LABORATORY APPROVAL

Certificate No.:	Issued:	Valid until:
LA-DNV-SE-0436-06499-1	2023-08-16	2026-09-04

Issued for:

Testing of Plastic Materials

Issued to:

Hexcel Composites Ltd.

Ickleton Road, Duxford, Cambridge CB22 4QB, United Kingdom

According to:

DNV-SE-0436:2022-09 Shop approval in renewable energy

Applying:

DNV-SE-0441:2021-10 Type and component certification of wind turbines

Based on the document:

CR-LA-DNV-SE-0436-06499-1 Certification Report, dated 2023-08-14

This laboratory approval is valid for the test methods listed in Annex 1.

Changes in the relevant processes (testing and quality) or in responsible personnel as named in this certificate are to be approved by DNV. See Annex 1 for listing of personnel.

Hellerup, 2023-08-16

For DNV Renewables Certification

Bente Vestergaard
Service Line Leader

DAkkS Deutsche Akkreditierungsstelle D-ZE-22290-01-00

By DAkkS according DIN EN IEC/ISO 17065 accredited Certification Body for products. The accreditation is valid for the fields of certification listed in the certificate.

Hamburg, 2023-08-16

For DNV Renewables Certification

Nikunjkumar Pokiya
Project Manager

LABORATORY APPROVAL – ANNEX 1

Personnel

Heads of Laboratory	Mr. Chris Harrington
	Mr. Kilian O´Byrne

List of approved test methods

Mechanical and Technological

ISO 178	Plastics — Determination of flexural properties
ISO 527-1	Plastics — Determination of tensile properties — Part 1: General principles
ISO 527-4	Plastics — Determination of tensile properties — Part 4: Test conditions for isotropic and orthotropic fibre-reinforced plastic composites
ISO 527-5	Plastics — Determination of tensile properties — Part 5: Test conditions for unidirectional fibre-reinforced plastic composites
ISO 13003	Fibre-reinforced plastics — Determination of fatigue properties under cyclic loading conditions
ISO 14125	Fibre-reinforced plastic composites — Determination of flexural properties
ISO 14126	Fibre-reinforced plastic composites — Determination of compressive properties in the in-plane direction
ISO 14129	Fibre-reinforced plastic composites — Determination of the in-plane shear stress/shear strain response, including the in-plane shear modulus and strength, by the ± 45° tension test method
ISO 14130	Fibre-reinforced plastic composites — Determination of apparent interlaminar shear strength by short beam-method
BS EN 2377	Specification for glass fibre reinforced plastics Test method - Determination of apparent interlaminar shear strength
BS EN 2561	Carbon fibre reinforced plastics Unidirectional laminates - Tensile test parallel to the fibre direction
BS EN 2562	Carbon fibre reinforced plastics Unidirectional laminates - Flexural test parallel to the fibre direction
BS EN 2563	Carbon fibre reinforced plastics Unidirectional laminates - Determination of the apparent interlaminar shear strength
BS EN 2597	Carbon fibre reinforced plastics Unidirectional laminates - Tensile test perpendicular to the fibre direction
BS EN 2746	Glass fibre reinforced plastics Flexural test - Three-point bend method
BS EN 2747	Glass fibre reinforced plastics: Tensile test
DIN EN 2850	Carbon fibre thermosetting resin unidirectional laminates Compression test parallel to fibre direction
ISO 15024	Fibre-reinforced plastic composites: Determination of Mode I interlaminar fracture toughness, Gic, for unidirectionally reinforced materials

LABORATORY APPROVAL – ANNEX 1

BS EN 6031	Aerospace series - Fibre reinforced plastics – Test method - Determination of in-plane shear properties (± 45° tensile test)
EN 6033	Carbon fibre reinforced plastics Test method - Determination of interlaminar fracture toughness energy - Mode I G[IC]
ASTM D3039/ D3039M	Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials
ASTM D3410/ D3410M	Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading
ASTM D6641/ D6641M	Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials Using a Combined Loading Compression (CLC) Test Fixture
ASTM D3518/ D3518M	Standard Test Method for In-Plane Shear Response of Polymer Matrix Composite Materials by Tensile Test of a ±45° Laminate
ASTM D5379/ 5379M	Standard Test Method for Shear Properties of Composite Materials by the V-Notched Beam Method
ASTM D7078/ D7078M	Standard Test Method for Shear Properties of Composite Materials by V-Notched Rail Shear Method
ASTM D5528	Standard Test Method for Mode I Interlaminar Fracture Toughness of Unidirectional Fiber-Reinforced Polymer Matrix Composites
ASTM D3479/ D3479M	Standard Test Method for Tension-Tension Fatigue of Polymer Matrix Composite Materials I
ASTM D790	Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials
EN 2243-1	Aerospace series - Non-metallic materials Structural adhesives - Test method - Part 1: Single lap shear
EN 2243-2	Aerospace series - Non-metallic materials Structural adhesives - Test method - Part 2: Peel Metal-Metal
EN 2243-3	Aerospace series - Non-metallic materials Structural adhesives - Test method - Part 3: Peeling test metal-honeycomb core
EN 1464	Adhesives - Determination of peel resistance of adhesive bonds - Floating roller method

Analytical

ISO 291	Plastics - Standard atmospheres for conditioning and testing
ISO 1172	Textile-glass-reinforced plastics: Prepregs, moulding compounds and laminates - Determination of the textile-glass and mineral-filler content; calcination methods
ISO 1183-1	Plastics – Methods for determining the density of non-cellular plastics Immersion method, liquid pyknometer and titration method
ISO 3374	Reinforcement products: Mats and fabrics - Determination of mass per unit area
ISO 11357-2	Plastics - Differential scanning calorimetry (DSC)

LABORATORY APPROVAL – ANNEX 1

	Part 2: Determination of glass transition temperature
ISO 15034	Composites — Prepregs - Determination of resin flow
BS EN 2329	Textile glass fibre preimpregnates Test method for the determination of mass per unit area
BS EN 2330	Textile glass fibre preimpregnates Test method for the determination of the content of volatile matter
BS EN 2331	Textile glass fibre preimpregnates Test method for the determination of the resin and fibre content and mass of fibre per unit area
BS EN 2557	Carbon fibre preimpregnates: Determination of mass per unit area
BS EN 2558	Carbon fibre preimpregnates: Determination of the volatile content
BS EN 2559	Carbon fibre preimpregnates Determination of the resin and fibre content and the mass of fibre per unit area
BS EN 2560	Carbon fibre preimpregnates: Determination of the resin flow
BS EN 2564	Carbon fibre laminates: Determination of the fibre, resin and void contents
BS EN 2743	Aerospace series - Fibre reinforced plastics - Standard procedures for conditioning prior to testing unaged materials
BS EN 12127	Textiles – Fabrics: Determination of mass per unit area using small samples
ISO 6721-11	Plastics - Determination of dynamic mechanical properties - Part 11: Glass transition temperature
ASTM D618	Standard Practice for Conditioning Plastics for Testing
ASTM D792	Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
ASTM D3171	Standard Test Methods for Constituent Content of Composite Materials
ASTM 3418	Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry
ASTM D3530/ D3530M	Standard Test Method for Volatiles Content of Composite Material Prepreg
ASTM D5229/ D5229M	Standard Test Method for Moisture Absorption Properties and Equilibrium Conditioning of Polymer Matrix Composite Materials
ASTM D7028	Standard Test Method for Glass Transition Temperature (DMA Tg) of Polymer Matrix Composites by Dynamic Mechanical Analysis (DMA)
ASTM E1640	Standard Test Method for Assignment of the Glass Transition Temperature by Dynamic Mechanical Analysis

The authorized personnel who will sign the test reports:

- Mr. Chris Harrington
- Mr. Johannes Moser
- Mr. Kilian O´Byrne