



CERTIFICATE NUMBER	21-2055302-1-PDA
EFFECTIVE DATE	20-Sep-2022
EXPIRY DATE	23-Feb-2026
ABS TECHNICAL OFFICE	Gdynia Engineering Department

CERTIFICATE OF Product Design Assessment

This is to certify that a representative of this Bureau did, at the request of

OPTIMARIN

located at

SJOVEIEN 34, , SANDNES, Norway, N-4315

assess design plans and data for the below listed product. This assessment is a representation by the Bureau as to the degree of compliance the design exhibits with applicable sections of the Rules. This assessment does not waive unit certification or classification procedures required by ABS Rules for products to be installed in ABS classed vessels or facilities. This certificate, by itself, does not reflect that the product is Type Approved. The scope and limitations of this assessment are detailed on the pages attached to this certificate.

Product: Ballast Water Treatment
Model: Optimarin Ballast System (OBS), Optimarin Ballast System Ex (OBS Ex)
Models 167/72BK3 – 3000/3100BK3, 167/65BK4-3000/2600BK4 and 167/87FX2 – 3000/3000FX2.
Endorsements:
Tier: 2 - PDA Issued

This Product Design Assessment (PDA) Certificate remains valid until 23/Feb/2026 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

American Bureau Of Shipping


Arkadiusz Pytkowski, Engineer/Consultant

NOTE: This certificate evidences compliance with one or more of the Rules, Guides, standards or other criteria of ABS or a statutory, industrial or manufacturer's standards. It is issued solely for the use of ABS, its committees, its clients or other authorized entities. Any significant changes to the aforementioned product without approval from ABS will result in this certificate becoming null and void. This certificate is governed by ABS Rules 1-1-A3/5.9 Terms and Conditions of the Request for Product Type Approval and Agreement (2010)

TERMS & CONDITIONS OF ABS DESIGN ASSESSMENT

1. AGREEMENT

Unless otherwise agreed in writing, all services rendered and certificates issued are governed by the terms and conditions of the "Request for Product Type Approval and Agreement" (the "Agreement") which are hereby incorporated by reference.

2. REPRESENTATIONS AS TO DESIGN ASSESSMENT

A certificate of design assessment represents that the product design meets the ABS, statutory, industrial or manufacturer's standard described on the reverse hereof and that the manufacturer has established a systematic quality monitoring system sufficient to show its capacity to consistently manufacture a product which meets the designated standards. ABS is not a substitute for the independent judgment of professional designers or engineers nor a substitute for the quality control procedures of constructors, steel makers, suppliers, manufacturers and vendors of marine structures, materials, machinery or equipment. ABS represents solely to the manufacturer or other client of ABS that it will use due diligence in developing Rules, Guides and standards and in surveying the plant as called for by ABS criteria for type approval.

3. SUSPENSION OF CERTIFICATION

Any of the following events will cause immediate suspension of the certificate of design assessment unless the change is submitted to ABS for a new review and audit.

- a) Redesign of the product or products covered by this certificate;
- b) Change in production methods;
- c) Substantial change in management organization;
- d) Substantial change in frequency or curriculum for personnel training;
- e) Refusing access to ABS personnel for periodic or annual audits;
- f) Failure to correct a non-compliance identified during an audit or in service;
- g) Failure to pay ABS fees.

4. VALIDITY

The validity, applicability and interpretation of a certificate issued under the terms of or in contemplation of ABS Type Approval are governed by the Rules, Guides and standards of American Bureau of Shipping which shall remain the sole judge thereof. Nothing contained in this certificate or in

any report issued in contemplation of this certificate shall be deemed to relieve any designer, builder, owner, manufacturer, seller, supplier, repairer, operator or other entity of any warranty express or implied, nor create any interest, right, claim or benefit in any third party. It is understood and agreed that nothing expressed herein is intended or shall be construed to give any person, firm or corporation other than the parties hereto, any right, remedy, or claim hereunder or under any of the provisions herein contained; all of the provisions hereof are for the sole and exclusive benefit of the parties hereto.

5. LIMITATION

ABS makes no representations beyond those contained herein and in the provisions of the Agreement regarding its reports, statements, plan review, surveys, certificates or other services.

6. HOLD HARMLESS

The party to whom this certificate is issued, and his assignee and successor in interest, agree to indemnify and hold harmless ABS from and against any and all claims, demands, lawsuits, or actions for damages, including legal fees, to persons or other legal entities and property, tangible, intangible, or otherwise which may be brought against ABS incidental to, arising out of or in connection with the work done, services performed or material to be furnished under this certificate, except for those claims caused solely and completely by the negligence of ABS, its agents, employees, officers, directors or subcontractors.

7. ARBITRATION

Any and all differences and disputes of whatsoever nature arising out of this agreement shall be put to arbitration in the City of New York pursuant to the laws relating to the arbitration there in force, before a board of three persons, consisting of one arbitrator to be appointed by ABS, one by Client, and one by the two so chosen. The decision of any two of the three on any point or points shall be final. Until such time as the arbitrators finally close the hearings either party shall have the right by written notice served on the arbitrators and on an officer of the other party to specify further disputes or difference under this Agreement for hearing and determination. The arbitration is to be conducted in accordance with the rules of the Society of Maritime Arbitrators, Inc. The arbitrators may grant any relief, other than punitive damages,

which they, or a majority of them, deem just and equitable and within the scope of the agreement of the parties, including, but not limited to, specific performance. Awards made in pursuance to this clause may include costs including a reasonable allowance for attorney's fees and judgment may be entered upon any award made hereunder in any court having jurisdiction. ABS and client hereby mutually waive any and all claims to punitive damages in any forum.

Client shall be required to notify ABS within thirty (30) days of the commencement of any arbitration between it and third parties which may concern ABS's work in connection with this Agreement and shall afford ABS an opportunity, at ABS's sole option, to participate in the arbitration.

8. TIME BAR TO LEGAL ACTION

Any statutes of limitation notwithstanding, Client expressly agrees for itself and its affiliated companies that its right to bring or to assert against ABS any and all claims, demands or proceedings whether in arbitration or otherwise shall be waived unless (a) notice is received by ABS within thirty (30) days after Client or its affiliates had notice of or should reasonably have been expected to have had notice of the basis for such claims; and (b) arbitration or legal proceedings, if any, based on such claims or demands of whatever nature are commenced within one (1) year of the date of such notice to ABS.

9. LIMITATION OF LIABILITY

The combined liability of American Bureau of Shipping, its officers, employees, agents or subcontractors for any loss, claim, or damage arising from negligent performance or non-performance of any services under this Agreement, of from breach of any implied or express warranty of workmanlike performance in connection with the services, or from any other reason, to any person, corporation, partnership, business entity, sovereign, country or nation, shall be limited to the greater of a) \$100,000 or b) an amount equal to ten times the sum actually paid for the services alleged to be deficient.

The limitation of liability may be increased up to an amount twenty-five times that sum paid for services upon receipt of Client's written request at or before the time of performance of service and upon payment by Client of an additional fee of \$10.00 for every \$1,000.00 increase in the limitation.

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Tier: 2 - PDA Issued

Product: Ballast Water Treatment

Model: Optimarin Ballast System (OBS), Optimarin Ballast System Ex (OBS Ex)
Models 167/72BK3 – 3000/3100BK3, 167/65BK4-3000/2600BK4 and 167/87FX2 –
3000/3000FX2.

Endorsements:

Intended Service:

The Optimarin Ballast Water Management System (BWMS) is based on filtration and UV-treatment. The Optimarin BWMS treatment process does not utilize any chemical or poisoning agents.

Description:

Ballast water treatment system. The treatment is based on filtration and UV-treatment.

Treatment sequence:

- Ballast water uptake: Filtration and UV treatment
- Ballast water discharge: UV treatment

OBS BWMS model designation: xxxx/yyyyBK3, xxxx/yyyyBK4 or xxxx/yyyyFX2 where xxxx designates the below listed UV model and yyyy the below listed filter model manufactured by Boll & Kirch (BK3 or BK4) or the filter series manufactured by Filtrex (FX2).

- UV models: 167, 334, 500, 667, 834, 1000, 1167, 1334, 1500, 1667, 1834, 2000, 2167, 2334, 2500, 2667, 2834 and 3000,
- BK3 filter models: 72, 94, 204, 378, 518, 614, 1274, 1384, 2040 and 3100,
- BK4 filter models: 65, 125, 220, 430, 770, 1000, 1350, 1900 and 2600,
- FX2 filter models: 87, 135, 190, 255, 340, 515, 770, 1040, 1500, 2100 and 3000

The OBS contains the following electrical components:

- Power Distribution Panel (PDP) that is used to distribute ship power to Optimarin cabinet.
- Control Panel (CP), which contains the Programmable Logic Controller (PLC) that controls and logs all executed operations in the OBS. A touch panel is used as a user interface for control, monitor and displaying the log of OBS. There are terminals for connecting Power Management System integration and terminals for connecting remote control of OBS.
- Filter Control Panel, which contains the terminals for connecting equipment and instrumentation related to the filter: Valves surrounding the filter, Stripping valves, Filter gear motor, Back flush pump, Filter signals, Flow, Pressure. Enclosure: IP 65, Power supply: 440VAC, 3-phase, from PDP.
- Sensor box, which contains terminals for connecting safety signals on the UV system: Temperature measurement, UV sensor.
- UV Power Cabinets that controls the ignition and power to one UV lamp. One cabinet is needed for each UV chamber. Each UV power cabinets provides power (up to 35kW) to one UV lamp. It also contains terminals for connecting the high voltage UV lamp. The UV lamp is located in a UV chamber designed for treatment of ballast water and is connected to the UV Power cabinet via suitable electrical cables.
- Sub-Control Panel is a “slave” panel to the CP. It is used to control and monitor OBS in the same matter as control panel, and the connection between the two panels is established using Ethernet cable.
- Terminal Box that is used to connect the UV lamp cable to the UV Power Cabinet. The UV lamp is delivered with 3-meter-long cables in each end. One box is required for each UV chamber.
- Interlock Panel that is used to connect feedback signal from valves and pumps that are outside of OBS.

Controls:

The OBS can be operated/controlled (Start ballasting / Start ballasting / Start deballasting / Start stripping / Open bypass) from two different locations: Local and remote.

- Local operation is defined by a ballast water operation where the OBS is started from the ‘Touch Panel’. This panel

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may be located in the vicinity of the OBS or somewhere else on the vessel.

· Remote operation works in the exact way as local. The only difference is that the status messages are replaced by a various set of indicators.

Rating:

Treatment Rated Capacity (TRC): 65 – 3000 m³/h (intake), 167 – 3000 m³/h (discharge)

Enclosures:

- Power Distribution Panel (PDP): IP 66
- Control Panel (CP): IP 65.
- Filter Control Panel: IP 65.
- UV Power Cabinets: IP 54.
- Sub-Control Panel: IP 65.
- Terminal Box: IP 66.
- Interlock Panel: IP 66.

Power Ratings: 440 VAC.

Maximum lamp output: 35kW @ 2150 VAC (nominal).

Maximum working pressure: 10 bar

Filters:

- BK3 (AquaBoll filter 6.18.3 series): 25 microns mesh.
- BK4 : 25 microns mesh.
- FX2 (Filtrex ACB filter series): 20 microns mesh.

UV Reactor - Minimum lower limit of UV intensity at IMO operation mode:

- at 24% of full flow: 150 W/m²
- at full flow: 400 W/m².

Service Restriction:

1. The TRCs of the designated OBS BWMS models during ballasting is limited to either on the TRC of the UV system or the TRC of the selected filter model, whichever is lowest. During deballasting, the TRC is limited to the TRC of the UV system only.
2. The minimum flow rate at which designated OBS BWMS model can be operated is the minimum flow rate of the selected filter model + (10m³/h x number of UV chambers).
3. The OBS 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.
4. UVI below lower limit implies that the ballast water is not treated in accordance with this certificate. The system includes a UV-lamp power optimization control based on measured UV-intensity. Lamp power can be reduced when UVI measures above 800 W/m². The system also has a USCG mode of operation which applies a higher UV dose.
5. Ex installations are to be approved in each case according to the Rules and Ex-Certification/Special Condition for Safe Use listed in valid Ex-certificate issued by a notified/recognized Certification Body. Please note that for U.S. Flagged Vessels, equipment certified under ATEX Directive does not comply with 46CFR 111.105-7(a), unless it has IECEx Conformity approval by a USCG accepted laboratory. Ex certification is not covered by this certificate.
6. See attachment for additional Service Restrictions.

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7. If the manufacturer or purchaser request an ABS Certificate for compliance with a specification or standard, the specification or standard, including inspection standards and tolerances, must be clearly defined.

Comments:

1. The Manufacturer has provided a declaration about the control of, or the lack of Asbestos in this product.
2. Please see attachment for detailed list of comments.

Notes/Drawing/Documentation:

Operation, maintenance and safety manual (OMSM), Template OMS for BK3, Rev.8, 2022-05-16
Operation, maintenance and safety manual (OMSM), Template OMS for BK3 Ex, Rev.8, 2022-05-16
Operation, maintenance and safety manual (OMSM), Template OMS for FX2, Rev.8, 2022-05-16
Operation, maintenance and safety manual (OMSM), Template OMS for FX2 EX, Rev.8, 2022-05-16
Flow Diagram, Dwg. No. 300000, Rev. 7, 2022-05-10
Flow Diagram EX, Dwg. No. 300000, Rev. 7, 2022-05-10
Flow Diagram (stripping with filter), Dwg. No. 300000, Rev. 7, 2022-05-10
Flow Diagram (stripping without filter), Dwg. No. 300000, Rev. 7, 2022-05-10
Electrical Wiring diagram with UV POWER CABINET TYPE ETA, Dwg. No. 500000, Rev. 6, 2022-05-10
Electrical Wiring diagram with UV POWER CABINET TYPE NED MK3, Dwg. No. 500000, Rev. 6, 2022-05-10
Electrical Wiring diagram UV POWER CABINET TYPE UVA, Dwg. No. 500000, Rev. 6, 2022-05-10
ABS Type Approval 17-GE1627572-PDA and 15-GE1430938-PDA for ACB filter series manufactured by Filtrex.
ABS Type Approval 18-1757595-1-PDA for AquaBoll filter 6.18.3 series manufactured by Boll & Kirch.
ABS Type Approval 20-2058808-1-PDA for UV chamber and manifolds.
OBS complete BOM, Rev3, 2022-05-22.

DNVGL Certificate No. TAP0000271 issued on behalf of Norwegian Maritime Authority for compliance with the BWMS Code.

USCG Certificate of Approval Number 162.060/1/3 dated February 25, 2019.

Biological test reports:

- NIVA, Land-based testing of OBS 334 Ballast Water Management system of Optimarin AS – Final Report, Report SNO 6921-2015, Final report v2.1, June 2016
- NIVA, Shipboard testing of the Ballast Water Management System OBS1000 of Optimarin AS, Report SNO 7063-2016, Final report v2.0, June 2016
- NIVA, Land-based testing of OBS 334 Ballast Water Management system of Optimarin AS – Final Report, Report SNO 7523-2020, Final report, August 2020
- DHI, Biological comparison tests of three filters manufactured by BollFilter in land-based test - Land-based test report, project 11824919, Final test report, 11 January 2021

Environmental test reports

- Applica EMC and Environmental testing of Gönheimer Elektronik GmbH Control unit F850S and power supply for Optimarin AS, Report 20226, Rev. 1
- Applica Technical Report Optimarin AS Environmental testing of Temperatures Switches, Report No. 21250 Rev 1
- Applica Technical Report Optimarin AS Environmental testing of Sensor Box +EXSB01 and temperature transmitter TR-34, Report No. 21356 Rev 0
- Applica Technical Report Optimarin AS Environmental testing, Report No. 20597 Rev 0
- Applica Technical Report Optimarin AS Environmental testing of Environmental testing of TB (Terminal Boxes) Report No. 20984 Rev 0
- Applica Technical Report Optimarin AS EMC and Environmental testing of new components to Optimarin BWMS, Report No. 30486 Rev 0
- Applica Technical Report, Optimarin AS EMC and Environmental testing of Optilink Panel 4G, Report No. 30732 Rev. 0
- Applica Technical Report, Optimarin AS Environmental testing of Lamp connection box, Report No. 30906 Rev. 1
- Applica Technical Report, Optimarin AS EMC and Environmental testing of Flow interlock panel, Report No.

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30972 Rev. 0

- Phoenix Technical Reports, Optimarin AS EMC and Environmental testing of Flow interlock panel, Report No. U211234E1, Rev. 0 Report No E211234E1 Rev. 0
- Treco Laboratory Test Report – Inclination test of X36B Tiny Cabinet, 22-04-26/Rev. 1

Commissioning procedure

- Class survey checklist for Optimarin Ballast System, Rev. 8 Template dated 2022-05-16

Terms of Validity:

This Product Design Assessment (PDA) Certificate remains valid until 23/Feb/2026 or until the Rules and/or Standards used in the assessment are revised or until there is a design modification warranting design reassessment (whichever occurs first).

Acceptance of product is limited to the "Intended Service" details prescribed in the certificate and as per applicable Rules and Standards.

This Certificate is valid for installation of the listed product on ABS units which exist or are under contract for construction on or previous to the effective date of the ABS Rules and standards applied at the time of PDA issuance. Use of the Product for non-ABS units is subject to agreement between the manufacturer and intended client.

STANDARDS

ABS Rules:

2022 Rules for Conditions of Classification: 1-1-4/7.7, 1-1-A3 and 1-1-A4, which covers the following:

2022 Rules for Building and Classing Marine Vessels: 4-6-2/3, 4-6-2/5, 4-8-3/1.7, 4-8-3/1.11, 4-9-3/5.1.1, 4-9-3/5.1.8, 4-9-3/7, 4-9-3/9, 4-9-3/11, 4-9-9/13.1, 4-9-9/ Table 1, Table 2.

2022 Guide for Ballast Water Treatment.

National:

NA

International:

IMO Resolution MEPC.300(72), Code for Approval of Ballast Water Management Systems (BWMS Code), adopted on 13 April 2018

Government:

NA

EUMED:

NA

OTHERS:

NA



Product Design Assessment (PDA) Certification Attachment for Listing

OPTIMARIN,
Sjoveien 34, Sandnes, Norway, N-4315

Ballast Water Treatment System

PDA Number: 21-2055302-1-PDA
Issuance date: 20-September-2022
Expiration date: 23-February-2026
Revision number: 1

LIST OF MODELS:

OBS BWMS model designation: xxxx/yyyyBK3 and xxxx/yyyyFX2, where xxxx designates the below listed UV model and yyyy the below listed filter model of either the filter series manufactured by Boll & Kirch (BK3 or BK4) or the filter series manufactured by Filtrex (FX2).

UV models: 167, 334, 500, 667, 834, 1000, 1167, 1334, 1500, 1667, 1834, 2000, 2167, 2334, 2500, 2667, 2834 and 3000

BK3 filter models: 72, 94, 204, 378, 518, 614, 1274, 1384, 2040 and 3100

BK4 filter models: 65, 125, 220, 430, 770, 1000, 1350, 1900 and 2600

FX2 filter models: 87, 135, 190, 255, 340, 515, 770, 1040, 1500, 2100 and 3000

An OBS BWMS model intended for installation in hazardous area are designated with the suffix Ex (e.g., xxxx/yyyyBK3Ex).

RATINGS:

The UV system is formed by several UV chambers installed in parallel configuration using specific manifolds with the TRCs as listed below. The TRC of the filter models, BK3 and FX2 are also listed in tables below.

Manifold model	Number of UV chambers	TRC [m3/h]
Type 1, DN150	1	167
Type 1, DN200	2	334
Type 1, DN250	3	500
Type 1, DN300	4	667
Type 1, DN300	5	834
Type 1, DN350	6	1000
Type 1, DN400	7	1167
Type 1, DN400	8	1334
Type 1, DN400	9	1500

Manifold model	Number of UV chambers	TRC [m3/h]
Type 2, DN200	2	334
Type 2, DN250	3	500
Type 2, DN300	4	667
Type 2, DN300	5	834
Type 2, DN350	6	1000
Type 2, DN400	7	1167
Type 2, DN400	8	1334
Type 2, DN400	9	1500
Type 2, DN500	10	1667



Type 1, DN500	10	1667
Type 1, DN500	11	1834
Type 1, DN500	12	2000
Type 1, DN500	13	2167
Type 1, DN500	14	2334
Type 1, DN500	15	2500

Type 2, DN500	11	1834
Type 2, DN500	12	2000
Type 2, DN500	13	2167
Type 2, DN500	14	2334
Type 2, DN500	15	2500
Type 2, DN500	16	2667
Type 2, DN600	17	2834
Type 2, DN600	18	3000

Filtrex ACB	Model designation	Flow range [m3/h]
ACB-906-100	87FX2	15 – 87
ACB-910-150	135FX2	25 – 135
ACB-915-150	190FX2	35 – 190
ACB-935-200	255FX2	35 – 255
ACB-945-200	340FX2	45 – 340
ACB-955-250	515FX2	50 – 515
ACB-985-300	770FX2	65 – 770
ACB-999-350	1040FX2	95 – 1040
ACB-9100-400	1500FX2	126 – 1500
ACB-9120-500	2100FX2	126 – 2100
ACB-9200-600	3000FX2	126 – 3000

Boll & Kirch 6.18.3 / AquaBoll	Model designation	Flow range [m3/h]
aquaBoll 273	72BK3	19-72
aquaBoll 324	94BK3	19-94
aquaBoll 356	204BK3	24-204
aquaBoll 419	378BK3	33-378
aquaBoll 521	518BK3	33-518
aquaBoll 600	614BK3	34-614
aquaBoll 750	1274BK3	50-1274
aquaBoll 900	1384BK3	47-1384
aquaBoll 1000	2040BK3	47-2040
aquaBoll 1100	3100BK3	69-3100

The minimum and maximum system operating pressure and the differential pressure triggering backflushing are listed below.

Filter Type	Minimum inlet pressure (back-pressure)	Differential pressure triggering backflushing	Maximum operating pressure
Filtrex Type ACB, FX2	1.5 bar	≥0.3 bar	10 bar
aquaBoll 6.18.3, BK3	1.5 bar	≥0.38 bar	10 bar

SERVICE RESTRICTIONS:

1. Where a vessel is fitted with a ballast water management system (BWMS) and the “BWT” or “BWT+” Notation is not being pursued, the installed BWMS is to comply with the requirements in Sections 4 and 5 of the ABS Ballast Water Treatment Guide and to be verified by an ABS Surveyor during installation. All plans and information are to be submitted to ABS Engineering Office for review of each individual application of this Ballast Water Management System (BWMS) onboard ABS Classed vessels and units to verify the service restrictions stated below and compliance with the requirements in the Rules and relevant Regulations.
2. Unit Certification is not required for the BWMS unless the BWT+ notation is assigned for a specific vessel. However, for any computer-based or PLC hardware of the BWMS, when BWT or BWT+ notation is assigned for a specific vessel, the tests in 4-9-3/11.9 of the ABS Marine Vessels Rules are to be witnessed by a Surveyor. In addition, the main components of a BWTS, as defined by ABS Guide for Ballast Water Treatment, section 1/7.1.2 (such as filters and UV chambers) which are subjected to



or rated at a pressure greater than 6.9 bars as defined in MVR 4-4-1/Table 1& Table 2, are required to be "Unit Certified" to the satisfaction of an ABS Surveyor for all installations.

3. The BWMS is being approved subject to the acceptance of the vessel's Flag Administration.
4. Temperature detector/switch is fitted to the UV chamber so that unsafe situations caused by possible breakdowns are prevented. When the liquid temperature exceeds 55°C, a shut down by the control system is initiated. In case of control system failure the system will be shut down when the temperature exceeds 70°C by a hardwired signal connected directly from the temperature detector/switch to the corresponding UV Power cabinet.
5. Based on the Safety Assessment identified by the requirements in 4/9.1.2 along with the guidance of IMO BWM.2/Circ.20 and the requirements of the IBC and IGC Codes where applicable, a suitable number of protective suits, gloves, boots, gas masks, hermetically sealed filters, etc. are to be located at appropriate locations in the vicinity of the BWMS.
6. An Interlock arrangement is to be provided such that the UV lamps are not energized while not in ballasting or deballasting operation to avoid the UV unit overheating and resulting in excessive surface temperatures.
7. The computer-based system has been assigned with a Category II systems classification on the basis of 4-9-3/7 of ABS Marine Vessels Rules. Accordingly, the development procedures, software quality plan and evidence of formal testing are to be maintained such that these could be made available to the Surveyor when requested. The following tests are to be specifically witnessed by the attending Surveyor in accordance with 4-9-3/Table 2, 3.6, 3.7 and 4.1, 4.2 of the ABS Marine Vessels Rules :(i) Fault Simulation and Factory Acceptance Test, (ii) On Board Complete System and On Board Integration Test.
8. Any significant modification to the software or hardware is to be submitted for approval. The performance test, after the modification, is to be witnessed by the Surveyor in accordance with 3.6, 3.7, and 5.4 of 4-9-3/Table 2 of the ABS Marine Vessels Rules as a Category II system. Software version records shall be available for the ABS Surveyor witness per 5.2 of 4-9-3/Table 2 as a Category II system of the ABS Marine Vessels Rules. Any modification to hardware required shall be in accordance with items 3 and 4 of 4-9-3/Table 3 and 4-9-3/11.9 of the ABS Marine Vessels Rules as a Category II system.
9. Where the cables (not supplied by Optimarin) fed from non-hazardous area are terminated at the equipment in hazardous area, the cable are to be of extruded impervious inner sheath type or the cables at the termination point are to be fitted with the gas-tight sealing grand in order to prevent migration of gas through these cables in accordance with 4-8-3/9.1 of the ABS Marine Vessels Rules.
10. Suitable provisions acceptable to ABS are to be provided for cable or piping penetrations through the bulkhead between "hazardous" (non-safe) areas and "non-hazardous" (safe) areas to avoid the possible migration of hydrocarbon or other flammable liquids or vapors.
11. The attending Surveyor onboard is requested to verify the following:
 - a. On-board Test as per 4-9-3/Table 2 and Table 3 as a Category II system of the ABS Marine Vessels Rules.
 - i. Complete system test.
 - ii. Integration test
 - iii. Wireless Data Communication test
 - b. The BWMS is in conformance with the Type Approval Certificate issued by the Administration or its representative.
 - c. The installation of the complete BWMS has been carried out in accordance with the manufacturer's equipment specification and the above service restrictions.



- d. Any operational inlets and outlets are located in the positions indicated on the drawing of the pumping and piping arrangements.
- e. The workmanship of the installation is satisfactory and, in particular, that any bulkhead penetrations or penetrations of the ballast system piping are in accordance with ABS Rules.
- f. The control and monitoring equipment operates correctly.
- g. A copy of the Type Approval certificate should be carried on board a vessel fitted with the BWMS at all times. A reference to the test protocol and a copy of the test results should be available for inspection on board the subject vessel.

COMMENTS:

1. For each installation detailed ship's arrangement plans are to be submitted for approval. See Section 2/1.1 and 2/1.3 of ABS Ballast Water Treatment Guide. The plans are to clearly indicate and/or include information such as the following (but not be limited to):
 - a) General arrangement of the BWMS, including location/layout and local instrumentation arrangement.
 - b) Structural plans showing installation details of attachment supports and foundations of principal components of the BWMS.
 - c) The piping system drawings, including BWMS piping system layout/routing, connection arrangement to ship's ballasting system, filling arrangement and booklet of construction details, etc.
 - d) Location of ballast water sampling facilities.
 - e) Electrical load analysis, circuit drawings and main power cable drawings. The main source of electrical power is to have sufficient capacity for the maximum electrical load of the BWMS, this is to be indicated in the electrical load analysis for the system to be installed. The electrical system associated with the BWMS are to be provided with protections against overload and short circuit by automatic protective devices, so that in the event of an overload or a short circuit, the device will operate to isolate it from the systems. See 4-8-2/9 of the ABS Marine Vessels Rules.
 - f) Arrangements and details of all associated control equipment, monitoring equipment and safety system.
 - g) Details of all other electrical equipment including power interlock arrangements to be located in or around the BWMS structure.
 - h) Types and operating controls for system isolation valves, etc.
 - i) Personnel Protection Equipment arrangements.
 - j) Firefighting measures.
2. Cables (i.e., power or control cables) are to be in accordance with IEC Publication 60092-353, IEEE Std-45 or other marine standards acceptable to the ABS as per 4-8-3/9.1 of the ABS Marine Vessels Rules.
3. At each installation, the vessel is to maintain a Ballast Water Management Plan (BWMP) on board for use by the vessel's Master and crew and the port State authorities.
4. Depending on the type of vessel which the system is installed on, the BWTS is to comply with the relevant sections of ABS Guide for Ballast Water Treatment.
5. The treatment rated capacity (TRC) is to be sufficient to meet the ship's ballast capacity and normal ballast operations rate.
6. The arrangements in ABS Guide for Ballast Water Treatment 4/7.7 are to be verified at each installation.
7. A BWMS operating manual describing safe operations of the equipment, safe testing, maintenance of the equipment, occupational health hazards relevant to the BWMS and its application to the ballast tank system is to be provided. The BWMS operating manual is to be kept updated and available in a location



known to the operating personnel. The BWMS operating manual is to include, but not limited to, the following aspects:

- a) Inspection and maintenance is to be carried out only by experienced and authorized personnel. Appropriate refresher training shall be given to such personnel on a regular basis.
 - b) Alarms, monitoring and interlocks arrangements are to be periodically tested to ensure correct operation. The inspection and testing methods are to be documented in the BWT system operating manual.
 - c) Post appropriate warning notices of the risk of eye and skin injuries from exposure to UV light are to be posted.
 - d) Detailed procedures for mandatory manual cleaning / back flush of the Filter every time the ballast pump stops at each ballasting port.
 - e) Guidance on procedures to be followed in the event of a fault or failure of the BWMS.
8. The scope of Type Approval is to comply with "MSC.1/Circ.1221 dated 11 December 2006 – Validity of Type Approval Certification for Marine Products"
9. The ABS Type Approval verifies that the system satisfies the requirements in the ABS Rules and Guide (pressures, electrical connections, design features). ABS Type Approvals do not consider the efficacy of the system, that is how effective the system is at killing or rendering harmless the organisms and pathogens in the ballast water.

NOTES, DRAWINGS, AND DOCUMENTATION: please refer to document title: BOM, Rev3, edition 2022-05-22