BRITISH STANDARD

BS EN
12576:1998

Plastics — Fibre reinforced composites — Preparation of compression moulded test plates of SMC, BMC and DMC

The European Standard EN 12576:1998 has the status of a British Standard

ICS 83.120; 83.140.10

National foreword

This British Standard is the English language version of EN 12576:1998.

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 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.

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Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 5 and a back cover.

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EUROPEAN STANDARD

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Descriptors: Plastics, reinforced plastics, plastic moulding, reinforcing materials, thermosetting resins, composition: property, specimen preparation, plates, dimensions, procedures

English version

Plastics — Fibre reinforced composites — Preparation of compression moulded test plates of SMC, BMC and DMC

Plastiques — Composites renforcés de fibres — Préparation de plaque d'essais de SMC, BMC et DMC pour moulage par compression

Kunststoffe — Fasverstärkte Verbundwerkstoffe — Herstellung von formgepreßten Prüfplatten aus SMC, BMC und DMC

This European Standard was approved by CEN on 1 May 1998.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

This European Standard exists in three official versions English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Central Secretariat has the same status as the official versions.

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CEN

European Committee for Standardization
Comité Européen de Normalisation
Europäisches Komitee für Normung

Central Secretariat: rue de Stassart 36, B-1050 Brussels

Ref. No. EN 12576:1998 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 249, Plastics, the Secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by November 1998, and conflicting national standards shall be withdrawn at the latest by November 1998.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

Compression moulding of SMC, BMC and DMC differs from all other compression mouldable reinforced thermoset materials. Because of the flowing characteristic of the reinforcing fibres and the typical maturation process before moulding, a particular manufacturing method is specified for the fabrication of test plates.

Contents

1 Scope

This European Standard specifies the general principles and procedures for the preparation of compression moulded test plates from fibre reinforced thermosetting moulding compounds such as sheet moulding compound (SMC), bulk moulding compound (BMC) and dough moulding compound (DMC).

The purpose of this European Standard is to specify the preparation of flat test plates from which test specimens can be machined (for applicable test purposes see informative annex A). Test plates are being manufactured to give representative results by the different test procedures using specimens machined out of these test plates.

2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

EN 1842, *Plastics — Thermoset moulding compounds (SMC – BMC) — Determination of compression moulding shrinkage.*

EN ISO 12115:1997, *Fibre-reinforced plastics — Thermosetting moulding compounds and prepregs — Determination of flowability, maturation and shelf life* (ISO 12115:1997).

ISO 472, *Plastics — Vocabulary.*

ISO 8604, *Plastics — Prepregs — Definitions of terms and symbols for designations.*

3 Definitions

For the purposes of this European Standard the terms and definitions given in ISO 472 and ISO 8604 apply with the addition of the following definitions.

3.1

pressing time

period during a press cycle in which the mould is closed, and the required pressure is reached

3.2

elementary unit

smallest normally commercially available entity of a given product

NOTE The description (form, dimensions, mass, etc.) of the elementary unit will normally be defined in the product specification. Elementary unit can be supplied in the form of rolls or packages for instance.

For a given product, the dimensions, mass or volume of the elementary unit can change, as manufacturing techniques evolve, without necessarily causing any modification in the properties of the product or the way in which these properties vary within the elementary unit

4 Health and safety

This European Standard limits itself to describing the preparation of compression moulded test plates. The handling conditions of the products and materials used shall comply with the national regulations in force in each country and the staff shall be informed of the risks involved and appropriate precautions taken.

5 Plate dimensions

It is recommended to compression mould a plate of about 200 mm × 590 mm (see also Method II in EN ISO 12115). If no suitable mould is available a plate with a minimum area of 450 cm^2 shall be produced to achieve at least five test specimens of 20 mm × 250 mm.

Most of the test procedures for SMC, BMC and DMC require a thickness of the test specimen of about 4 mm. For particular test methods the moulded plate according to EN 1842 could also be used.

6 Apparatus and equipment

6.1 Press

Test plates can be moulded on any hydraulic moulding press which complies with the following conditions:

— maintaining the specified pressure within ±5 % during pressing time;

— capable of being closed within 15 s prior to pressure build up.

6.2 Mould

A mould for compression moulding shall be able to withstand the specified temperatures and pressures. The mould design shall ensure the entire force is applied to the moulding material. The mould cavity shall be flat and have an area of 450 cm^2 as a minimum (see also **5.22** of EN ISO 12115:1997 concerning Method II).

6.3 Cooling rack

A nonmetallic cooling rack to hold samples vertically with a minimum spacing of 20 mm and two additional protective plates.

To achieve symmetrical cooling for all test plates the outer lateral test plates shall be protected by additional protective plates.

7 Sampling and conditioning

An SMC sample shall be taken out of an elementary unit and of full width. The width shall be reduced from both sides by 5 cm each to prevent edge influences of the production process.

From BMC or DMC a sample shall be taken out of the centre of an elementary unit. Immediately after sampling the material shall be protected by an appropriate bag to avoid variations of volatile contents and moisture absorption.

Samples shall be conditioned to establish temperature equilibrium before moulding by placing them into a room with a temperature of 23 °C ± 2 °C.

8 Procedure

8.1 Preparation of charge

The mould coverage for SMC shall not be less than 90 % based on the total cavity area, unless other levels of the mould coverage are specified. The SMC charge is prepared by stacking the necessary number of SMC layers. To prevent orientation of fibres both the length and the width are reduced in case of not using 100 % coverage. The reduction of length and width is of the same ratio. The stacked layers (SMC charge) shall be weighed and moulded immediately after preparation of the charge.

Moulding materials like BMC and DMC shall be preformed to a homogenous charge prior to moulding by shaping and dispersing as even as possible into an appropriate geometry on a flat tray and then directly loaded into the open mould.

NOTE In the case of not being able to apply the provisions of **8.1** the top layer of the SMC charge can be of a smaller size compared to the others; the reduction of the size being perpendicular to the orientation of the test piece machined from the test plate.

8.2 Moulding conditions

The mould temperature shall be 140 × (1 ± 2 %) °C, unless other conditions are specified or agreed between user and supplier. The moulding material shall be put into the open mould and the mould shall be closed within 15 s.

According to the type of material the pressure to be applied as well as the pressing time shall follow the respective material specification.

8.3 Moulding procedure

8.3.1 Select the moulding conditions to be used.

8.3.2 Prepare the charge to obtain the specified thickness of the flat test plate according to **8.1**.

8.3.3 Weigh the material.

8.3.4 Load the prepared charge into the centre of the mould cavity and close the press. Check if closing time is within the specification. After closing, and as soon as the specified pressure is reached, the pressing time measurement shall start.

8.3.5 When the pressing time is completed, open the press, remove the moulded part and place it into the cooling rack for cooling to room temperature.

8.3.6 Check that the moulding is satisfactory and does not exhibit any faults which might affect further testing operations.

8.3.7 Measure the thickness.

9 Stabilization

Unless otherwise stated, it is recommended to keep the test plates for 48 h in the laboratory atmosphere before cutting the test specimens from the manufactured plates. The conditioning of test specimens is given in the particular testing standard.

10 Manufacturing report

The report shall include the following details:

— reference to this European Standard;

— complete identification of the material tested, including at least type, source, manufacturer's name and designation;

— date of manufacturing;

— number of elementary units;

— type of press;

— type and size of mould used;

— description of charge (length, width, weight and number of SMC layers, weight of BMC/DMC;

— moulding conditions (temperature, pressure, pressing time);

— number and thickness of test plates;

— observations on any circumstances liable to influence the moulding results.

11 Precision

The precision of this procedure is not known because interlaboratory data are not available. When interlaboratory data are obtained, a precision statement will be added with the next revision.

Annex A (informative)

Bibliography

EN ISO 12114, *Fibre-reinforced plastics — Thermosetting moulding compounds and prepregs — Determination of cure characteristics* (ISO 12114:1997).

ISO 295, *Plastics — Compression moulding of test specimens of thermosetting materials.*

Annex B (informative)

Applicable test methods

Test specimens machined out of test plates according to this European Standard, can be used for the following test methods:

B.1 Mechanical properties

EN ISO 178, *Plastics — Determination of flexural properties.*

EN ISO 179, *Plastics — Determination of Charpy impact strength.*

EN ISO 180, *Plastics — Determination of Izod impact strength.*

EN ISO 527-1, *Plastics — Determination of tensile properties — Part 1: General principles.*

EN ISO 527-2, *Plastics — Determination of tensile properties — Part 2: Test conditions for moulding and extrusion plastics.*

EN ISO 6603-1, *Plastics — Determination of multiaxial impact behaviour of rigid plastics — Part 1: Falling dart method.*

EN ISO 6603-2, *Plastics —Determination of multiaxial impact behaviour of rigid plastics — Part 2: Instrumented puncture test.*

B.2 Thermal properties

EN ISO 75-1, *Plastics — Determination of temperature of deflection under load — Part 1: General test method.*

EN ISO 75-2, *Plastics — Determination of temperature of deflection under load — Part 2: Plastics and ebonite.*

EN ISO 75-3, *Plastics — Determination of temperature of deflection under load — Part 3: High-strength thermosetting laminates and long-fibre-reinforced plastics.*

B.3 Chemical and physical properties

ISO 62, *Plastics — Determination of water absorption.*

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

B.4 Electrical properties

IEC 93, *Methods of test for volume resistivity and surface resistivity of solid electrical insulating materials.*

IEC 112, *Recommended method for determining the comparative tracking index of solid insulating materials under moist conditions.*

IEC 243-1, *Methods of test for electric strength of solid insulating materials — Part 1: Tests at power frequencies.*

IEC 243-2, *Methods of test for electric strength of solid insulating materials — Part 2: Additional requirements for tests using direct voltage.*

IEC 250, *Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including meter wavelengths.*

IEC 695-2-1, *Fire hazard testing — Part 2: Test methods — Section 1/sheet 0: Glow-wire test methods, general.*

B.5 Fire and burning behaviour

ISO 1172, *Textile–glass-reinforced plastics — Prepregs, moulding compounds and laminates — Determination of the textile–glass and mineral–filler content — Calcination methods.*

ISO 1210, *Plastics — Determination of the burning behaviour of horizontal and vertical specimens in contact with a small-flame ignition source.*

ISO 4589, *Plastics — Determination of burning behaviour by oxygen index.*

ISO 10350, *Plastics — Acquisition and presentation of comparable single-point data.*

This list of test methods is an informative reference and will not be revised every time these test methods are amended, revised or withdrawn.

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