



LABORATORY APPROVAL

Certificate No.:
LA-DNVGL-SE-0436-07715-0

Issued:
2021-08-31

Valid until:
2024-05-17

Issued for:

Testing of Plastic Materials

Issued to:

Gurit (UK) Ltd.

St Cross Business Park, Newport Isle of Wight, PO030 5WU, United Kingdom

According to:

DNVGL-SE-0436:2018-04 Shop approval in renewable energy

Applying:

DNVGL-SE-0441:2016-06 Type and component certification of wind turbines

Based on the document:

CR-LA-DNVGL-SE-0436-07715-0

Certification Report, dated 2021-08-30

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, 2021-08-31

For DNV Renewables Certification

Hamburg, 2021-08-31

For DNV Renewables Certification

Bente Vestergaard

Service Line Leader, Type and Component
Certification

Pablo Andrés Buriticá Henao

Project Manager

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Personnel

Heads of Laboratory Mr. Harvey Francis
 Deputy mechanical tests: Mr. Ben Wood
 Deputy analytical tests: Mr. Fergus Kenny

List of approved test methods

| Test | Test Method |
|-------------------|---|
| Analytical | |
| ISO 175 | Methods of test for the determination of the effects of immersion in liquid chemicals |
| 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 | Methods for determining the density of non-cellular plastics Immersion method, liquid pycnometer method and titration method |
| ISO 1675 | Determination of density by the pycnometer method |
| ISO 1887 | Textile glass - Determination of combustible-matter content |
| ISO 2555 | Determination of apparent viscosity by the Brookfield test method |
| ISO 2811 | Paints and varnishes - Determination of density Part 1: Pycnometer method |
| ISO 6721-1 | Determination of dynamic mechanical properties Part 1: General principles |
| ISO 6721-11 | Plastics — Determination of dynamic mechanical properties Part 11: Glass transition temperature |
| ISO 11357-1 | Differential scanning calorimetry (DSC) Part 1: General principles |
| ISO 11357-2 | Differential scanning calorimetry (DSC) Part 2: Determination of glass transition temperature |
| ISO 11357-3 | Differential scanning calorimetry (DSC) Part 3: Determination of temperature and enthalpy of melting and crystallization |
| ISO 11357-5 | Differential scanning calorimetry (DSC) Part 5: Determination of characteristic reaction-curve temperatures and times, enthalpy of reaction and degree of conversion |

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| Test | Test Method |
|-------------------------------------|--|
| ISO 11359-2 | Plastics - Thermomechanical Analysis (TMA) - Part 2: Determination of Coefficient of Linear Thermal Expansion and Glass Transition Temperature |
| ASTM C 271 | Standard Test Method for Density of Sandwich Core Materials |
| ASTM C 272 | Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions |
| ASTM E 1640 | Standard Test Method for Assignment of the Glass Transition Temperature by Dynamic Mechanical Analysis |
| ASTM D 7028 | Standard Test Method for Glass Transition Temperature (DMA Tg) of Polymer Matrix Composites by Dynamic Mechanical Analysis (DMA) |
| Mechanical and Technological | |
| ISO 178 | Determination of tensile properties Part 2: test conditions for moulding and extrusion plastics |
| ISO 527-1 | Plastics - Determination of tensile properties Part 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 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 604 | Plastics - Determination of compressive properties |
| ISO 844 | Rigid cellular plastics - Determination of compression properties |
| ISO 4587 | Adhesives - Determination of tensile lap-shear strength of rigid-to-rigid bonded assemblies |
| ISO 11339 | T-peel test for flexible-to-flexible bonded assemblies |
| ISO 14125 | Fibre-reinforced plastic composites Determination of flexural properties |

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| Test | Test Method |
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| 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 $\pm 45^\circ$ tension test method |
| ISO 14130 | Fibre reinforced plastic composites Determination of apparent interlaminar shear strength by short beam-method |
| EN 1465 | Determination of tensile lap-shear strength of bonded assemblies |
| EN 6031 | Aerospace series - Fibre reinforced plastics Test method - Determination of in-plane shear properties ($\pm 45^\circ$ tensile test) |
| EN 6033 | Aerospace series - Carbon fibre reinforced plastics Test method - Determination of interlaminar fracture toughness energy - Mode I - GIC |
| EN 6038 | Aerospace series - Fibre reinforced plastics Test method - Determination of the compression strength after impact |
| ASTM C 273 | Standard Test Method for Shear Properties of Sandwich Core Materials |
| ASTM C 297 | Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions |
| ASTM C 365 | Standard Test Method for Flatwise Compressive Properties of Sandwich Cores |
| ASTM C 393 | Standard Test Method for Core Shear Properties of Sandwich Constructions by Beam Flexure |
| ASTM D 1621 | Standard Test Method for Compressive Properties of Rigid Cellular Plastics |
| ASTM D 2344 | Standard Test Method for Short-Beam Strength of Polymer Matrix Composite Materials and Their Laminates |
| ASTM D 3163 | Standard Test Method for Determining Strength of Adhesively Bonded Rigid Plastic Lap-Shear Joints in Shear by Tension Loading |
| BS 5350-C1 | Methods of test for adhesives. Adhesively bonded joints: mechanical tests. Determination of cleavage strength of adhesive bonds |
| BS 5350-C5 | Determination of bond strength in longitudinal shear for rigid adherends |

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| Test | Test Method |
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| BS 5350-C6 | Methods of test for adhesives. Adhesively bonded joints: mechanical tests. Determination of bond strength in direct tension in sandwich panels |
| BS 5350-C12 (withdrawn) | Mechanical tests. 180° peel test for flexible-to- flexible bonded assemblies (T-peel test) |
| BS 5350-C13 | Methods of test for adhesives. Adhesively bonded joints: mechanical tests. Climbing drum peel test |
| Recommended Method SRM 1R-94 | SACMA Recommended Test Method for Compressive Properties of oriented Fiber |