
**Fibre-reinforced plastics — Methods of
producing test plates —**

**Part 5:
Filament winding**

*Plastiques renforcés de fibres — Méthodes de fabrication de plaques
d'essai —*

Partie 5: Moulage par enroulement filamentaire

ISO 1268-5:2001

<https://standards.iteh.ai/catalog/standards/sist/cf5ce63a-afâ1-4a84-9f11-9d8f90f6e926/iso-1268-5-2001>



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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 part of ISO 1268 may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

International Standard ISO 1268-5 was prepared by Technical Committee ISO/TC 61, *Plastics*, Subcommittee SC 13, *Composites and reinforcement fibres*.

This first edition cancels and replaces ISO 9291:1996, which has been technically revised.

ISO 1268 consists of the following parts, under the general title *Fibre-reinforced plastics — Methods of producing test plates*:

- *Part 1: General conditions*
- *Part 2: Contact and spray-up moulding*
- *Part 3: Wet compression moulding*
- *Part 4: Moulding of prepregs*
- *Part 5: Filament winding*
- *Part 6: Pultrusion moulding*
- *Part 7: Resin transfer moulding*
- *Part 8: Compression moulding of SMC and BMC*
- *Part 9: Moulding of GMT/STC*

The following additional parts are in preparation:

- *Part 10: Injection moulding of SMC and BMC — General principles and moulding of multipurpose test specimens*
- *Part 11: Injection moulding of SMC and BMC — Small plates*

Annexes A and B of this part of ISO 1268 are for information only.

Fibre-reinforced plastics — Methods of producing test plates —

Part 5:

Filament winding

1 Scope

This part of ISO 1268 specifies a method of preparing reinforced-plastic test plates by the filament winding process, using textile glass rovings and thermoset resins (preimpregnated fibres are excluded).

It specifies the preparation, under optimum industrial conditions, of unidirectionally reinforced plates, from which test specimens for various static mechanical tests can be cut.

This part of ISO 1268 has been established for glass-reinforced plastics made of polyester or epoxy resin, but it can be extended to other types of resin and reinforcement.

It is intended to be read in conjunction with ISO 1268-1.

NOTE To aid understanding of the method, the word "roving" is used throughout the text and is taken to include yarns, unless specifically mentioned to the contrary.

2 Normative reference

ISO 1268-5:2001
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The following normative document contains provisions which, through reference in this text, constitute provisions of this part of ISO 1268. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this part of ISO 1268 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 1268-1, *Fibre-reinforced plastics — Methods of producing test plates — Part 1: General conditions.*

3 Health and safety

See ISO 1268-1.

4 Principle

A roving (or a number of rovings together) impregnated with resin is wound, in several successive layers, onto a former.

The required final thickness of the plates is obtained by strapping outer-mould pieces onto the former. Polymerization can be carried out either in a press with heated platens or in an oven.

This method leads to the preparation of two similar plates simultaneously.

5 Materials

5.1 Roving

This method applies to all rovings having a linear density between 200 tex and 4 800 tex. For lower linear densities, use several rovings in combination to reach a linear density between 200 tex and 4 800 tex (for example, 10 yarns of 22 tex to obtain 220 tex).

5.2 Resin system

It is recommended that the resin system used (polyester or epoxy resin + catalyst or hardener system) has the following characteristics:

- viscosity: less than 0,4 Pa · s at the winding temperature;
- minimum pot life: the minimum pot life of the resin system at the operating temperature should be such that the increase in viscosity of the resin at the end of the winding operation is less than 40 % of the initial value.

If a resin system that does not have the above characteristics is chosen, the viscosity and minimum pot life of the resin system used shall be stated in the test plate preparation report (clause 11).

6 Plate dimensions

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The minimum dimensions of the plates produced are 300 mm in length and 220 mm in width.

7 Reinforcement content

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The glass content shall be specified by the person requesting the plate. The glass content of this type of laminate is typically 70 % by mass.

NOTE A glass content of 70 % by mass corresponds to 52 % by volume.

8 Apparatus

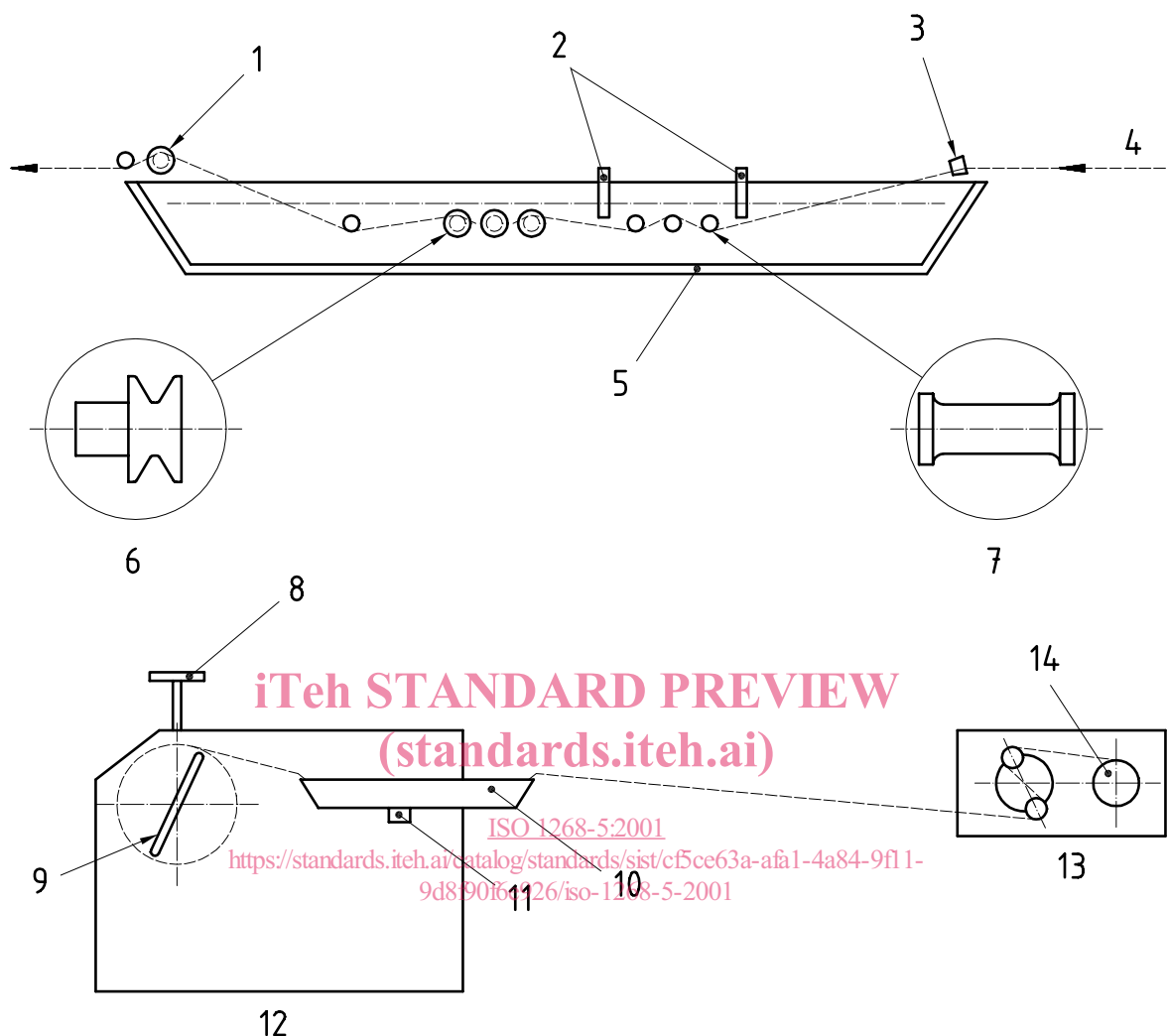
8.1 Reel (optional)

The reel shall be fitted with a tension-regulating system permitting adjustment of the roving tension between 0 N and 15 N (tension measured before the roving enters the impregnating bath).

8.2 Winding machine (see Figure 1)

The winding machine shall have the following characteristics:

- speed of spindle: continuously variable from 0 r/min to 70 r/min;
- pitch: adjustable from 0,5 mm to 5 mm (the pitch is equal to the travel of the thread guide when the former makes a complete revolution);
- when necessary, a radiant panel permitting winding of the roving on to the former at a nearly constant temperature.

**Key**

- | | |
|----|------------------------------------|
| 1 | Exit guide |
| 2 | Foam-retaining devices |
| 3 | Entrance guide (eye-type) |
| 4 | Roving |
| 5 | Impregnating bath with double wall |
| 6 | Grooved guide rod |
| 7 | Flat guide rod |
| 8 | Radiant panel |
| 9 | Former |
| 10 | Impregnating bath |
| 11 | Movable arm |
| 12 | Winding machine |
| 13 | Tension-regulating system |
| 14 | Roving bobbin or package |

Figure 1 — Impregnating bath and winding machine

8.3 Impregnating devices

8.3.1 General

One of the impregnation devices described in 8.3.2 and 8.3.3 may be used. If a different system is used, details shall be given in the test plate preparation report (clause 11).

8.3.2 Impregnating bath (see Figure 1)

The temperature of the resin system in the bath shall be monitored to maintain its viscosity (see 5.2) as nearly constant as possible in order to ensure uniform and complete impregnation of the roving.

It is therefore recommended that the impregnating bath should have a double wall permitting the circulation of a temperature-regulating liquid, and that the dimensions of the bath allow an impregnation length of at least 400 mm and provide a resin capacity of about 1 l.

The type of bath shown in Figure 1 is given as an example. It is recommended that the bath have the following characteristics:

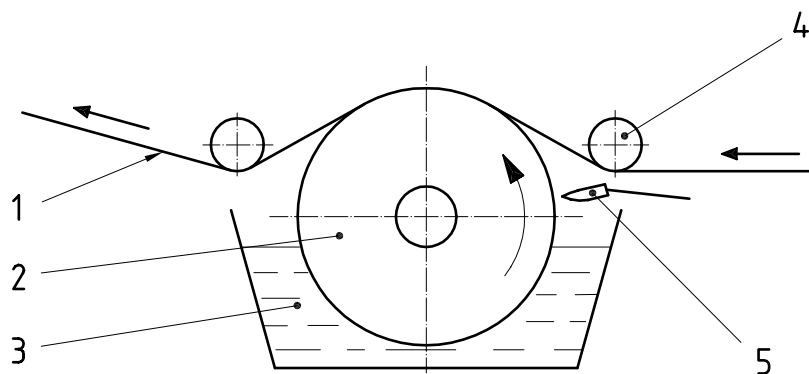
- an eye-type thread guide at the entrance to prevent abrasion (made of e.g. polytetrafluoroethylene or chromium-plated metal);
- a thread guide at the exit, ensuring complete impregnation without drying;
- devices for retaining resin foam;
- guide rods under the resin surface (alternating sets of flat and grooved).

8.3.3 Impregnating roller (see Figure 2)

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The roller shall be corrosion- and wear-resistant. It shall be free-wheeling and have a minimum diameter of 120 mm. The length of the area of contact between the roving and the roller shall be not less than 20 % of the roller circumference, and the roller shall be immersed in the resin to a depth of approximately 20 % to 30 % of its diameter. A doctor blade shall be used to control the amount of resin on the roller. The distance between this blade and the roller shall be variable between 0 mm and 3 mm. The setting of this blade shall be determined by preliminary tests. A scraper blade shall be used to remove the resin the roving does not pick up.



Key

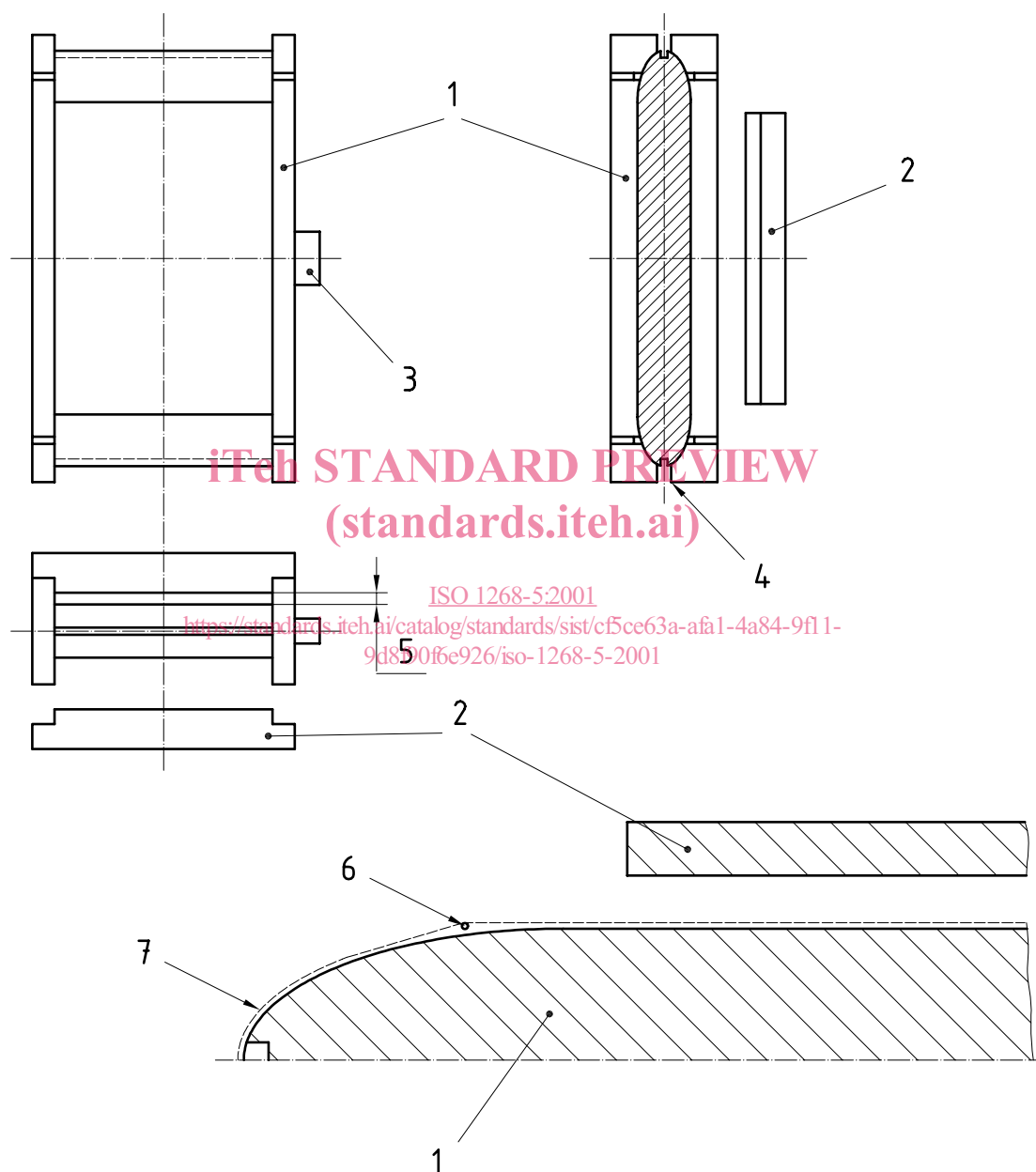
1	Roving
2	Roller
3	Resin
4	Guide
5	Doctor blade

Figure 2 — Impregnating roller

8.4 Former (see Figure 3)

This shall consist of a former frame, ground flat on both sides, onto which the roving is wound and outer-mould pieces designed to be placed over both faces of the winding and press onto the sides of the former, thus accurately defining the thickness of the winding. The faces of the outer-mould pieces shall be perfectly flat, and parallel to the former faces.

Rod-shaped silicone-rubber end pieces are required to seal the gap between the former and the outer-mould pieces and prevent resin loss during curing.



Key

- 1 Former frame
- 2 Outer-mould pieces
- 3 Spindle mounting
- 4 Notch
- 5 Thickness of winding
- 6 Silicone-rubber end piece
- 7 Roving

Figure 3 — Winding and curing former