

Second edition
2013-03-01

Corrected version
2015-12-15

**Plastics — Thermoplastic polyester/
ester and polyether/ester elastomers
for moulding and extrusion —**

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

iTeh STANDARD PREVIEW
(standards.iteh.ai)

*Plastiques — Élastomères thermoplastiques à base de polyester/ester
et polyether/ester, pour moulage et extrusion —*

Partie 2: Préparation des éprouvettes et détermination des propriétés

<https://standards.iteh.ai/catalog/standards/sist/ad9bdb02-dd11-4c2d-b2f0-60cc2085a71a/iso-14910-2-2013>



Reference number
ISO 14910-2:2013(E)

© ISO 2013

iTeh STANDARD PREVIEW
(standards.iteh.ai)

ISO 14910-2:2013

<https://standards.iteh.ai/catalog/standards/sist/ad9bdb02-dd11-4c2d-b2f0-60cc2085a71a/iso-14910-2-2013>



COPYRIGHT PROTECTED DOCUMENT

© ISO 2013, Published in Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Ch. de Blandonnet 8 • CP 401
CH-1214 Vernier, Geneva, Switzerland
Tel. +41 22 749 01 11
Fax +41 22 749 09 47
copyright@iso.org
www.iso.org

Contents

Page

Foreword	iv
Introduction	v
1 Scope	1
2 Normative references	1
3 Preparation of test specimens	3
3.1 Treatment of the material before moulding.....	3
3.2 Injection moulding.....	3
4 Conditioning of test specimens	4
5 Determination of properties	4
5.1 General.....	4
5.2 Shore D hardness ≤ 25	6
5.2.1 Standard properties and test conditions.....	6
5.2.2 Special properties and test conditions.....	7
5.3 $25 < \text{Shore D hardness} \leq 65$	8
5.3.1 Standard properties and test conditions.....	8
5.3.2 Special properties and test conditions.....	10
5.4 Shore D hardness > 65	11
5.4.1 Standard properties and test conditions.....	11
5.4.2 Special properties and test conditions.....	12
Bibliography	14

<https://standards.iteh.ai/catalog/standards/sist/ad9bdb02-dd11-4c2d-b2f0-60cc2085a71a/iso-14910-2-2013>
 ISO 14910-2:2013

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 14910-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This second edition cancels and replaces the first edition (ISO 14910-2:1997), which has been technically revised.

ISO 14910 consists of the following parts, under the general title *Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion*:

- Part 1: Designation system and basis for specification
- Part 2: Preparation of test specimens and determination of properties

This corrected version of ISO 14910-2:2013 includes the following corrections:

- in [Figure 1](#), the line between “TPEs” and “Standards properties” has been deleted;
- in [Table 4](#), the dimensions of the specimen type for water absorption determination “60 × 6 × 1” have been replaced by “60 × 60 × 1”.

Introduction

The structure of thermoplastic-elastomer material standards is based on the following considerations.

For each type of thermoplastic elastomer, reference is made to the relevant material standard.

Thermoplastic-elastomer materials are classified into three classes according to the primary elastomeric property, hardness, as shown in [Figure 1](#) below. This classification on the basis of hardness reflects the special position of thermoplastic elastomers between rubber materials on the one hand and plastics on the other.

Each class is subdivided into standard properties and special properties. The classes have many standard properties and many special properties in common. Furthermore, a standard property in one class can be a special property in another class and *vice versa*.

Special properties are those properties which are in wide use or of particular significance in the practical characterization of a specific material.

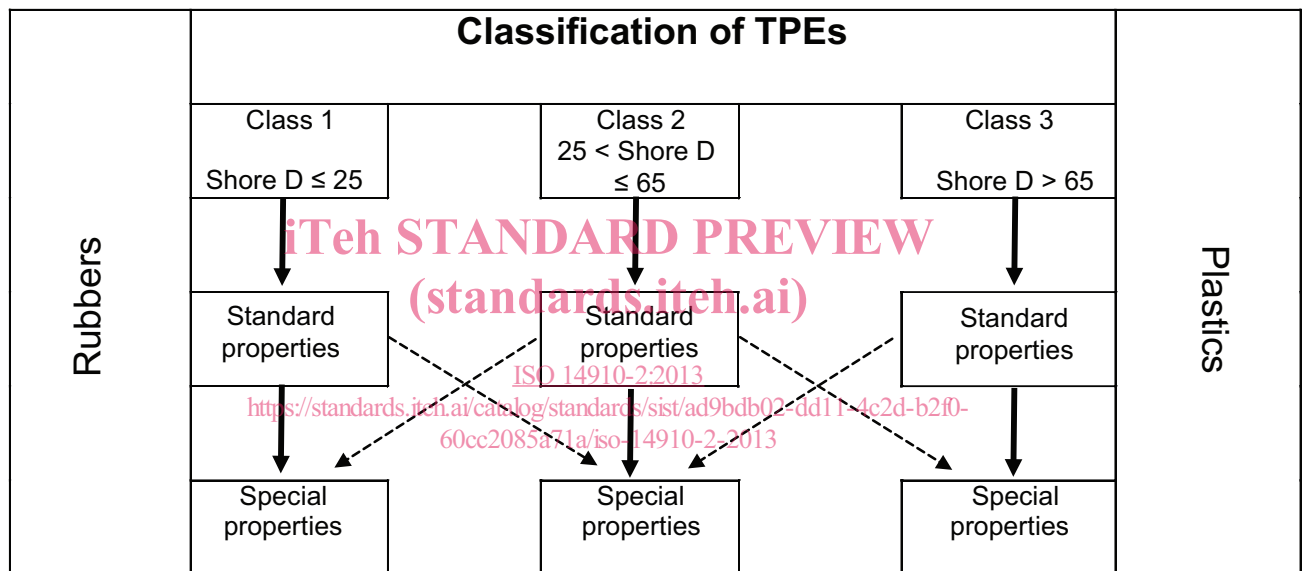


Figure 1 — Classification of thermoplastic elastomers on the basis of their hardness

iTeh STANDARD PREVIEW **(standards.iteh.ai)**

ISO 14910-2:2013

<https://standards.iteh.ai/catalog/standards/sist/ad9bdb02-dd11-4c2d-b2f0-60cc2085a71a/iso-14910-2-2013>

Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion —

Part 2: Preparation of test specimens and determination of properties

1 Scope

This part of ISO 14910 specifies the methods of preparation of test specimens and the standard test methods to be used in determining the properties of thermoplastic polyester/ester and polyether/ester moulding and extrusion materials. Requirements for handling test material and/or for conditioning both the test material before moulding and the specimens before testing are given.

Procedures and conditions for the preparation of test specimens in a specified state and procedures for measuring properties of the materials from which these specimens are made are given. Properties and test methods which are suitable and necessary to characterize thermoplastic polyester/ester and polyether/ester 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 these moulding and extrusion materials are also included in this part of ISO 14910, as are the designatory properties specified in ISO 14910-1 (hardness, melting temperature and tensile modulus).

In order to obtain reproducible and comparable test results, it is necessary to use the methods of preparation and conditioning, the specimen dimensions and the test procedures specified in this part of ISO 14910. Values determined will not necessarily be identical to those obtained using specimens of different dimensions or prepared using different procedures.

NOTE This part of ISO 14910 has been developed on the basis of ISO 10350-1 as, at the moment, no standard exists for the acquisition and presentation of comparable single-point data for thermoplastic elastomers. After publication of this part of ISO 14910 and the analogous document for polyurethanes (ISO 16365-2), it is the intention to develop ISO 10350-3 for the acquisition and presentation of comparable single-point data for thermoplastic elastomers, based on this part of ISO 14910 and ISO 16365-2, as the basis for the development of thermoplastic-elastomer material standards.

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 34-1:2010, *Rubber, vulcanized or thermoplastic — Determination of tear strength — Part 1: Trouser, angle and crescent test pieces*

ISO 37, *Rubber, vulcanized or thermoplastic — Determination of tensile stress-strain properties*

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

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

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 815-1, *Rubber, vulcanized or thermoplastic — Determination of compression set — Part 1: At ambient or elevated temperatures*

ISO 868, *Plastics and ebonite — Determination of indentation hardness by means of a durometer (Shore hardness)*

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

ISO 974, *Plastics — Determination of the brittleness temperature by impact*

ISO 1133-2, *Plastics — Determination of the melt mass-flow rate (MFR) and melt volume-flow rate (MVR) of thermoplastics — Part 2: Method for materials sensitive to time-temperature history and/or moisture*

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 3167, *Plastics — Multipurpose test specimens*

ISO 4589-2, *Plastics — Determination of burning behaviour by oxygen index — Part 2: Ambient-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 11357-3, *Plastics — Differential scanning calorimetry (DSC) — Part 3: Determination of temperature and enthalpy of melting and crystallization*

ISO 11357-4, *Plastics — Differential scanning calorimetry (DSC) — Part 4: Determination of specific heat capacity*

ISO 11359-2:1999, *Plastics — Thermomechanical analysis (TMA) — Part 2: Determination of coefficient of linear thermal expansion and glass transition temperature*

ISO 14910-1, *Plastics — Thermoplastic polyester/ester and polyether/ester elastomers for moulding and extrusion — Part 1: Designation system and basis for specification*

ISO 15512, *Plastics — Determination of water content*

ISO 22007-2, *Plastics — Determination of thermal conductivity and thermal diffusivity — Part 2: Transient plane heat source (hot disc) method*

ISO 22007-3, *Plastics — Determination of thermal conductivity and thermal diffusivity — Part 3: Temperature wave analysis method*

ISO 22007-4, *Plastics — Determination of thermal conductivity and thermal diffusivity — Part 4: Laser flash method*

IEC 60093, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials*

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

IEC 60243-1, *Electric 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 60695-11-10, *Fire hazard testing — Part 11-10: Test flames — 50 W horizontal and vertical flame test methods*

ASTM E96, *Standard Test Methods for Water Vapor Transmission of Materials*

3 Preparation of test specimens

3.1 Treatment of the material before moulding

Before processing, the material sample shall have reached room temperature and the moisture content of the material sample shall not exceed 0,05 % (by mass).

The material shall be dried as specified in [Table 1](#), preferably using a vacuum oven with a dry N₂ purge and a maximum pressure of 100 mbar. [ISO 14910-2:2013](#)

<https://standards.iteh.ai/catalog/standards/sist/ad9bdb02-dd11-4c2d-b2f0-600541a48d74/iso-14910-2-2013>

Table 1 Drying conditions

Dryer type	Temperature
Vacuum oven with N ₂ purge; $p \leq 0,01$ MPa	80 °C to 135 °C
Vacuum oven	80 °C to 120 °C
Desiccant dryer, pre-dried-air dryer	80 °C to 120 °C
Hot-air oven	80 °C to 135 °C

Drying at higher temperatures might change the molecular mass and hence the properties of the material. The drying temperature recommended by the supplier should preferably be used.

The moisture content of filled or reinforced materials shall be expressed as a percentage of the total mass of the compound. The moisture content shall be determined in accordance with ISO 15512.

To ensure that the moisture content remains low, it is recommended that the sample material in the feed hopper of the injection-moulding machine be blanketed with a suitable gas (dried air, nitrogen or argon, for example). Better results might be obtained using a dehumidifier hopper drier.

3.2 Injection moulding

Injection-moulded specimens shall be prepared in accordance with ISO 294-1, using the conditions specified in [Table 2](#). The moulding conditions recommended by the supplier should preferably be used. The specimens shall be prepared by injection moulding from dry granules. It is essential that specimens are always prepared by the same procedure using the same processing conditions. The material shall be kept in moisture-proof containers until it is required for use.

Table 2 — Conditions for injection moulding of test specimens

Mould temperature °C	Melt temperature °C	Nozzle temperature °C	Heating-zone temperature		
			Front °C	Centre °C	Rear °C
20 to 50	Melting temperature + 30 °C	230 to 250	200 to 240	200 to 240	200 to 240
Injection pressure: 10 MPa to 100 MPa, holding pressure: 10 MPa to 100 MPa, back pressure: 0,5 MPa to 2 MPa, injection velocity: 100 mm/s to 300 mm/s.					

4 Conditioning of test specimens

Test specimens for the determination of mechanical properties, electrical properties and density shall be conditioned for at least 16 h at (23 ± 2) °C and (50 ± 10) % relative humidity.

5 Determination of properties

5.1 General

In order to obtain reproducible and comparable test results, it is necessary to use the methods of specimen preparation and conditioning, the specimen dimensions and the test procedures specified in this part of ISO 14910. Values determined will not necessarily be identical to those obtained using specimens of different dimensions or prepared using different procedures.

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 4](#) to [8](#).

Table 3 is compiled from ISO 10350-1 (see [Clause 1](#)) and gives an overview of the standard properties and special properties which are appropriate to thermoplastic polyester/ester and polyether/ester moulding and extrusion materials. These properties are those considered useful for comparisons of data generated for different thermoplastic elastomers.

[Tables 4](#), [6](#) and [8](#) contain those properties that are considered to be standard properties for the relevant hardness class. [Tables 5](#), [7](#) and [9](#) contain those properties that are considered to be special properties for the relevant hardness class, i.e. in wide use and/or of particular significance in the practical characterization of thermoplastic polyester/ester and polyether/ester moulding and extrusion materials.

Table 3 — Overview of standard properties and special properties for the characterization of thermoplastic polyester/ester and polyether/ester materials

Properties	Test method	Shore D ≤ 25		25 < Shore D ≤ 65		Shore D > 65	
		Standard	Special	Standard	Special	Standard	Special
Rheological properties							
Melt mass-flow rate/melt volume-flow rate	ISO 1133-2	X		X		X	
Mechanical properties							
Hardness, Shore D	ISO 868	X		X		X	

Table 3 (continued)

Properties	Test method	Shore D ≤ 25		25 < Shore D ≤ 65		Shore D > 65	
Tensile modulus	ISO 527-2	X		X		X	
Tensile stress							
— at 5 % and 10 % strain					X	X	
— at > 50 % strain			X		X		X
Stress at break		X		X		X	
Yield stress			X		X	X	
Strain at break			X	X		X	
Nominal strain at break		X		X			X
Strain at yield			X		X		X
Tensile creep modulus	ISO 899-1		X		X		X
Flexural modulus	ISO 178		X		X	X	
Tensile-impact strength	ISO 8256		X		X		
Charpy unnotched impact strength	ISO 179-1 or ISO 179-2		X	X	X	X	
Charpy notched impact strength			X		X	X	
Brittleness temperature	ISO 974	X			X		X
Tear strength	ISO 34-1:2010, method B, procedure (a)	X		X			X
Compression set	ISO 815-1	X			X		X
Thermal properties		Standard	Special	Standard	Special	Standard	Special
Specific heat capacity	ISO 11357-4		X		X	X	
Thermal conductivity	ISO 22007-2, ISO 22007-3 or ISO 22007-4		X		X		X
Melting temperature	ISO 11357-3	X		X		X	
Deflection of temperature under load	ISO 75-2				X	X	
Coefficient of linear thermal expansion	ISO 11359-2:1999, method A		X		X		X
Vicat softening temperature	ISO 306				X	X	
Oxygen index	ISO 4589-2		X		X		X
Burning behaviour	IEC 60695-11-10		X		X		X
Electrical properties		Standard	Special	Standard	Special	Standard	Special
Relative permittivity	IEC 60250		X		X		X
Dissipation factor, tan δ	IEC 60250		X		X		X
Volume resistivity	IEC 60093		X		X		X
Surface resistivity, σ_e	IEC 60093		X		X		X
Dielectric strength	IEC 60243-1		X		X		X
Comparative tracking index (CTI)	IEC 60112		X		X		X
Other properties		Standard	Special	Standard	Special	Standard	Special
Density	ISO 1183-1, ISO 1183-2 or ISO 1183-3	X		X		X	