

First edition  
2016-02-01

**AMENDMENT 1**  
2018-04

---

---

**Carbon-fibre-reinforced plastics —  
Determination of the size and aspect  
ratio of crushed objects**

**AMENDMENT 1**

*Plastiques renforcés de fibres de carbone — Détermination des  
dimensions et du rapport d'apparence d'objets broyés*

*AMENDEMENT 1*

STANDARDSISO.COM : Click to view the full PDF of ISO 30012:2016/Amd 1:2018



Reference number  
ISO 30012:2016/Amd.1:2018(E)

© ISO 2018



**COPYRIGHT PROTECTED DOCUMENT**

© ISO 2018

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

## 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*.

STANDARDSISO.COM : Click to view the full PDF of ISO 30012:2016/Amd 1:2018

# Carbon-fibre-reinforced plastics — Determination of the size and aspect ratio of crushed objects

## AMENDMENT 1

### Clause 10

Replace Clause 10 with the following.

### 10 Precision

Table 1 gives the repeatability data from tests conducted at one laboratory with three materials. Four samples were sampled from a pile of each crushed CFRP, respectively. Each test result was the average of 100 individual measurements by method B.

**Table 1 — Average and repeatability — Method B**

| Material         | Parameter | Unit | Average | $s_r$ | $r$  |
|------------------|-----------|------|---------|-------|------|
| UD TYPE CFRP     | $L$       | mm   | 7,8     | 0,47  | 1,31 |
|                  | $W$       | mm   | 1,4     | 0,07  | 0,19 |
|                  | $R_A$     | —    | 7,4     | 0,66  | 1,83 |
| FABRIC TYPE CFRP | $L$       | mm   | 5,8     | 0,40  | 1,12 |
|                  | $W$       | mm   | 3,1     | 0,11  | 0,32 |
|                  | $R_A$     | —    | 2,1     | 0,07  | 0,18 |
| MIXTURE CFRP     | $L$       | mm   | 6,0     | 0,99  | 2,76 |
|                  | $W$       | mm   | 1,9     | 0,33  | 0,94 |
|                  | $R_A$     | —    | 4,9     | 0,34  | 0,95 |

$s_r$  is the inter-sample standard deviation from the mean.  
 $r$  is the inter-sample repeatability limit (= 2,8  $s_r$ ; 95 % confidence limits).

Table 2 provides the results of a comparison study of the three test methods at one laboratory with three materials. One sample was sampled from a pile of each crushed CFRP. Each test was conducted with the same 100 fragments. Each result was the average of 100 individual measurements by methods A, B and C.

**Table 2 — Average and comparison of the three test methods**

| Material       | Parameter | Unit | Average  |          |          | Mean | $s_m$ | CV    |
|----------------|-----------|------|----------|----------|----------|------|-------|-------|
|                |           |      | Method A | Method B | Method C |      |       |       |
| UD TYPE CFRP-1 | $L$       | mm   | 15,0     | 15,2     | 14,3     | 14,8 | 0,46  | 3,1 % |
|                | $W$       | mm   | 2,6      | 2,7      | 2,6      | 2,6  | 0,05  | 1,8 % |
|                | $R_A$     | —    | 7,9      | 8,3      | 7,5      | 7,9  | 0,40  | 5,0 % |
| UD TYPE CFRP-2 | $L$       | mm   | 12,2     | 12,3     | 12,0     | 12,2 | 0,16  | 1,3 % |
|                | $W$       | mm   | 5,8      | 5,8      | 5,8      | 5,8  | 0,03  | 0,5 % |
|                | $R_A$     | —    | 2,7      | 2,7      | 2,5      | 2,6  | 0,11  | 4,4 % |

$s_m$  is the inter-test method standard deviation from the mean.  
 $CV$  is the coefficient of variation.

Table 2 (continued)

| Material                                                         | Parameter | Unit | Average  |          |          | Mean | $s_m$ | CV    |
|------------------------------------------------------------------|-----------|------|----------|----------|----------|------|-------|-------|
|                                                                  |           |      | Method A | Method B | Method C |      |       |       |
| FABRIC TYPE CFRP                                                 | $L$       | mm   | 6,8      | 6,6      | 7,0      | 6,8  | 0,21  | 3,1 % |
|                                                                  | $W$       | mm   | 4,1      | 4,0      | 4,4      | 4,2  | 0,18  | 4,3 % |
|                                                                  | $R_A$     | —    | 1,7      | 1,8      | 1,7      | 1,8  | 0,03  | 1,9 % |
| $s_m$ is the inter-test method standard deviation from the mean. |           |      |          |          |          |      |       |       |
| CV is the coefficient of variation.                              |           |      |          |          |          |      |       |       |

Table 3 gives the interlaboratory reproducibility data from tests conducted at four laboratories with three materials. One sample was sampled from a pile of each crushed CFRP. Each test was conducted with the same 100 fragments. Each result was the average of 100 individual measurements at two laboratories by methods A, B and C.

Table 3 — Average and reproducibility of the three test methods

| Material                                                                                      | Parameter | Unit | Average  |          |          | Mean | $s_R$ | R    |
|-----------------------------------------------------------------------------------------------|-----------|------|----------|----------|----------|------|-------|------|
|                                                                                               |           |      | Method A | Method B | Method C |      |       |      |
| UD TYPE CFRP-1                                                                                | $L$       | mm   | 16,8     | 14,5     | 15,4     | 15,6 | 1,74  | 4,88 |
|                                                                                               | $W$       | mm   | 2,9      | 2,5      | 2,9      | 2,8  | 0,37  | 1,04 |
|                                                                                               | $R_A$     | —    | 7,9      | 8,5      | 6,8      | 7,8  | 0,68  | 1,91 |
| UD TYPE CFRP-2                                                                                | $L$       | mm   | 13,0     | 12,1     | 13,1     | 12,7 | 0,99  | 2,77 |
|                                                                                               | $W$       | mm   | 6,1      | 5,9      | 6,2      | 6,0  | 0,33  | 0,91 |
|                                                                                               | $R_A$     | —    | 2,7      | 2,7      | 2,5      | 2,6  | 0,08  | 0,23 |
| FABRIC TYPE CFRP                                                                              | $L$       | mm   | 7,1      | 6,6      | 7,1      | 6,9  | 0,30  | 0,84 |
|                                                                                               | $W$       | mm   | 4,6      | 4,3      | 4,4      | 4,4  | 0,37  | 1,04 |
|                                                                                               | $R_A$     | —    | 1,6      | 1,7      | 1,7      | 1,7  | 0,11  | 0,30 |
| $s_R$ is the interlaboratory standard deviation from the mean.                                |           |      |          |          |          |      |       |      |
| R is the interlaboratory reproducibility limit ( $\approx 2,8 s_R$ ; 95 % confidence limits). |           |      |          |          |          |      |       |      |