TYPE APPROVAL CERTIFICATE

Certificate No:
TAK000008A
Revision No:
3

This is to certify:

That the Plastic Piping System, Fibre Reinforced Thermosetting

with type designation(s)
Fiberdur EP - GRE system, Fiberdur CS EP - GRE system

Issued to
TPR Fiberdur GmbH & Co. KG.
Aldenhoven, **Germany**

is found to comply with
DNV GL rules for classification – Ships
DNVGL-OS-D101 – Marine and machinery systems and equipment, Edition January 2018
DNV GL class programme DNVGL-CP-0070 – Type approval – Fibre reinforced thermosetting plastic piping systems

Application :

The Fiberdur GRE plastic piping system is accepted for installation on all vessels classed by DNV.

Issued at **Hamburg** on **2021-06-03**
This Certificate is valid until **2026-06-02**.
DNV local station: **Essen**

Approval Engineer: **Hagen Markus**

for **DNV**

Olaf Drews
Head of Section

Application/Limitation

The Fiberdur GRE piping systems, EP / CS EP Fibermarine and Fibermarine HighLine, are type approved for application in piping systems as listed in “Table 1- Fire endurance requirements matrix” specified in DNV GL Rules Pt.4 Ch.6, Section 2.
Approved installation locations where “0” or “L3” is specified in the matrix. Appropriate footnotes are to be observed.
Not approved for installation locations where “NA” or “X” is indicated.

In addition EP/CS EP Fibermarine and Fibermarine HighLine are approved for exhaust gas scrubber systems acc. to Pt.6 Ch.2 Section 7 Exhaust Cleaning Systems for the reduction of NOx or Sox – ER.
For installation on Offshore units the requirements specified in DNVGL-OS-D101 Marine and machinery systems and equipment are to be observed.

The GRE piping systems of type EP10 and EP16 with sizes > DN100 are not external pressure resistant and are therefore limited in the range of application. These GRP piping system types are not approved for the use in piping systems as listed in Pt.4 Ch.6 Section 2 “Table 1 - Fire endurance requirement matrix” and exhaust gas scrubber systems.
GRE piping systems of type EP 10 and EP16 with sizes >DN100 are only approved for non-essential piping systems.

Non-essential piping systems are systems not serving main functions as defined in DNV GL Rules Pt. 1 Ch.1, [Sec.1 Table 2].

Maximum internal operating pressure

Temperature [°C]	EP/CS EP10 [bar]	EP/CS EP 16 [bar]	EP/CS EP Fibermarine 10/16 [bar]	EP/CS EP Fibermarine HighLine 16 [bar]
-50 up to 80	10	16	10/16	16
Up to 95	8	13	8/13	13

Extent of Type Tests applicable to piping system dependent on application

Fire endurance Level
Fire Endurance Level 3 according to IMO Resolution A.753 (18), Appendix 2 includes the following sizes and pipe connections.

Type of connection	Size range DN	Fire barrier[1]
Conical to Cylindrical pipe adhesive bonded joint	25 up to 50	10 mm
	> 50 up to 100	5 mm
	> 100 up to 152	2.5 mm
	> 152	None

Note
[1] Fire barrier with final layer of EP / glass laminates. Reference Fiberdur Technical Bulletin 12. Straight pipes shall be delivered from the manufacturer with the protective coating on. In considering fire protection coatings, such characteristics as thermal expansion, resistance against vibrations, and elasticity shall be considered for each installation.

Type of connection	Size range DN	Fire barrier
GRE collar with metallic loose flange	50 up to 800	Design according to Fiberdur Technical Bulletin 25
GRE fixed flange connection		

Flame spread

Surface flame spread characteristics is determined by ASTM D635:2006.

Smoke and toxicity

The Fiberdur GRE piping system is not tested with respect to smoke and toxicity characteristics.

Electrical conductivity

For installation in gas hazardous areas or conveying non- conductive fluids, the GRE conductive system is to be used.

Piping system	Electrically conductive	
	outside	inside
GRE system non-conductive	no	no
GRE conductive	yes	yes

Where conductive piping is required, the resistance per unit length of the pipe, bends, elbows, fabricated branch pieces etc., should not exceed 10^5 Ω/m.
After installation, the conductivity of the piping system shall be measured, and the resistance to earth from any point in the piping system shall not exceed 10^6 Ω to earth.
Reference Rules Pt.4 Ch.6 – Sec. 9 and 10.

Passenger vessels

For application on passenger vessels additional requirements specified in the Rules and Regulations of the appropriate flag state authority may have to be observed.

Installation

For the design and installation of piping systems the following documents issued by TPR Fiberdur are to be observed:

“Planning with Fiberdur”	Edition 05/2021
“Assembly Instruction for Lamination”	Edition 11/2018
“Assembly Instruction for Adhesive Bonding Technology”	Edition 11/2018
“SITE INSTALLATION MANUAL” (Pipe-Fitters Manual)	Edition 11/2018
“Technical Bulletin 12 - Procedure application Favuseal on top of GRP pipe & fittings”	11/2020
“Technical Bulletin 25 – L3 GRP Flanges”	05/2021

In addition, the DNVGL Rules Pt.4 Ch.6 – Section 10 – [4 Installation of Plastic Piping Systems] is to be observed.

Bulkhead and Deck penetration

Pipe penetration through watertight bulkheads or decks as well as through fire divisions shall be type approved unless the penetration pipe is welded into the bulkhead/deck.

Plastic pipes passing watertight bulkheads or decks which are also a fire division and a fire may cause flooding of watertight compartments, the watertight integrity of the bulkhead or deck is to be maintained by a metallic shut-off valve fitted at the bulkhead or deck. The operation of this valve shall be provided from above the freeboard deck.
Refer to DNV GL Rules Pt.4 Ch.6 Section 3 – [1.4 Fittings on watertight bulkheads].

On passenger vessels, where the watertight bulkhead is also a fire division, the requirements of the SOLAS Chapter II - 1, Regulation 13.2.3. are to be observed.

When plastic pipes pass through watertight bulkheads or decks, the watertight integrity of the bulkhead or deck is to be maintained by installation of external pressure resistant pipe types “Fibermarine” or “Fibermarine Highline” depending on external pressure resistance level required.
In case GRE piping systems of type EP 10 and EP 16 with pipe sizes >DN100 penetrate watertight bulkheads, one of the following two arragements shall be applied:

a) a steel spool piece of 900mm in length, preferable 450mm on each side, with wall thickness acc. to DNVGL-RU-SHIP Pt.4 Ch.6 Sec. 9 [1.2.1] is arranged at the watertight penetration.
A remote operated emergency shut off valve shall be arranged between the steel spool piece and the plastic pipe on one side. This valve shall be of safe to close type, or else the control including hydraulic piping and electric cables must be routed inboard of B/5, but preferably to CL, before being routed longitually. On the opposite side the plastic pipe shall be flanged or similar to the steel spool piece.
or:
b) two manual valves, one each side of the steel spool piece in a) are arranged, under the provision that these valves are easily accessible.

Reference DNV GL Rules Pt.4 Ch.6 Section 2 – [1.7.6].

Type Approval documentation

Type Tests carried out

- Internal pressure short term and long-term test
- Water and gas tightness tests on bulkhead penetration
- External pressure ASTM D 2924, Fig 2- Procedure B, External load CP-070
- Electrical conductivity CP-070
- Load deformation ASTM D2412
- Bonding Procedure Qualification test ASTMD 1598/ASTMD 2992, HDT test, ISO 75-2:2013
- Axial tensile strength ASTM D2105-14
- Fire endurance test L3 on pipe joints specified on page 3
- Surface flammability (flame spread) acc. to ASTM D635.

Production Places

Production Testing

Each batch shall be subjected to product tests according to Fiberdur Instruction QIP AA014, Rev.B.

Marking of product

To ensure traceabilty from the final product to this type approval certificate each pipe or pipe spool is to be marked at least with:

Scope		**Example**
Manufacturer's name and / or logo		fiberdur®
Type designation / material of which the pipe or fitting is made		GREP Fibermarine HighLine 16
Size / dimensions		DN200
Type of joining method		L=laminate system K=adhesion bonding system
Nominal design pressure PN	internal	PN16
	external	PN-4
Working pressure at max. service temperature	internal	WP16bar@80°C, >80°C see DNV certificate
Conductive / non-conductive		C / NC
Date of fabrication and / or serial number		Barcode plus number 6192180400.1280720001

In addition, labels with the following text shall be attached to flanges which shall be joined by bolting:
“APPLY BOLTING TORQUE ACCORDING TO MANUFACTURER'S RECOMMENDATION”.

Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment to verify that the conditions for the Type Approval are complied with. Refer to the Class Programme DNV GL-CP-0338, Sec.4.

To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com .

END OF CERTIFICATE