

# INTERNATIONAL STANDARD

# ISO 4900

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## Textile glass — Mats and fabrics — Determination of contact mouldability

*Verre textile — Mats et tissus — Détermination de l'aptitude au moulage au contact*



Reference number  
ISO 4900 : 1990 (E)

## 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.

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 4900 was prepared by Technical Committee ISO/TC 61, *Plastics*.

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# Textile glass — Mats and fabrics — Determination of contact mouldability

## 1 Scope

This International Standard specifies a method for the determination of the contact mouldability of textile glass mats and fabrics.

NOTE — The hand lay-up method of moulding is generally not regarded as lending itself to objective determinations. However, if the process is carried out by the same operator, useful comparison can be drawn between results obtained with different mats or fabrics.

## 2 Normative reference

The following standard contains provisions which, through reference in this text, constitute provisions of this International Standard. At the time of publication, the edition indicated was valid. All standards are subject to revision, and parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent edition of the standard indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 291 : 1977, *Plastics — Standard atmospheres for conditioning and testing*.

## 3 Definition

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

**mouldability of a textile glass mat [fabric]:** The ease with which the mat [fabric], when it is wetted out with resin, can be made to conform permanently to a mould of specified configuration.

## 4 Principle

The mould is in the form of steps as indicated in figure 1 with progressively decreasing radii of the peaks and valleys of the mould.

A rectangular strip of mat or fabric is laid up on the mould and the minimum radius at which the mat or fabric conforms to the contour is recorded as the mouldability. The time taken to perform the test is also recorded.

## 5 Conditioning and testing atmosphere

Condition the test specimens for at least 6 h in one of the standard laboratory atmospheres specified in ISO 291. Carry out the test under the same conditions.

## 6 Apparatus and materials

**6.1 Radius mould**, as shown in figure 1, with the specified radii marked at each ridge.

The mould shall be made from glass fibre reinforced plastic.

**6.2 Standard "hand lay-up" polyester resin** (to be agreed between the supplier and the purchaser), incorporating methyl ethyl ketone peroxide catalyst and cobalt naphthenate accelerator, to give a pot life of approximately 30 min at the specified test temperature.

**6.3 Balance**, accurate to 0,1 g.

**6.4 Stop-watch**, graduated in seconds.

**6.5 Bristle paint brush**, 50 mm in width, with bristles 50 mm to 60 mm in length.

**6.6 Sharp knife**.

**6.7 Mould release agent**.

## 7 Procedure

### 7.1 Preparation of the mould

Keep the mould as clean as possible. Before each test, coat the surface of the mould with mould release agent. After every test, remove all excess resin by solvent and/or a plastic scraper (not a sharp metal one which may damage the surface).

### 7.2 Moulding of the specimen

Users should note that sub-clauses 7.2.4 to 7.2.9 are written for a right-handed operator. Left-handed operators shall carry out this part of the procedure in the same way, but starting with the

mould positioned so that the larger radii are to the left, and working from left to right.

**7.2.1** Using the knife (6.6), cut out a specimen of mat or fabric 950 mm ± 10 mm in length and 150 mm ± 2 mm in width. Use samples cut parallel and perpendicular to the length direction of the mat.

**7.2.2** Weigh the cut specimen of mat or fabric (mass  $m_g$ ).

**7.2.3** Weigh in an unwaxed container a quantity of the resin (6.2) equal to two and a half times the mat specimen mass plus approximately 50 g to allow for wastage on the brush (6.5) and in the container.

**7.2.4** Position the mould (6.1) with the larger radii to the right.

**7.2.5** Using the brush, paint a thin coat of resin, the same width as the specimen, along the centre line of the mould.

**7.2.6** Place the specimen over the painted band, letting the mat or fabric rest on the peaks of the corrugations, and with the right-hand end of the specimen coinciding with the right-hand end of the mould. Start the stop-watch (6.4) and immediately, by means of the brush, apply resin to the specimen as evenly as possible, leaving a very small dry area at the extreme left-hand end of the specimen for handling.

**7.2.7** Holding the left-hand end of the specimen up, clear of the mould, so that the mat or fabric only touches the mould at the start of the corrugations on the right-hand side, by means of the brush push the specimen into the first of the corrugations.

**7.2.8** Lowering the left hand slowly, work the specimen by means of the brush into and over the succeeding corrugations fairly rapidly until the specimen is roughly moulded in.

**7.2.9** Returning to the right-hand side, mould the specimen to the contours of the corrugations by means of the brush, progressively moving to the left.

**7.2.10** If at any corrugation the specimen "springs away" from the mould, continue the moulding operation until the specimen conforms to the contour, i.e. do not proceed on to a more difficult corrugation until all the previous ones have been moulded correctly.

Note the time elapsed between the first application of the resin to the specimen and the end of the operation (working time).

The maximum working time shall be 5 min. At the end of this period, inspect the specimen.

**7.2.11** Note the ridge of the corrugation (not the valley) at which the specimen will no longer conform to the contour.

Record the mouldability value as the actual radius, in millimetres, of the previous less severe contour. In case of doubt, use the following guideline:

If the specimen has broken away over more than 25 % of its width on a particular ridge, record the radius of the previous ridge as the mouldability value.

Normally the mouldability value may be ascertained on the uncured laminate. In case of doubt it may be necessary to wait for polymerization of the resin before removing the laminate from the mould to enable the underside to be examined for air pockets and non-conformity with the mould.

**7.2.12** Weigh the cured laminate (mass  $m_l$ ).

**7.2.13** Repeat the test on two more specimens.

## 8 Expression of results

Calculate the ratio of the mass of the reinforcement to the mass of the resin in the laminate using the formula

$$\frac{m_g}{m_l - m_g}$$

where

$m_l$  is the mass of the laminate;

$m_g$  is the total mass (glass plus size and/or binder) of the reinforcement.

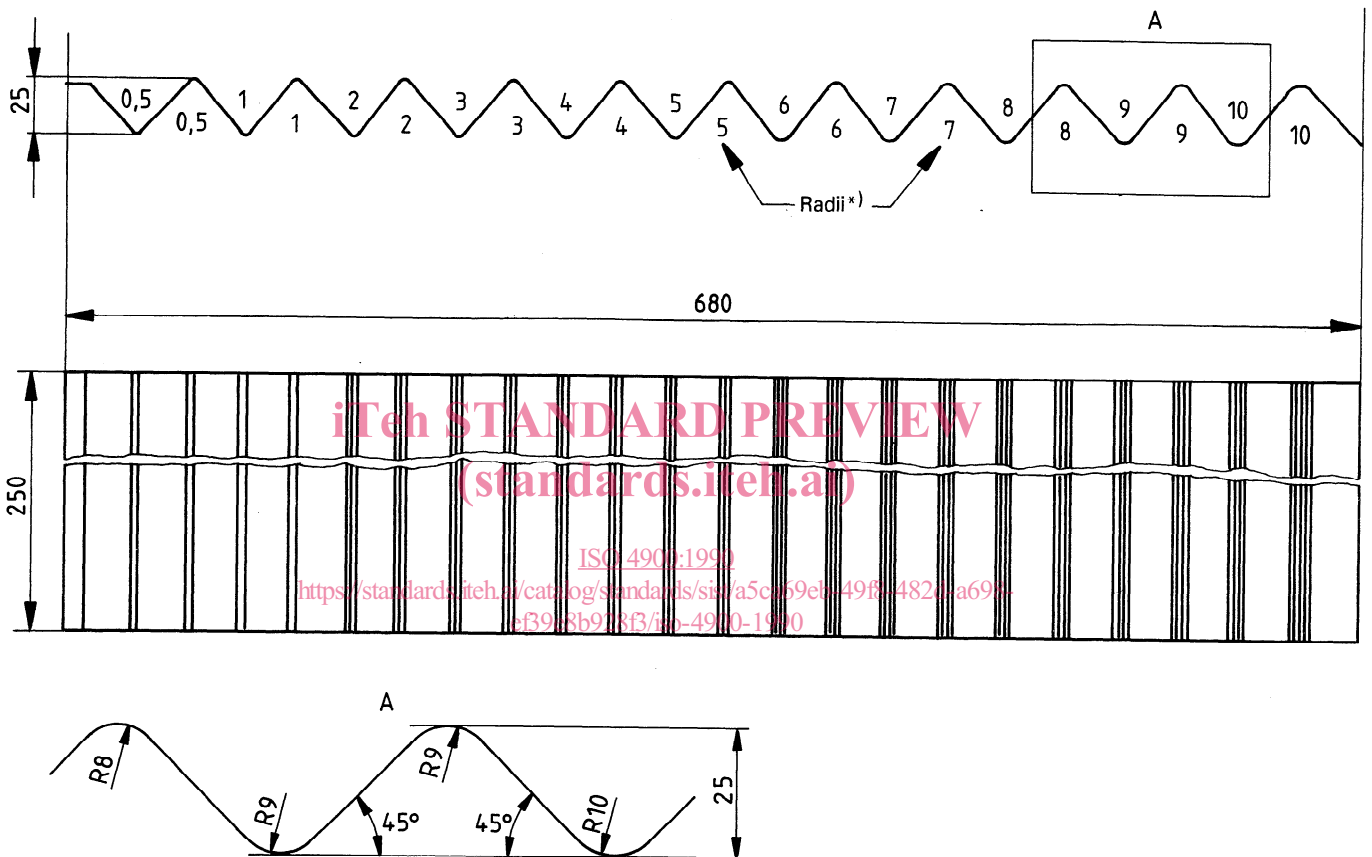
Calculate the average of the three results.

## 9 Test report

The test report shall include the following information:

- a) a reference to this International Standard;
- b) the reference number and full description of the mat or fabric;
- c) a full description of the resin;
- d) the formulation of the catalysed and accelerated resin system and the viscosity of the system at the test temperature;
- e) the arithmetic mean and the individual values of the mouldability, the working time and the ratio of textile glass to resin content, by mass;
- f) all details of procedure not given in this International Standard;
- g) any incidents liable to have influenced the results.

Dimensions in millimetres



\*) All curved sections are full quadrants; flats are tangents at 45° to the horizontal.

Figure 1 – Radius mould for mats and fabrics

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