



Marine & Offshore

Certificate number: 60630/B0 BV

File number: .

Product code: 9086I

This certificate is not valid when presented without the full attached schedule
composed of 7 sections

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TYPE APPROVAL CERTIFICATE

This certificate is issued to

PANASIA CO., LTD.
BUSAN - KOREA (REPUBLIC OF)

for the type of product

BALLAST WATER MANAGEMENT SYSTEM
GloEn-Patrol 2.0 Ballast Water Management System (BWMS)

Requirements:

- BUREAU VERITAS Rules for the Classification of Steel Ships
- IMO Res. MEPC.300(72) - Code for Approval of Ballast Water Management Systems

This certificate is issued to attest that Bureau Veritas Marine & Offshore did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 18 Apr 2027

For Bureau Veritas Marine & Offshore,

At BV PUSAN, on 18 Apr 2022,

Chang-Uk HONG

This certificate was created electronically and is valid without signature



This certificate remains valid until the date stated above, unless cancelled or revoked, provided the conditions indicated in the subsequent page(s) are complied with and the product remains satisfactory in service. This certificate will not be valid if the applicant makes any changes or modifications to the approved product, which have not been notified to, and agreed in writing with Bureau Veritas Marine & Offshore. Should the specified regulations or standards be amended during the validity of this certificate, the product(s) is/are to be re-approved prior to it/they being placed on board vessels to which the amended regulations or standards apply. This certificate is issued within the scope of the General Conditions of Bureau Veritas Marine & Offshore available on the internet site www.veristar.com. Any Person not a party to the contract pursuant to which this document is delivered may not assert a claim against Bureau Veritas Marine & Offshore for any liability arising out of errors or omissions which may be contained in said document, or for errors of judgement, fault or negligence committed by personnel of the Society or of its Agents in establishment or issuance of this document, and in connection with any activities for which it may provide.

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BV Mod. Ad.E 530 June 2017

This certificate consists of 6 page(s)

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

GloEn-Patrol™ 2.0 Ballast Water Treatment System (BWTS)

BWTS Models:

- **Standard Models:** GloEn-P50, GloEn-P150, GloEn-P250, GloEn-P300, GloEn-P350, GloEn-P500, GloEn-P700, GloEn-P750, GloEn-P800, GloEn-P900, GloEn-P1000, GloEn-P1200, GloEn-P1500, GloEn-P2000, GloEn-P2500, GloEn-P3000, GloEn-P3500, GloEn-P4000, GloEn-P4500, GloEn-P5000 & GloEn-P6000

- **IEC-Ex Models:** GloEn-P150-Ex, GloEn-P250-Ex, GloEn-P300-Ex, GloEn-P350-Ex, GloEn-P500-Ex, GloEn-P700-Ex, GloEn-P750-Ex, GloEn-P800-Ex, GloEn-P900-Ex, GloEn-P1000-Ex, GloEn-P1200-Ex, GloEn-P1500-Ex, GloEn-P2000-Ex, GloEn-P2500-Ex, GloEn-P3000-Ex, GloEn-P3500-Ex, GloEn-P4000-Ex, GloEn-P4500-Ex, GloEn-P5000-Ex & GloEn-P6000-Ex

Ballast Water Treatment Technology

- Consists of two treatment steps in order to comply with the IMO D2 standard : a) Mechanical Filtration unit by a 50 micron automatic backflushing filter, and b) Ultraviolet disinfection by a powerful UV system

- Main components : filter, UV unit, flow meter, control panel and power supply panel

- Control and monitoring made through a PLC and a touch-screen

List of major equipment and devices which are part of this approval

- Filter, UV Unit, Flow Meter, Control Panel and UV Power Supply Panel including PLC and Touch-screen

Technical Specifications as described by the manufacturer

Model	Capacity [m3/h]	Filter	UV Unit
GloEn-P50	50	PF50	PU50
GloEn-P250 (-Ex)	250	PF250	PU250
GloEn-P350 (-Ex)	350	PF500	PU250
GloEn-P700 (-Ex)	700	PF750	PU500
GloEn-P800 (-Ex)	800	PF900	PU1000
GloEn-P800-1 (-Ex)		PF500 x 2	PU250 + PU500
GloEn-P1000 (-Ex)	1,000	PF1200	PU1000
GloEn-P1000-1 (-Ex)		PF500 x 2	PU500 x 2
GloEn-P1500 (-Ex)	1,500	PF1500	PU1500
GloEn-P1500-1 (-Ex)		PF500 x 3	PU500 x 3
GloEn-P2500 (-Ex)	2,500	PF2500	PU500 x 4
GloEn-P2500-1 (-Ex)			PU1250 x 2
GloEn-P3500 (-Ex)	3,500	PF1200 x 3	PU1250 x 3
GloEn-P4500 (-Ex)	4,500	PF1500 x 3	PU1500 x 3
GloEn-P6000 (-Ex)	6,000	PF3000 x 2	PU1500 x 4

Model	Capacity [m3/h]	Filter	UV Unit
GloEn-P150 (-Ex)	150	PF250	PU250
GloEn-P300 (-Ex)	300	PF500	PU250
GloEn-P500 (-Ex)	500	PF500	PU500
GloEn-P750 (-Ex)	750	PF750	PU1000
GloEn-P750-1 (-Ex)			PU250 + PU500
GloEn-P900 (-Ex)	900	PF900	PU1000
GloEn-P900-1 (-Ex)		PF500 x 2	PU500 x 2
GloEn-P1200 (-Ex)	1,200	PF1200	PU1250
GloEn-P1200-1 (-Ex)		PF750 x 2	PU500 x 2
GloEn-P2000 (-Ex)	2,000	PF750 x 3	PU500 x 3
GloEn-P2000-1 (-Ex)		PF2000	PU1000 x 2
GloEn-P3000 (-Ex)	3,000	PF3000	PU500 x 6
GloEn-P3000-1 (-Ex)			PU1500 x 2
GloEn-P4000 (-Ex)	4,000	PF1500 x 3	PU1500 x 3
GloEn-P5000 (-Ex)	5,000	PF2500 x 2	PU1250 x 4

Technical Characteristics of Filter (50 µm screen, automatic back flushing)

Model	Size DN	Max. Flow [m3/h]	Model	Size DN	Max. Flow [m3/h]
PF50	80	50	PF250	200	250
PF500	250	500	PF750	300	750
PF900	350	900	PF1200	400	1,200
PF1500	450	1,500	PF2000	500	2,000
PF2500	600	3,000	PF3000	600	3,000

Maximum working pressure: 10kg/cm² (PF50, PF250, PF500, PF750, PF900, PF1000, PF1200, PF1500, PF2000, PF2500, PF3000)

Working pressure for back flushing: 1 bar

Differential pressure for backflushing: 0.45 bar

Material Filter housing: SS400 / SUS 316L

Mounting: horizontal and vertical

Technical Characteristics of UV unit

Capacity [m3/h]	50 (PU50), 150~350 (PU250), 500~700 (PU500), 1,000 (PU1000), 1,250 (PU1250), 1,500 (PU1500)
Type of lamps	Medium pressure UV lamp
Number of lamps per unit	2 (PU50), 6/8/12 (PU250), 18/24 (PU500), 22 (PU1000), 26 (PU1250), 32 (PU1500)
UV Intensity	Above 600 W/m2
Lamp Power	4.0 kW

Material of UV chamber: SUS 316L; Mounting of chambers: horizontal

Technical Characteristics of Electrical & Electronic components

Component	Models
Control Panel	PCP-8W PCP-8S PCP-14S
UV Power Supply Panel	PBP-7XEB PBP-10XEB PBP-14XEB PBP-20XEB
Repeat Panel	PRP
UV Intensity Transmitter	SUV20.2 Y2 C

Software version

- V 3.30 (standard) / V3.30.1 (associated with HMI TP1200 - SIEMENS)

2. DOCUMENTS AND DRAWINGS

- Piping and Instrumentation Diagram N° PAD-USCG-03 Rev. H dated 28/02/2019
- General Arrangement Drawings N° PAD-USCG-02 Rev. D dated 05/08/2019
- Drawings of components N° PAD-USCG-02 Rev. D dated 05/08/2019. Including technical data sheets of the following components: filter unit, UV unit, limit switch, transmitters, control panel, UV power supply panel, flow meter).
- Electrical wiring diagram N° PAD-USCG-05 Rev. D dated 28/02/2019. Including circuit diagram of control panel, wiring diagrams, assembly drawings of control/power supply panel.
- Bill of Materials N° PAD-USCG-01 Rev. H dated 23/11/2020
- OMSM N° PAD-USCG-07 Rev. Q dated 05/07/2019
- Functional Specifications Manual N° PAR-USCG-02 Rev. G dated 28/02/2019
- CFD report N° 1 dated 23/07/2015: Performance analysis of UV sterilizer and design support of optimal layout for BWTS (60% and 75% UV transmittance) by KOMERI .
- CFD report N° 2 dated 20/11/2015: Performance analysis of UV sterilizer about transmittance changes and elbow pipe by KOMERI.
- CFD report N° 3 dated 19/02/2016: Analysis on irradiation of UV reactor (55% of transmittance) by KOMERI, .
- CFD report N° 4 dated 27/02/2018: Analysis on irradiation of UV reactor (full flow at UVT=70% and half flow at UVT=55%) by KOMERI.
- Mathematical Calculation Sheet for Filter N° PAD-TP-06 Rev. 1.1
- UV Lamp emission test report N° PA-ET-201905 dated 11/06/2019

No departure from the above documents shall be made without the prior consent of the Society named on this certificate. The manufacturer must inform the Society of any modification or changes to these documents and drawings.

3. TEST REPORTS

3.1 IMO Type Approval Certificate N° TAP00001VN Rev. 4 dated 15/06/2021 issued by DNV-GL on behalf of the Norwegian Maritime Authority. The Type Approval Certificate was issued for the Treatment Rated Capacity (TRC): 50 m3/h to 6000m3/h.

Note: TRC is defined as net flow out of the treatment system, a net flow exceeding the given value implies that the ballast water is not treated in accordance with this certificate

3.2 Tests carried out according to the Code for Approval of Ballast Water Management Systems (BWMS Code), Res. MEPC279(70).

Land-based tests, DHI (Denmark) & Golden Bear Facility (US). All land based tests were performed with a GloEn-P250 BWMS, Capacity of 250m3/h, consisting of one filter unit PF250 with 50 µm screen and one UV Unit PU250(8).

- Final Land-Based test report dated 19/12/2017

- Additional Land-Based test report N° 11820902 dated 04/03/2019 (including SDL report)

3.3 **Shipboard tests**, DHI (Denmark). All shipboard tests were performed with a GloEn-1000 BWMS BWMS, Capacity of 1000m3/h, consisting of one filter unit PF1200 with 50 µm screen and one UV Unit PU1000(22)

- Biological efficacy performance evaluation N° 11818185 dated 28/03/2018

3.4 Environmental type tests

- N° STA-R16-0001 Rev. 2 dated 21/12/2017 (major components)

- N° STA-R18-0001 Rev. 0 dated 26/03/2019 (flow switch)

- N° SGS-R18-1520-EN00 dated July 2018 (BWMS Control Panel)

- N° SGS-E19-0057 & N° SGS-E19-0049 dated July 2019, N° SGS-R19-1720-EN00 & N° SGS-R19-1737-EN00 dated 30/07/2019 (transmitter)

- N° SGS-E19-0058 & N° SGS-E19-0050 dated July 2019, N° SGS-R19-1719-EN00 & N° SGS-R19-1736-EN00 dated 30/07/2019 (conductivity sensor)

- Test report N° F690501-RF-EMH000333 dated 23/04/2020 (Conductivity Sensor)

- KOMERI-0311-19T3379 dated 09/08/2019 (Pressure Transmitter)

- Test report N° SGS-E19-0057 (Transmitter)

- Test report N° SGS-E19-0058 dated 05/08/2019 (Conductivity Sensor)

- Test reports N° SGS-RF-EMH001259, N° SGS-RF-EMH001260, N° SGS-RF-EMH001265, N° SGS-RF-EMH001266, N° SGS-RF-EMH001272, N° SGS-RF-EMH001273, N° SGS-RF-EMH001281, N° SGS-RF-EMH001282, N° SGS-RF-EMH001294, N° SGS-RF-EMH001295, N° SGS-RF-EMH001309, N° SGS-RF-EMH001310, N° SGS-RF-EMH001314, N° SGS-RF-EMH001315, N° SGS-RF-EMH001325, N° SGS-RF-EMH001346, N° SGS-RF-EMH001347, N° SGS-RF-EMH001377 dated 23/06/2021: additional tests according to IACS UR E10 Rev. 7

4. APPLICATION / LIMITATION

4.1 This certificate is issued for the Ballast Water Treatment System **GloEn-Patrol™ 2.0** as far as the classification is concerned. This installation onboard a ship is subject to approval by the Flag Administration of the ship.

4.2 - Intended for Ballast Water Treatment systems:

- Ballast Water Uptake: Filtration + UV disinfection

- Ballast Water Discharge: UV disinfection

4.3 The system can be used in the following common ambient and water condition:

Water Temperature range	0 / 35°C
Ambient Air Temperature	0 / 55°C
Relative Humidity	max. 90%
Water Salinity range	No limitation

4.4 Operating conditions for **GloEn-Patrol™ 2.0 BWMS**:

Treatment Rated Capacity	50 - 6000m3/h
Treatment System max. Water Pressure	max. 10 bar
Power Consumption	8 - 450 kW depending on system size
Minimum holding time	No limitation

4.5 - The treatment rated capacity of the BWMS is not be less than the operated flow rate of the ballast pump. Several UV chambers are installed in parallel depending on models.

4.6 Minimum UV Intensity

UV-reactor size (m3/h)	UV intensity lower limit * (marine & brackish water)	UV intensity lower limit ** (fresh water)	UV intensity lower limit at half flow *** (all salinities)
50 - 6000	700W/m2	900W/m2	600W/m2

* UV intensity below lower limit, corresponding to an UV transmission of approx. 55-60% for marine & brackish water, implies that the ballast water will be automatically treated with a reduced flow of 50%.

** UV intensity below lower limit, corresponding to an UV transmission of approx. 70% for fresh water, implies that the ballast water will be automatically treated with a reduced flow of 50%.

*** UV intensity below lower limit, corresponding to an UV transmission of approx. 50-55%, implies that the ballast water is not treated in accordance with this certificate.

4.7 - Bureau Veritas Environmental Category, EC Code: 31 acc. to the Society's Rules Pt C, Ch 2, Sec 1 [table 2].

4.8 - Ex-certification is not covered by this certificate. Application for use in hazardous areas to be approved in each case.

Certified safe-type electrical equipment, Ex enclosure acc. to the Society's rules are required in zone 1 or zone 2 areas where explosive gas or vapour atmospheres may occur corresponding to groups [I-IIA-IIB-IIC] and to temperature class [T1-T2-T3-T4-T5] as defined in IEC classification depending on Ex marking. The degree of protection for electrical equipment in relation to the location of the GloEn-Patrol System Ex on board will be to the Society surveyor's satisfaction. The system is to be installed, operated and maintained according to a selected standard used to eliminate the risk of explosion. All Ex certified components are to be listed in the GloEn-Patrol 2.0 component list.

4.9 - Installation surveys and commissioning procedures on board BV-classed ship: To be witnessed by the Society surveyor for each on-board installation of a Type Approved GloEn-Patrol 2.0 system. It shall be the duty of **PANASIA Co Ltd**'s customers to submit the following documents for approval to the Society for each installation intended for retrofits or new construction:

- On-board location of the BWMS unit (individual or skid-mounted);
- All connection details of interface towards ship's ballast piping systems;
- Layout of the system;
- Ballast stripping operations;
- Sensors, transmitters, automatic self-cleaning filter are to be type approved and subject to review by the Society;
- All associated control, alarm and monitoring equipment;
- Wiring diagrams and the cable specifications;
- Pipes with associated fittings, automatic self-cleaning filter, electrical equipment including control, sensors, safety devices and cables required to be type approved are to be in conformity with the applicable Society's Rules;
- Materials list;
- Arrangement and location of Ballast Water sampling ports.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 - The Ballast Water Management systems are to be supplied by **PANASIA CO., LTD.** in compliance with the type and the requirements described in this certificate. This type of product is within the category IBV of Bureau Veritas Rule Note NR320.

5.2 - **PANASIA CO., LTD.** has declared to **Bureau Veritas** that some components detailed in this certificate can be manufactured/assembled at his suppliers's production sites, but however always under his full responsibility and reliability.

5.3 - Production surveys requested for components:

a) Filters and Pressure Vessels are classified as Class 3 pressure vessels according to the Society's Rules Pt C, Ch 1, Sec 3 [table 2].

- Housings are to be hydraulically pressure tested to 1.5 times the design pressure under witnessing of a Society's surveyor;
- Work's certificate is to be provided for raw materials of shell assembly according to the Society's Rules [Class 3 vessels];
- Bureau Veritas certificate is required for final assembly according to the Society's Rules Pt C, Ch 1, Sec 3 [Class 3 vessels]

b) Electric and functional tests of Power and Control cabinets are to be performed to the surveyor satisfaction.

c) Production surveys for other components (class III piping and manifold, sensors, pumps, electrical cables...) are to be in compliance with the **PANASIA Co., Ltd**'s regime and Society's Rules.

d) When components (non-skid) are manufactured at supplier or subcontractor workshops, production surveys are to be carried out by the BV local surveyor in charge of the survey.

5.4 - Fabrication and welding requirements to comply with the Society's Rules Pt C, Ch 1, Sec 3 [4.11 Class 3 vessels]. Welding procedures and welding consumables are to be approved by the Society.

5.5 - A Bureau Veritas product certificate is required for the complete system. Factory acceptance tests records, including functional tests and electrical test are to be provided to the surveyor satisfaction.

5.6 - Functional tests of the system to be carried out after onboard installation as required by the IMO resolution MEPC.300(72).

5.7 - For information, **PANASIA CO., LTD.** has declared to Bureau Veritas the following production site:

PANASIA CO., LTD.
55, Mieumsandan3-ro, Gangseo-gu, Busan
Republic of Korea

6. MARKING OF PRODUCT

Each Ballast Water Management System shall be marked with:

- Manufacturer's name or trade mark
- Type designation
- Serial number
- Capacity
- IEC Ex marking when required
- Society's brand as relevant

7. OTHERS

It is **PANASIA CO., LTD.**'s responsibility to inform shipbuilders or their sub-contractors of the proper methods of fitting, use and general maintenance of the approved equipment and the conditions of this approval.

This certificate supersedes the Type Approval Certificate N° 60630/A0 BV issued by the Society.

***** END OF CERTIFICATE *****