DNV·GL

Certificate No:
TAK00000J0

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Carbon Fibre Products

with type designation(s)
Triaxial; DBL (+45°/0°/-45°) (100 - 1800 g/m²), DBL (+60°/0°/-60°) (100 - 1800 g/m²), DBL (+30°/0°/-30°) (100 - 1800 g/m²), DBT (+45°/90°/-45°) (100 - 1800 g/m²), DBT (+60°/90°/-60°) (100 - 1800 g/m²), DBT (+30°/90°/-30°) (100 - 1800 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**

for **DNV GL**

DNV GL local station: **Manchester**

Approval Engineer: **Gisle Hersvik**

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.

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Product description

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

- Tri-directional stitched cross plied roving
- DBL (+45°/0°/-45°) (100 - 1800 g/m²), DBL (+60°/0°/-60°) (100 - 1800 g/m²),
  DBL (+30°/0°/-30°) (100 - 1800 g/m²),
  DBT (+45°/90°/-45°) (100 - 1800 g/m²), DBT (+60°/90°/-60°) (100 - 1800 g/m²),
  DBT (+30°/90°/-30°) (100 - 1800 g/m²)
  including all the sequences of these combinations with or without F (20 – 50 g/m^2)

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**	**FCIM357** (0°)		
Tensile Strength	ASTM D3039–07	775	MPa	msmv
Tensile Modulus	ASTM D3039–07	57.1	GPa	msv
Tensile Elongation	ASTM D3039–07	1.8 / 1.7	%	mean/msmv
Compressive Strength	EN ISO 604:2003	157	MPa	msmv
Compressive Modulus	EN ISO 604:2003	57.9	GPa	msv
Compressive Elongation	EN ISO 604:2003	5.8 / 3.1	%	mean/msmv
Flexural Strength	ASTM D790–10	562	MPa	msmv
Flexural Modulus	ASTM D790–10	21.1	GPa	msv
Flexural Elongation	ASTM D790–10	2.5 / 2.0	%	mean/msmv
Fibre content (by weight)	-	64	%	mean
Resin		Gurit's Prime™ 20LV Epoxy Infusion System		
Curing Procedure for Type Testing		24 hrs at ambient temperature, 7 hrs at 65°C		

Legend:
msmv = Manufacturer's Specified Minimum Value (verified to be below mean - 2 standard deviation of Type Test results)
msv = Manufacturer's Specified Value
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

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

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