



# Type Approval Certificate

[ Thermoplastic Pipes, Fittings ]

**Initial Approval** 9 March 2023  
**Manufacturer** GF Hakan Plastik  
 Organized Industrial Zone, Gazi Osman Pasa Mah. 3. St. No:11-13 59500 Cerkezkoy /TEKIRDAG, Turkiye  
**Product Description** +GF+ AQUASYSTEM, PP-R Pipes and Fittings

" See Appendix 1 "

**Approval Condition** " See Appendix 1 "

**THIS IS TO CERTIFY** that the above-mentioned product has been approved in accordance with the relevant requirement of this Society's Rules and / or of the recognized standards as follows.

Pt 5, Annex 5-6 of the Rules for the Classification of Steel Ships and Ch 3, Sec 16 of Guidance for Approval of Manufacturing Process and Type Approval, Etc.

This Certificate is valid until 8 March 2028

Issued at Busan, Korea on 9 March 2023



This certificate is signed electronically in accordance with IMO FAL.5/Circ.39/Rev.2. Validation and authentication of the certificate can be confirmed from "<http://e-cert.krs.co.kr>" by using the tracking No(ME23009761373) and certificate No.(IST48177-PE001).



**KOREAN REGISTER**

*General Manager of  
Marine & Ocean Equipment Team*

- Note :**
1. This certificate will be valid subject to complying with the approval conditions described on the certificate and/or on the Rules of this Society.
  2. This certificate will be invalid from the expiry date aforementioned unless the extension or renewal has been granted to the applicant or the manufacturer.
  3. Any significant modifications or changes in design or construction to the above product without approval from this Society will render this certificate invalid.
  4. Should the specified rules, regulations or standards be amended during the validity of this certificate, the product is to be re-approved by this Society in accordance with the requirements as amended.

## Product Description and/or Approval Condition

Date of Issue : 9 March 2023

### A. Product Description

#### 1. Product Specification

- 1) Product : Thermoplastic pipe, fittings and joints
- 2) Model : +GF+ Aquasystem PP-R, PP-R Glass Fiber
- 3) Raw Materials : Borealis Polypropylene RA130E, PP-R (Random polypropylene)  
Specification
- 4) Intended for : Fresh & sea water
- 5) Outside diameter : DN 20, 25, 32, 40, 50, 63, 75, 90, 110, 125, 140, 160, 200
- 6) Internal pressure: PN 10, 16, 20
- 7) External pressure : 2.1 bar (PN10), 3.2bar (PN16), 3.9bar (PN20) (Collapse resistant)
- 8) Operating temperature : 0 ~ 70°C (For shorter periods up to 95°C)
- 9) Joint type : Socket fusion welding, socket, electrofusion welding, Threaded
- 10) Fittings : Elbow, end cap, coupler, reducer, socket, valve, tee, union,  
(DN 20 ~ 160) clamp, cap, reducing tee, cross, connection, manifold
- 11) Wall thickness for each diameter of pipes  
(1) Pipes – SDR11 (PN10) ;

##### Outside diameters, minimum wall thickness

OD (mm) :	20	25	32	40	50	63	75	90
t (mm) :	1.9	2.3	2.9	3.7	4.6	5.8	6.8	8.2
OD (mm) :	110	125	140	160	200			
t (mm) :	10.0	11.4	12.7	14.6	18.2			

- (2) Pipes – SDR7.4 (PN16) ;

##### Outside diameters, minimum wall thickness

OD (mm) :	20	25	32	40	50	63	75	90
t (mm) :	2.8	3.5	4.4	5.5	6.9	8.6	10.3	12.3
OD (mm) :	110	125	140	160	200			
t (mm) :	15.1	17.1	19.2	21.9	27.4			

- (3) Pipes – SDR6 (PN20) ;

##### Outside diameters, minimum wall thickness

OD (mm) :	20	25	32	40	50	63	75	90
t (mm) :	3.4	4.2	5.4	6.7	8.3	10.5	12.5	15.0
OD (mm) :	110	125	140	160	200			
t (mm) :	18.3	20.8	23.3	26.6	33.2			

#### 2. Approved Drawings and Documents

- 1) Drawing list No. 130827375 Approved on 27 February 2023.
- 2) Technical data and product catalog Approved on 27 February 2023.

#### 3. Test Reports, etc.

- 1) GF hakan test report-pipe for mass flow rate, short/long term pressure and impact resistance dated on 24 June 2020
- 2) GF hakan test report-fitting for mass flow rate and short/long term pressure dated on 23 June 2020
- 3) GF hakan test report-red.tee1 for long term pressure dated on 20 April 2021
- 4) GF hakan test report-red.tee2 for short term pressure dated on 13 April 2021
- 5) GF hakan test report-valve for pressure test dated on 02 February 2022
- 6) Ceis report No. PLA-0107/19-1 for axial strength, internal pressure, impact resistance and opacity dated on 21 March 2019 ~ 30 May 2019
- 7) Exova test report No. 2017-1536 for flame spread test ASTM D635 dated on 30 May 2017
- 8) TSE report No. AB-0001-T/491590/10-19, ISO 15874-3 dated on 01 August 2019 ~ 01 October 2019

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- 9) TSE report No. AB-0001-T/618808/07-21 for smoke and toxicity test dated on 31 May 2021 ~ 05 July 2021
- 10) SKZ Report No. RA4441.223483.22 for Dimension, Long-term pressure and material properties dated on 08 April 2022 ~ 20 May 2022

### B. Approval Condition

#### 1. Application & Limitation

- 1) The plastic pipes may be used for Class III piping system. Proposals for the use of plastic pipes in Class I and Class II piping system will be specially considered.
- 2) The plastic piping system is type approved for application in piping systems as listed in "Table 1- Fire endurance requirements matrix" of Part 5, Appendix 5-6 of Rules for the Classification of Steel Ships, where "0" is specified.  
Relevant footnotes in the Table 1 are to be observed.
- 3) The piping system is not tested with respect to Fire Endurance characteristics.
- 4) The material is not considered electrically conductive and therefore cannot be used in hazardous areas, or with non-conductive fluids.
- 5) Where plastic pipes pass through watertight bulkheads or decks, the watertight integrity and strength integrity of the bulkhead or deck is to be maintained using Pipe Penetration method approved by the Society.
- 6) Maximum allowable pressure to be reduced as a function of operating temperature when service temperature is above 20°C.
- 7) The products are tested with respect to Low Flame Spread performance in accordance with ASTM D635 (accepted as an alternative to IMO Resolution A.653(16)).
- 8) The installation of plastic pipes is to be in accordance with the KR Rules and the manufacturer's instruction.

#### 2. Individual Product Cert. and Drawing Approval Requirement

- 1) Individual Product Certification is required for the Class II piping systems.
- 2) Individual Product Certification is not required for Class III piping systems.
- 3) Tests as below shall be performed after installation on board
  - Piping systems for essential services are to be subjected to a test pressure not less than 1.5 times the design pressure or 0.4 MPa whichever is greater.
  - Piping systems for non-essential services are to be checked for leakage under operational conditions.

#### 3. Marking

- 1) The products are to be marked with at least the following items:
  - Manufacturer's name or logo
  - Material/type designation
  - Nominal diameter, Pressure rating, Temperature rating
  - Date of manufacture

#### 4. Others

- Nil

< End of Certificate >