INTERNATIONAL STANDARD

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Fibre-reinforced plastics — Moulding compounds and prepregs — Determination of mass per unit area

Plastiques renforcés de fibres — Mélanges à mouler et préimprégnés — Détermination de la masse surfacique

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 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 10352 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This third edition cancels and replaces the second edition (ISO 10352:1997), which has been technically revised to make a distinction between materials which have been manufactured using a solvent and those which have been manufactured without using a solvent, a different variant of the procedure being specified for each.

Fibre-reinforced plastics — Moulding compounds and prepregs — Determination of mass per unit area

1 Scope

This International Standard specifies a method for the determination of the mass per unit area of sheet moulding compound and preimpregnated unidirectional sheet, tape, fabric and mats.

Unless stated to the contrary in the relevant material specification, this International Standard is applicable to prepregs in which any type of reinforcement (aramid, carbon, glass, etc.) and any type of matrix (thermosetting or thermoplastic) has been used.

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 291, *Plastics — Standard atmospheres for conditioning and testing*

3 Terms and definitions

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

3.1
elementary unit
individual sample roll or sheet which is intended for the measurement of mass per unit area using this International Standard

NOTE Prepregs are usually supplied in rolls or in packs of sheets. In this context, an individual roll or pack of sheets is an elementary unit.

3.2
laboratory sample
sample taken from an elementary unit

3.3
test specimen
specimen cut from a laboratory sample

4 Principle

The mass of a test specimen of known area is determined. Two different specimen sizes are specified, depending on the type of material. If the material has been manufactured using a solvent or if the volatile-matter content of the material is not negligible, the sample is conditioned in a specified atmosphere before test specimens are taken. The result is expressed as the mass per unit area.

5 Apparatus

5.1 Balance, graduated in tenths of grams and accurate to 0,5 g for type Ia and type Ib specimens, or graduated in milligrams and accurate to 5 mg for type IIa and type IIb specimens.

5.2 Square template, with the dimensions given in Table 1 for the material being tested, with a tolerance of ±0,1 mm on the length of each side.

5.3 Ancillary items, such as a sharp cutting tool and tweezers.

6 Conditioning and testing

6.1 Conditioning

6.1.1 Materials for which no conditioning is required

Conditioning is not required for the following materials:

— those which are known to have been manufactured without using a solvent and to have been stored under conditions close to standard atmospheric conditions;

— those for which the volatile-matter content is known, from test data, to be negligible and which are known to have been stored under conditions close to standard atmospheric conditions;

— those for which the material specification states that no conditioning is required.

After the laboratory sample has been cut from an elementary unit, the sample shall be covered with a plastic film.

6.1.2 Conditioning of material stored at ambient temperature

With material which has been stored at ambient temperature, the laboratory sample cut from an elementary unit shall be conditioned in the same standard atmosphere as that which will be used for testing (see 6.2.1) for a minimum of 2 h, unless otherwise specified.

The laboratory sample shall be kept covered with its protective films in a solvent-resistant bag.

6.1.3 Conditioning of material stored at below ambient temperature

With material which has been stored at temperatures lower than ambient temperature, the material (generally an elementary unit), suitably packed in an airtight, solvent-resistant bag to prevent moisture pick-up, shall be allowed to reach ambient temperature over a period of time determined by the mass of the package. This time shall not be less than 8 h, and the actual time shall be recorded in the test report.

When the material has reached ambient temperature, the laboratory sample cut from the elementary unit shall be conditioned in the same standard atmosphere as that which will be used for testing (see 6.2.1) for a minimum of 2 h, unless otherwise specified.

The laboratory sample shall be kept covered with its protective films in a solvent-resistant bag.

6.2 Testing

6.2.1 Test atmosphere

The test shall be carried out in a standard atmosphere as specified in ISO 291.

6.2.2 Time interval between conditioning and testing

6.2.2.1 Materials not requiring conditioning

There is no time-interval requirement for the three categories of material described in 6.1.1.

6.2.2.2 Materials requiring conditioning

After conditioning, the test shall be carried out within 6 h unless otherwise specified, the laboratory sample being kept in the same standard atmosphere as that which will be used for testing until the test is carried out (see 6.1.2 or 6.1.3).

7 Test specimens

7.1 Shape and dimensions

The preferred test specimen shape is a square with the dimensions given in Table 1, which depend on the type of material. The various types of material given in Table 1 are defined as follows:

— Type Ia materials: relatively heavy materials, such as sheet moulding compounds, preimpregnated mats and woven prepregs, made without using a solvent.

— Type Ib materials: relatively heavy materials, such as sheet moulding compounds, preimpregnated mats and woven prepregs, made using a solvent.

— Type IIa materials: relatively light materials, such as unidirectional prepregs (e.g. for aerospace use), made without using a solvent.

— Type IIb materials: relatively light materials, such as unidirectional prepregs (e.g. for aerospace use), made using a solvent.

NOTE 1 A production method which uses a solvent is usually called a “wet” method and a production method which does not use a solvent is usually called a “dry” method or “hot melt” method.

NOTE 2 The designations type IIa and type IIb are usually used for relatively lightweight materials that require a more accurate determination.

For special applications, rectangular specimens, round specimens or square specimens of dimensions different from those given in Table 1 may be used by agreement between the interested parties. The surface area of these specimens should preferably be between 0,04 m^2 and 0,10 m^2 for type Ia and type Ib materials and between 0,01 m^2 and 0,04 m^2 for type IIa and type IIb materials.

Table 1 — Preferred specimen sizes

Type of material	Description of material	Specimen size m
Ia or Ib	Sheet moulding compounds, preimpregnated mats and heavy preimpregnated fabrics	0,20 × 0,20
IIa or IIb	Lightweight unidirectional prepregs and preimpregnated fabrics	0,10 × 0,10

7.2 Number

Unless otherwise required by the material specification or agreed between the interested parties, three test specimens shall be taken.

7.3 Preparation

Test specimens will usually be taken from the laboratory sample cut from an elementary unit comprising a roll or a pack of sheets. If necessary, taking into account the roll dimensions and the number of sheets per pack, an agreement between the interested parties shall define either the size of the laboratory sample to be taken from each elementary unit or other information such as the number of specimens and their location within the laboratory sample.

The specimens shall be taken uniformly across the roll or sheet and cut perpendicularly to the edges of the sheet.

The specimens shall be taken at least 50 mm away from the edges of the roll or sheet and from any folds or creases in the roll or sheet.

In the case of an edge-trimmed roll or sheet without folds or creases, the specimens may be taken from the edge of roll or sheet (see Figure 3).

Typical cutting plans are shown in Figures 1, 2 and 3.

NOTE In practice, the locations from which the specimens are taken will usually be specified by the material specification or be agreed between the interested parties.

8 Procedure

8.1 Materials made without using a solvent

Cut the test specimens from each laboratory sample using the template (5.2) and a suitable cutting tool (see 5.3).

To ensure consistency in the specimen dimensions, it is important that precise instructions concerning the cutting operation be given to the operator.

After removing the protective film(s), weigh each specimen and record the mass (m_0) to the nearest 0,1 g for type Ia materials or to the nearest 1 mg for type IIa materials.

8.2 Materials made using a solvent

On completion of conditioning, cut the test specimens from each laboratory sample using the template (5.2) and a suitable cutting tool (see 5.3).

To ensure consistency in the specimen dimensions, it is important that precise instructions concerning the cutting operation be given to the operator.

Weigh each test specimen, with its protective film(s), and record the mass (m_1) to the nearest 0,1 g for type Ib materials or to the nearest 1 mg for type IIb materials.

Remove, then weigh, the protective film(s) and record the mass (m_2) to the nearest 0,1 g for type Ib materials or to the nearest 1 mg for type IIb materials. Ensure that all the film is removed from a specimen before weighing the film together with any material attached to it.

IMPORTANT — Perform the weighings immediately after cutting out the test specimens, so that the result will not be influenced by loss of volatile matter due to a delay between this operation and the weighings.

If the protective film(s) can be removed without any material adhering to them, the specimens may be weighed directly without their film(s).

9 Expression of results

9.1 Materials made without using a solvent

The mass per unit area, ρ_A, expressed in grams per square metre, is given by the equation:

$$\rho_A = \frac{m_0}{A}$$

where

m_0 is the mass, in grams, of the test specimen without its protective film(s);

A is the surface area, in square metres, of the test specimen (see 7.1).

Report as the test result the arithmetic mean of the values of ρ_A obtained for all the test specimens cut from that particular laboratory sample (i.e. originating from a particular elementary unit).

9.2 Materials made using a solvent

The mass per unit area, ρ_A, expressed in grams per square metre, is given by the equation:

$$\rho_A = \frac{m_1 - m_2}{A}$$

where

m_1 is the mass, in grams, of the test specimen with its protective films;

m_2 is the mass, in grams, of the protective films;

A is the surface area, in square metres, of the test specimen (see 7.1).

Report as the test result the arithmetic mean of the values of ρ_A obtained for all the test specimens cut from that particular laboratory sample (i.e. originating from a particular elementary unit).

10 Precision

The precision of this test method is not known because interlaboratory data are not available. When interlaboratory data are obtained, a precision statement will be added at the following revision.

11 Test report

The test report shall include the following information:

a) a reference to this International Standard;

b) all details necessary for the complete identification of material tested, including the designation of the type of material as defined in 7.1;

c) the sampling method used;

d) the shape of the specimen tested and its dimensions;

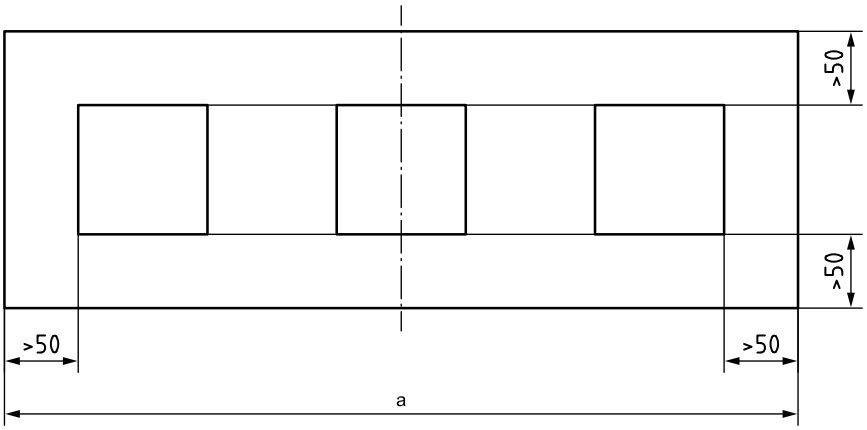
e) the standard atmosphere used for conditioning and testing, and the conditioning time;

f) the average mass per unit area for each elementary unit and, if required, the results obtained for each test specimen;

g) the date of the test;

h) details of any departure from the test method specified in this International Standard and details of any incident which might have influenced the results.

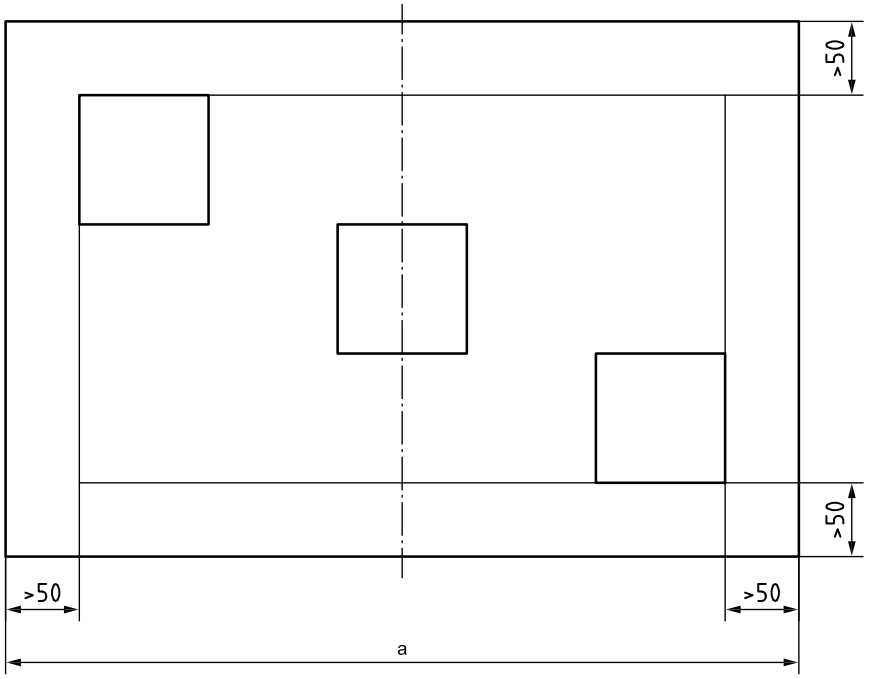
Dimensions in millimetres



[a] Width of material.

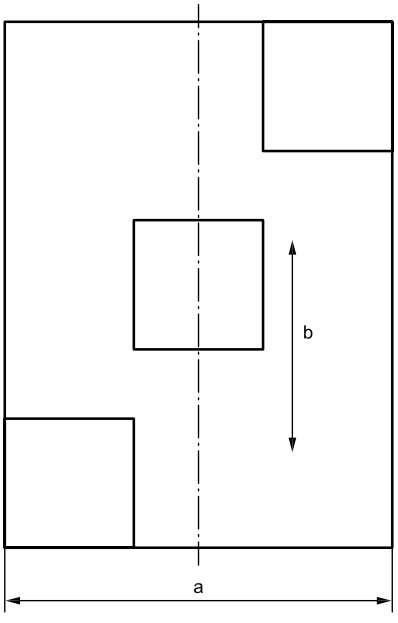
Figure 1 — Example of locations of specimens across the width of the material

Dimensions in millimetres



a Width of material.

Figure 2 — Example of locations of specimens along an axis inclined at an angle across the material



a Width of material.

b Fibre direction.

Figure 3 — Example of diagonal positioning of test specimens in unidirectional sheet or continuous tape

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