



DET NORSKE VERITAS

TYPE APPROVAL CERTIFICATE

CERTIFICATE NO. **K-4811**

This is to certify that the
Plastic Pipes, Fibre Reinforced Thermosetting

with type designation(s)
EP (GRE) and Navicon EP (GRE)

Manufactured by
TPR Fiberdur GmbH & Co. KG.
Aldenhoven, Germany

is found to comply with
Det Norske Veritas' Type Approval Programme 1-501.1, 2009, Fibre Reinforced Thermosetting Plastic Pipes
Det Norske Veritas' Rules for Classification of Ships
IMO Resolution A.753(18). Guidelines for the Application of Plastic Pipes on Ships

Application

For installation according to DNV Rules and Manufacturer's Specification. The piping system is approved as non-conductive (EP) and conductive (Navicon EP). The piping system is approved to Fire Endurance L3 according to IMO Resolution A.753(18), and to Low Flame Spread according to ASTM D635.

Høvik, 2011-12-02
for Det Norske Veritas AS



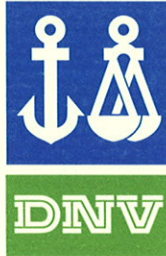
This Certificate is valid until
2015-12-31

Rikard Törnqvist
Head of Section

DNV local office:
Essen

Gisle Hersvik
Surveyor

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.
If any person suffers loss or damage which is proved to have been caused by any negligent act or omission of Det Norske Veritas, then Det Norske Veritas shall pay compensation to such person for his proved direct loss or damage. However, the compensation shall not exceed an amount equal to ten times the fee charged for the service in question, provided that the maximum compensation shall never exceed USD 2 million. In this provision "Det Norske Veritas" shall mean the Foundation Det Norske Veritas as well as all its subsidiaries, directors, officers, employees, agents and any other acting on behalf of Det Norske Veritas.



Certificate No.: K-4811
 File No.: 332.30
 Job Id.: 262.1-012414-1

Product description

Type EP (GRE); PN10 and PN16 bar Fibre Reinforced Thermosetting Epoxy Resin Pipe and Fittings, filament wound;

- **Type EP;** Non-conductive
- **Type Navicon EP;** Conductive
- PN10 and PN16 bar
- PN16 bar collapse resistant (from full vacuum up to full vacuum + x meter water head). Wall thickness based on collapse formula with a 3:1 safety and $0 \leq x \leq 30$ meter water head.

Pipes:

Diameter [mm]	Minimum structural wall thickness [mm] *	
	EP-16 Conductive	EP-16 and EP-16 Conductive / Collapse resistant
<i>Cylindrical-Conical adhesive bonded joint</i>		
25	1,6	1,6
40	1,6	1,6
50	1,6	1,6
65	1,6	1,6
80	1,6	1,6
100	1,6	2,2
125	1,6	2,9
150	2,0	3,7
<i>Conical-Conical adhesive bonded joint</i>		
200	3,2	5,8
250	3,8	7,2
300	4,7	8,6
350	5,7	10,0
400	6,6	11,5
450	7,6	12,9
500	8,5	14,3
600	10,2	17,2
700	11,9	20,0
800	13,7	22,9

* Wall thickness = Liner thickness + Structural wall thickness + External coating thickness = Structural wall thickness + 0.8 [mm].

Fittings:

Elbows, tees, concentric and eccentric reducers, saddles, couplings, flanges.

Joining technique:

Adhesive bonded.

Application/Limitation

For installation according to DNV Rules and Manufacturer's Specification.

Piping system is approved as:

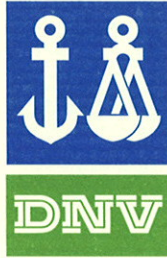
- non-conductive, not for installation in gas hazardous area
- conductive, for installation in gas hazardous area.

Test of conductivity is to be carried out after installation of piping system.

Piping system is approved to Fire Endurance Level 3, according to IMO Resolution A.753(18).

Piping system is approved to Low Flame Spread, according to ASTM D635-06 (accepted as an alternative to IMO Resolution A.653(16)).

Maximum working temperature is +100°C. For applications with working temperature above +30°C, the permissible pressure is to be reduced according to DNV Rules for Classification of Ships, Pt.4 Ch.6 Sec.6, Table A9.



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Type Approval documentation

- « Documentation for DNV Type Approval » from Fiberdur of 2011-11-09, including:
 - Product description, Product specification, Description of fabrication process and QC arrangement,
 - Test Reports (pressure tests, Fire Endurance tests, Flame Spread test etc.).
- Emails from Fiberdur of 2011-11-29 and 2011-12-02, including various test reports/test results.
- Survey Report from DNV Essen of 2011-11-14

Tests carried out

Type Testing carried out according to **Type Approval documentation**.

Marking of product

The pipes and fittings are to be marked. The marking shall at least include the following information:

- Manufacturer name: **Fiberdur**
- Product name and type: **EP** or **Navicon EP**
- Pressure rating
- Temperature rating

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.

Certificate Retention/Renewal Survey

The scope of the Retention/Renewal Survey 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.

Survey to be performed after two (2) years (Certificate Retention Survey) and at renewal after four (4) years (Certificate Renewal Survey).

The main elements of the survey are:

- Ensure that **Type Approval documentation** is available.
- Review design, materials, production process, and performance with respect to possible changes, in order to ensure compliance with **Type Approval documentation** and/or referenced material specifications.
- Ensure traceability between manufacturer's product marking and the DNV Type Approval Certificate.

END OF CERTIFICATE