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CR Classification Society

Certificate No. 940-24-061

Date 19 December 2024

型式認可證書
TYPE APPROVAL CERTIFICATE

This is to certify that the undernoted product(s) has/have been approved by CR Classification Society in accordance with the requirements given in *CR Guidelines for Survey of Products for Marine Use* as an approved type for use in ships classed or intended to be classed with the Society.

Manufacturer : PANASIA CO., LTD.

Approved Product(s): Ballast Water Management System
GloEn-Patrol 2.0 and GloEn-Patrol 2.01
(model range P50-P6000)

This certificate is valid **23 February 2030**

CHIEN-HUA HUANG

中國驗船中心 總驗船師

Chief Surveyor
CR Classification Society

(See next page for further details regarding the approval.)



UTN: 940-24-061

This certificate evidences that the type of the products of the Manufacturer has been assessed to be in compliance with the specified CR Rules or Guidelines and to be capable of providing the listed products. This Certificate may be cancelled by CR Classification Society if the applicant makes any changes or modifications relevant to the approval, which have not been notified to, and agreed in writing with the Society. Any person not a party to the contract pursuant to which this document is delivered may not assert a claim against CR Classification Society for any liability arising out of errors or omissions which may contained in said documents, or for errors of judgment, fault or negligence committed by personnel of the Society.

Please refer to the CR website for the latest status of this approval: www.crclass.org/aw0/aw0.htm

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Name of Manufacturer:

PANASIA Co., Ltd,

Address of Manufacturer:

55, Mieumsandan 3-ro, Gangseo-gu, Busan, Republic of Korea.

Product Specification:

Ballast Water Management System
GloEn-Patrol 2.0 or GloEn-Patrol 2.01

Model Name:

GloEn-P50	GloEn-P150	GloEn-P250	GloEn-P300
GloEn-P350	GloEn-P500	GloEn-P700	GloEn-P750
GloEn-P750-1	GloEn-P800	GloEn-P800-1	GloEn-P900
GloEn-P900-1	GloEn-P1000	GloEn-P1000-1	GloEn-P1200
GloEn-P1200-1	GloEn-P1500	GloEn-P1500-1	GloEn-P2000
GloEn-P2000-1	GloEn-P2500	GloEn-P2500-1	GloEn-P3000
GloEn-P3000-1	GloEn-P3500	GloEn-P4000	GloEn-P4500
GloEn-P5000	GloEn-P6000		
GloEn-P150-Ex	GloEn-P250-Ex	GloEn-P300-Ex	GloEn-P350-Ex
GloEn-P500-Ex	GloEn-P700-Ex	GloEn-P750-Ex	GloEn-P750-1-Ex
GloEn-P800-Ex	GloEn-P800-1-Ex	GloEn-P900-Ex	GloEn-P900-1-Ex
GloEn-P1000-Ex	GloEn-P1000-1-Ex	GloEn-P1200-Ex	GloEn-P1200-1-Ex
GloEn-P1500-Ex	GloEn-P1500-1-Ex	GloEn-P2000-Ex	GloEn-P2000-1-Ex
GloEn-P2500-Ex	GloEn-P2500-1-Ex	GloEn-P3000-Ex	GloEn-P3000-1-Ex
GloEn-P3500-Ex	GloEn-P4000-Ex	GloEn-P4500-Ex	GloEn-P5000-Ex
GloEn-P6000-Ex			

Treatment sequence:

1. Ballast water uptake: Filtration and disinfection by UV treatment
2. Ballast water discharge: UV treatment

The BWMS applied a PANASIA 50µm filtration unit to remove organisms and suspended matter. The organisms and suspended matter collected by the filtration unit are returned to the ambient water by an auto back-flushing function.

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Treatment Rated Capacity (TRC) of the BWMS:
Non explosion proof type

Model Name	TRC	UV Unit (Quantity of Lamps)	Filter Unit
GloEn-P50	50m ³ /h	PU50 (2)	PF50
GloEn-P150	150m ³ /h	PU250(6)	PF250
GloEn-P250	250m ³ /h	PU250 (8)	
GloEn-P300	300m ³ /h	PU250 (12)	PF500
GloEn-P350	350m ³ /h		
GloEn-P500	500m ³ /h	PU500 (18)	PF750
GloEn-P700	700m ³ /h	PU500 (24)	
GloEn-P750	750m ³ /h	PU1000 (22)	
GloEn-P750-1	750m ³ /h	PU250 (8) + PU500 (18)	
GloEn-P800	800m ³ /h	PU1000 (22)	PF900
GloEn-P800-1	800m ³ /h	PU250 (12) + PU500 (18)	2 x PF500
GloEn-P900	900m ³ /h	PU1000 (22)	PF900
GloEn-P900-1	900m ³ /h	2 x PU500 (18)	2 x PF500
GloEn-P1000	1,000m ³ /h	PU1000 (22)	PF1200
GloEn-P1000-1	1,000m ³ /h	2 x PU500 (18)	2 x PF500
GloEn-P1200	1,200m ³ /h	PU1250 (26)	PF1200
GloEn-P1200-1	1,200m ³ /h	2 x PU500 (24)	2 x PF750
GloEn-P1500	1,500m ³ /h	PU1500 (32)	PF1500
GloEn-P1500-1	1,500m ³ /h	3 x PU500 (18)	3 x PF500
GloEn-P2000	2,000m ³ /h	2 x PU1000 (22)	PF2000
GloEn-P2000-1	2,000m ³ /h	3 x PU500 (24)	3 x PF750
GloEn-P2500	2,500m ³ /h	2 x PU1250 (26)	PF2500
GloEn-P2500-1	2,500m ³ /h	4 x PU500 (24)	PF2500
GloEn-P3000	3,000m ³ /h	2 x PU1500 (32)	PF3000
GloEn-P3000-1	3,000m ³ /h	6 x PU500 (18)	PF3000
GloEn-P3500	3,500m ³ /h	3 x PU1250 (26)	3 x PF1200
GloEn-P4000	4,000m ³ /h	3 x PU1500 (32)	3 x PF1500
GloEn-P4500	4,500m ³ /h	3 x PU1500 (32)	3 x PF1500
GloEn-P5000	5,000m ³ /h	4 x PU1250 (26)	2 x PF2500
GloEn-P6000	6,000m ³ /h	4 x PU1500 (32)	2 x PF3000

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Explosion proof type

Model Name	TRC	UV Unit (Quantity of Lamps)	Filter Unit
GloEn-P150-Ex	150m ³ /h	PU250(6)-Ex	PF250
GloEn-P250-Ex	250m ³ /h	PU250 (8)-Ex	
GloEn-P300-Ex	300m ³ /h	PU250 (12)-Ex	PF500
GloEn-P350-Ex	350m ³ /h		
GloEn-P500-Ex	500m ³ /h	PU500 (18)-Ex	PF750
GloEn-P700-Ex	700m ³ /h	PU500 (24)-Ex	
GloEn-P750-Ex	750m ³ /h	PU1000 (22)-Ex	
GloEn-P750-1-Ex	750m ³ /h	PU250 (8) + PU500 (18)-Ex	PF900
GloEn-P800-Ex	800m ³ /h	PU1000 (22)-Ex	
GloEn-P800-1-Ex	800m ³ /h	PU250 (12) + PU500 (18)-Ex	2 x PF500
GloEn-P900-Ex	900m ³ /h	PU1000 (22)-Ex	PF900
GloEn-P900-1-Ex	900m ³ /h	2 x PU500 (18)-Ex	2 x PF500
GloEn-P1000-Ex	1,000m ³ /h	PU1000 (22)-Ex	PF1200
GloEn-P1000-1-Ex	1,000m ³ /h	2 x PU500 (18)-Ex	2 x PF500
GloEn-P1200-Ex	1,200m ³ /h	PU1250 (26)-Ex	PF1200
GloEn-P1200-1-Ex	1,200m ³ /h	2 x PU500 (24)-Ex	2 x PF750
GloEn-P1500-Ex	1,500m ³ /h	PU1500 (32)-Ex	PF1500
GloEn-P1500-1-Ex	1,500m ³ /h	3 x PU500 (18)-Ex	3 x PF500
GloEn-P2000-Ex	2,000m ³ /h	2 x PU1000 (22) -Ex	PF2000
GloEn-P2000-1-Ex	2,000m ³ /h	3 x PU500 (24)-Ex	3 x PF750
GloEn-P2500-Ex	2,500m ³ /h	2 x PU1250 (26)-Ex	PF2500
GloEn-P2500-1-Ex	2,500m ³ /h	4 x PU500 (24)-Ex	PF2500
GloEn-P3000-Ex	3,000m ³ /h	2 x PU1500 (32)-Ex	PF3000
GloEn-P3000-1-Ex	3,000m ³ /h	6 x PU500 (18)-Ex	PF3000
GloEn-P3500-Ex	3,500m ³ /h	3 x PU1250 (26)-Ex	3 x PF1200
GloEn-P4000-Ex	4,000m ³ /h	3 x PU1500 (32)-Ex	3 x PF1500
GloEn-P4500-Ex	4,500m ³ /h	3 x PU1500 (32)-Ex	3 x PF1500
GloEn-P5000-Ex	5,000m ³ /h	4 x PU1250 (26)-Ex	2 x PF2500
GloEn-P6000-Ex	6,000m ³ /h	4 x PU1500 (32)-Ex	2 x PF3000

Note: This table shows general system configuration as recommended by the manufacturer. A GloEN-Patrol 2.0 and GloEN-Patrol 2.01 BWMS model may be used with a larger filter unit than the specified above. The maximum TRC of any configuration is determined by either the maximum capacity of the UV unit or the filter unit, whichever is smaller.

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Dosing:

The system applies an UV dose controlled by flow and UV intensity. The low limit for UV intensity at full flow or half flow treatment is listed below. The system also includes UV-lamp power optimization control at higher UV intensity.

BWMS model	BWMS model size (m ³ /h)	UV intensity lower limit in marine or brackish water at full flow (TRC) ¹⁾	UV intensity lower limit in fresh water at full flow (TRC) ²⁾	UV intensity lower limit in all salinities at half flow (50% TRC) ³⁾
GloEn-Patrol 2.0	50-6000	70 mW/cm ²	90 mW/cm ²	60 mW/cm ²
GloEn-Patrol 2.01		90 mW/cm ²	90 mW/cm ²	60 mW/cm ²

- 1) UV intensity set point for full flow treatment in marine and brackish water, 70 mW/cm² corresponding to an UV transmission of approximately 55-60%; 90 mW/cm² corresponding to an UV transmission of 70%. Below this UV intensity limit, ballast water will automatically be treated with a reduced flow of 50% TRC.
- 2) UV intensity set point for full flow treatment in fresh water, corresponding to an UV transmission of approximately 70%. Below this UV intensity limit, ballast water will be treated with a reduced flow of 50% TRC.
- 3) UV intensity set point for lower limit, corresponding to an UV transmission of approximately 50-55%. Below this UV intensity limit, the ballast water is not treated in accordance with this certificate and alarm will be triggered at ≤59 mW/cm².

Electrical and electric components:

Component Name	Manufacturer	Model(s)
BWMS Control panel	PANASIA	PCP-8W PCP-8S PCP-14S
UV power supply panel	PANASIA	PBP-7XEB PBP-10XEB PBP-14XEB PBP-20XEB
Repeat panel for remote control	PANASIA	PRP
UV intensity transmitter	IL Metronic	SUV20.2 Y2 C
Flow meter	ABB	FEP311 FEP315 (Ex-proof Type)

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Requirements:

1. CR Guidelines for Survey of Products for Marine Use.
2. IMO Resolution MEPC. 300(72).

Test Reports:

1. IMO Type Approval Certificate No. TAP00001VN Rev.10 issued by DNV-GL on behalf of the Norwegian Maritime Authority is valid until August 15, 2029.
2. Biological Efficacy Performance Evaluation of Ballast Water Management System Glo-En Patrol in Land-based Test – Supplementary Study, Revised Final Report No. 11820902 dated March 04, 2019 issued by DHI Denmark.
3. Biological Efficacy Performance Evaluation of Ballast Water Management System Glo-En Patrol in Shipboard Test, Final Report No. 11818185 dated March 28, 2018 issued by DHI Denmark.
4. Biological Efficacy Performance Evaluation of Ballast Water Management System Glo-En Patrol in Land-based Test, Report No. 11820902 dated March 27, 2018 issued by DHI Denmark.
5. CFD Validation in Land-based Test Facility of GloEn-Patrol Ballast Management System – Pilot Test, Report No. 11821043_Final V.2 dated February 13, 2018 issued by DHI Denmark.
6. Final Land-based Ballast Water Management Report According to USCG Final Rule, dated December 19, 2017, issued by Golden Bear Facility, California.
7. Test Quality Assurance Plan GloEn P250 BWMS land-based test plan, dated October 23, 2015, issued by Golden Bear Facility, California.
8. Summary for Environmental Testing – Filter Unit (4 components), UV Unit, Control Panel, UV Power Supply Panel for USCG Component Testing of BWMS, Document No. STA-R16-0001 Rev.2 dated December 21, 2017 issued by SGS Korea Co., Ltd.
9. Summary for Environmental Testing – Flow Switch for USCG Component Testing of BWMS, Document No. STA-R18-0001 dated March 12, 2018 issued by SGS Korea Co., Ltd.
10. Summary for Environmental Testing – Flow Switch for USCG Component Testing of BWMS, Document No. STA-R18-0001 Rev.0 dated March 12, 2018 issued by SGS Korea Co., Ltd.
11. Test Plan – Biological Efficacy Performance Evaluation of Ballast Water Management System Glo-En Patrol in Land-based Test, dated March 20, 2017 issued by DHI Denmark.

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12. Test Plan – Biological Efficacy Performance Evaluation of PANASIA GloEn Patrol Ballast Water Management Systems in Shipboard Test, dated September 23, 2016 issued by DHI Denmark.
13. Report on additional environmental testing for IMO TA, PU1000 Environmental test, KOMERI-P-24-03(9) dated January 16, 2014 issued by KOMERI.
14. Report on additional environmental testing for IMO TA, P1250, P1500 Environmental test reports, dated December 24, 2015/January 06, 2016 issued by SGS.
15. Test Report for PANASIA PCP-14S, Report No. SGS-R18-1520-EN00, dated August 08, 2018 issued by SGS Korea Co., Ltd. Dongtan Laboratory.
16. Test Report for conductivity sensor and transmitter, Report No. SGS-R19-1719-EN00 and 1720-EN00, dated July 29, 2019 issued by SGS Korea Co., Ltd. Dongtan Laboratory.
17. Test Report for conductivity sensor and transmitter, Report No. SGS-R19-1736-EN00 and 1737-EN00, dated July 30, 2019 issued by SGS Korea Co., Ltd. Dongtan Laboratory.
18. Test Report for conductivity sensor and transmitter, Report No. SGS-E19-0049 and 0050, dated July 08, 2019 issued by SGS Korea Co., Ltd. Gunpo Laboratory.
19. Test Report for conductivity sensor and transmitter, Report No. SGS-E19-0057 and 0058, dated August 05, 2019 issued by SGS Korea Co., Ltd. Gunpo Laboratory.

Document & Drawings:

Drawing Number	Rev.	Date	Description	Pages
PAD-GPC-D00	A-1	2023.09.01	Instruction Manual	193
PAD-GPC-D01	A-1	2023.09.01	Bill of Material	155
PAD-GPC-D02	A-1	2023.09.01	Drawings of Components	114
PAD-GPC-D03	A-1	2023.02.01	General Arrangement Drawings	20
PAD-GPC-D04	A	2023.02.01	Piping and Instrumentation Diagram (P&ID)	65
PAD-GPC- D04	A	2023.02.01	Electrical Wiring Diagram	98

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Application / Limitation:

1. Treatment Rated Capacity (TRC) range from 50m³/h up to 6,000m³/h. The BWMS controls the flow rate in the ballast water line by using a flow control valve to ensure that flow rates are kept within the TRC of a specific model. UV Reactors and filter units can be installed in parallel configuration for higher flow rates.
2. Suitable for installation in non-hazardous area and in hazardous area according to the Society's rules. Application for use in hazardous areas is to be approved in each case in compliance with the Society's rules.
The Ex system requires:
 - a. Certified safe-type electrical equipment, explosion-proof enclosure according to the Society's rules is required in zone 0, zone 1 or zone 2 areas where explosive gas or vapor atmospheres may occur corresponding to groups [IIA-IIB-IIC] and to temperature class [T1-T2-T3-T4-T5-T6] as defined in IEC classification depending on Ex marking.
 - b. The degree of protection for electrical equipment in relation to the location of the Glo-En Patrol 2.0 and GloEn-Patrol 2.01 BWMS on board will be to the Society surveyor's satisfaction.
 - c. The system must be installed, operated and maintained according to a selected standard used to eliminate the risk of explosion.
3. Where the Glo-En Patrol 2.0 and GloEn-Patrol 2.01 BWMS is to serve a ballast water system that is located in a hazardous (non-safe) area (e.g. segregated ballast water system of an Oil or Chemical Carrier) the following additional requirements apply:
 - a. Arrangements are to be provided to prevent the passage of hazardous vapors and/or hazardous liquids back into the safe area via the interconnected piping. These arrangements are subject to approval.
 - b. Any electrical equipment or components installed in the hazardous area is to be suitable for the service and location.
4. The GloEn-Patrol 2.0 BWMS is type approved with the system control software versions: V3.31. or V3.31.1 (when using alternative HMI TP1200 from SIEMENS) while GloEn-Patrol 2.01 BWMS is type approved with the system control software versions: V3.202. or V3.3202.1 (when using alternative HMI TP1200 from SIEMENS). Any changes to the software are to be recorded as long as the system is in use onboard. Major changes in the software, as defined in the Software Quality Procedure Document PAR-SQ-01 (Rev A), require approval. Testing of the application functions of the revised software may be required.

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5. Limit Values and Environmental Conditions of the GloEn-Patrol 2.0 and GloEn-Patrol 2.01 BWMS:

Treatment System Maximum Working Pressure	10 bar
Ambient Air Temperature	0°C ~ 55°C
Ballast Water Temperature Range	-2°C ~ 40°C
Salinity Criteria	0 ~ 37 PSU

GloEn-Patrol 2.0 and GloEn-Patrol 2.01 BWMS have demonstrated performance to the discharge standard with a minimum holding time between uptake and discharge of 24 hours in land-based testing. UV treatment is instant and does not require any hold time in a ballast tank to render organisms inviable. Therefore, holding time is not found to be a limiting condition for the ballast water management system.

6. Installation surveys and commissioning procedures are to be witnessed by the Society surveyor for each on-board installation of a Type Approved GloEn-Patrol 2.0 and GloEn-Patrol 2.01 BWMS.

7. Periodical assessment:

The intermediate audit is to be carried out within 3 months before or after the second anniversary date or within 3 months before or after the third anniversary date of the certificate. The intermediate audit will include, but not limited to, confirmation of operation of the manufacturer's quality system, compliance of production procedures with the technical documents accepted at the time of type approval, purchase control of raw materials, components and parts, use of survey marks and approved products logos, languages required to be used in nameplates and operation instructions, product quality feedback. In case where the intermediate audit items mentioned above are not practical, considerations will be given by the Society on a case-by-case basis.

- The End -