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Textile glass — Chopped-strand and continuous-filament mats — Determination of average thickness, thickness under load and recovery after compression

Verre textile — Mats à fils coupés et mats à fils continus — Détermination de l'épaisseur moyenne, de l'épaisseur sous charge et de la recouvrance après compression

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 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 3616 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This second edition cancels and replaces the first edition (ISO 3616:1977), in which the title and scope clause have been reworded to indicate clearly that the standard applies to chopped-strand and continuous-filament mats.

Textile glass — Chopped-strand and continuous-filament mats — Determination of average thickness, thickness under load and recovery after compression

1 Scope

This International Standard specifies a method for the determination of the average thickness, the thickness under load and the recovery after compression of chopped-strand and continuous-filament textile-glass mats.

2 Normative references

The following normative documents contain 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 editions of the normative documents 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*.

ISO 1886, *Reinforcement fibres — Sampling plans applicable to received batches.*

ISO 3374, *Reinforcement products — Mats and fabrics — Determination of mass per unit area*.

3 Terms and definitions

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

3.1
average thickness
the thickness of a mat, in millimetres, measured in accordance with the specified method, under a specified nominal light pressure

NOTE The average thickness determined by this method does not necessarily bear a direct relation to the thickness of a single layer. The regularity of thickness of a mat must be measured on a single layer and with apparatus with a much smaller contact area than that specified in this International Standard.

3.2
thickness under load
the thickness of a mat, measured in accordance with the specified method, under a specified heavy pressure applied for a specified time, expressed as a percentage of the initial average thickness

3.3
recovery after compression
the thickness to which the mat recovers after a specified interval following removal of the specified heavy pressure, expressed as a percentage of the initial average thickness

4 Principle

The distance between the outer surfaces of a pile of superimposed layers of mats, having a total thickness of at least 5 mm, is measured under a specified light pressure. The average thickness is calculated by dividing the value obtained by the number of layers in the pile.

The distance between the outer surfaces of the pile is measured both during the application of a specified high pressure and again after a specified interval following removal of the pressure. The thickness under pressure and the recovery after compression, respectively, are calculated by dividing the two values obtained by the number of layers in the pile and expressing the results as a percentage of the average thickness.

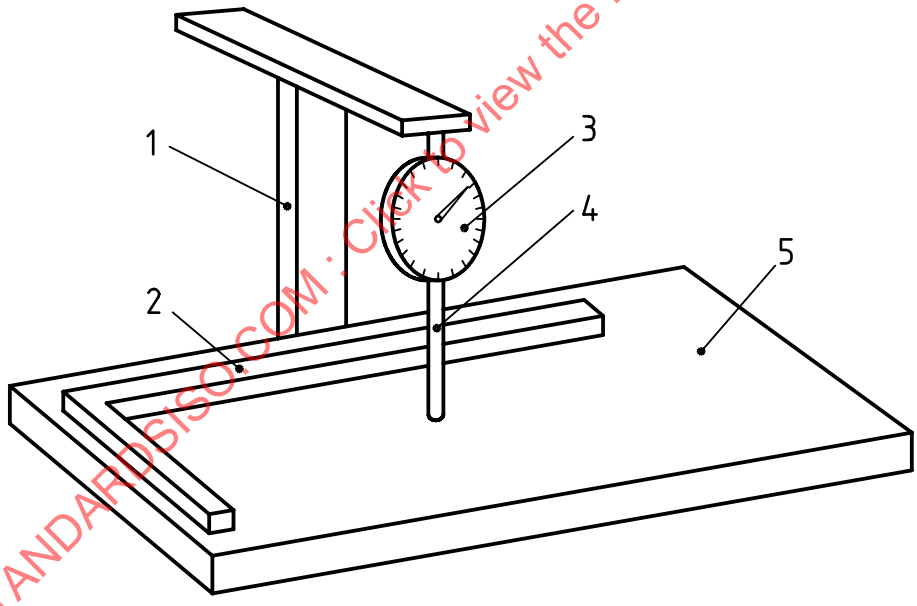
5 Apparatus

5.1 Sharp knife.

5.2 Template for cutting out test samples, of dimensions 316 mm × 316 mm or 400 mm × 250 mm (see clause 7).

5.3 Template for cutting out test specimens, of dimensions 158 mm × 158 mm or 200 mm × 125 mm (see clause 7).

5.4 Stand, having a plane base-plate for supporting the test specimens and a suitable support for a dial-gauge micrometer (see Figure 1).



Key

1 Support for dial-gauge micrometer
2 Positioning jig
3 Dial-gauge micrometer
4 Micrometer stem
5 Base-plate

Figure 1 — Stand for test specimens and dial-gauge micrometer

5.5 Dial micrometer thickness gauge, graduated at 10 µm intervals and with a stem of length at least 70 mm.

5.6 Positioning jig, to ensure that the test specimens and steel plates A and B (see 5.7 and 5.8) are placed with their centres directly under the foot of the micrometer, and of such thickness that plate B rests on the mats (and not on the jig).

5.7 Polished steel plate, plate A (see Figure 2), of dimensions 158 mm × 158 mm × 1,3 mm (plate A_1) or 200 mm × 125 mm × 1,3 mm (plate A_2), having a mass of about 255 g and exerting a pressure of 100 Pa on the test specimens.[1)]

The surfaces of the plate shall be plane and parallel.

NOTE A hydraulic system may be used in place of the plate provided that the same pressure is produced.

5.8 Polished steel plate, plate B (see Figure 3), of dimensions either 158 mm × 158 mm × 65,5 mm (plate B_1) or 200 mm × 125 mm × 65,5 mm (plate B_2), having a mass of about 12,25 kg and exerting a pressure of 5 kPa on the test specimens when used together with plate A.[1)] Plate B has a cut-out as shown in Figure 3.

The surfaces of the plate shall be plane and parallel.

NOTE A hydraulic system may be used in place of the plate provided that the same pressure is produced.

Dimensions in millimetres

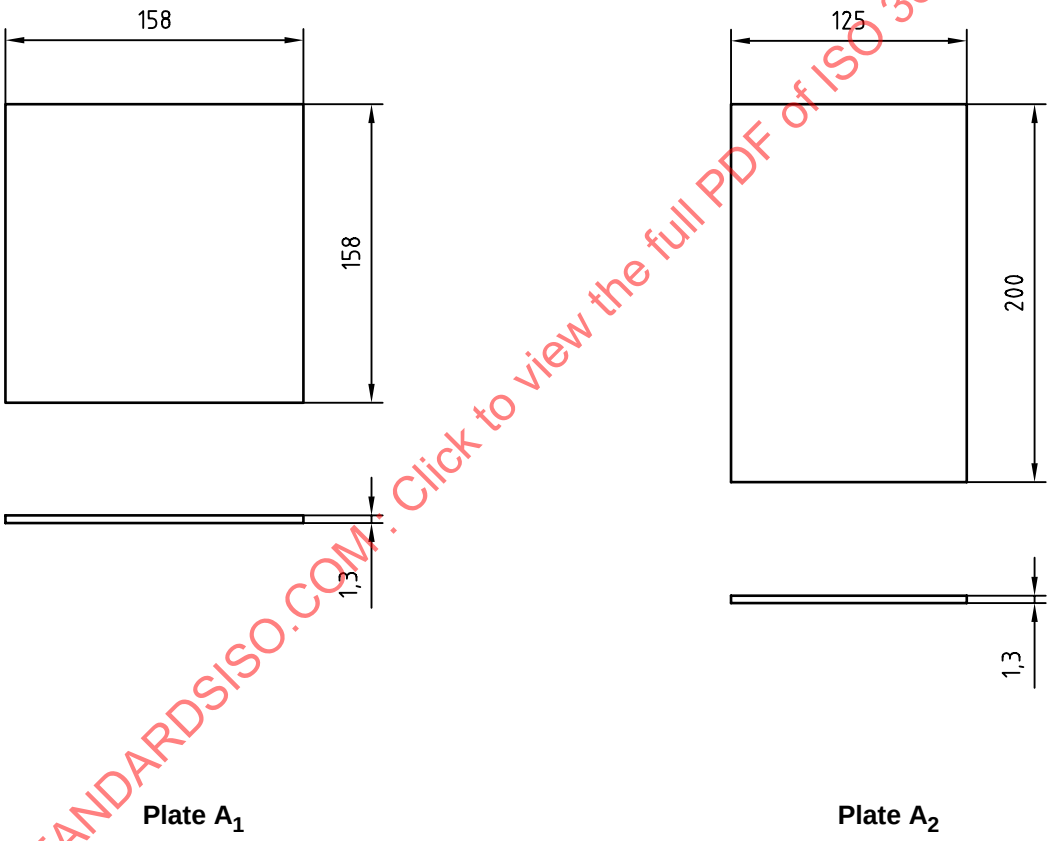


Plate A_1 **Plate A_2**

Figure 2 — Light mild-steel plate (density of steel 7,84 Mg/m^3) for determination of average thickness

1) Plates A_1 and B_1 (disregarding the cut-out) each have an area of 158 mm × 158 mm and plates A_2 and B_2 (disregarding the cut-out) each have an area of 200 mm × 125 mm. Plate A is designed to exert a pressure of 100 Pa and plates A plus B a pressure of 5 kPa. Other dimensions or details of construction given in Figures 1, 2 and 3 are only given by way of example; they may be varied provided that the values for area and pressure given above are complied with.

Dimensions in millimetres

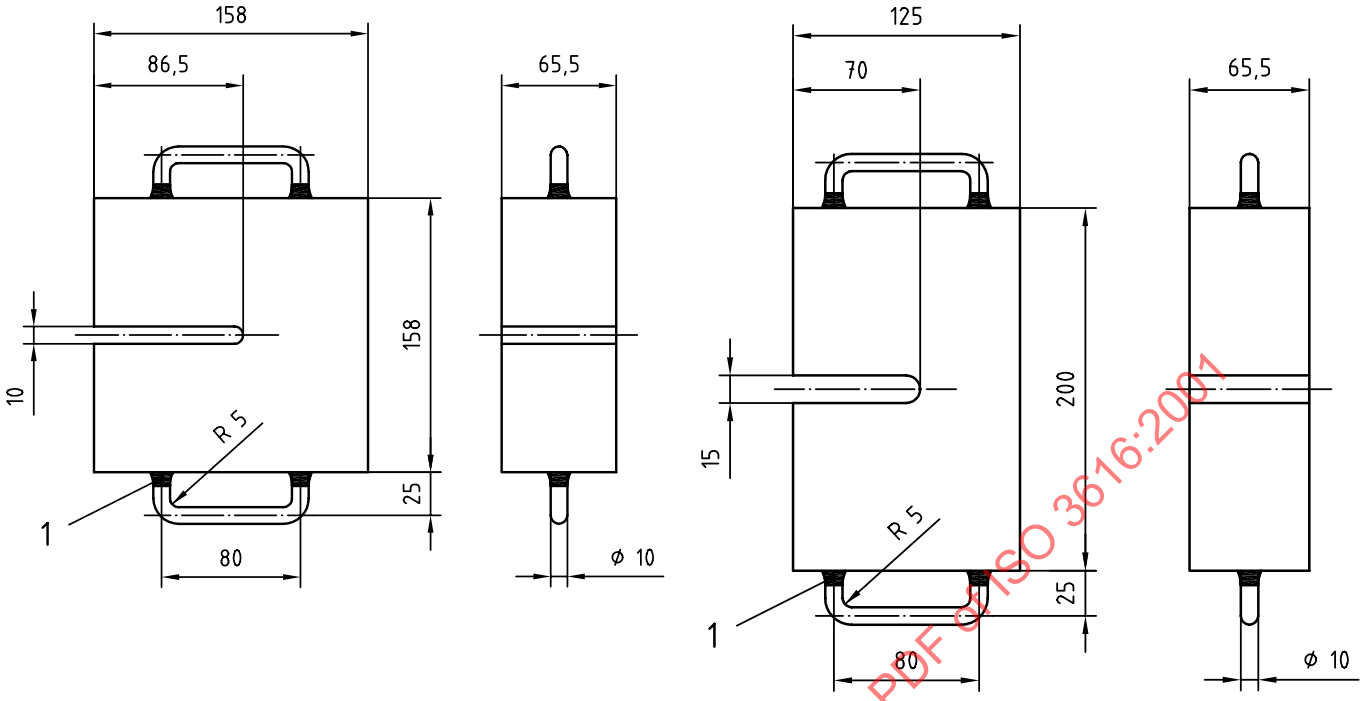


Plate B_1 **Plate B_2**

Key

1 Weld

Figure 3 — Heavy mild-steel plate (density of steel 7,84 Mg/m^3) for determination of thickness under load and recovery after compression

6 Sampling

Carry out sampling in accordance with the method specified in ISO 1886.

7 Preparation of test specimens

Using the template (5.2) and sharp knife (5.1), cut out three test samples, evenly distributed across the mat, of dimensions 316 mm × 316 mm or 400 mm × 250 mm, following the procedure specified in ISO 3374.

Using the template (5.3) and sharp knife, cut each test sample into four test specimens of dimensions 158 mm × 158 mm or 200 mm × 125 mm.

8 Conditioning of test specimens

Condition the test specimens for at least 16 h in one of the standard atmospheres specified in ISO 291.

The atmosphere during the test shall be the same as that used for conditioning.

9 Procedure

9.1 Place steel plate A (5.7) on the base-plate of the stand (5.4), under the foot of the dial-gauge micrometer (5.5). Ensure that the axis of the micrometer foot is perpendicular to plate A.

9.2 Record the dial-gauge reading, h_1, in millimetres, to the nearest 0,1 mm.

9.3 Remove plate A.

9.4 Place four test specimens, cut from the same test sample, one above the other on the base-plate and with two adjacent sides contacting the positioning jig (5.6).

9.5 Cover them with plate A, aligning this too in the positioning jig.

9.6 With the micrometer foot resting on plate A, record the dial-gauge reading, h_2, in millimetres, to the nearest 0,1 mm.

9.7 If $h_2 - h_1$ is less than 5 mm, cut out a further test sample and add the four new test specimens to the pile on the base-plate. Repeat steps 9.5 and 9.6 to obtain a new value for h_2 (to be used in the calculation).

9.8 Place steel plate B (5.8) on top of plate A, aligning it with the positioning jig.

9.9 Allow 10 s to elapse and then, with the micrometer foot passing through the cut-out in plate B and resting on plate A, record the new dial gauge reading, h_3, in millimetres, to the nearest 0,1 mm.

9.10 Immediately after taking the reading, remove plate B.

9.11 Allow 20 s to elapse and then, with the micrometer foot resting on plate A, record the new dial-gauge reading, h_4, in millimetres, to the nearest 0,1 mm.

9.12 Repeat steps 9.4 to 9.11 twice using new test specimens.

10 Calculation and expression of results

10.1 Notation

In the calculations which follow:

— h_1 is the dial-gauge reading, in millimetres, with the micrometer foot resting on plate A only;

— h_2 is the dial-gauge reading, in millimetres, with the micrometer foot resting on plate A, with the test specimens in position;

— h_3 is the dial-gauge reading, in millimetres, with the micrometer foot resting on plate A and with the test specimens and plate B in position;

— h_4 is the dial-gauge reading, in millimetres, with the micrometer foot resting on plate A and with the test specimens in position after removal of plate B;

— n is the number of the test specimens in the pile (4 or a multiple of 4).