

TYPE APPROVAL CERTIFICATE

Certificate no.:
TAK00001TH
Revision No:
1

This is to certify:

that the **Glass Fibre Products**

with type designation(s)

Woven Rovings: EWR270, EWR360, EWR500, EWR580, EWR600 and EWR800

issued to

Jushi Group Co., Ltd.
Tongxiang, ZHEJIANG, China

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:

Manufacturing of FRP laminates.

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

Issued at **Hamburg** on **2024-11-01**

This Certificate is valid until **2029-10-28**.

DNV local unit: **Shanghai**

Approval Engineer: **Gisle Hersvik**

for **DNV**



Digitally Signed By:
Martin Wenning
Location: **DNV Hamburg,**
Germany

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 USD 300 000.

Product description

Woven Rovings: **EWR270, EWR360, EWR500, EWR580, EWR600 and EWR800.**

Legends:

E: E-Glass

WR: Woven Roving

270, 360, 500, 580, 800: Weight per unit area, g/m²

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

| Properties | Test Method | EWR270 | EWR360 | EWR500 | | |
|--|---|-------------------------|-------------------------|-------------------------|------|-----|
| Tensile Strength – warp | ISO 527-1,4 | 409.04 | 425.57 | 457.28 | mean | MPa |
| Tensile Modulus – warp | ISO 527-1,4 | 24.04 | 25.28 | 22.80 | mean | GPa |
| Tensile Strength – weft | ISO 527-1,4 | 395.67 | 350.77 | 440.20 | mean | MPa |
| Tensile Modulus – weft | ISO 527-1,4 | 23.70 | 23.65 | 24.17 | mean | GPa |
| Fibre content by weight | ISO 1172 | 61.13 (0) 61.89 (90) | 61.16 (0) 61.22 (90) | 61.65 (0) 61.32 (90) | mean | % |
| Resin | TM-107 | | | | | |
| Curing Procedure used for Type Testing | 24 hrs at room temperature, 4 hrs at 80°C | | | | | |

| Properties | Test Method | EWR580 | EWR600 | EWR800 | | |
|--|---|-------------------------|-------------------------|-------------------------|------|-----|
| Tensile Strength – warp | ISO 527-1,4 | 459.29 | 511.93 | 440.15 | mean | MPa |
| Tensile Modulus – warp | ISO 527-1,4 | 24.77 | 26.62 | 23.53 | mean | GPa |
| Tensile Strength – weft | ISO 527-1,4 | 400.52 | 388.37 | 364.75 | mean | MPa |
| Tensile Modulus – weft | ISO 527-1,4 | 23.00 | 24.25 | 19.47 ¹⁾ | mean | GPa |
| Fibre content by weight | ISO 1172 | 61.64 (0) 61.19 (90) | 64.76 (0) 64.51 (90) | 62.61 (0) 62.36 (90) | mean | % |
| Resin | TM-107 | | | | | |
| Curing Procedure used for Type Testing | 24 hrs at room temperature, 4 hrs at 80°C | | | | | |

(0): fibre content for warp laminates

(90): fibre content for weft laminates

¹⁾ Value is below stated acceptance criteria of CP-0467, Table 3.

Legends:

mean = Mean of Type Test results

Application/Limitation

The product 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

1. Assessment Report from DNV Shanghai of 2024-10-29.
2. ISO 9001 Certificate, DEKRA Registration No. 20319142/1-1.
3. Jushi Group Co., Ltd. Testing Center, Report Nos. BG241011107 Rev.A (EWR270), BG241011108 Rev.A (EWR360), BG241011109 Rev.A (EWR500), BG241011110 Rev.A (EWR580), BG241011111 Rev.A (EWR600), BG241011112 Rev.A (EWR800) of 2024-10-11.
4. Assessment Report from DNV GL Shanghai of 2019-05-10.
5. Testing Center, Jushi Group Co., Ltd. Report Nos. BG190325101 (EWR270), BG190325102 (EWR360), BG190325103 (EWR500), BG190325104 (EWR580), BG190325105 (EWR600), BG190325106 (EWR800) of 2019-03-25.
6. ISO 9001 Audit Report (DEKRA).
7. Application for Type Approval of 2019-03-25.
8. Email from DNV GL Shanghai of 2015-05-05, including Assessment Report of 2015-05-05 and Application Letter from Jushi of 2015-01-29.



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9. Email from DNV Shanghai of 2011-05-09, including Survey Report of 2011-05-09, Declaration of Conformity from Jushi of 2011-04-08, Application Letter from Jushi of 2011-04-08 and DNV Approval Documents 2011 issued by Jushi, Test Report Nos. BG110402004 and BG110402005 of 2011-04-02.

Tests carried out

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

Marking of product

Product shall be marked with *manufacturer's name*: **Jushi Group Co., Ltd., Tongxiang, China** 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 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.

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