



Type Approval Certificate

[Ballast Water Management System]

Initial Approval 31 January 2020

Manufacturer Panasia Co., Ltd.
55, Mieumsandan-3ro, Gangseo-Gu, Busan, Rep. of Korea

Product Description Ballast Water Management System(Name of BWMS : GloEn-Patrol 2.0)

Treatment sequence:

- Ballast Water Uptake: Filter and UV disinfection
- Ballast Water Discharge: UV disinfection

" 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.

Resolution MEPC.300(72) - Code for Approval of Ballast Water Management Systems,
Part 9 Rules for the Classification of Steel Ships and Guidance of Approval of Manufacturing process
and Type Approval, Etc.

This Certificate is valid until 30 January 2030

Issued at Gamcheon, Korea on 26 February 2025



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(ME25009959056) and certificate No.(GCH04454-BT002).



KOREAN REGISTER

*General Manager of
Gamcheon Branch Office*

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

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A. Product Description

1. Product Specification

- 1) System Description (Type: GloEn-Patrol 2.0)
The GloEn-Patrol 2.0 is a ballast water management system. The treatment sequence of GloEn-Patrol 2.0 under ballast water uptake mode is filtration and UV disinfection and UV disinfection mode is operated at the discharge mode without filtration
- 2) General Specification
 - Capacity : 50 ~ 6000 m³/h
 - Operation Performance :
 - a) UV Intensity Lower Limit in marine or brackish water at full flow : 70 mW/cm²
 - b) UV Intensity Lower Limit in fresh water at full flow : 90 mW/cm²
 - c) UV Intensity Lower Limit in all salinities at half flow : 60 mW/cm²
 - Holding Time : N/A
- 3) Software Version : V3.30.
V3.30.1(Using HMI TP1200 from SIEMENS)

4) Model Line-up

Model	TRC(m ³ /h)	Filter	UV Unit(number of lamps)
GloEn-P50	50	PF50	PU50 (2)
GloEn-P150 (-Ex)	150	PF250	PU250 (6)
GloEn-P250 (-Ex)	250	PF250	PU250 (8)
GloEn-P300 (-Ex)	300	PF500	PU250 (12)
GloEn-P350 (-Ex)	350	PF500	PU250 (12)
GloEn-P500 (-Ex)	500	PF500	PU500 (18)
GloEn-P700 (-Ex)	700	PF750	PU500 (24)
GloEn-P750 (-Ex)	750	PF750	PU1000 (22)
GloEn-P750-1 (-Ex)			PU250 (8) + PU500 (18)
GloEn-P800 (-Ex)	800	PF900	PU1000 (22)
GloEn-P800-1 (Ex)		PF500 x 2	PU250 (12) + PU500 (18)
GloEn-P900 (-Ex)	900	PF900	PU1000 (22)
GloEn-P900-1 (-Ex)		PF500 x 2	PU500 (18) x 2
GloEn-P1000 (-Ex)	1000	PF1200	PU1000 (22)
GloEn-P1000-1 (-Ex)		PF500 x 2	PU500 (18) x 2
GloEn-P1200 (-Ex)	1200	PF1200	PU1250 (26)
GloEn-P1200-1 (-Ex)		PF750 x 2	PU500 (24) x 2
GloEn-P1500 (-Ex)	1500	PF1500	PU1500 (32)
GloEn-P1500-1 (-Ex)		PF500 x 3	PU500 (18) x 3
GloEn-P2000 (-Ex)	2000	PF2000	PU1000 (22) x 2
GloEn-P2000-1 (-Ex)		PF750 x 3	PU500 (24) x 3

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GloEn-P2500(-Ex)	2500	PF2500	PU1250 (26) x 2
GloEn-P2500-1(-Ex)			PU500 (24) x 4
GloEn-P3000(-Ex)	3000	PF3000	PU1500 (32) x 2
GloEn-P3000-1(-Ex)			PU500 (18) x 6
GloEn-P3500(-Ex)	3500	PF1200 x 3	PU1250 (26) x 3
GloEn-P4000(-Ex)	4000	PF1500 x 3	PU1500 (32) x 3
GloEn-P4500(-Ex)	4500	PF1500 x 3	PU1500 (32) x 3
GloEn-P5000(-Ex)	5000	PF2500 x 2	PU1250 (26) x 4
GloEn-P6000(-Ex)	6000	PF3000 x 2	PU1500 (32) x 4

* TRC: Treatment Rated Capacity(m³/hr)

* The model names of Ex-models are expressed with a suffix "-Ex" to the normal type.

5) Filter (PF)

- Minimum Filter Inlet Pressure : 1.0 bar
- Maximum Working Pressure : 10 bar
- Differential Pressure Triggering Backflushing : 0.1 bar

6) Control & Monitoring Equipment

Model	Component Name	Manufacturer
PCP-8W PCP-8S PCP-14S	Control Panel	PANASIA Co., Ltd.
PBP-7XEB PBP-10XEB PBP-14XEB PBP-20XEB	UV Power Supply Panel	PANASIA Co., Ltd.
PRP	Repeat Panel for remote	PANASIA Co., Ltd.
SUV20.2 Y2 C	UV Intensity Transmitter	IL Metronic

2. Approved Drawings and Documents

1) Reviewed Documents

- Bill of Material Doc. No. PAD-USCG-01 Rev.G, dated 2019-02-28
- BWMS All Model Drawing and Detail Drawings of all main components, Doc. No. PAD-USCG-02 Rev.D, dated 2019-08-05
- GloEn-Patrol Ballast System P&ID Doc. No. PAD-USCG-03 Rev.H, dated 2019-02-28
- Electrical Wiring Diagram Doc. No. PAD-USCG-05 Rev.D, dated 2019-02-28
- GloEn-Patrol Ballast System Classification by installation type of Filter & UV Unit, Doc. No. PAD-KR-A6, dated 2020-01-20
- Software Design Doc. No. SDD-10-001 Rev.3.30, dated 2019-02-28
- Software Design Doc. No. SDD-10-001 Rev.3.30.1, dated 2019-02-28

3. Test Reports, etc.

1) Land-Based Testing Plan & Report

- Test Quality Assurance Plan GloEn-P250 BWMS issued by Golden Bear Facility, dated 2015-10-23
- Biological Efficacy performance evaluation of Ballast Water Management System GloEn-Patrol in land-based test(Test Plan) issued by DHI Denmark, dated 2017-03-20
- Final Land-based Ballast Water Management Report According to USCG Final Rule - Panasia GloEn Patrol-250 BWMS issued by Golden Bear Facility, dated 2017-12-19

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- Biological Efficacy performance evaluation of Ballast Water Management System GloEn-Patrol land-based test issued by DHI Denmark, dated 2019-03-04
- 2) Shipboard Testing Plan & Report
 - Biological Efficacy performance evaluation of Ballast Water Management System GloEn-Patrol in shipboard test(Test Plan) issued by DHI Denmark, dated 2016-09-23
 - Biological Efficacy performance evaluation of Ballast Water Management System GloEn-Patrol in shipboard test issued by DHI Denmark, dated 2018-03-28
- 3) Environment Test Reports
 - Summary for Environmental Testing Doc. No. STA-R16-0001 issued by SGS Korea, dated 2017-12-21
 - Summary for Environmental Testing Doc. No. STA-R18-0001 issued by SGS Korea, dated 2018-03-12
 - Test Report No. KOMERI-0314-14T2271 issued by KOMERI, dated 2014-11-18
 - Test Report No. KOMERI-0602-14T2272 issued by KOMERI, dated 2014-11-18
 - Test Report No. KOMERI-0311-14T2273 issued by KOMERI, dated 2014-11-18
 - Test Report No. SGS-E15-0095 issued by SGS Korea, dated 2015-11-06
 - Test Report No. SGS-R15-2279-EN00 issued by SGS Korea, dated 2015-12-24
 - Test Report No. SGS-E15-0097 issued by SGS Korea, dated 2015-11-06
 - Test Report No. SGS-R15-2280-EN00 issued by SGS Korea, dated 2015-12-24
 - Test Report No. SGS-R15-2292-EN01 issued by SGS Korea, dated 2016-01-06
 - Test Report No. SGS-R15-2293-EN01 issued by SGS Korea, dated 2016-01-06
 - Test Report No. SGS-E19-0050 issued by SGS Korea, dated 2019-07-08
 - Test Report No. SGS-E19-0049 issued by SGS Korea, dated 2019-07-08
 - Test Report No. SGS-R19-1719-EN00 issued by SGS Korea, dated 2019-07-29
 - Test Report No. SGS-R19-1720-EN00 issued by SGS Korea, dated 2019-07-29
 - Test Report No. SGS-R19-1736-EN00 issued by SGS Korea, dated 2019-07-30
 - Test Report No. SGS-R19-1737-EN00 issued by SGS Korea, dated 2019-07-30
 - Test Report No. SGS-E19-0058 issued by SGS Korea, dated 2019-08-05
 - Test Report No. SGS-E19-0057 issued by SGS Korea, dated 2019-08-05
 - Test Report No. F690501-RF-EMH001259 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001260 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001265 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001266 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001272 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001273 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001281 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001282 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001294 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001295 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001309 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001310 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001314 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001315 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001346 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001347 by SGS Korea, dated 2021-06-23
 - Test Report No. F690501-RF-EMH001377 by SGS Korea, dated 2021-06-23
- 4) Simulation Tests have been performed on 06 Nov., 2015 witnessed by DNVGL's Surveyor.
- 5) Other Documents
 - Instruction Manual for GloEn-Patrol 2.0 Doc. No. PAD-USCG-07 Rev.Q
 - HAZARD and OPERABILITY STUDY(HAZOP) Report No. 3388328/R1 Rev.A
 - GloEn-Patrol Functional Specification Doc. No. PAR-USCG-02 Rev.G, dated 2019-02-28
 - Performance analysis of UV sterilizer and design support of optimal layout for BWTS issued by KOMERI, dated 2015-07-23
 - Performance analysis of UV sterilizer about transmittance changes and elbow pipe issued by KOMERI, dated 2015-11-20
 - Analysis on irradiation of UV Reactor(55% of Transmittance) issued by KOMERI, dated 2016-02-19
 - Analysis on irradiation of UV Reactor issued by KOMERI, dated 2018-02-27
 - Mathematical Calculation for Filter Doc. No. PAD-TP-06 Rev.1.1

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B. Approval Condition

1. Application & Limitation

- 1) This certificate is issued on the basis of the test reports and the documentation type-approved by Norway Administration (Date: 16 August, 2019 / Certificate No : TAP00001VN).
- 2) Degree of protection shall be complied with Rule Pt.6 Ch.1 Sec.2 201.2. (5).
- 3) The manufacturer is to inform this Society of all kinds of revisions of the equipment including software. If the changes are recognized to affect functionality of the approved equipment, type test to confirm the reliability of the revised equipment may be performed in the presence of our surveyor.
- 4) Unless specifically directed by the Administration, this approval should not be interpreted as a replacement for approval from the flag Administration.
- 5) This certificate will be automatically revoked when the type approval certificate issued by Norway Administration is not valid.
- 6) If there are any amendments to performance requirements of IMO(International Maritime Organization) or Administrations, the product is to be re-approved in accordance with the requirements as amended.
- 7) The above models may be installed on board in parallel, provided that the ultimate functioning and effectiveness of the system on board a ship of the type and size for which the equipment will be certified will not be adversely affected.
- 8) Explosion-proof certification by a notified/recognized certification body is not covered by this certificate. Ratings and special condition for safe use in hazardous areas are to be obtained from the relevant valid Ex-certificate.
- 9) Equipment covered by this Type Approval certificates has been tested according to requirements of IACS UR E10 Rev.7.

2. Individual Product Cert. and Drawing Approval Requirement

- 1) Individual product certification is required.
- 2) In case where the BWMS is installed on board, the documents for individual vessel are to be approved by the Society. The documents to be submitted are including but not limited to the followings:
 - Ballast Piping Diagram
 - Electrical Schematic Drawings of BWMS
 - Operation and Maintenance Manual (if required by Administration)
 - Any other documents deemed necessary by the Society and/or Administration

3. Marking

- 1) The product or packing is to be marked with the manufacturer's name and type designation on a suitable position.

4. Others

N/A

< End of Certificate >