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Plastics — Thermoplastic polyurethanes for moulding and extrusion —

Part 2: Preparation of test specimens and determination of properties

Plastiques — Polyuréthannes thermoplastiques 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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT) see the following URL: Foreword - Supplementary information

The committee responsible for this document is ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

ISO 16365 consists of the following parts, under the general title *Plastics — Thermoplastic polyurethanes for moulding and extrusion*:

— *Part 1: Designation system and basis for specifications*

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

— *Part 3: Distinction between ether and ester polyurethanes by determination of the ester group content*

Introduction

Thermoplastic elastomer materials are classified into groups by the primary elastomeric property Hardness and with this as result of some relation with modulus, as shown in Figure 1. The classification on basis of hardness considers the special position of TPE's between the rubber materials on the one side and the plastic materials on the other.

Each class is subdivided in standard properties and special properties. The standard properties for a class are not only connected with the adjacent group(s) by many of the specified properties but also by special properties specified in the adjacent class(es). A standard property in a class can be a special property in an adjacent 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.

For each type of thermoplastic elastomer, refer to the relevant material standard.

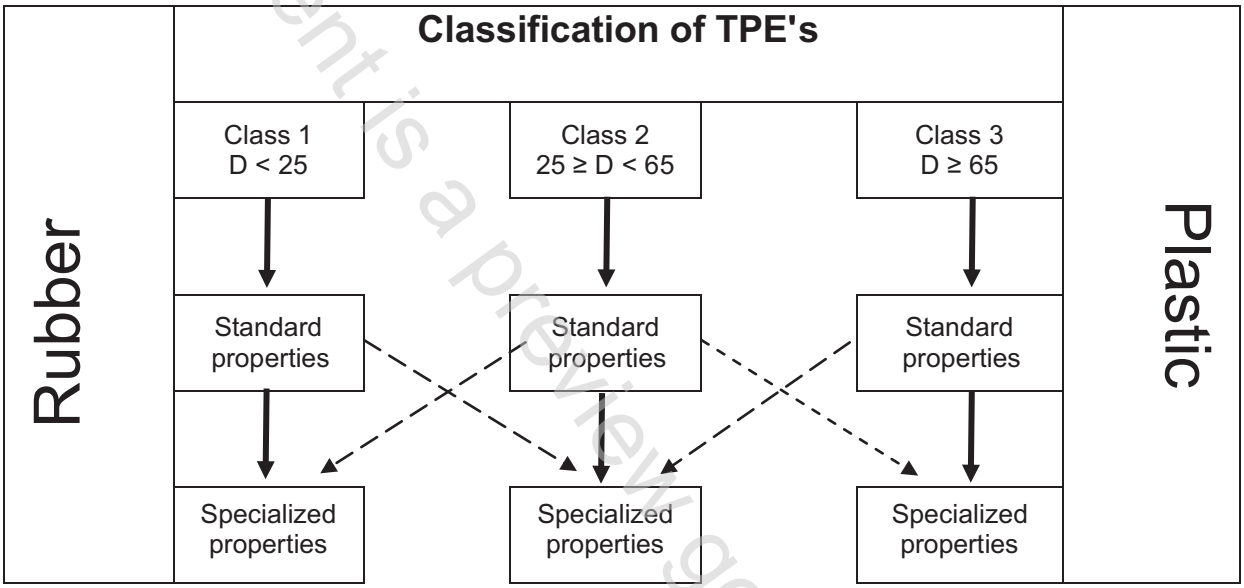

Figure 1 — Structure of thermoplastic elastomer (TPE) material standards

Plastics — Thermoplastic polyurethanes for moulding and extrusion —

Part 2: Preparation of test specimens and determination of properties

1 Scope

This part of ISO 16365 specifies the methods of preparation of test specimens and the standard test methods to be used in determining the properties of thermoplastic polyurethane moulding and extrusion materials. Requirements for handling test material and for conditioning both the test material before moulding and the specimens before testing are also 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 given. Properties and test methods which are suitable and necessary to characterize thermoplastic polyester/polyurethane and polyether/polyurethane (TPU) moulding and extrusion materials, are listed.

The properties have been selected from the general test methods in ISO 10350. Other test methods in wide use or of particular significance to these moulding and extrusion materials are also included in this part of ISO 16365, as are the designatory properties specified in ISO 16365-1.

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 16365. Values determined are not necessarily identical to those obtained using specimens of different dimensions or prepared using different procedures.

NOTE This part of ISO 16365 has been developed on the basis of ISO 10350-1 as at the time of publication a standard on 'acquisition and presentation of comparable single point data' for thermoplastic elastomers' does not exist yet. After acceptance and publication of this part of ISO 16365, it is the intension to develop ISO 10350-3, based on the two International Standards mentioned before, as starting point for the development of thermoplastic elastomer material standards.

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 34-1, *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 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 291, *Plastics — Standard atmospheres for conditioning and testing*

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 472, *Plastics — Vocabulary*

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

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

ISO 815, (all parts), *Rubber, vulcanized or thermoplastic — Determination of compression set*

ISO 846, *Plastics — Evaluation of the action of microorganisms*

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

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 (all parts), *Plastics-Methods for determining the density and relative density of non-cellular plastics*

ISO 4649, *Rubber, vulcanized or thermoplastic — Determination of abrasion resistance using a rotating cylindrical drum device*

ISO 15512, *Plastics — Determination of water content*

ISO 16365-1, *Plastics — Thermoplastic polyurethanes for moulding and extrusion — Part 1: Designation system and basis for specifications*

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

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

IEC 60112, *Method for determining of the proof and the comparative and the proof tracking indices of solid insulation materials under moist conditions*

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 Flammability—11-10: Test flames — 50 W horizontal and vertical flame*

3 Preparation of test specimens

3.1 Treatment of the material before moulding

The granules/moulding compound shall have reached room temperature and the moisture content shall not exceed 0,02 % (m/m).

For drying a dehumidified air dryer is recommended, but an oven with circulating air can also be used provided that the drying temperature is increased by 20 °C. For a dehumidified air dryer 3 h at 100 °C might be sufficient, but for several products longer times up to 1 day and a temperature of 110 °C can be used for drying without checking the water content for each sample, if proven to give a moisture content < 0,02 % (m/m). If colour master batches, pigments, or other additives are added, it

