

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Carbon Fibre Products

with type designation(s)

Biaxial; LT (0°/90°) (100 - 1200 g/m²), DB (+45°/-45°) (100 - 1200 g/m²), DB (+30°/-30°) (100 - 1200 g/m²) and DB (+60°/-60°) (100 - 1200 g/m²) with or without F (20 - 50 g/m²)

Issued to

Hexcel Reinforcements UK Ltd
Leicester, United Kingdom

is found to comply with

DNV GL class programme DNVGL-CP-0434 – Type approval – Uni- and multi-axial multi-ply fabrics made of carbon fibres

DNV GL rules for classification – High speed and light craft

DNV GL standard DNVGL-ST-0342 – Craft

Det Norske Veritas' Standards for Certification No. 2.20, Lifeboats and Rescue Boats, 2007

Application :

For use in marine vessels according to stated Rules/Standards.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.

This Certificate is valid until **2021-11-09**.

Issued at **Høvik** on **2016-11-10**

DNV GL local station: **Manchester**

Approval Engineer: **Gisle Hersvik**

for **DNV GL**

.....
Martin Strande
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid. The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

Product description

Bi-axial Carbon Fibre Products of 0°/90°, +45°/-45°, +30°/-30° and of +60°/-60° orientations:

- Bi-directional stitched cross plied roving
- LT (0°/90°) (100 - 1200 g/m²),
DB (+45°/-45°) (100 - 1200 g/m²),
DB (+30°/-30°) (100 - 1200 g/m²) and
DB (+60°/-60°) (100 - 1200 g/m²) with or without F (20 - 50 g/m²)

Legends:

DB: Double Bias

L: Longitudinal

T: Transverse

F: Fleece (Micromesh/Veil/Nonwoven)

The following indicative properties have been verified by Type Testing of laminates:

Property	Test Method	C12K200 (+45° / -45°)	C12K300 (+45° / -45°)		
Tensile Strength	ISO 527	709 / 757	524 / 548	MPa	mean
Tensile Modulus	ISO 527	58.3 / 54.9	51.3 / 58.0	GPa	mean
Tensile Elongation	ISO 527	1.1 / 1.3	- / -	%	mean
Compressive Strength	ISO 604	354 / 406	315 / 345	MPa	mean
Compressive Modulus	ISO 604	59.0 / 71.2	73.3 / 52.9	GPa	mean
Compressive Elongation	ISO 604	6.0 / 6.2	- / -	%	mean
Flexural Strength	ISO 178	695 / 752	623 / 549	MPa	mean
Flexural Modulus	ISO 178	45.5 / 46.3	45.6 / 46.1	GPa	mean
Flexural Elongation	ISO 178	-	- / -	%	mean
Fibre content (by weight)	-	73.3	71.3	%	mean
Resin		Gurit's Ampreg 22 Epoxy Laminating System			
Curing Procedure for Type Testing		24 hrs at ambient temperature, 16 hrs at 40°C			
Legend:					
mean = Mean of Type Test results					

Application/Limitation

Area of application will be evaluated during approval of classified objects.

Type Approval documentation

Tests carried out

Type Testing carried out according to **Type Approval documentation**.

Job Id:
Certificate No: **TAK00000HZ**

Marking of product

Product shall be marked with *manufacturer's name*: **Hexcel Reinforcements UK Ltd., Leicester, UK** and *type designation*.

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV GL Type Approval Certificate.

Periodical assessment

The scope of the Periodical Assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

Periodical Assessment to be performed after 2.5 years (Certificate Retention) and at renewal after 5 years (Certificate Renewal).

The main elements of the Periodical Assessment are to:

- Ensure that **Type Approval documentation** is available.
- Review design, materials, production process, and performance with respect to possible changes, in order to ensure compliance with **Type Approval documentation** and/or referenced material specifications.
- Ensure traceability between manufacturer's product marking and the DNV GL Type Approval Certificate.

END OF CERTIFICATE