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Textile glass — Determination of combustible-matter content

Verre textile — Détermination de la teneur en matières combustibles

Reference number
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Foreword

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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.

International Standard ISO 1887 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

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Textile glass — Determination of combustible-matter content

1 Scope

This International Standard specifies a method for the determination of the combustible-matter content of products made from textile glass, such as continuous-filament yarns, staple-fibre yarns, rovings, chopped strands, milled fibres, fabrics, chopped-strand and continuous-filament mats and other glass reinforcements.

2 Definition

For the purposes of this International Standard, the following definition applies.

2.1 combustible-matter content: The ratio of the mass of material removed on calcination from a dried textile glass product to the mass of the dried product.

NOTE 1 This ratio is expressed as a percentage in this International Standard. It is equal to the content of size or finish on the textile glass product when the size or finish is completely combustible without significant residue (i.e. primarily organic products).

3 Principle

Test specimens, dried under prescribed conditions, are weighed before and after calcination at a temperature of 625 °C ± 20 °C or, with types of glass which are unstable at this temperature, at a temperature between 500 °C and 600 °C, also kept constant to within 20 °C.

4 Apparatus

4.1 Air-circulation oven, for drying specimens, capable of being maintained at 105 °C ± 5 °C or the chosen drying temperature ± 5 °C (see 6.3).

4.2 Muffle furnace, capable of being maintained, with a tolerance of ± 20 °C, at any desired temperature up to 625 °C, the temperature being measured at the centre of the muffle furnace with the door closed.

4.3 Desiccator, containing a suitable desiccant, for example silica gel, calcium chloride, phosphorous(V) oxide.

4.4 Specimen holder, made from a material stable at the test temperature, allowing the best possible air circulation around the test specimen and designed to prevent loss of material. The holder may be a porcelain crucible, a basket made of stainless-steel gauze, etc.

4.5 Stainless-steel tongs, for handling test specimens and holders.

4.6 Balance, accurate to 1 mg and graduated to 0,1 mg.

4.7 Polished-metal templates, for the preparation of test specimens.

4.8 Suitable cutting tool, for cutting mat or fabric, for example a knife, scissors or a cutting disc.

4.9 Suitable wrap-reel, for taking yarn and roving test specimens.

5 Test specimens

5.1 Selection of test specimens

Unless stated to the contrary in the product specification or by the person requesting the test, the test specimens shall be selected as specified in 5.1.1 to 5.1.4.

5.1.1 Yarns and rovings

Table 1 gives the length of yarn to be taken as a function of the linear density of the yarn. The test specimen shall not be unduly compressed, in order to ensure that the air will circulate as freely as possible and that drying and calcination will therefore be complete.

Table 1

Linear density, Tt tex	**Length of yarn** m
Tt < 25	500
25 < Tt < 45	200
45 < Tt < 280	100
280 < Tt < 650	50
650 < Tt < 2 000	10
2 000 > Tt	5

5.1.2 Chopped strands and milled fibres

Each specimen shall have a mass of not less than 5 g, but preferably between 15 g et 30 g.

5.1.3 Fabrics

Each specimen shall have a mass of not less than 5 g.

The recommended specimen shape is a rectangle measuring 150 mm × 80 mm. Cut the specimen out using the template (4.7) and the cutting tool (4.8) and fray out the edges over about 5 mm to prevent any subsequent loss of yarns.

If it is necessary to use more than one rectangle to achieve the required minimum specimen mass, these shall be taken along the length of the roll, in the same lane.

The test-specimen dimensions shall be compatible with the apparatus (muffle furnace, balance). If for this reason it has not been possible to comply with the specified dimensions or the 5 g minimum mass, this shall be mentioned in the test report (see also 5.2).

5.1.4 Mats

The test specimen shall have a mass of at least 5 g.

The recommended specimen shape is a square measuring 316 mm × 316 mm (0,1 m^2). However, other shapes may be used provided that the area is approximately 0,1 m^2. In this case, it is necessary to modify slightly the preparation procedure described below.

If it is necessary to use more than one square to achieve the required minimum specimen mass, these shall be taken along the length of the roll, in the same lane.

Cut a strip of width at least 316 mm from across the whole width of the mat. Using the template (4.7) and the cutting tool (4.8), cut from this strip:

a) at each end (in the case of mats with trimmed edges, at least 10 mm inside the edges), a test specimen measuring 316 mm × 316 mm;

b) between these end specimens, as many test specimens measuring 316 mm × 316 mm as the remaining width allows (these test specimens shall be evenly distributed).

5.2 Number of test specimens

Unless stated to the contrary or in more detail (i.e. number and location) in the specification or by the person requesting the test, the number of test specimens taken per elementary unit shall be as specified in table 2.

Table 2

Type of product	**Number of test specimens**
Yarns, rovings	1
Chopped strands, milled fibres	1
Fabrics, mats	3 for each metre of width, repeated regularly across the full width

NOTE 2 The number of test specimens used for each determination of the combustible-matter content may be modified depending on the type of elementary unit, which may come in very different forms. In addition, a determination may have to be repeated at one or more locations in the elementary unit depending on the mass (chopped strands, milled fibre) or the length (fabrics, mats) of the elementary unit being tested. The additional information concerning the number and location of these specimens may be given in the product specification or by the person requesting the test.

6 Procedure

6.1 Precautions to be taken during test

6.1.1 Ensure that the test specimen does not come into contact with the furnace during the carbonization stage.

6.1.2 Always transfer the test specimen plus holder with care to prevent loss of material.

6.1.3 Never touch the test specimen with the bare hands.

6.2 Weighing the specimen holder

Stabilize the mass of the specimen holder (4.4) by placing it in the muffle furnace (4.2), maintained at 625 °C ± 20 °C or, if the type of glass being tested is unstable at this temperature, at a temperature between 500 °C and 600 °C, also maintained to within ± 20 °C. The temperature between 500 °C and 600 °C shall be chosen either on the basis of the specification for the glass or by agreement between the interested parties.

Allow the holder to cool in the desiccator (4.3), to ambient temperature.

Weigh the holder and note the mass to the nearest 0,1 mg (m_0).

Repeat the heating, cooling and weighing operations until constant mass is reached (see, however, note 6).

6.3 Weighing the dried test specimen plus holder

Place the holder with a specimen in the oven (4.1), maintained at 105 °C ± 5 °C or, in the case of products containing components which are volatile, or susceptible to change, at this temperature, a lower temperature chosen by agreement between the interested parties and also maintained to within ± 5 °C.

NOTE 3 For fabrics and mats, the specimens may be cut and stacked rather than folded, in order to put them in a holder which fits into the apparatus (muffle furnace, balance).

Heat the specimen for at least 30 min.

Remove the holder plus specimen from the drying oven and allow to cool in the desiccator (4.3) for 30 min.

Weigh the holder plus dried specimen and note the mass to the nearest 0,1 mg (m_1).

Repeat the heating, cooling and weighing operations until constant mass is reached (see, however, note 6).

6.4 Weighing the calcinated test specimen plus holder

Place the holder plus dried specimen in the muffle furnace (4.2), maintained at 625 °C ± 20 °C or at the chosen temperature between 500 °C and 600 °C (see 6.2).

Allow the specimen to burn for 5 min with the door of the furnace open (see notes 4 and 5). Then close the door of the furnace and heat for a further 30 min or, if a temperature lower than 625 °C is used, for at least a further 1 h.

Remove the holder plus specimen from the furnace and transfer to the desiccator (4.3). Allow to cool to ambient temperature.

Weigh the holder plus calcinated specimen and note the mass to the nearest 0,1 mg (m_2).

Repeat the heating, cooling and weighing operations until constant mass is reached (see, however, note 6).

NOTES

4 The door is left open to allow volatile products to escape from the furnace, thus preventing condensible materials being redeposited on the specimen or on the holder.

5 If a ventilated furnace is used, this open-door time is not necessary.

6 The test method requires that all weighings be confirmed to be to constant mass by repetition of the drying and calcination stages. In cases in which known materials are being tested regularly, the user of this International Standard is permitted to define, by experimentation, a *minimum* time for the drying and calcination stages to ensure that constant mass has been obtained.

7 Expression of results

The combustible-matter content of a test specimen, expressed as a percentage by mass of the dried product, is given by the formula:

$$\frac{m_1 - m_2}{m_1 - m_0} \times 100$$

where

m_0 is the mass, in grams, of the holder;

m_1 is the mass, in grams, of the holder plus the dried specimen;

m_2 is the mass, in grams, of the holder plus the dried and calcinated specimen.

Take as the result of the determination of the combustible-matter content either the result obtained with the single test specimen if only one was used or the average of the results obtained, if more than one specimen was used.

If this determination is repeated for several locations in the elementary unit, the person requesting the test shall stipulate if each determination is to be reported separately or if the average of the different determinations is to be calculated to obtain the test result for the whole elementary unit.

8 Precision

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

9 Test report

The test report shall include the following particulars:

a) a reference to this International Standard;

b) all details necessary for the complete identification of the textile glass product tested;

c) the temperature of the muffle furnace, if different from 625 °C;

d) the temperature of the drying oven, if different from 105 °C;

e) the number of test specimens used and the dimensions and mass of each;

f) the result or results obtained for each elementary unit sampled, and the arithmetic mean of all the results obtained for each elementary unit sampled (sample average);

g) any operational details not specified in this International Standard and any circumstances liable to have had an influence upon the results.

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