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**Fibre-reinforced polymer (FRP)  
reinforcement of concrete — Test  
methods —**

**Part 3:  
CFRP strips**

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Published in Switzerland

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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.

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 of 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 [www.iso.org/iso/foreword.html](http://www.iso.org/iso/foreword.html).

This document was prepared by Technical Committee ISO/TC 71, *Concrete, reinforced concrete and pre-stressed concrete*, Subcommittee SC 6, *Non-traditional reinforcing materials for concrete structures*.

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).

A list of all parts in the ISO 10406 series can be found on the ISO website.

# Fibre-reinforced polymer (FRP) reinforcement of concrete — Test methods —

## Part 3: CFRP strips

### 1 Scope

This document specifies test methods applicable to unidirectional carbon fibre-reinforced polymer (CFRP) strips as external-bonded reinforcements on the concrete substrate.

This document is applicable for the CFRP strips that:

- consist of carbon fibre and thermoset resin;
- are manufactured by pultrusion method;
- have a higher carbon fibre fraction such as over 60 %; and
- have a thickness within 3 mm.

Also, the test pieces for determining tensile properties are cut down from CFRP strips along the CFRP strips axis, and have bonded anchorage block at the both ends.

### 2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 7500-1, *Metallic materials — Calibration and verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Calibration and verification of the force-measuring system*

ISO 10406-2:2015, *Fibre-reinforced polymer (FRP) reinforcement of concrete — Test methods — Part 2: FRP sheets*

### 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <http://www.electropedia.org/>

#### 3.1

##### **accelerated artificial exposure testing machine**

machine that creates reproducible standard test conditions to accelerate weathering artificially

#### 3.2

##### **anchorage block**

*tab* (3.6) corresponding to the test block to prevent bond failure of the CFRP strips

**3.3  
anchorage portion**

end parts of a test piece fitted with anchoring devices to transmit loads from the testing machine to the test portion

**3.4  
Young's modulus**

$E_f$   
elastic modulus in the direction of the fibres

**3.5  
strip**

flat board which has thin thickness compared to width, a flatness-formed rectangular section and stretches in the longitudinal direction

**3.6  
tab**

plate made of fibre-reinforced polymer, aluminium, or any other suitable material bonded to the test piece to transmit loads from the testing machine to the test portion

**3.7  
tensile capacity**

$F_u$   
maximum tensile load which the test piece bears during the tensile test

**3.8  
tensile strength retention rate**

$R_{ett}$   
ratio of the tensile strength after accelerated artificial exposure compared with tensile strength before accelerated artificial exposure

**4 Symbols**

For the purposes of this document, the symbols presented in [Table 1](#) apply.

**Table 1 — Symbols**

Symbol	Unit	Description	Reference
$A$	mm <sup>2</sup>	Cross-sectional area	<a href="#">5.4.3</a> , <a href="#">5.4.4</a>
$D_{tab}$	°	Tab bevel angle	<a href="#">5.1.1</a>
$E_f$	N/mm <sup>2</sup>	Young's modulus	<a href="#">5.4.4</a>
$f_{fu}$	N/mm <sup>2</sup>	Tensile strength	<a href="#">5.4.3</a>
$f_{fu0}$	N/mm <sup>2</sup>	Average value for tensile strength before accelerated artificial exposure	<a href="#">6.4.3</a>
$f_{fu1}$	N/mm <sup>2</sup>	Average value for tensile strength after accelerated artificial exposure	<a href="#">6.4.3</a>
$F_u$	N	Tensile capacity	<a href="#">5.4.3</a>
$L_{A1}$	mm	Anchorage length	<a href="#">5.1.1</a>
$t_A$	mm	Anchorage thickness	<a href="#">5.1.1</a>
$L_{A2}$	mm	Anchorage portion length	<a href="#">5.1.1</a>
$b_{test}$	mm	Width at the range of the test length	<a href="#">5.1.1</a>
$L_{test}$	mm	Test length	<a href="#">5.1.1</a>
$t_{test}$	mm	Thickness	<a href="#">5.1.1</a>
$L_{tot}$	mm	Total length	<a href="#">5.1.1</a>
$R_{ett}$	%	Tensile strength retention rate	<a href="#">6.4.3</a>
$\Delta F$	N	Difference between loads at 2 points at 20 % to 50 % tensile capacity	<a href="#">5.4.4</a>