

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Glass Fibre Products

with type designation(s)

Dongsung HiMax Triaxial Fabrics:

DBL (0°/+45°/-45°) (450 – 1200 g/m²) with or without CSM (100 – 450 g/m²),

DBT (+45°/90°/-45°) (350 – 1200 g/m²) with or without CSM (100 – 450 g/m²)

Issued to

Dongsung Advanced Materials Co., Ltd.

Hwaseong-si, Gyeonggi-do, Republic of Korea

is found to comply with

DNV class programme DNV-CP-0467 – Type approval – Uni- and multi-axial multi-ply fabrics made of glass fibres

DNV rules for classification – High speed and light craft

DNV standard DNV-ST-0342 – Craft

Application :

For use in marine vessels in accordance with stated Rules/Standards.

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

Issued at **Hamburg** on **2023-07-16**

This Certificate is valid until **2028-07-08**.

DNV local unit: **Seoul**

for **DNV**

Approval Engineer: **Gisle Hersvik**

Thorsten Lohmann
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.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.



Product description

Dongsung HiMax Tri-axial Glass Fibre Products of 0°/+45°/-45° and of 45°/90°/-45° orientations:

- E-glass tri-axial stitched fabrics
- DBL (0°/+45°/-45°) (450 – 1200 g/m²) with or without CSM (100 – 450 g/m²) and
- DBT (+45°/90°/-45°) (350 – 1200 g/m²) with or without CSM (100 – 450 g/m²)

Legends:

DB: Double Bias

L: Longitudinal

T: Transverse

CSM : Chopped Strand Mat

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

Property	Test Method	DBL800	DBT750		
Tensile Strength - 0°	ISO 527	398	-	MPa	mean
Tensile Modulus - 0°	ISO 527	17.4	-	GPa	mean
Tensile Strength - 45°	ISO 527	-	251	MPa	mean
Tensile Modulus - 45°	ISO 527	-	15.2	GPa	mean
Flexural Strength - 0°	ISO 14125	564	-	MPa	mean
Flexural Modulus - 0°	ISO 14125	14.7	-	GPa	mean
Flexural Strength - 45°	ISO 14125	-	436	MPa	mean
Flexural Modulus - 45°	ISO 14125	-	16.1	GPa	mean
Fibre content (by weight)	ISO 1172	50.5	56.2	%	mean
Fibre volume fraction, FVF	-	30.15	35.18	%	mean
Resins		Unsaturated Polyester: PolyStar R235 (Sewon Chemical Co., Ltd.)			
Curing Procedure for Type Testing		24 hrs at ambient temperature, 3 hrs at 80°C			
Legend: mean = Mean of Type Test results					

Applications/Limitations

The approval covers the weight ranges given above.

The fabric complies with the applicable requirements of DNV and is compatible to the laminating resin.

Any significant changes in design and / or quality of the material will render the approval invalid.

Type Approval documentation

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**.

Marking of product

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 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 assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-CP-0338.



Job Id: **262.1-038341-1**
Certificate No: **TAK0000291**

This certificate is only valid if required Periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

END OF CERTIFICATE