



# LABORATORY APPROVAL

Certificate No.:  
LA-DNV-SE-0436-07034-2

Issued:  
2025-11-27

Valid until:  
2027-11-27

Issued for: Testing of Materials for Wind Turbines made of Fibre Reinforced Plastics  
Issued to: Jushi Group Co., Ltd. Test Center  
No. 669 Wenhua South Road, Economic Development Zone, Tongxiang City, Zhejiang Province, China.

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

Head of laboratory: Mr. Cui, Fengbo  
The authorized personnel to sign test reports:  
Mr. Cui, Fengbo      Mr. Sheng, Weifeng      Mr. Chen, Jianliang

## List of approved test methods:

<b>Mechanical and Technological</b>	
ASTM D2343	Standard Test Method for Tensile Properties of Glass Fiber Strands, Yarns, and Rovings Used in Reinforced Plastics
ASTM D2344	Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates
ASTM D2583	Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor
ASTM D3039	Standard Test Method for Tensile Properties of Polymer Matrix Composite Materials
ASTM D3410	Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials with Unsupported Gage Section by Shear Loading
ASTM D5379	Standard Test Method for Shear Properties of Composite Material by the V-Notched Beam Method
ASTM D5528	Standard Test Method for Mode I Interlaminar Fracture Toughness of Unidirectional Fiber-Reinforced Polymer Matrix Composites
ASTM D6641	Standard Test Method for Compressive Properties of Polymer Matrix Composite Materials Using a Combined Loading Compression (CLC) Test Fixture
ASTM D6671	Standard Test Method for Mixed Mode I-Mode II Interlaminar Fracture Toughness of Unidirectional Fiber Reinforced Polymer Matrix Composites
ASTM D7078	Standard Test Method for Shear Properties of Composite Materials by V-Notched Rail Shear Method1
ASTM D7905	Standard Test Method for Determination of the Mode II Interlaminar Fracture Toughness of Unidirectional Fiber-Reinforced Polymer Matrix Composites
ISO 13003	Fibre-reinforced plastics – Determination of fatigue properties under cyclic loading conditions (Tension – Tension, Compression – Compression, Tension– Compression) (The specimen geometry mentioned in SOP "JSJC/ZY-WJ-38, C/2, dated 2025-10-31" refers to GB/T 35465.3, GB/T 35465.4 and GB/T 35465.5)
ISO 14125	Fibre-reinforced plastic composites. Determination of flexural properties
ISO 14126	Fiber-reinforced Plastic composites — Determination of compressive properties in the in-plane direction Note: Tests conducted using the standard fixtures "ISO 14126: 2023, Figure C.1 — ASTM D 3410/B" and "ISO 14126: 2023, Figure D.5 — ASTM D6641 — Combined loading fixture" as referenced in SOP "JSJC/ZY-WJ-27, C/1, dated 2025-10-31" are approved under this Laboratory Approval.
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 $\pm 45^\circ$ tension test method

ISO 14130	Fibre-reinforced plastic composites – Determination of apparent inter laminar shear strength by short-beam method
ISO 15024	Fibre-reinforced plastic composites – Determination of mode I interlaminar fracture toughness, GIC, for unidirectionally reinforced materials
ISO 178	Plastics – Determination of flexural properties
ISO 179-1	Plastics – Determination of Charpy impact properties. Non-instrumented impact test
ISO 179-1	Plastics – Determination of Charpy impact properties — Part 1: Non-instrumented impact test
ISO 180	Plastics – Determination of Izod impact strength
ISO 3341	Textile glass – Yarns – Determination of breaking force and breaking elongation
ISO 3342	Textile glass – Mats – Determination of tensile breaking force
ISO 3375	Textile glass – Determination of stiffness of rovings
ISO 3597-1	Textile-glass-reinforced plastics – Determination of mechanical properties on rods made of roving-reinforced resin – Part 1: General considerations and preparation of rods
ISO 3597-2	Textile-glass-reinforced plastics – Determination of mechanical properties on rods made of roving-reinforced resin – Part 2: Determination of flexural strength
ISO 3597-3	Textile-glass-reinforced plastics – Determination of mechanical properties on rods made of roving-reinforced resin – Part 3: Determination of compressive strength
ISO 3597-4	Textile-glass-reinforced plastics – Determination of mechanical properties on rods made of roving-reinforced resin – Part 4: Determination of apparent interlaminar shear strength
ISO 4587	Adhesives – Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies
ISO 4606	Textile glass – Woven fabric. Determination of tensile breaking force and elongation at break by the strip method
ISO 527-1	Plastics – Determination of tensile properties – 1: General principles
ISO 527-2	Plastics – Determination of tensile properties – Part 2: Test conditions for moulding and extrusion plastics
ISO 527-4	Plastics – Determination of tensile properties – 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 6721-1	Plastics – Determination of dynamic mechanical properties – Part 1: General principles
ISO 6721-5	Plastics – Determination of dynamic mechanical properties – Part 5: Flexural vibration – Non-resonance method
ISO 899	Plastics- Determination of creep behaviour – Part 1: Tensile creep
ISO 9163	Textile glass – Rovings – Manufacture of test specimens and determination of tensile strength of impregnated rovings
DIN EN 1465	Adhesives – Determination of tensile lap-shear strength of bonded assemblies
<b>Analytical</b>	
ASTM C693	Standard Test Method for Density of Glass by Buoyancy
ASTM D2584	Standard Test Method for Ignition Loss of Cured Reinforced Resins
ASTM D2734	Standard Test Methods for Void Content of Reinforced Plastics
ASTM D3171	Standard Test Methods for Constituent Content of Composite Materials (Test method 1: procedure B and procedure G)
ASTM D3418	Standard Test Method for Transition Temperatures and Enthalpies of Fusion and Crystallization of Polymers by Differential Scanning Calorimetry
ASTM D7028	Standard Test Method for Glass Transition Temperature (DMA Tg) of Polymer Matrix Composites by Dynamic Mechanical Analysis (DMA)

DIN EN 1049-2	Determination of number of threads per unit length of textile woven fabrics; construction methods of analysis
ISO 11357-1	Plastics – Differential scanning calorimetry (DSC) – Part 1: General principles
ISO 11357-2	Plastics – Differential scanning calorimetry (DSC) – Part 2: Determination of glass transition temperature and glass transition step height
ISO 1172	Textile-glass-reinforced plastics. Prepregs, moulding compounds and laminates. Determination of the textile-glass and mineral-filler content. Calcination method
ISO 1183-1	Plastics – Part 1 Immersion method, liquid pyknometer method and titration method
ISO 14127	Carbon-fibre-reinforced composites - Operating instructions for the resin, fibre and void contents (method A3)
ISO 1887	Textile glass – Determination of combustible-matter content
ISO 1888	Textile glass – Staple fibres or filaments - Determination of average diameter
ISO 1889	Textile glass products – Continuous filament yarns, staple fibre yarns and rovings in the form of packages – Determination of linear density
ISO 3344	Reinforcement products. Determination of moisture content
ISO 3374	Reinforcement products. Mats and fabrics. Determination of mass per unit area
ISO 3616	Textile glass - Chopped-strand and continuous-filament mats - Determination of average thickness, thickness under load and recovery after compression
ISO 4602	Reinforcements – Woven fabrics – Determination of number of yarns per nit length of warp and weft
ISO 4603	Textile glass – Woven fabrics – Determination of thickness
ISO 7822	Textile glass reinforced plastics; determination of void content; loss on ignition, mechanical disintegration and statistical counting methods

Remarks:

- Tensile tests, bending tests and shear tests are approved for additional test condition: -80°C to 250°C temperature in controlled environmental test chamber.

Limitations:

- Test procedures and equipment deviating from the approved work instructions as documented in the Certification Report fall outside the scope of this Laboratory Approval.

Hellerup, 2025-11-27

For DNV Renewables Certification



Bente Vestergaard  
Service Line Leader

Shanghai, 2025-11-27

For DNV Renewables Certification




By DAkkS according DIN EN IEC/ISO 17065  
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listed in the certificate.