
**Plastics — Reinforcement fibres —
Chopped strands — Determination of bulk
density**

*Plastiques — Fibres de renfort — Fils coupés — Détermination de la masse
volumique apparente*

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Printed in Switzerland

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 International Standard may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 15100 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

Annex A of this International Standard is for information only.

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Plastics — Reinforcement fibres — Chopped strands — Determination of bulk density

1 Scope

This International Standard specifies a method for determining the bulk density of dry, uncompacted chopped strands of glass fibre which are commonly used for the reinforcement of thermoplastic resins. This test may be used for product control or for quality control.

This test method is not recommended for use when the chopped glass-fibre strands are wet, exceed a length of 8 mm or do not exhibit a reasonable ease of flow when transferred from one container to another.

NOTE This test measures the free-flowing bulk density. The bulk density of compacted material will be different than that measured by this test.

2 Normative reference

The following normative document contains provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the normative document 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 291, *Plastics — Standard atmospheres for conditioning and testing*.

3 Principle

A container of known volume is filled with chopped glass-fibre strands and weighed. The resulting weight is divided by the volume of the container to obtain the density (in g/cm³).

4 Apparatus

4.1 Balance, of 500 g minimum capacity, reading to 0,1 g (calibration accuracy: 1 g).

4.2 Volumetric container, of well defined volume. This is typically a 500 ml size beaker, or a graduated cylinder.

IMPORTANT — The total volume of the container shall be known to the nearest 0,5 millilitres. This total volume may be larger than that indicated by the reference lines marked on the container.

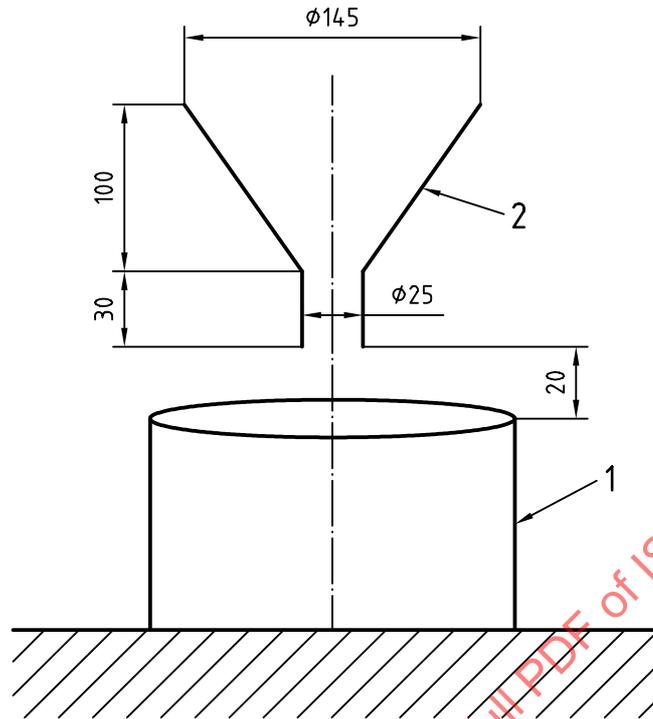
NOTE See annex A for information on one method of determining the container volume.

4.3 Funnel, capacity 150 ml, made of glass or plastic, with approximate dimensions as shown in Figure 1.

4.4 Large spatula, knife or trowel, having a flat edge longer than the width of the opening of the container used.

5 Conditioning

The laboratory sample shall be conditioned for at least 2 h in one of the standard atmospheres defined in ISO 291.



- Key**
- 1 Container
 - 2 Funnel

Figure 1 — Approximate funnel dimensions

The testing shall be performed in the same standard atmosphere.

6 Sampling

6.1 Collect a sample of chopped glass-fibre strands of approximately 1 kg from an elementary unit (e.g. a batch or lot) or from the production line.

6.2 Take two specimens for the determination of the bulk density from this sample. Handle the material carefully to prevent damage.

The specification or the person ordering the test shall state how many determinations, as described in this International Standard, are to be run and from which locations within the elementary unit the samples must be taken.

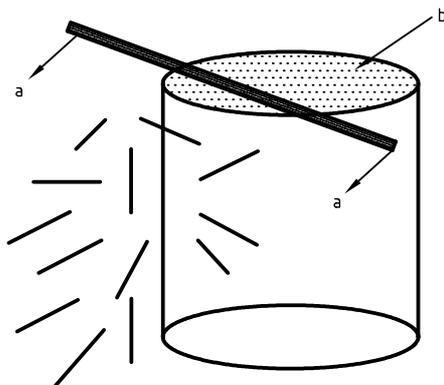
7 Procedure

7.1 Weigh the container to the nearest 0,1 g and record the mass as m_1 (tare mass).

7.2 Position the funnel about 2 cm above the container.

7.3 Pour the chopped strands through the funnel into the flask as quickly as possible without the material clogging the funnel. A spatula or knife may be used as an aid in transferring the material.

7.4 When the container overflows, stop feeding. Pass the straight edge of a ruler, knife or spatula over the top of the container to discard chopped strands above the top of the container. Be careful not to compact the strands, or to remove strands which are below the top of the container. See Figure 2.



- a Move straight edge
- b Strands level with top of container

Figure 2 — Levelling the strands in the container

7.5 Weigh the container with the chopped strands and record the mass as m_2 .

7.6 Subtract m_1 from m_2 to obtain the mass of the chopped strands in the container, m_{3a} .

7.7 Empty the container completely, then repeat steps 7.1 to 7.6 to obtain a second value of the mass of the chopped strands in the container, m_{3b} .

8 Expression of results

8.1 For each individual determination, divide the mass of the strands in the container in grams (m_{3a} and m_{3b}) by the volume of the container in cm^3 .

8.2 Report as the test result the average of the two values of the bulk density calculated in 8.1.

9 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) all details necessary for complete identification of the material tested;
- c) the test result (and, if required, the value for each individual determination);
- d) any other useful information relating to the test or the material;
- e) the date of the test.

Annex A (informative)

One method of determining the container volume

To determine the chopped-strand bulk density by this test method, the volume of the container used to weigh the strands must be known to a high degree of accuracy. The volume of the container can be found by determining the mass of water needed to fill it, then converting this mass into the container volume, applying a temperature correction.

When a glass vessel contains G grams of water at a temperature t °C, the volume of the container is given by the equation:

$$V = Wt \times G$$

where

V is the container volume;

Wt is the water temperature correction factor;

G is the mass of water in the container in grams.

To determine the volume of the container:

- 1) dry the container, if necessary;
- 2) weigh the dry container to the nearest 1 g (tare);
- 3) condition to equilibrium at one of the standard temperatures defined in ISO 291 (23 °C or 27 °C) a sufficient amount of water to perform the following steps;
- 4) fill the container with conditioned water to the very top;
- 5) weigh the container plus water;
- 6) subtract the mass of the dry container from the mass of the container plus water;
- 7) select the conversion factor Wt (1,003 5 for water at 23 °C or 1,004 6 for water at 27 °C);
- 8) multiply the mass of the water [from step 6)] by the conversion factor [from step 7)] to obtain the container volume;
- 9) mark the container volume on the container for future reference.