INTERNATIONAL STANDARD

ISO 10724-1

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Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs) —

Part 1:
General principles and moulding of multipurpose test specimens

Plastiques — Moulage par injection d’éprouvettes en compositions de poudre à mouler (PMC) thermodurcissables —

Partie 1: Principes généraux et moulage d’éprouvettes à usages multiples

Reference number
ISO 10724-1:1998(E)

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.

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.

International Standard ISO 10724-1 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 12, *Thermosetting materials*.

Together with part 2, this part of ISO 10724 cancels and replaces ISO 10724:1994, which has been revised to improve the definition of the injection-moulding parameters and has been restructured to specify two types of ISO mould for the production of the basic specimen types required for the acquisition of comparable test data.

Care has been taken to ensure that the ISO moulds described can all be fitted in existing injection-moulding equipment and have interchangeable cavity plates.

As far as possible, the wording of this part of ISO 10724 and its definitions corresponds to that in its counterpart for thermoplastic materials, ISO 294:1996, *Plastics — Injection moulding of test specimens of thermoplastics materials*. Unlike the latter, however, there is no need for the separate moulding of rectangular bars (80 mm × 10 mm × 4 mm, which should be taken from the central portion of the multipurpose test specimen) or for the moulding of small tensile bars ($\geqslant$ 60 mm × 10 mm × 3 mm). Therefore the type B and type C ISO moulds specified in ISO 294 have not been included in this part of ISO 10724. Regardless of this, and to avoid confusion, the designation of the different mould types in this part of ISO 10724 and in ISO 294 correspond to each other.

ISO 10724 consists of the following parts, under the general title *Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs):*

— *Part 1: General principles and moulding of multipurpose test specimens*

— *Part 2: Small plates*

Annexes A to D of this part of ISO 10724 are for information only.

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Introduction

Many factors in the injection-moulding process which can influence the properties of moulded test specimens and hence the measured values obtained when the specimens are used in a test method. The thermal and mechanical properties of such specimens are in fact strongly dependent on the conditions of the moulding process used to prepare the specimens. Exact definition of each of the main parameters of the moulding process is a basic requirement for reproducible and comparable operating conditions.

It is important in defining moulding conditions to consider any influence the conditions may have on the properties to be determined. Thermosets may show differences in orientation and length of anisotropic fillers such as short fibres and in curing. Residual ("frozen-in") stresses in the moulded test specimens may also influence properties. Due to the crosslinking of thermosets, molecular orientation is of less influence on mechanical properties than it is for thermoplastics. Each of these phenomena must be controlled to avoid fluctuation of the numerical values of the measured properties.

Plastics — Injection moulding of test specimens of thermosetting powder moulding compounds (PMCs) —

Part 1:
General principles and moulding of multipurpose test specimens

1 Scope

This part of ISO 10724 specifies the general principles to be followed when injection moulding test specimens of thermosetting powder moulding compounds (PMCs) and gives details of mould designs for preparing one type of specimen for use in establishing reproducible moulding conditions. Its purpose is to promote uniformity in describing the main parameters of the moulding process and also to establish uniform practice in reporting moulding conditions. The particular conditions required for the reproducible preparation of test specimens which will give comparable results will vary for each material used. These conditions are given in the International Standard for the relevant material or are to be agreed upon between interested parties.

NOTE ISO round-robin tests with phenolic (PF), urea-formaldehyde (UF), melamine (MF), melamine phenolic (MP) and unsaturated-polyester (UP) injection-moulding materials have shown that mould design is an important factor in the reproducible preparation of test specimens.

2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 10724. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 10724 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 294-1:1996, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 1: General principles, and moulding of multipurpose and bar test specimens.*

ISO 294-2:1996, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 2: Small tensile bars.*

ISO 294-3:1996, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 3: Small plates.*

ISO 472:—[1], *Plastics — Vocabulary.*

ISO 2577:1984, *Plastics — Thermosetting moulding materials — Determination of shrinkage.*

ISO 3167:1993, *Plastics — Multipurpose test specimens.*

ISO 10350-1:1998, *Plastics — Acquisition and presentation of comparable single-point data — Part 1: Moulding materials.*

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[1] To be published. (Revision of ISO 472:1988)

ISO 10724-2:1998, *Plastics — Injection moulding of test specimens of thermosetting materials — Part 2: Small plates.*

ISO 11403-1:1994, *Plastics — Acquisition and presentation of comparable multipoint data — Part 1: Mechanical properties.*

ISO 11403-2:1995, *Plastics — Acquisition and presentation of comparable multipoint data — Part 2: Thermal and processing properties.*

ISO 11403-3:—[2], *Plastics — Acquisition and presentation of comparable multipoint data — Part 3: Environmental influences on properties.*

3 Definitions

For the purposes of this part of ISO 10724, the definitions given in ISO 472 as well as the following apply.

3.1 mould temperature, T_C: The average temperature of the mould cavity surfaces measured after the system has attained thermal equilibrium and immediately after opening the mould.

It is expressed in degrees Celsius (°C).

3.2 melt temperature, T_M: The temperature of the plasticized material in a free shot.

It is expressed in degrees Celsius (°C).

3.3 melt pressure, p: The pressure of the plastic material in front of the screw at any time during the moulding process (see Figure 1).

It is expressed in megapascals (MPa).

The melt pressure, which is generated hydraulically for instance, can be calculated from the force F_S acting longitudinally on the screw using equation (1):

$$p = \frac{4 \times 10^3 \times F_S}{\pi \times D^2} \tag{1}$$

where

p is the melt pressure, in megapascals (MPa);

F_S is the longitudinal force, in kilonewtons (kN), acting upon the screw;

D is the screw diameter, in millimetres (mm).

3.4 hold pressure, p_H: The melt pressure during the hold time (see Figure 1).

It is expressed in megapascals (MPa).

3.5 moulding cycle: The complete sequence of operations in the moulding process required for the production of one set of test specimens (see Figure 1).

3.6 cycle time, t_T: The time required to carry out a complete moulding cycle.

It is expressed in seconds (s).

The cycle time is the sum of the injection time t_I, the cure time t_{CR} and the mould-open time t_O.

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[2] To be published.