INTERNATIONAL STANDARD

ISO 1268-6

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Fibre-reinforced plastics — Methods of producing test plates —

Part 6: Pultrusion moulding

Plastiques renforcés de fibres — Méthodes de fabrication de plaques d'essai —

Partie 6: Moulage par pultrusion

Reference number
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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 1268 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1268-6 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

ISO 1268 consists of the following parts, under the general title *Fibre-reinforced plastics — Methods of producing test plates*:

— *Part 1: General conditions*

— *Part 2: Contact and spray-up moulding*

— *Part 3: Wet compression moulding*

— *Part 4: Moulding of prepregs*

— *Part 5: Filament winding*

— *Part 6: Pultrusion moulding*

— *Part 7: Resin transfer moulding*

— *Part 8: Compression moulding of SMC and BMC*

— *Part 9: Moulding of GMT/STC*

— *Part 10: Injection moulding of BMC and other long-fibre moulding compounds — General principles and moulding of multipurpose test specimens*

— *Part 11: Injection moulding of BMC and other long-fibre moulding compounds — Small plates*

Fibre-reinforced plastics — Methods of producing test plates —

Part 6: Pultrusion moulding

1 Scope

This part of ISO 1268 specifies a pultrusion-moulding method for preparing reinforced plastics test plates to be used for the preparation of test specimens to determine the mechanical and physical properties of the laminate.

The method is applicable to laminates made from thermosetting or thermoplastic resins reinforced with glass, carbon or aramid fibres alone or in combination and in any form suitable for the pultrusion process (continuous rovings, tows, mats, fabrics or combinations of these).

This part of ISO 1268 is intended to be read in conjunction with ISO 1268-1.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of ISO 1268. 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 1268 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 1172, *Textile-glass-reinforced plastics — Prepregs, moulding compounds and laminates — Determination of the textile-glass and mineral-filler content — Calcination methods*

ISO 1268-1, *Fibre-reinforced plastics — Methods of producing test plates — Part 1: General conditions*

3 Health and safety

See ISO 1268-1.

4 Principle

4.1 The pultrusion process is unique among processes for the manufacture of fibre-reinforced composites in being able to produce continuous lengths of profile with complex geometry and different fibre content, orientation and type of reinforcement material within the profile. Satisfactory performance in service can depend on the properties of parts of the profile which are too small or of an unsuitable shape for their properties to be verified by cutting test specimens from the profile. If test specimens meeting the required test conditions cannot be obtained from the production profile, it is necessary to produce a representative flat strip laminate made from the same materials and under the same processing conditions as the production laminate. Test specimens may then be cut from the representative flat strip in accordance with the relevant mechanical test method. This part of ISO 1268 defines a procedure for the manufacture of such representative laminates. The method may also be used to compare the performance of alternative input materials and alternative profile production conditions.

4.2 The reinforcement is impregnated with a suitable resin and pulled through a forming die, under specified conditions, to consolidate the matrix system and form a flat strip profile.

The flat strip profile has to be of sufficient width to allow test specimens of the requisite length to be cut perpendicular to the direction of production or in other specified directions.

5 Materials

5.1 **Reinforcement materials**, in any form suitable for the pultrusion process, in most cases continuous rovings, tows or strands, mats and woven fabrics, with surface treatment compatible with the resin system used.

5.2 Either a **thermosetting resin system**, formulated in accordance with the supplier's instructions, that will perform adequately at the selected processing conditions of temperature, production speed, etc., resulting in a cured matrix system, or a **thermoplastic matrix**, in which case the nature and form of both the matrix polymer and the reinforcement may be specific to the system being used to make the test plates.

6 Shape and dimensions

For the purposes of this part of ISO 1268, only flat strip profiles are acceptable for the production of test plates. The permitted width and thickness of the plate will depend on the purpose for which the plate is made.

In all cases, the thickness shall be the thickness required in the final test specimens.

The width of the plate shall be sufficient to allow test specimens of a length suitable for the test being undertaken to be cut perpendicular to the direction of production.

7 Reinforcement content

The reinforcement content, the nature of the reinforcement and the orientation of individual layers in the laminate shall be as defined in the specification for the test plate or by the person ordering the production of the test plate. In all cases, there shall be sufficient reinforcement included to completely fill the die cavity.

8 Apparatus

8.1 **Pultrusion equipment** consisting of the following.

8.1.1 **Reinforcement rack** or **creel** to hold the required number of roving ends and, optionally, the required rolls of mat, fabric, etc.

8.1.2 **Impregnating unit**.

8.1.3 **Forming die** for the selected profile, equipped with a suitable heating system (it is sometimes possible to combine the forming die and the impregnating unit).

8.1.4 **Pulling section**, designed to adequately pull the selected profile at constant speed.

8.1.5 **Cutting section**.

8.1.6 **Clamp** or **press**, suitable for holding the test plates while they stabilize and/or while they are post-cured.

9 Procedure

For general conditions, see ISO 1268-1.

The equipment shall be set up in accordance with the manufacturer's instructions.

The reinforcement content, the nature of the reinforcement and the orientation of individual layers in the laminate shall be as defined in the specification for the test plate or by the person ordering the production of the test plate. The