INTERNATIONAL STANDARD

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Plastics — Acquisition and presentation of comparable single-point data —

Part 2: Long-fibre-reinforced plastics

Plastiques — Acquisition et présentation de caractéristiques intrinsèques comparables —

Partie 2: Plastiques renforcés par de longues fibres

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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.

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 10350-2 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 2, *Mechanical properties*.

This second edition cancels and replaces the first edition (ISO 10350-2:2001), which has been technically revised.

ISO 10350 consists of the following parts, under the general title *Plastics — Acquisition and presentation of comparable single-point data*:

— *Part 1: Moulding materials*

— *Part 2: Long-fibre-reinforced plastics*

Introduction

This part of ISO 10350 has been prepared because users of long-fibre-reinforced plastics find that available data cannot always be readily used 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 may allow the adoption of a wide range of alternative test conditions, and the data obtained are not necessarily comparable. The purpose of this part of ISO 10350 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.

This part of ISO 10350 is concerned with tests employed to present “single-point” data on the limited range of properties commonly included in data sheets and used for the preliminary selection of materials. Such data represent the most basic approach to the specification of properties of materials and this part of ISO 10350 thus facilitates the first steps towards more efficient selection and use of plastics in the many applications to which they are suited.

Many properties of long-fibre-reinforced plastics are anisotropic. The test method standards for these properties have been produced with different procedures for specific types of reinforcement. In this part of ISO 10350, use of the appropriate procedure is specified rather than the use of a specific specimen geometry as adopted in Part 1 for moulding materials. This is necessary for the recording of meaningful material property values.

Complementary International Standards (ISO 11403-1, ISO 11403-2 and ISO 11403-3) (see the Bibliography) are concerned with the standardized acquisition and presentation of multipoint data, to demonstrate how properties vary with important factors such as time, temperature and the presence of particular natural and chemical environments. In these standards, some additional properties are included. Their use will provide a more substantial database than one containing only single-point data, and so will enable improved assessment of the fitness of a material for any particular application. In addition, ISO 11403-1, which deals with mechanical properties, assists predictions of the performance of components and ISO 11403-2, covering thermal and processing properties, aids predictions of melt-flow behaviour during manufacturing. ISO 11403-3 is concerned with environmental influences on properties, and other parts may be prepared to cover additional properties. The various parts of ISO 11403 were written primarily for moulding materials. The test methods and test conditions referred to might not therefore be ideally suited to the acquisition of data for all long-fibre-reinforced plastics.

Plastics — Acquisition and presentation of comparable single-point data —

Part 2:
Long-fibre-reinforced plastics

1 Scope

ISO 10350 identifies specific test procedures for the acquisition and presentation of comparable data for certain basic properties of plastics. In general, each property is specified by a single experimental value, although in certain cases properties are represented by two values obtained under different test conditions or along different directions in the material. The properties included are those presented conventionally in manufacturers' data sheets. This part of ISO 10350 applies to reinforced thermoplastic and thermosetting materials where the reinforcement fibres are either discontinuous with a fibre length prior to processing greater than 7,5 mm or continuous (e.g. fabric, continuous-strand mat or unidirectional). Part 1 of this International Standard deals specifically with unreinforced and filled plastics, including those using fibres less than 7,5 mm in length.

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 62, *Plastics — Determination of water absorption*

ISO 75-3, *Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics*

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

ISO 527-5, *Plastics — Determination of tensile properties — Part 5: Test conditions for unidirectional fibre-reinforced plastic composites*

ISO 1172, *Textile-glass-reinforced plastics — Prepregs, moulding compounds and laminates — Determination of the textile-glass and mineral-filler content — Calcination methods*

ISO 1183 (all parts), *Plastics — Methods for determining the density of non-cellular plastics*

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

ISO 2577, *Plastics — Thermosetting moulding materials — Determination of shrinkage*

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

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 7822, *Textile glass reinforced plastics — Determination of void content — Loss on ignition, mechanical disintegration and statistical counting methods*

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

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 14125:1998, *Fibre-reinforced plastic composites — Determination of flexural properties*

ISO 14127, *Carbon-fibre-reinforced composites — Determination of the resin, fibre and void contents*

ISO 14130, *Fibre-reinforced plastic composites — Determination of apparent interlaminar shear strength by short-beam method*

ISO 15310, *Fibre-reinforced plastic composites — Determination of the in-plane shear modulus by the plate twist 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, *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 60695-11-20, *Fire hazard testing — Part 11-20: Test flames — 500 W flame test methods*

3 Terms and definitions

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

3.1
single-point data
data characterizing a plastics material by means of those property tests in which important aspects of performance can be described with single-value results

3.2
specimen coordinate axes
coordinate axes for a material in which the fibres are preferentially aligned in one direction

NOTE 1 Where the material contains a known axis of preferred fibre orientation, then this is defined as the “1”-axis (or “1”-direction). For materials prepared as a test plate, then the in-plane direction transverse to the “1”-axis is defined as the “2”-axis.

NOTE 2 Where the direction of preferred orientation is not known, the “1”-axis is taken as the production direction of the composite or the reinforcement (e.g. the warp direction for fabrics).

4 Specimen preparation and conditioning

Specimens shall be cut from test plates manufactured by the method given in the part of ISO 1268 appropriate to the material under test. Machining shall be performed in accordance with ISO 2818, as applicable, and the dimensions of the specimen shall comply with those for the appropriate specimen in Table 2.

The moulding conditions stipulated in ISO 1268, or any other International Standard, shall be recorded with the single-point data for that material. Typical parameters are shown in Table 1.

Table 1 — Moulding parameters

Moulding-material type	Manufacturing method and standard	Manufacturing parameters
Long-fibre-reinforced plastic	Test plate manufacture ISO 1268, Parts 1-11	Typical parameters given in the appropriate part of ISO 1268 will cover: Temperatures (e.g. of mould, resin, preform, cure, post-cure) Pressures (e.g. of moulding, holding, resin transfer, vacuum level) Times, speeds and rates (e.g. curing times, speed of winding or pultrusion, quantity of glass and resin sprayed by unit of time)

For materials that have properties that are not significantly sensitive to any absorbed water, specimens shall be conditioned in accordance with the International Standard appropriate to the material concerned. If no materials standard is available, condition test specimens at (23 ± 2) °C and (50 ± 10) % RH for a minimum length of time of 88 h (see ISO 291).

For those materials having properties that are significantly dependent upon the concentration of any absorbed water, data shall be presented both for material that is dry and also for material that is in equilibrium with an atmosphere of 50 % RH at 23 °C but with the following exceptions (see Table 2).

— Rheological properties 1.1 to 1.6 dry only

— Thermal properties 3.1 to 3.8 dry only

— Surface resistivity and comparative tracking index 4.6 and 4.9 50 % RH only

For these materials, consult the relevant materials standard for procedures for conditioning specimens to achieve material that is dry or in equilibrium under 50 % RH. Following such conditioning, all test specimens shall be stored at (23 ± 2) °C for a minimum of 16 h before testing. The storage atmosphere shall then be either dry or at 50 % RH, depending upon the condition of the specimen.