INTERNATIONAL STANDARD 1172

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Textile glass reinforced plastics — Determination of loss on ignition

Matières plastiques renforcées au verre textile — Détermination de la perte au feu

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FOREWORD

ISO (the International Organization for Standardization) is a worldwide federation of national standards institutes (ISO Member Bodies). The work of developing International Standards is carried out through ISO Technical Committees. Every Member Body interested in a subject for which a Technical Committee has been set up 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.

Draft International Standards adopted by the Technical Committees are circulated to the Member Bodies for approval before their acceptance as International Standards by the ISO Council.

Prior to 1972, the results of the work of the Technical Committees were published as ISO Recommendations; these documents are now in the process of being transformed into International Standards. As part of this process, Technical Committee ISO/TC 61 has reviewed ISO Recommendation R 1172 and found it technically suitable for transformation. International Standard ISO 1172 therefore replaces ISO Recommendation R 1172-1970 to which it is technically identical.

ISO Recommendation R 1172 was approved by the Member Bodies of the following countries :

Austria	Iran	Spain
Belgium	Israel	Sweden
Czechoslovakia	Italy	Switzerland
Egypt, Arab Rep. of	Japan	United Kingdom
France	Netherlands	U.S.A.
Germany	Poland	U.S.S.R.
Hungary	Romania	
India	South Africa, Rep. of	

No Member Body expressed disapproval of the Recommendation.

The Member Body of the following country disapproved the transformation of ISO/R 1172 into an International Standard :

Canada

Printed in Switzerland

Textile glass reinforced plastics — Determination of loss on ignition

1 SCOPE AND FIELD OF APPLICATION

This International Standard specifies a method for determining the loss on ignition of textile glass reinforced plastics.

1.1 If the material to be tested contains only glass and a resin which is completely combustible (under the conditions of this test method), the loss on ignition is equal to the resin content (see note below). The glass content may be then calculated by difference.

1.2 In the case of products which contain non-combustible mineral fillers, other than glass reinforcement, or resins which are incompletely combustible (under the conditions of this test method), the presence of which materials can be recognized or verified by examination of the residue after ignition, this method will only allow determination of the ash content by difference.

NOTE — The glass used as a reinforcement is usually coated with ancillary products (sizing, finish, etc.) which most often are completely eliminated during calcination and therefore taken into consideration with the loss on ignition.

2 PRINCIPLE

Ignition of weighed test specimens at a standard temperature of 625 ± 20 °C to constant mass.

NOTE — For glass reinforcements which are unstable at this temperature, a temperature between 500 and 600 °C may be chosen according to the glass specification or upon agreement. The chosen temperature must be kept constant to ± 20 °C.

3 APPARATUS

3.1 **Container** made of an appropriate material and of suitable dimensions (a porcelain or platinium crucible, or porcelain boat may be used).

3.2 **Electric muffle furnace,** capable of maintaining a temperature between 450 and 650 °C with an accuracy of ± 20 °C.

3.3 **Desiccator** containing a suitable drying agent (for example, silica gel, calcium chloride, phosphorus pentoxide).

3.4 **Balance** with an accuracy of 0,1 mg.

4 SAMPLING AND TEST SPECIMENS

The test specimens must collectively form a representative sample of the part or the consignment to be tested.

Consequently, the number of test specimens and the sampling plan must be taken as indicated by a particular specification or by previous agreement, taking into account the nature and type of distribution of the reinforcement.

However, the following requirements must be taken into consideration :

a) At least four test specimens shall be taken.

b) The mass of each specimen shall be at least 2 g.

c) The thickness of each specimen shall be not more than 5 mm. If the thickness of the product to be tested is greater than 5 mm, either specimens shall be reduced in thickness, so as to obtain a remaining thickness equal to or less than 5 mm, or, in the case of products having non-uniform distribution of glass fibre reinforcement over the whole thickness, specimens shall be taken over the whole thickness of the product to ensure a representative sample.

If specimens are reduced in thickness, care shall be taken that the machining operation does not cause significant variations in the glass content of the specimens.

d) The specimens must be prepared in such a manner that edges are smooth and free of all loosely adhering resin and reinforcement particles.

NOTE — It is often convenient to use specimens obtained from test pieces that have been tested for mechanical properties, such as flexural or tensile strength. In this case the fractured areas of the specimens must be removed.

5 CONDITIONING

In most cases, preconditioning of the test specimens is not necessary. However, if the product in question seems to contain a certain noticeable amount of water, it is advisable to condition the specimens at 50 ± 2 °C in an air ventilated oven. The relative humidity of the air ventilated oven shall not be more than 10 %.

The drying operation is complete when the difference in mass before and after 30 min of drying is not more than 1 mg.

6 PROCEDURE

6.1 Preparation of container

Before commencing each series of tests, a test with the empty container (3.1) must be performed, by heating in the muffle furnace (as specified in 6.2), to verify that the mass is constant to 1 mg. Otherwise, repeat this blank test until constant mass is achieved.

NOTE – The weighing of the container must be performed after the container has been cooled to room temperature in a desiccator (3.3).

6.2 Weighing and ignition of test specimens

For each test specimen carry out the following sequence of operations :

6.2.1 Weigh the container (3.1) prepared as indicated in 6.1. Condition the test specimen in accordance with clause 5, if necessary, and weigh together with the container. Heat the container with the test specimen in a flame until the contents ignite. Maintain such a temperature that the specimen burns at a moderate rate until only ash and carbon remain when the burning ceases.

6.2.2 Heat the container and residue in the muffle furnace (3.2) at the standard temperature (625 ± 20 °C) or at the chosen temperature, until all carbon has disappeared.

6.2.3 Cool the container and the residue in a desiccator (3.3) to room temperature and weigh.

6.2.4 Repeat the procedure specified above until the difference in mass on two successive weighings is less than 1 mg.

7 EXPRESSION OF RESULTS

For each test specimen, calculate the loss on ignition, expressed as a percentage of the original mass, by the formula

$$P = \frac{m_2 - m_3}{m_2 - m_1} \times 100$$

where

P is the percentage loss on ignition;

m_1 is the mass of the container;

m_2 is the initial total mass of the container plus the specimen;

m_3 is the final total mass, after combustion, of the container and the residue.

Calculate the arithmetic mean of the values obtained for P.

Calculate the estimated standard deviation by the formula given in the annex.

8 TEST REPORT

The test report shall include the following particulars :

a) complete identification of the product;

b) description of the sampling method, if necessary;

c) number of test specimens used;

d) dimensions of the test specimens;

e) description of the method of machining test specimens thicker than 5 mm;

f) conditioning of the test specimens (if necessary);

g) ignition temperature if it is different from 625 ± 20 °C;

h) ignition loss of each test specimen;

i) arithmetic mean and standard deviation of each homogeneous group of test specimens;

j) observations about any irregularities noted in the physical aspect of the residue, such as, for instance, traces of melting of the glass.

ANNEX

ESTIMATED VALUE OF STANDARD DEVIATION

The value of the standard deviation s is estimated from the formula

$$s = \sqrt{\frac{\Sigma (P_i - \bar{P})^2}{n - 1}}$$

where

P_i is the value of a single observation;

$\bar{P}$ is the arithmetic mean of all n values of P_i;

n is the number of observations;

NOTE – The standard deviation of a series of results may be estimated by the formula

$$s = X R$$

where

X is a number which is a function of the total number of measurements, obtained from a table;

R is the range of variation, obtained by the difference between the highest and lowest value, in the tested series.