INTERNATIONAL STANDARD

ISO 295

Third edition
2004-02-01

Plastics — Compression moulding of test specimens of thermosetting materials

Plastiques — Moulage par compression des éprouvettes en matières thermodurcissables

Reference number
ISO 295:2004(E)

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Published in Switzerland

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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 295 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 12, *Thermosetting materials*.

This third edition cancels and replaces the second edition (ISO 295:1991), which has been technically revised.

Plastics — Compression moulding of test specimens of thermosetting materials

1 Scope

This International Standard

— establishes the general principles and lays down the procedure to prepare test specimens of heat- and pressure-moulded thermosetting material from different moulding compounds;

— specifies the details for test specimen preparation to be included with the test reports on properties;

— gives the general principles for the design of the mould intended for the preparation of the test specimens.

The conditions required for preparing, in a reproducible manner, test specimens which will give comparable results are discussed relative to the substance under consideration.

The method applies to phenolic resin, aminoplastic, melamine/phenol, epoxy and unsaturated-polyester based thermosetting powder moulding compounds (PMCs). Due to the nature of certain moulding compounds, their flow properties or other variable factors, it may be necessary to prepare the test specimens according to special methods. The latter are normally in an agreement between the interested parties and noted in the moulding report.

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 472:1999, *Plastics — Vocabulary*

ISO 1183:1987, *Plastics — Methods for determining the density and relative density of non-cellular plastics*

ISO 3167:2002, *Plastics — Multipurpose test specimens*

ISO 4287, *Geometrical Product Specifications (GPS) — Surface texture: Profile method — Terms, definitions and surface texture parameters*

ISO 14526-1, *Plastics — Phenolic powder moulding compounds (PF-PMCs) — Part 1: Designation system and basis for specifications*

ISO 14526-2, *Plastics — Phenolic powder moulding compounds (PF-PMCs) — Part 2: Preparation of test specimens and determination of properties*

ISO 14526-3, *Plastics — Phenolic powder moulding compounds (PF-PMCs) — Part 3: Requirements for selected moulding compounds*

ISO 14527-1, *Plastics — Urea-formaldehyde and urea/melamine-formaldehyde powder moulding compounds (UF- and UF/MF-PMCs) — Part 1: Designation and basis for specifications*

ISO 14527-2, *Plastics — Urea-formaldehyde and urea/melamine-formaldehyde powder moulding compounds (UF- and UF/MF-PMCs) — Part 2: Preparation of test specimens and determination of properties*

ISO 14527-3, *Plastics — Urea-formaldehyde and urea/melamine-formaldehyde powder moulding compounds (UF- and UF/MF-PMCs) — Part 3: Requirements for selected moulding compounds*

ISO 14528-1, *Plastics — Melamine-formaldehyde powder moulding compounds (MF-PMCs) — Part 1: Designation system and basis for specifications*

ISO 14528-2, *Plastics — Melamine-formaldehyde powder moulding compounds (MF-PMCs) — Part 2: Preparation of test specimens and determination of properties*

ISO 14528-3, *Plastics — Melamine-formaldehyde powder moulding compounds (MF-PMCs) — Part 3: Requirements for selected moulding compounds*

ISO 14529-1, *Plastics — Melamine/phenolic powder moulding compounds (MP-PMCs) — Part 1: Designation system and basis for specifications*

ISO 14529-2, *Plastics — Melamine/phenolic powder moulding compounds (MP-PMCs) — Part 2: Preparation of test specimens and determination of properties*

ISO 14529-3, *Plastics — Melamine/phenolic powder moulding compounds (MP-PMCs) — Part 3: Requirements for selected moulding compounds*

ISO 14530-1, *Plastics — Unsaturated-polyester powder moulding compounds (UP-PMCs) — Part 1: Designation system and basis for specifications*

ISO 14530-2, *Plastics — Unsaturated-polyester powder moulding compounds (UP-PMCs) — Part 2: Preparation of test specimens and determination of properties*

ISO 14530-3, *Plastics — Unsaturated-polyester powder moulding compounds (UP-PMCs) — Part 3: Requirements for selected moulding compounds*

ISO 15252-1, *Plastics — Epoxy powder moulding compounds (EP-PMCs) — Part 1: Designation system and basis for specifications*

ISO 15252-2, *Plastics — Epoxy powder moulding compounds (EP-PMCs) — Part 2: Preparation of test specimens and determination of properties*

ISO 15252-3, *Plastics — Epoxy powder moulding compounds (EP-PMCs) — Part 3: Requirements for selected moulding compounds*

3 Terms and definitions

For the purposes of this document, the terms and definitions of ISO 472 and the following apply.

3.1
spatial temperature differences
differences in temperature existing simultaneously at various points inside the mould after the temperature adjustment device has been set at a given temperature and after a permanent thermal equilibrium has been reached

3.2
temporal temperature differences
differences in temperature that may occur at a single given point on the inside of the mould at various times after the temperature adjustment device has been set at a given temperature and after a permanent thermal equilibrium has been reached

3.3
crosslinking time or cure time
time interval between the end of the mould-closing operation and the beginning of the mould-opening operation

NOTE In practice, the cure time is generally counted as from the moment when the pressure reaches the specified value.

4 Apparatus

4.1 Compression mould, made of steel, able to withstand the prescribed moulding temperatures and pressures.

The mould shall be designed so that the compression force is transmitted to the moulding material with no appreciable loss. It may be a single-cavity or a multi-cavity type mould. Figure 1 shows an example of a single-cavity positive mould. The cavity of the mould may have the shape of the multi-purpose test specimen in accordance with ISO 3167. In some cases, e.g., for aminoplastic moulding materials, a semi-positive mould is more suitable, even though the pressure on the moulding material is not as well defined. In this case, the test-specimen thickness shall be adjusted using spacers on the mould parting line.

The mould cavity may have various forms, e.g., square plate, disc or multi-purpose specimen in accordance with ISO 3167.

For moulding powders, a "type E ISO 295" single-cavity mould with dimensions of 120 mm × 120 mm is recommended. In the moulding report, the plate is designated as "type Eh ISO 295," where h is the thickness in millimetres (e.g., "type E4 ISO 295" for a plate with a thickness of 4 mm and dimensions of 120 mm × 120 mm).

The majority of the test methods require a thickness of 4 mm but, for a few, for instance the measurement of certain electrical properties, thinner plates may be required. When in doubt, the dimensions specified in the test procedure itself shall be used.

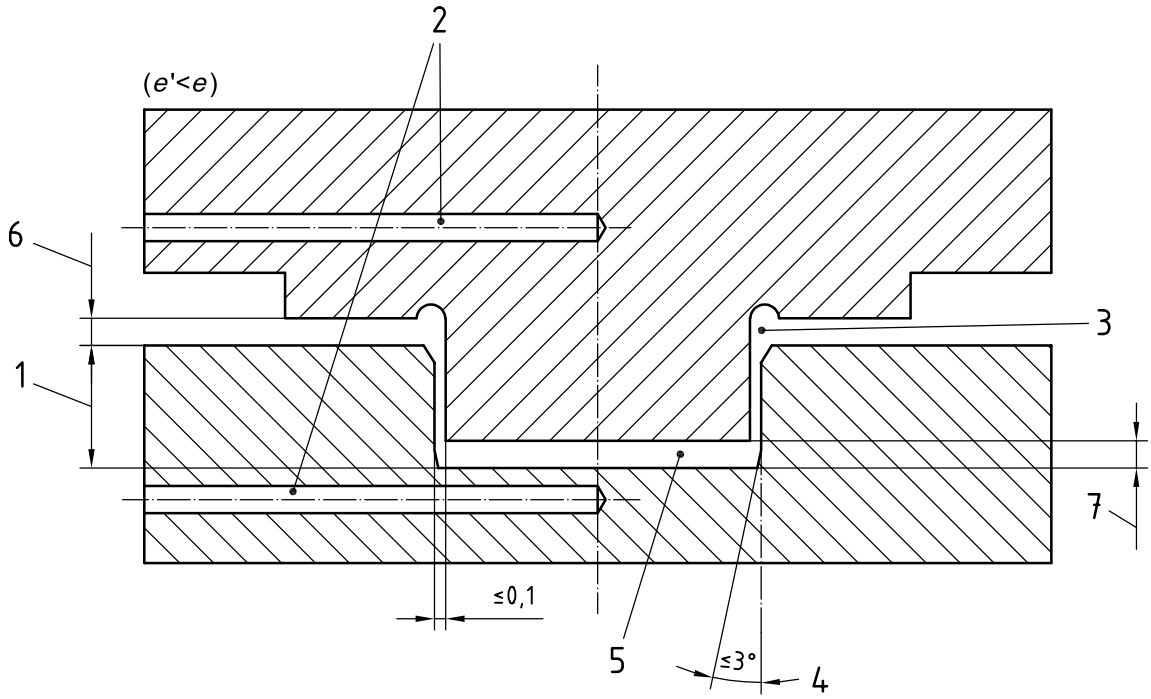
The use of a plate allows the required test specimens to be cut by machining. The test specimens shall not be taken from the edge of the plate. A margin of 10 mm is recommended.

The mould surface shall be free from superficial damage or contamination and have a roughness Ra between 0,4 µm and 0,8 µm, inclusive (see ISO 4287). Chrome plating is not always necessary, but it can prevent sticking.

The edge-taper angle, if any, shall not be greater than 3° (see Figure 1). Clearance between the vertical wall of the cavity and that of the punch shall not exceed 0,1 mm (see Figure 1). Dimension e' shall be calculated so that there is no risk of the punch damaging the die if there is no material present.

The mould shall have a cavity (see Figure 1) of sufficient volume to allow the introduction of the whole charge in one single operation. Bulk form moulding material occupies a volume two to ten times that of the object being moulded.

Dimension in millimetres



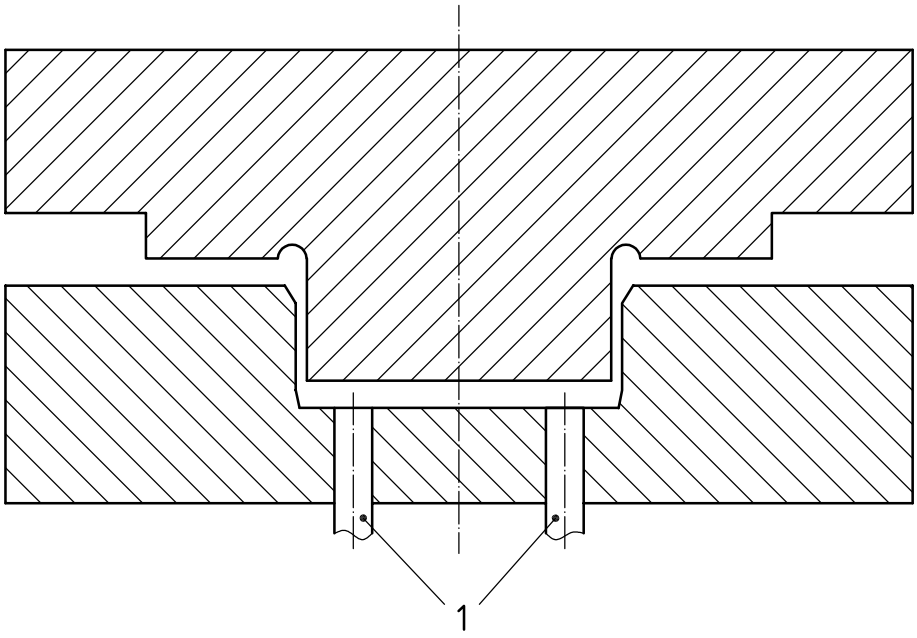
Key

1 depth of mould cavity
2 holes for probes and thermometers
3 clearance
4 edge taper
5 mould cavity
6 dimension e'
7 dimension e

Figure 1 — Example of single-cavity positive mould

The mould may be fitted with an ejector. If ejector pins are used (see Figure 2), they shall not deform the specimen in any way. If the parts are ejected by the movable bottom of the mould (see Figure 3), there shall be no significant leakage of material at the joint between the bottom and the cavity walls.

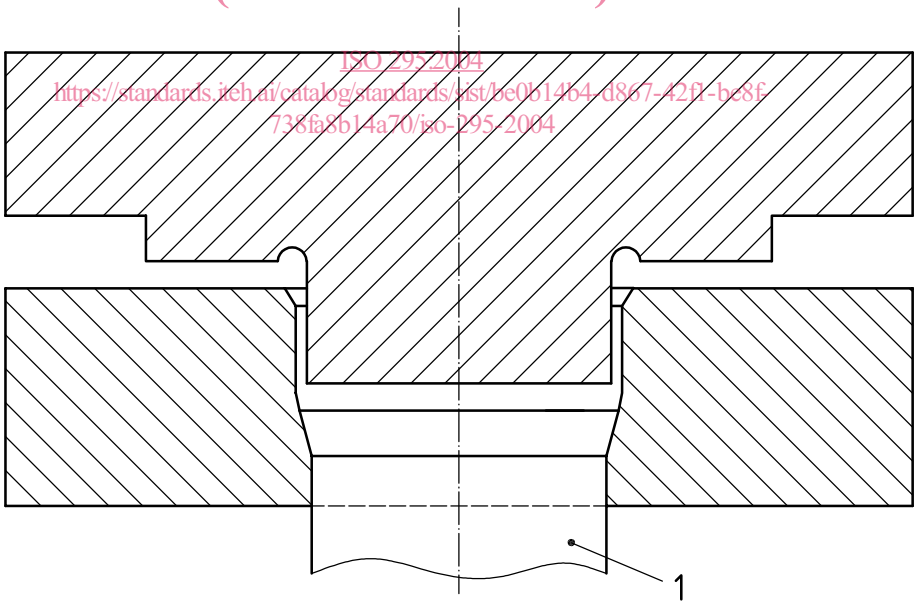
As the face of the moulded test specimen facing the lower die is heated for a longer time during the period between filling and compression, it may be worthwhile to distinguish between the two faces by means of a fixed mark in the cavity. The use of a mark in the mould cavity can also enable one to identify, if necessary, the direction in which the test specimens were taken from the plate. An example of cavity markings is given in Annex A.



Key

1 ejectors

Figure 2 — Example of a mould with ejectors



Key

1 movable bottom

Figure 3 — Example of mould with ejection by movable bottom

4.2 Heating device, capable of heating the mould so that the moulding temperature remains constant and uniform over all parts of the mould within the specified tolerances.