BRITISH STANDARD

BS ISO
1268-6:2002

Fibre-reinforced plastics — Methods of producing test plates —

Part 6: Pultrusion moulding

ICS 83.120

National foreword

This British Standard reproduces verbatim ISO 1268-6:2002 and implements it as the UK national standard.

The UK participation in its preparation was entrusted to Technical Committee PRI/42, Fibre-reinforced thermosetting plastics and prepregs, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this committee can be obtained on request to its secretary.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the BSI Standards Catalogue under the section entitled "International Standards Correspondence Index", or by using the "Find" facility of the BSI Standards Electronic Catalogue.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

This British Standard, having been prepared under the direction of the Materials and Chemicals Sector Policy and Strategy Committee, was published under the authority of the Standards Policy and Strategy Committee on 27 May 2002

Summary of pages

This document comprises a front cover, an inside front cover, the ISO title page, pages ii and iii, a blank page, pages 1 to 3 and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments

ISBN 0 580 39704 1

INTERNATIONAL STANDARD

ISO 1268-6

First edition
2002-04-15

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
ISO 1268-6:2002(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.

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

process conditions shall be chosen in accordance with the recommendations of the resin supplier, to obtain a cured product free of defects, reflecting the standard production quality for such pultruded products.

The test specimens shall be cut from the profile only when stable process conditions have been achieved.

10 Stabilization

The test plate shall be flat and fully cured to enable satisfactory test specimens to be cut from it. Depending on the resin being used and the process conditions, the flat profile produced by the pultrusion machine may require a period of stabilization and/or post-cure.

The test plate shall be cut to approximately the right length on the pultrusion machine and (if stabilization is required to prevent warping) the plates shall be held flat in a suitable clamp or press. If post-curing is required, this shall be done while the plates are held in the press. The time and temperature of the post-cure shall be as defined in the process specification or by the person ordering the production of the test plate.

11 Verification of the characteristics of the test plate

The fibre content shall be determined by the method given in ISO 1172 for glass fibre, or by a method agreed between the interested parties for carbon fibre, and compared to the requirement given in the specification. The void content shall be assessed visually before submitting the test specimens for testing.

12 Test plate preparation report

The test plate preparation report shall include the following information:

a) a reference to this part of ISO 1268;

b) a full description of the constituents used, including the resin system, the reinforcement and any addivities (product codes and/or generic descriptions may be used as applicable);

c) identification of the plates, using a suitable numbering or code system;

d) a record of the production process conditions, including as a minimum the peak die temperature and the pull speed;

e) details of the conditions of any post-cure;

f) the reinforcement content;

g) any modifications to the procedure which might influence the properties of test specimens taken from the test plate.

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover. Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001. Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre. Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration. Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001. Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

BSI
389 Chiswick High Road
London
W4 4AL