

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Plastic Piping System, Fibre Reinforced Thermosetting**with type designation(s)
HS10/10C, HS16/16C

Issued to

Zhoushan Huasu Marine Fittings Co., Ltd.
Zhoushan, 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 :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.**Issued at **Hamburg** on **2022-01-05**This Certificate is valid until **2027-01-04**.for **DNV GL**DNV GL local station: **Ningbo FIS**Approval Engineer: **Hagen Markus**

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 GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") 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.



Job Id: **262.1-033622-1**
Certificate No: **TAK00001ZA**

Product description

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

References

- GRE Pipe Design Manual Ref. No.: HS-SJ-01, Version:C/0
- Application documents of Marine-Offshore GRE Pipes and fittings – HS/AD-DNVGL-202001, Vers. C

Type overview

Type designation	Design properties	Size range	Nominal internal pressure PN	Nominal external pressure
HS10	Non-conductive	DN25 – DN1200	1.0MPa	0.5MPa
HS10C	Conductive			
HS16	Non-conductive		1.6MPa	
HS16C	Conductive			

Size range and wall thickness of pipes¹

HS10, HS10C – 1.0MPa

Nominal Diameter DN	Inner Diameter mm	Outer Diameter mm	Structural Wall Thickness ² mm	Nominal Diameter DN	Inner Diameter mm	Outer Diameter mm	Structural Wall Thickness mm
25	25	35	4.3	450	435	459	11.4
40	40	50	4.3	500	485	511	12.3
50	50	60	4.3	550	532	560	13.3
65	65	75	4.3	600	580	610	14.4
80	80	90	4.3	650	632	665	15.6
100	100	110	4.3	700	682	717	16.8
125	125	136	4.9	750	732	770	18.4
150	150	161	5	800	782	822	19.5
200	200	214	6.1	900	880	926	22.3
250	250	266	7.3	1000	980	1031	24.7
300	300	320	9.1	1100	1075	1131	27.2
350	350	371	9.7	1200	1175	1236	29.9
400	400	422	10.5				

Notes

¹ Reference - Application documents of Marine-Offshore GRE Pipes and fittings – HS/AD-DNVGL-202001, Vers. C

² Structural wall thickness in mm (excl. internal liner 0.5mm and top layer 0.2mm)

HS16, HS16C – 1.6MPa

Nominal Diameter DN	Inner Diameter mm	Outer Diameter mm	Structural Wall Thickness ² mm	Nominal Diameter DN	Inner Diameter mm	Outer Diameter mm	Structural Wall Thickness mm
25	25	35	4.3	450	435	460	12.0
40	40	50	4.3	500	485	512	12.8
50	50	60	4.3	550	532	561	13.7
65	65	75	4.3	600	580	612	15.1
80	80	90	4.3	650	632	666	16.3
100	100	110	4.3	700	682	718	17.4
125	125	136	4.9	750	732	772	19.2
150	150	161	5	800	782	824	20.2
200	200	214	6.4	900	880	927	23
250	250	267	7.8	1000	980	1032	25.4
300	300	321	9.8	1100	1075	1132	27.9
350	350	373	10.9	1200	1175	1239	31.3
400	400	425	11.8				

Notes

¹ Reference GRE Pipe Design Manual – Ref. No.: HS-SJ-01, Version B/0

² Structural wall thickness in mm (excl. internal liner 0.5mm and top layer 0.2mm)

Standard fittings

Elbows (60°, 90°, 45°, 30°, 22.5°), Equal Tee, GRE Reducing Tee, GRE Coupling (taper bonded joint), Concentric and ECC Reducer, GRE Flanges.

Wall thickness of all fittings refer to GRE Pipe Design Manual – Ref. No.: HS-SJ-01, Version B/0

Joining methods

Adhesive bell & spigot, Lamination connection, Flange connections.

Application/Limitation

The GRE piping systems are type approved for application in piping systems 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.

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.

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Permissible working pressure and temperature range¹

Piping System	Permissible working pressure bar							
	-40°C to 30°C	40°C	50°C	60°C	70°C	80°C	90°C	95°C
HS10/HS10-C	10	10	10	10	9,5	8,5	7	6
HS16/HS16-C	16	16	16	16	15	13,5	11	9,5

Note

¹ Reference DNV CP-070 Table 2

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 connection	Flame protection	Approved size range O.D.
L3	GRE coupling adhesive bell and spigot (cone jointed)	Not applicable	DN25 up to DN150
	Adhesive bell and spigot (cone jointed)		>150 up to DN1200

Flame spread

Surface flame spread characteristics has been tested 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

Piping system	Electrically conductive	
	outside	inside
HS10, HS16	no	no
HSC10-C, HS16-C	yes	yes

The GRE piping system of type HS10, HS16 are not approved for installation in gas hazardous areas or conveying non-conductive fluids, e.g. refined oil products and distillates.

For installation in gas hazardous areas or conveying non-conductive fluids, the piping systems of type HSC10-C or HSC16-C are to be used.

Where conductive piping is required, the resistance per unit length of the pipe, bends, elbows, fabricated branch pieces etc., should not exceed 105 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 10⁶ 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.

Design and installation specification for piping systems

For the design and installation of piping systems the following documents are to be observed:

- "GRE Pipe Design Manual – HS-SJ-01, Version C/0"
- "GRP/GRE Pipe Installation Manual -HS-GY-02"

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

Bulkhead 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.

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 acc. to ASTM D1599, B
- Internal pressure long-term tests acc. to ASTM D2992, Procedure B
- Internal pressure 1.000h test at 95°C acc. to ASTM F1173
- External pressure ASTM D2924, Fig 2- Procedure B
- External load acc. to CP-070
- Electrical conductivity CP-070, 3.3.4b, ASTM D257
- Bonding Procedure Qualification test ASTMD1598/ASTMD2992, HDT test, ISO 75-2:2013
- Axial tensile strength ASTM D2105-14
- HDT Test, ISO 75-2:2013 Method A
- Liquid absorption, ISO62:2208
- Ageing, ASTM D4329:2005
- Chemical resistance, ASTM C581-20
- Bonding Procedure Qualification test, ASTMD1598, 2992
- Fire endurance test L3
- FTP Code Annex 1, Part 2–Smoke generation and toxicity
- FTP Code , Annex 1, Part 5 – Surface flammability (flame spread).

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Type Approval documentation

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Production Testing

Each batch shall be subjected to product tests according to "QUALITY CONTROL PLAN".

Marking of product

To ensure traceability 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		HS Zhoushan Huasu Marine Fittings Co. Ltd.
Size / dimensions		DN80
Type designation / material of which the pipe or fitting is made		HS10-C
Nominal design pressure PN	internal	1.0MPa
	external	0.57MPa
Working pressure at max. service temperature	internal	93°C
Conductive / non-conductive		conductive
Traceability final product to production by "Product No."		C18A0603-03

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".

Periodical assessment

For retention of the Type Approval, a DNV 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 <https://approvalfinder.dnv.com>

END OF CERTIFICATE