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Plastics — Acquisition and presentation of comparable multipoint data —

Part 3: Environmental influences on properties

Plastiques — Acquisition et présentation de données multiples comparables —

Partie 3: Effets induits par l'environnement sur les 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 Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical behaviour*, 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 third edition cancels and replaces the second edition (ISO 11403-3:2014), of which it constitutes a minor revision.

The changes compared to the previous edition are as follows:

— unified the indication methods of the unit;

— unified the quotation of the specimen shape in ISO 20753;

— performed the editorial corrections.

A list of all parts in the ISO 11403 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.

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Introduction

This document has been prepared because users of plastics find sometimes that available data cannot be used readily to compare the properties of similar materials, especially when the data have been supplied by different sources. Even when the same standard tests 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 identify specific methods and conditions of test to be used for the acquisition and presentation of data in order that valid comparisons between materials can be made. These data are not necessarily suitable for design.

The ISO 10350 series[7][8] is concerned with single-point data. Such data represent the most basic method for characterizing materials and are useful for the initial stages of material selection. This document identifies test conditions and procedures for the measurement and presentation of a more substantial quantity of data. Each property here is characterized by multipoint data which demonstrate how that property depends upon important variables such as time, temperature and environmental effects. Additional properties are also considered in this document. These data therefore enable more discriminating decisions to be made regarding the material's suitability for a particular application. Some data are also considered adequate for undertaking predictions of performance in service and of optimum processing conditions for moulding a component, although it should be recognized that, for purposes of design, additional data are often needed. One reason for this is that some properties are strongly dependent upon the physical structure of the material. The test procedures referred to in this document employ standard test specimens, and the polymer structure in these specimens may be significantly different from that in specific regions of a moulded component. Under these circumstances, therefore, the data are not suitable for accurate design calculations for product performance. The material supplier should be consulted for specific information on the applicability of data.

The ISO 10350 series together with the ISO 11403 series define the means for acquiring and presenting a core set of comparable data for use in material selection. Use of these International Standards should result in a rationalization of effort and a reduction of cost associated with provision of these data. Furthermore, reference to these International Standards simplify the development of data models for the computerized storage and exchange of data concerning material properties.

Where appropriate, values for test variables have been specified by this document. For some tests however, owing to the wide range of conditions over which different plastics perform, the standard gives guidance in the selection of certain test conditions so that they cover the operating range for that polymer. Because, in general, the properties and performance specifications for different polymers differ widely, there is no obligation to generate data under all the test conditions specified in this document.

Data on a wide range of properties are needed to enable plastics to be selected and used in the large variety of applications to which they are suited. ISO standards describe experimental procedures which are suitable for the acquisition of relevant information on many of these properties. For other properties, however, ISO standards either do not exist or exhibit shortcomings that complicate their use at present for the generation of comparable data (see Annex A). The ISO 11403 series has therefore been divided into parts so that each part can be developed independently. In this way, additional properties can be included as new or revised standards become available.

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Plastics — Acquisition and presentation of comparable multipoint data —

Part 3:
Environmental influences on properties

1 Scope

This document specifies test procedures for the acquisition and presentation of multipoint data which demonstrate the behaviour of plastics under the following environments:

— prolonged exposure to heat;

— liquid chemicals;

— environmental stress cracking under a constant tensile stress;

— artificial weathering.

The tests are listed in order of increasing severity of the environment. By testing under the least severe environments first, it is possible to make informed judgements regarding whether tests under more severe conditions are worthwhile.

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 175, *Plastics — Methods of test for the determination of the effects of immersion in liquid chemicals*

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 294-2, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 2: Small tensile bars*

ISO 295, *Plastics — Compression moulding of test specimens of thermosetting materials*

ISO 1268 (all parts), *Fibre-reinforced plastics — Methods of producing test plates*

ISO 1817, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 2578, *Plastics — Determination of time-temperature limits after prolonged exposure to heat*

ISO 4892-2:2013, *Plastics — Methods of exposure to laboratory light sources — Part 2: Xenon-arc lamps*

ISO 10724-1, *Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs) — Part 1: General principles and moulding of multipurpose test specimens*

ISO 10724-2, *Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs) — Part 2: Small plates*

ISO 20753, *Plastics — Test specimens*

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3 Terms and definitions

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

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/

3.1
multipoint data
data characterizing the behaviour of a plastics material by means of a number of test results for a property measured over a range of test conditions

3.2
indicative property
property that has been selected to reveal the influence of an environment on a material through a comparison of measurements of the property before and after exposure

3.3
indicative data
ratios of mean values of indicative properties after and before exposure

Note 1 to entry: They give a measure of the severity of the influence of an environment on a material for specific exposure conditions (see A.2).

3.4
tensile work to break
$\boldsymbol{W_{tB}}$
area under a plot of the applied stress against the grip displacement in a tensile test, the applied stress being determined from the ratio of the tensile force to the minimum initial cross-sectional area of the specimen

Note 1 to entry: It is expressed in kilojoules per square metre (kJ/m^2).

4 Specimen preparation

In the preparation of specimens by injection or compression moulding, the procedures described in ISO 293, ISO 294-1, ISO 294-2, ISO 295, ISO 10724-1, ISO 10724-2 or ISO 1268 (all parts) shall be used. The method of moulding and the conditions depend on the material being moulded. If these conditions are specified in the International Standard appropriate to the material, then they shall be adopted, where possible, for the preparation of every specimen on which data are obtained using this document. For those plastics for which moulding conditions have not yet been standardized, the conditions employed shall be within the range recommended by the polymer manufacturer and shall, for each of the processing methods, be the same for every specimen. Where moulding conditions are not stipulated in any International Standard, the values used for the parameters in Table 1 shall be recorded with the data for that material.

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