

# DRAFT INTERNATIONAL STANDARD

## ISO/DIS 10352

ISO/TC 61/SC 13

Secretariat: JISC

Voting begins on:  
2019-07-08

Voting terminates on:  
2019-09-30

---

---

### Fibre-reinforced plastics — Moulding compounds and prepregs — Determination of mass per unit area and fibre mass per unit area

*Plastiques renforcés de fibres — Mélanges à mouler et préimprégnés — Détermination de la masse surfacique*

ICS: 83.120

**iTeh STANDARD PREVIEW**  
(standards.iteh.ai)  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/87d5bb59-03f4-4593-b50e-b6753b71cd92/iso-fdis-10352>

THIS DOCUMENT IS A DRAFT CIRCULATED FOR COMMENT AND APPROVAL. IT IS THEREFORE SUBJECT TO CHANGE AND MAY NOT BE REFERRED TO AS AN INTERNATIONAL STANDARD UNTIL PUBLISHED AS SUCH.

IN ADDITION TO THEIR EVALUATION AS BEING ACCEPTABLE FOR INDUSTRIAL, TECHNOLOGICAL, COMMERCIAL AND USER PURPOSES, DRAFT INTERNATIONAL STANDARDS MAY ON OCCASION HAVE TO BE CONSIDERED IN THE LIGHT OF THEIR POTENTIAL TO BECOME STANDARDS TO WHICH REFERENCE MAY BE MADE IN NATIONAL REGULATIONS.

RECIPIENTS OF THIS DRAFT ARE INVITED TO SUBMIT, WITH THEIR COMMENTS, NOTIFICATION OF ANY RELEVANT PATENT RIGHTS OF WHICH THEY ARE AWARE AND TO PROVIDE SUPPORTING DOCUMENTATION.

This document is circulated as received from the committee secretariat.

**ISO/CEN PARALLEL PROCESSING**



Reference number  
ISO/DIS 10352:2019(E)

© ISO 2019

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/87d5bb59-03fd-4593-b50e-b6753b71cd92/iso-fdis-10352>



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2019

All rights reserved. Unless otherwise specified, or required in the context of its implementation, no part of this publication may be reproduced or utilized otherwise in any form or by any means, electronic or mechanical, including photocopying, or posting on the internet or an intranet, without prior written permission. Permission can be requested from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office  
CP 401 • Ch. de Blandonnet 8  
CH-1214 Vernier, Geneva  
Phone: +41 22 749 01 11  
Fax: +41 22 749 09 47  
Email: [copyright@iso.org](mailto:copyright@iso.org)  
Website: [www.iso.org](http://www.iso.org)

Published in Switzerland

# Contents

	Page
<b>Foreword</b> .....	<b>v</b>
<b>1 Scope</b> .....	<b>1</b>
<b>2 Normative references</b> .....	<b>1</b>
<b>3 Terms and definitions</b> .....	<b>1</b>
<b>4 Principle</b> .....	<b>2</b>
4.1 Determination of mass per unit area.....	2
4.2 Determination of fibre mass per unit area.....	2
4.2.1 Method A: Extraction by soxhlet.....	2
4.2.2 Method B: Extraction by immersion in solvent in a beaker.....	2
4.2.3 Method C: Decomposition by loss on ignition.....	2
4.2.4 Method D: Extraction by wet combustion.....	2
4.2.5 Method E: Method by calculation.....	2
<b>5 Apparatus and reagents</b> .....	<b>2</b>
5.1 General.....	2
5.2 For method A.....	3
5.3 For method B.....	3
5.4 For method C.....	3
5.5 For method D.....	4
<b>6 Conditioning and testing</b> .....	<b>4</b>
6.1 Conditioning.....	4
6.1.1 Materials for which no conditioning is required.....	4
6.1.2 Conditioning of material stored at ambient temperature.....	4
6.1.3 Conditioning of material stored at below ambient temperature.....	5
6.2 Testing.....	5
6.2.1 Test atmosphere.....	5
6.2.2 Time interval between conditioning and testing.....	5
<b>7 Test specimens</b> .....	<b>5</b>
7.1 Shape and dimensions.....	5
7.2 Number.....	6
7.3 Preparation.....	6
<b>8 Procedure</b> .....	<b>8</b>
8.1 Determination of mass per unit area.....	8
8.1.1 Materials made without using a solvent.....	8
8.1.2 Materials made using a solvent.....	8
8.2 Determination of fibre mass per unit area.....	8
8.2.1 Method A: Extraction by soxhlet.....	8
8.2.2 Method B: Extraction by immersion in solvent.....	9
8.2.3 Method C: Decomposition by loss on ignition.....	9
8.2.4 Method D: Extraction by wet combustion.....	9
8.2.5 Method E: Method by calculation.....	10
<b>9 Expression of results</b> .....	<b>10</b>
9.1 Mass per unit area.....	10
9.1.1 Materials made without using a solvent.....	10
9.1.2 Materials made using a solvent.....	11
9.2 Fibre mass per unit area.....	11
9.2.1 Method A: Extraction by soxhlet.....	11
9.2.2 Method B: Extraction by immersion in solvent.....	11
9.2.3 Method C: Extraction by Decomposition by loss on ignition.....	12
9.2.4 Method D: Extraction by wet combustion.....	12
9.2.5 Method E: Method by calculation.....	12
<b>10 Precision</b> .....	<b>13</b>

10.1	Mass per unit area.....	13
10.2	Fibre mass per unit area.....	13
<b>11</b>	<b>Test report.....</b>	<b>14</b>

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**  
Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/87d5bb59-03f4-4593-b50e-b6753b71cd92/iso-fdis-10352>

## 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.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see [www.iso.org/directives](http://www.iso.org/directives)).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see [www.iso.org/patents](http://www.iso.org/patents)).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html)

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

This fourth edition cancels and replaces the third edition (ISO 10352:2010), which has been technically revised.

The main changes compared to the previous edition are as follows.

- a) Determination of fibre mass per unit area by Method A, Method B, Method C, Method D and Method E have been added.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at [www.iso.org/members.html](http://www.iso.org/members.html).

**iTeh STANDARD PREVIEW**  
**(standards.iteh.ai)**

Full standard:  
<https://standards.iteh.ai/catalog/standards/sist/87d5bb59-03f4-4593-b50e-b6753b71cd92/iso-fdis-10352>

# Fibre-reinforced plastics — Moulding compounds and prepregs — Determination of mass per unit area and fibre mass per unit area

## 1 Scope

This International Standard specifies a method for the determination of the mass per unit area and five methods (Method A to Method E) for the determination of the fibre mass per unit area of moulding compounds and prepregs.

Method A: Extraction by soxhlet

Method B: Extraction by immersion in solvent in a beaker

Method C: Decomposition by loss ignition

Method D: Extraction by wet combustion

Method E: Method by calculation

This International Standard is applicable to the following types of material:

- moulding compound and preimpregnated unidirectional sheet, tape, fabric and mats.
- prepregs in which any type of reinforcement (aramid, carbon, glass, etc.) and any type of matrix (thermosetting or thermoplastic) has been used.

Typically, reinforcement fibres are coated with sizing or finishes. These normally dissolve with the resin and are, therefore, included in the resin content.

This International Standard is not applicable to the following types of prepregs:

- these containing reinforcements which are soluble (or partly soluble) in the solvents used to dissolve the resin.

## 2 Normative references

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

ISO 472, *Plastics — Vocabulary*

ISO 1889, *Reinforcement yarns — Determination of linear density*

ISO 4602, *Reinforcements — Woven fabrics — Determination of number of yarns per unit length of warp and weft*

## 3 Terms and definitions

### 3.1

#### elementary unit

individual sample roll or sheet which is intended for the measurement of the mass per unit area using this International Standard

Note 1 to entry: prepregs are usually supplied in rolls or in packs of sheets. In this context, an individual roll or pack of sheets is an elementary unit.

### 3.2

#### **laboratory sample**

sample taken from an elementary unit

### 3.3

#### **test specimen**

specimen cut from a laboratory sample

## 4 Principle

### 4.1 Determination of mass per unit area

The mass of a test specimen of known area is determined. Two different specimen sizes are specified, depending on the type of material. If the material has been manufactured using a solvent or if the volatile-matter content of the material is not negligible, the sample is conditioned in a specified atmosphere before test specimens are taken. The result is expressed as the mass per unit area.

### 4.2 Determination of fibre mass per unit area

#### 4.2.1 Method A: Extraction by soxhlet

Determination of mass by means of weighting to constant mass after extraction of the resin with suitable solvent. Solvent to use shall be able to extract all the resin component completely from the specimen.

#### 4.2.2 Method B: Extraction by immersion in solvent in a beaker

Similar to [4.2.1](#) but faster. In case of dispute, [4.2.1](#) shall be applied.

#### 4.2.3 Method C: Decomposition by loss on ignition

Determination of mass by means of weighting to constant mass after decomposition of the resin by ignition.

#### 4.2.4 Method D: Extraction by wet combustion

Determination of mass by means of weighting to constant mass after extraction of the resin by acid digestion. Use a solution of concentrated sulphuric acid and hydrogen peroxide.

#### 4.2.5 Method E: Method by calculation

If the linear density (in accordance with ISO 1889) and the number of yarns per unit (in accordance with ISO 4602) in use is known, the fibre mass per unit area can be simply calculated.

## 5 Apparatus and reagents

### 5.1 General

Normal laboratory equipment is required plus the following specific apparatus.

**5.1.1 Balance**, graduated in tenths of 0,1 mg and accurate to 0,5 mg.

**5.1.2 Square template**, with the dimensions given in Table 1 for the material being tested, with an accuracy of 0,1 mm on the length of each side.



**5.1.3 Ancillary items**, such as a sharp cutting tool and tweezers.

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

## 5.2 For method A

**5.2.1 Single thickness extraction thimble**, nominal diameter 20 mm to 22 mm, nominal length 60 mm to 80 mm.

**5.2.2 Electric oven**, capable of maintaining a temperature of 105 °C with an accuracy of 5 °C

**5.2.3 Extraction apparatus of the Soxhlet type**, comprising a condenser, siphon tube and flask and provided with an electric heating mantle

**5.2.4 Suitable solvent for extraction**, — analytical grade — solvent to use shall be able to extract all the resin component completely from the specimen.

NOTE 1 General solvent is methyl-ethyl-ketone (MEK), tetra-hydro-furan (THF), acetone, N-methyl-pyrrolidone (NMP), denatured ethanol and others.

NOTE 2 Other solvents or the combination of more than one solvent may be used in order to extract the full all of the resin component from the specimen.

## 5.3 For method B

**5.3.1 Container 400 ml**, Erlenmeyer flask or beaker

**5.3.2 Electric oven**, capable of maintaining a temperature of 105 °C with an accuracy of 5 °C

**5.3.3 Suitable solvent for extraction**, — analytical grade — solvent to use shall be able to extract all the resin component completely from the specimen

NOTE 1 General solvent is methyl-ethyl-ketone (MEK), tetra-hydro-furan (THF), acetone, N-methyl-pyrrolidone (NMP), denatured ethanol and others.

NOTE 2 Other solvents or the combination of more than one solvent may be used in order to extract the full all of the resin component from the specimen.

**5.3.4 Acetone (propanone)**

## 5.4 For method C

**5.4.1 Crucible from porcelain or equivalent properties**, with a capacity sufficient to completely contain the specimen

**5.4.2 Electric oven**, capable of maintaining a temperature of 105 °C with an accuracy of 5 °C

**5.4.3 Muffle designed electric furnace**, capable of maintaining temperature of 565°C with an accuracy of 30°C

**5.4.4 Bunsen flame**

**5.4.5 Heatproof gloves and safety screen for eye protection**

#### 5.4.6 Laboratory exhausts fan and/or ventilation system

### 5.5 For method D

5.5.1 **Erlenmeyer 250 ml double necked pear shaped flask**, with 50 ml dropping funnel equipped with air inlet and a water pump

5.5.2 **Heat source**, with suitable temperature control

5.5.2 **Container 400 ml**, Erlenmeyer flask or beaker

5.5.4 **20 ml sintered glass crucible and suitable filtration assembly**

5.5.5 **Electric oven**, with capable of maintaining a temperature of 105 °C with an accuracy of 5 °C

5.5.6 **Protective equipment**, with protective clothing and rubber gloves resistant to hydrogen peroxide and sulphuric acid solutions, safety screen for eye protection

5.5.7 **Concentrated sulphuric acid, with specific gravity: 1,84 to 1,89**

5.5.8 **Hydrogen peroxide solution, with concentration: 300 g/l to 500 g/l**

5.5.9 **Acetone (propanone)**

5.5.10 **Distilled water**

## 6 Conditioning and testing

### 6.1 Conditioning

#### 6.1.1 Materials for which no conditioning is required

Conditioning is not required for the following materials:

- those which are known to have been manufactured without using a solvent and to have been stored under conditions close to standard atmospheric conditions;
- those for which the volatile-matter content is known, from test data, to negligible and which are known to have been stored under conditions close to standard atmospheric conditions;
- those for which the material specification states that no conditioning is required.

After the laboratory sample has been cut from an elementary unit, the sample shall be covered with a plastic film.

#### 6.1.2 Conditioning of material stored at ambient temperature

With material which has been stored at ambient temperature, the laboratory sample cut from an elementary unit shall be conditioned in the same standard atmosphere as that which will be used for testing (see 6.2.1) for a minimum of 2 h, unless otherwise specified.

The laboratory sample shall be kept covered with its protective films in a solvent-resistant bag.