



NIPPON KAIJI KYOKAI

CERTIFICATE

No. KC15ES195

This is to certify that the ballast water treatment system listed below has been examined and tested in accordance with the requirements of the specifications contained in the Guidelines contained in IMO Resolution MEPC. 174(58). This certificate is valid only for the ballast water treatment system referred to below.

Item	: Ballast Water Treatment System
Product name	: RayClean™ BWTS
Specification	: See Annex.
Applicant	: DESMI Ocean Guard A/S Lufthavnsvej 12, DK-9400 Nørresundby, Denmark
Documentation	: See Annex.

A copy of this Type Approval Certificate, should be carried on board a vessel fitted with this ballast water treatment system at all times. A reference to the test protocol and a copy of the test results should be available for inspection on board the vessel. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

This certificate remains valid until 15 December 2020, the item, the design or manufacture is changed or modified, or the instruction by the Society, whichever is earliest.

This certificate is issued at Tokyo on 16 December 2015.

NIPPON KAIJI KYOKAI



 T. Imamura
 General Manager
 Material and Equipment Department

Initial approval date : 16 December 2015

This Report is issued subject to the condition that it is understood and agreed that neither the Society nor any of its Committees is under any circumstances whatever to be held responsible for any inaccuracy in any report or certificate issued by this Society or its Surveyors or in any entry in the Record or other publication of the Society or for any error of judgment, default or negligence of its Officers, Surveyors or Agents.



Specification

- Treatment Rated Capacity (TRC)

Model	TRC (m ³ /h)
RayClean-100	100
RayClean-200	200
RayClean-300	300
RayClean-400	400
RayClean-500	500
RayClean-600	600
RayClean-700	700
RayClean-800	800
RayClean-900	900
RayClean-1000	1000
RayClean-1100	1100
RayClean-1200	1200
RayClean-1300	1300
RayClean-1400	1400
RayClean-1500	1500

Model	TRC (m ³ /h)
RayClean-1600	1600
RayClean-1700	1700
RayClean-1800	1800
RayClean-1900	1900
RayClean-2000	2000
RayClean-2100	2100
RayClean-2200	2200
RayClean-2300	2300
RayClean-2400	2400
RayClean-2500	2500
RayClean-2600	2600
RayClean-2700	2700
RayClean-2800	2800
RayClean-2900	2900
RayClean-3000	3000

The RayClean BWTS modularized system where the maximum Treatment Rated Capacity (TRC) are dependent on the number of UV Units installed in parallel and the UV-Intensity (UVI) in the ballast water.

To achieve the required UV Disinfection dose, the maximum TRC through each UV Unit is 100 - 300 m³/h corresponding to an UVI on 55-165 W/cm².

The minimum UV – Transmittance is 33 – 55%.

Minimum capacity is 30 m³/h.

Salinity and temperature are no limiting conditions for RayClean BWTS.

-Treatment sequence;

Filtration & UV Irradiation (Ballast Water Uptake & Discharge)

- Manufacturers of components

Component	Manufacturer
Filter	BOLLFILTER - Boll & Kirch
UV Sensor	ZED Ziegler Electronic Devices GmbH
Valves/Actuators/Sensors/Transmitters/Pumps/ Frequency converter	Various Manufacturers To be Marine Type Approved by at least 1 classification society.

Note : UV unit, Master Control Panel (MCP), and UV Control Panel (UVCP) are manufactured according to design specifications and the manufacturing are quality controlled by Inspection and Test Plans by DESMI Ocean Guard A/S.

(Continued)



Documentation

- Operation Maintenance and Safety Manual for RayClean by DESMI Ocean Guard (Document ID : 10089, Version : 53)
- Piping and Instrumentation diagram (Drawing Nos : 470440 to 470457, and 470460)
- Quality Management Plan – Biological Efficacy Performance Evaluation of Ballast Water Management Systems, Version 3.2, DHI Denmark
- Biological efficacy performance evaluation of the ‘RAYCLEAN’ Ballast Water Management System in land-based test – Revised test plan, DHI
- Biological efficacy performance evaluation of Ballast Water Management Systems – Quality Assurance Project Plan, Version 2.2, DHI
- Operation Maintenance and Safety Manual RayClean DESMI Ocean Guard BWMS TEST SYSTEM – LANDBASED TEST, DHI – HUNDESTED – DENMARK
- Biological efficacy performance evaluation of the ‘RAYCLEAN’ Ballast Water Management System in shipboard test – Test plan, DHI
- Review of Quality Assurance Project Plan (QAPP) for biological efficacy performance evaluation of the “RAYCLEAN” Ballast Water Management System in shipboard test (DESMI OCEAN FUARD A/S) issued by DET NORSKE VERITAS
- AMENDMENT No.1 to No.3 – Test plan – Biological efficacy performance evaluation of the RayClean Ballast Water Management System in shipboard test. May 2013, DHI

Test Reports

- DELTA Test Report – Test for Marine Type Approval of RayClean Ballast Water Treatment System Performed for Desmi Ocean Guard A/S (DANAK-19/14301 Rev.A, Project No. T207266) issued by DELTA
- Final report – Performance evaluation in land-based test facility RayClean Filtration and UV disinfection issued by DHI (Project No.11812707)
- Technical description for DHI DESMI Ocean Guard – ballast water treatment systems
- REPORT – SURVEY REPORT FOR THE LAND BASED TEST OF RAYCLEAN BWMS – DESTMI OCEAN FUARD A/S issued by DET NORSKE VERITAS (REPORT No.TNANO386CAPPEL130502-1 Rev.0)
- Final report – Biological efficacy performance evaluation of Ballast Water Management System in shipboard test RayClean issued by DHI (Project No.11814563)
- REPORT – SURVEY OF SHIPBOARD TEST NO.1 ON RAYCLEAN BALLAST WATER MANAGEMENT SYSTEM – DESTMI OCEAN FUARD A/S issued by DET NORSKE VERITAS (REPORT No.TNANO386/QIWU/262.1-014477-J-32 Rev.0)
- Final report – Whole effluent toxicity test – RayClean –Filtration and UV disinfection issued by DHI (Project No.11812707)

Restriction/Condition

The documentation related to Arrangement of the BWMS and Piping and Diagram including the BWMS must be approved by our Society in each case.