BRITISH STANDARD

BS EN
13473-2:2001



# Reinforcement — Specifications for multi-axial multi-ply fabrics —

## Part 2: Methods of test and general requirements

The European Standard 13473-2:2001 has the status of a British Standard

ICS 59.100.99; 83.120

# National foreword

This British Standard is the official English language version of EN 13473-2:2001.

The UK participation in its preparation was entrusted to Technical Committee PRI/42, Fibre reinforced thermosetting plastics and prepregs, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

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This British Standard, having been prepared under the direction of the Sector Committee for Materials and Chemicals, was published under the authority of the Standards Committee and comes into effect on 15 August 2001

**Summary of pages**

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 7 and a back cover.

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EUROPEAN STANDARD

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# EN 13473-2

June 2001

ICS 59.100.99; 83.120

English version

# Reinforcement - Specifications for multi-axial multi-ply fabrics - Part 2: Methods of test and general requirements

Renfort - Spécifications pour les tissus multi-axiaux multicouches - Partie 2: Méthodes d'essai et exigences générales

Verstärkungen - Spezifikation für Multiaxialgelege - Teil 2: Prüfverfahren und allgemeine Produktanforderungen

This European Standard was approved by CEN on 10 May 2001.

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Ref. No. EN 13473-2:2001 E

# Contents

# Foreword

This European Standard has been prepared by Technical Committee CEN/TC 249 "Plastics", the secretariat of which is held by IBN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2001, and conflicting national standards shall be withdrawn at the latest by December 2001.

This standard is one part of EN 13473, «*Reinforcement - Specifications for multi-axial multi-ply fabrics*» which is constructed as follows:

— *Part 1: Designation*

— *Part 2: Methods of test and general requirements*

— *Part 3: Specific requirements*

This standard includes a Bibliography.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

## 1 Scope

This Part 2 of EN 13473 defines the test methods to be used to determine the designated and specified properties given in Parts 1 and 3 respectively.

Part 2 of EN 13473 defines the general requirements applicable to the specification of all types of multi-axial multi-ply fabrics falling within the scope of this specification as defined in Part 1 of this standard.

## 2 Normative references

This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 13473-1, *Reinforcement - Specifications for multi-axial multi-ply fabrics - Part 1: Designation*

EN ISO 527-4, *Plastics – Determination of tensile properties – Part 4: Test conditions for iso-tropic and orthotropic fibre-reinforced plastic composites* (ISO 527-4:1997)

EN ISO 3344, *Reinforcement products – Determination of moisture content* (ISO 3344:1997)

EN ISO 10548, *Carbon fibre – Determination of size content* (ISO 10548:1994)

ISO 472, *Plastics – Vocabulary*

ISO 1887, *Textile glass - Determination of combustible-matter content*

ISO 1888, *Textile glass - Staple fibres or filaments - Determination of average diameter*

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

ISO 4603, *Textile glass - Woven fabrics - Determination of thickness*

ISO 5025, *Reinforcement products - Woven fabrics - Determination of width and length*

ISO 11567, *Carbon fibre - Determination of filament diameter and cross-sectional area*

## 3 Terms and definitions

For the purposes of this European Standard, the following definitions given in ISO 472 and EN 13473-1 apply.

## 4 List of physical properties

The list of physical properties with the applicable test method shall be considered as a guide for the selection of the properties and limits which result of technical specifications of the application.

**Table 1 — List of test methods**

| Properties | Test methods according to | Remarks |
|---|---|---|
| Loss on ignition | ISO 1887 | for multi-axial multi-ply fabrics made out of glass fibres only |
| Size content | EN ISO 10548 | for multi-axial multi-ply fabrics made out of carbon/aramid fibres |
| Moisture content | EN ISO 3344 | for multi-axial multi-ply fabrics made out of glass/carbon/aramid fibres |
| Filament diameter | ISO 1888 | for multi-axial multi-ply fabrics made out of glass fibre for designation only |
| Filament diameter | ISO 11567 | for multi-axial multi-ply fabrics made out of carbon/aramid fibres for designation only |
| Mass per unit area | ISO 3374 | for special multi-axial multi-ply fabrics, e.g. fabrics easily going out of shape, special arrangements shall be made |
| Length & width | ISO 5025 | |
| Fabric thickness | ISO 4603 | |
| Mechanical properties of laminate | EN ISO 527-4 | I. Material parameters derived from composite tests of different reinforcement textiles, e.g. woven fabrics and multi-axial multi-ply fabrics, only then can be consulted for the comparison of the reinforcement textiles, if the composite samples are produced with the same number, orientation, stacking sequence and the same area weight of the reinforcement thread plies and furthermore tested in the same directions according to the composite sample construction. The use of the same resin type and the corresponding processing are obligatory.<br>II. An exact description of the construction of the composite samples has to be secured at the time of their production.<br>III. It is recommended to use only sample type 3 described in EN ISO 527-4 with a width $b=b_1$ of $50 \pm 0{,}5$ mm. |

## 5 General requirements

### 5.1 Appearance

The multi-axial multi-ply reinforcement fabric have to be substantially free from contamination (e. g. oil, dirt, etc.) and shall not contain unacceptable levels of other faults (see Table 2 below).

On the basis of the defect classification according to Table 2, the total number of defects by points shall not exceed 20 per 100 $m^2$ with a maximum of 3 major defects. Major defects shall be counted 2 points, minor defects 1 point. A maximum of 2 defect points shall be counted per square meter, even if several defects occur simultaneously. If required the product specification shall define alternative acceptance levels.

**Table 2 — List of defects**

| Defect | Description | Acceptance level | |
|---|---|---|---|
| | | Major defect | Minor defect |
| 1 Ply construction | | | |
| 1.1 Broken or missing thread | 0°-thread: 1 missing thread | | X |
| | 2 or more contiguous missing threads | X | |
| | $\alpha$-thread: 5 or more contiguous missing threads | X | |
| 1.2 Lane without broken or missing thread (right-angled measured to thread direction) | 5...10 mm | | X |
| | > 10 mm | X | |
| 2 Binding system | | | |
| 2.1 Broken single yarn (> 300 mm) in loop system | for multi-axial multi-ply constructions with 0°-threads on fabric surface | X | |
| | for other multi-axial multi-ply constructions | | X |
| 3 Multi-axial multi-ply fabric | | | |
| 3.1 Cuts, tears | defects greater than 10 mm | X | |
| 3.2 Dirty spots or stains | width and length less than 50 mm | | X |
| | width and length equal and greater than 50 mm | X | |
| 3.3 Deviation of width | width beyond specific tolerances (see EN 13473-3) | X | |
| 3.4 Folds | | | X |

## 5.2 Packaging

The packaging shall protect the product during handling, storage and transportation.

## 5.3 Labelling

Each package shall be identified with :

**5.3.1** Designation code (see EN 13473-1).

**5.3.2** Total mass per unit area including ply construction and binding system.

**5.3.3** Width.

**5.3.4** Length.

**5.3.5** Weight of multi-axial multi-ply fabric package (net).

**5.3.6** Defect designation.

**5.3.7** Any special handling/storage instructions.

**5.3.8** Manufacturer´s production and traceability reference.

## Bibliography

EN ISO 527-1, *Plastics – Determination of tensile properties – Part 1: General principals* (ISO 527-1:1993 including Corr. 1:1994)

EN ISO 1886, *Reinforcement fibres – Sampling plans applicable to received batches* (ISO 1886:1990)

ISO 1043-2, *Plastics - Symbols - Part 2: Fillers and reinforcing materials*

ISO 4921, *Knitting - Basic concepts – Vocabulary*

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