Certificate No:
TAK00001W7

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Plastic Piping System, Fibre Reinforced Thermosetting

with type designation(s)
250, 250-C, 250-F, 250-CF

Issued to
Shandong North Ocean New Material Technology Co., Ltd.
Dezhou, **China**

is found to comply with
DNV rules for classification – Ships Pt.4 Ch.6 Piping systems
DNV-OS-D101 – Marine and machinery systems and equipment, Edition July 2021
DNV class programme DNV-CP-0070 – Type approval – Fibre reinforced thermosetting plastic piping systems

Application :

External pressure rating: 0.21MPa
Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Issued at **Hamburg** on **2022-08-22**
This Certificate is valid until **2027-08-21**.
DNV local station: **Qingdao NB & CMC**

Approval Engineer: **Hagen Markus**

for **DNV**

Olaf Drews
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

Filament Wound Fibre Reinforced Thermosetting Epoxy Resin Pipe and Fittings
Conductive and Non – Conductive.

Type overview

Type designation	Product property
250	250psi = 1.6MPa
C	Electrical conductive
F	Fire endurance resistant L3 – non-conductive
CF	Both electrical conductive and Fire endurance resistant L3.

Types	Nominal Diameter DN	Nominal Pressure PN	External pressure resistance
250, 250-C, 250-F, 250-CF	40 - 1000	1.6MPa	0.21MPa

Size range and wall thickness of pipes[1]

Outside diameter (O.D.) of the pipes based on structural wall thickness in mm (excl. internal liner[2] or outer coating)

Nominal Diameter DN	Structural Wall Thickness mm	O.D.[3] mm	Nominal Diameter DN	Structural Wall Thickness mm	OD mm
40	2.5	45.0	400	9.8	420.0
50	2.5	55.0	450	11.0	472.0
65	2.5	70.0	500	12.3	525.0
80	2.5	85.0	550	12.5	575
100	3.6	107.0	600	14.9	630.0
125	3.6	132.0	650	16.0	682.0
150	3.6	157.0	700	18.2	736.0
200	5.0	210.0	750	19.5	789
250	6.5	263.0	800	20.9	842.0
300	7.8	316.0	900	23.5	947
350	8.5	367	1000	26.4	1053.0

Note
1 Reference document “Marine engineering and ship pipeline product schedule”
2 Pipes and fittings used for exhaust gas scrubber systems are provided with 0.5mm liner
3 O.D. may vary due to production tolerance of wall thicknes by 10% and pipes with liner

Standard fittings

Elbows (45°, 90°), tee, concentric reducer, double O-Ring expansion joint (up to DN500).

Joining methods

Bonded connection, Key lock bonded connection (up to DN500), Flange connection.

Application/Limitation

The GRE piping systems specified in this type approval certificate are type approved for application in piping systems of pipe class III as listed in “Table 1- Fire endurance requirements matrix” of the DNV Rules Pt.4, Ch.6, Section 2.
Approved installation locations are 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 and for installation in gas hazardous area.

For installation on Offshore units the requirements specified in the applicable DNV GL rules for classification of Offshore units (RU-OU) are to be observed.

Permissible working pressure and temperature range

Nominal pressure PN	Permissible working pressure at elevated media temperatures			
16 bar	up to 60°C	70°C	80°C	90°C
	16 bar	15 bar	13,5 bar	11 bar

Extent of Type Tests applicable to piping system dependent on application

Fire endurance Level

Fire Endurance tests according to IMO Resolution A.753 (18), Appendix 2 has been successfully tested on the following joining methods.

Test level	Type of system	Type of connection	Approved size range O.D.
L3	250-F, 250-FC	Bonding connection[1] 	≥ DN150

Notes
1 Curing agent (methyltetrahydrophthalic anhydride, MTHPA).

Flame spread

Surface flame spread characteristics has been tested on type 250-F acc. to FTP Code Annex 1, Part 5 – Surface flammability.

Smoke and toxicity

The GRE piping system has been tested acc. to FTP Code Annex 1, Part 2 – Smoke generation and toxicity.

Electrical conductivity

The 250 and 250-F system (non-conductive) is limited for installation in non-gas hazardous areas.

Type 250-C and 250-FC (conductive) piping system is approved for installation in gas hazardous areas.
Conductivity test is to be carried out after installation of piping system on board ship.

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.

Design and installation specification for piping systems

For the design and installation of piping systems the following documents are to be observed:
- “Installation Manual for Marine and Offshore Platform GRE Pipe”
- “ Production work instructions”
- “GRE pipe introduction”

In addition, the DNV Rules Pt.4, Ch.6 – Section 10 – Para. 4 Installation of Plastic Piping Systems are to be observed.

Bulkhead penetration

General requirements

When plastic pipes pass through watertight bulkheads or decks, the watertight integrity of the bulkhead or deck is to be maintained, that means penetration of GRP pipes without external pressure capability is not approved.

When plastic pipes pass through 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 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.

Type Tests carried out

- Internal pressure short term test
- Internal pressure term test at room temperature
- External pressure ASTM D2924, Fig 2 - Procedure B
- External load CP-070
- Electrical conductivity ASTM D257, ASTM F1173
- Impact resistance ASTMD2444, Load deformation ASTM D2412
- Bonding Procedure Qualification test ASTMD1598/ASTMD2992
- HDT test (Load deformation test) acc. to GB/T1634.3-2004
- Aging test acc. to ISO 4892-3: 2006 - Cycle 1
- Axial tensile strength ASTM D2105-14, External load test,
- Fire endurance test L3
- FTP Code Annex 1
  Part 2–Smoke generation and toxicity
  Part 5 – Surface flammability (flame spread).

Production Testing

Each batch shall be subjected to product tests according to “GRE Pipe Product Quality Plan”, 2020-09-12.

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		Shandong North Ocean New Material Technology Co.,Ltd.
Type designation / material of which the pipe or fitting is made		GRE Type:□250 □250-C □250-F □250-CF
Size / dimensions		DN80
Type of joining method		Bounded
Nominal design pressure PN	internal	1.6MPa
	external	0.35MPa
Working pressure at max. service temperature	internal	60°C/1.6MPa 90°C/1.1MPa
Conductive / non-conductive		Conductive
Fire endurance level		L3
Date of fabrication and / or serial number		2020-07-02 / SDNO200501

Note
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”.

Type Approval documentation

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessments.
Refer to the Class Programme DNV-CP-0338, Sec.4.

To check the validity of this certificate, please look it up in www.approvalfinder.dnv.com
END OF CERTIFICATE