11357-1	—	Record the method for determination of T_g . Use 10 K/min.
Temperature of deflection under load	$T_{f1,8}$	°C	ISO 75-1	80 × 10 × 4	Injection moulding	0,45 MPa and 1,8 MPa.
	$T_{f0,45}$		ISO 75-2			
Vicat softening temperature	VST B50	°C	ISO 306	≥ 10 × ≥ 10 × 4		Heating rate 50 °C /h, load 50 N.
Burning behaviour	B50/3	mm/min	IEC 60695-11-10	125 × 13 × 3		Record one of classifications with thickness, for example V-0 at 3,0 mm, V-1 at 3,0 mm, V-2 at 3,0 mm, HB40 at 3,0 mm, HB75 at 3,0 mm.
Oxygen index	OI	%	ISO 4589-2 ISO 4589-3	80 × 10 × 4		Procedure A — top surface ignition in ISO 4589-2.
^a 240 °C at 10 kg load is recommended for high-heat grades with a low content of <i>N</i> -phenylmaleimide when polymer residue adheres to the cylinder wall or MFR/MVR value is not reproducible at 220 °C, 10 kg load. Likewise, 265 °C, 10 kg load is recommended for high-heat grades with a high content of <i>N</i> -phenylmaleimide when polymer residue adheres to the cylinder wall or MFR/MVR value is not reproducible at 240 °C, 10 kg load.						

^a 240 °C at 10 kg load is recommended for high-heat grades with a low content of *N*-phenylmaleimide when polymer residue adheres to the cylinder wall or MFR/MVR value is not reproducible at 220 °C, 10 kg load. Likewise, 265 °C, 10 kg load is recommended for high-heat grades with a high content of *N*-phenylmaleimide when polymer residue adheres to the cylinder wall or MFR/MVR value is not reproducible at 240 °C, 10 kg load.