
**Plastics — Injection moulding of test
specimens of thermoplastic materials —**

**Part 4:
Determination of moulding shrinkage**

*Plastiques — Moulage par injection des éprouvettes de matériaux
thermoplastiques —*

Partie 4: Détermination du retrait au moulage



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Printed 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 3.

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 part of ISO 294 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 294-4 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 9, *Thermoplastic materials*.

This second edition cancels and replaces the first edition (ISO 294-4:1997), which has been technically revised.

ISO 294 consists of the following parts, under the general title *Plastics — Injection moulding of test specimens of thermoplastic materials*:

- *Part 1: General principles, and moulding of multipurpose and bar test specimens*
- *Part 2: Small tensile bars*
- *Part 3: Small plates*
- *Part 4: Determination of moulding shrinkage*
- *Part 5: Preparation of standard specimens for investigating anisotropy*

Annex A of this part of ISO 294 is for information only.

Introduction

See ISO 294-1.

In the injection moulding of thermoplastics, the difference between the dimensions of the mould cavity and those of the moulded articles produced from it may vary with the design and operation of the mould. Such differences may depend on the size of the injection-moulding machine, the shape and dimensions of mouldings including any restrictive action this may have on the shrinkage, the degree and direction of flow or movement of the material in the mould, the sizes of the nozzle, sprue, runner and gate, the cycle on which the machine is operated, the temperature of the melt and the mould, and the magnitude and duration of the hold pressure. Moulding and post-moulding shrinkage are caused by crystallization, volume relaxation and orientation relaxation of the material and by thermal contraction of both the thermoplastic material and the mould. Post-moulding shrinkage may also be influenced by humidity uptake.

The measurement of moulding and post-moulding shrinkage is useful in making comparisons between thermoplastics and in checking uniformity of manufacture.

The method is not intended as a source of data for design calculations of components. Information on the typical behaviour of a material can be obtained, however, by carrying out measurements at different melt and mould temperatures, injection velocities and hold pressures, as well as at different values of other injection-moulding parameters. The information thus obtained is important in establishing the suitability of the moulding material for the production of moulded articles with accurate dimensions.

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Plastics — Injection moulding of test specimens of thermoplastic materials —

Part 4: Determination of moulding shrinkage

1 Scope

This part of ISO 294 specifies a method of determining the moulding shrinkage and post-moulding shrinkage of injection-moulded test specimens of thermoplastic material in the directions parallel to and normal to the direction of melt flow.

For the determination of shrinkage of thermosets see ISO 2577^[2].

Moulding shrinkage as defined in this part of ISO 294 excludes the effects of humidity uptake. This is included in post-moulding shrinkage and thus in total shrinkage. For cases when post-moulding shrinkage is caused by the uptake of humidity only, see ISO 175^[1].

Moulding shrinkage as defined in this part of ISO 294 represents the so-called free shrinkage with unrestricted deformation of the cooling plates in the mould during the hold period. It may be considered therefore as the maximum value of any restricted shrinkage.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 294. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 294 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC 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 294-3:—¹⁾, *Plastics — Injection moulding of test specimens of thermoplastic materials — Part 3: Small plates*

1) To be revised. (Revision of ISO 294-3:1996)