Marine & Offshore

Certificate number: 54846/A0 BV
File number: ACM 223/1432/01
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

MMC GREEN TECHNOLOGY AS

FOSNAVÅG - NORWAY

for the type of product

BALLAST WATER MANAGEMENT SYSTEM

MMC BWMS models 50/100/150/300/370/450/500/600/750/1000/1400

Requirements:
BUREAU VERITAS Rules for the Classification of Steel Ships
NI 538 November 2011 Ballast Water Management Systems
IMO Res. MEPC.174(58)
IMO Res. MEPC.169(57)

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: 24 Oct 2023

For Bureau Veritas Marine & Offshore,
At BV OSLO, on 24 Oct 2018,
Rune MARSTEIN

Rune Marstein

BUREAU VERITAS SURVEYORS AT PARIS 1828 OSLO INTERNATIONAL REGISTER

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

MMC BWMS

1.1 Ballast Water Technology

- The MMC BWMS consists of two treatment steps in order to comply with the IMO D2 standard:

a) Mechanical Filtration by 40 micron automatic filter which removes sediments and larger organisms, and

b) Ultraviolet disinfection by a medium pressure UV system which inactivates or kills the smaller plankton and bacteria.

1.2 Table for MMC BWMS Range Description

BWMS Model	TRC Range (m3/h)	UV-Chamber
MMC BWMS model 50	5 - 50	DL.2.1500
MMC BWMS model 100	10 - 100	DXL6-1500 or DL4-1500
MMC BWMS model 150	10 - 150	DXL6-1500
MMC BWMS model 300	10 - 300	2x DXL6-1500 in serie or, DXL12-1500
MMC BWMS model 370	20 - 370	D4XL10.3000
MMC BWMS model 450	30 - 450	3x DXL6-1500 in parallel
MMC BWMS model 500	20 - 500	D4XL10.3000
MMC BWMS model 600	20 - 600	2x 2x DXL6-1500 in serie or, D4XL12.3000
MMC BWMS model 750	40 - 750	2x D4XL10.3000 in parallel
MMC BWMS model 1000	40 - 1000	2x D4XL10.3000 in parallel
MMC BWMS model 1400	40 - 1400	3x D4XL10.3000 in parallel

1.3 Technical characteristics of filters

1.3.1 Ratings

Maker	Boll & Kirch
Filtration size	40µm screen, automatic backflush
Working pressure	10 bar Max. differential pressure: 0.5 bar; Min. back pressure: 1 bar
Material of Filter housing	Ductile cast iron (EN-GJS-400-18)

1.3.2 Models

6.18.2	Max flowrate (m3/h)
100	100

6.18.3	Max flowrate (m3/h)
AquaBoll 6.18.3 373	62
AquaBoll 6.18.3 324	94
AquaBoll 6.18.3 356	173
6.18.3 419 / AquaBoll 6.18.3 419	370
6.18.3 521 / AquaBoll 6.18.3 521	500
6.18.3 600 / AquaBoll 6.18.3 600	750
6.18.3 750 / AquaBoll 6.18.3 750	1400
900	2100
1000	2500
1100	3800
1200	4600
1350	5400

1.4 Technical characteristics of UV assembly

Maker	BestUV
Flow rate per UV reactor	50 to 500 m3/h
Power Supply	380 to 690V; 50-60 Hz, 3-Phase
Mounting	Horizontal. Mounting in parallel and/or in serie depending on BWMS model.
Material	Stainless Steel AiSi 316L

1.5 Control and Monitoring

- PLC Program V3.0

2. DOCUMENTS AND DRAWINGS

2.1 IMO G8 Type Approval Certificate N° TAP00000WD Rev.1 issued on 15/10/2018 by DNV GL on behalf of the Norwegian Maritime Authority

2.2 General Arrangement drawings:

- N° D1371 Rev.A dated 22/09/2017 for 50 m3/h
- N° D1565 Rev.- dated 06/07/2018 for 100 m3/h
- N° D1520 Rev.B dated 26/01/2018 for 150 m3/h
- N° 1511 Rev.B dated 13/12/2017 for 300 m3/h
- N° D1372 Rev.- dated 30/03/2017 for 370 m3/h
- N° D1494 Rev.C dated 14/12/2017 for 500 m3/h
- N° D1397 Rev.- dated 31/05/2017 for 600m3/h
- N° D1359 Rev.- dated 14/04/2016 for 750 m3/h
- N° D1313 Rev.- dated 14/04/2016 for 1000m3/h
- N° D1373 Rev.- dated 03/12/2015 for 1400 m3/h

2.3 P&ID for MMC BWMS 300m3/h N° P1449 Rev.A dated 05/12/2017

2.4 Filters as per documents:

- Z122495 dated 02/09/2009 for type 6.18.2
- Z132463 BI dated 21/01/2014 & Z138807 BI dated 23/01/2014 for type 6.18.3
- Z154933 Rev.07 dated 27/11/2017 for type AquaBoll 6.18.3
- Assessment of BollFilter model 6.18.3 versus Filter model 6.18.2 N° 385FIST130315-2 Rev.1 dated 15/03/2013
- Assessment of aquaBoll 6.18.3 - with candle insert as per report N° 262.1-016831-J-13 Rev.1 dated 08/05/2018

2.5 UV Reactor

- Drawing N° Mechanical DL2.1500 Mc Us3 NW80 PN10 Q200 17009 Rev.X00 dated 04/12/2017 for DL.2.1500
- Drawing N° DXL6.1500 Ec US3 NW200 PN10 Q200 Rev.X03 dated 23/05/2014 for DXL6-1500
- Drawing N° Mechanical D4XL10.3000 Ec Us3 NW250 PN10 Q200 16963 Rev.0 X01 dated 29/01/2018 for D4XL10.3000
- Drawing N° DL4.1500 Mc Us3 NW150 PN10 Q200 LC Rev.X00 dated 12/10/2017 for DL4.1500
- Drawing N° Mechanical D4XL12.3000 Ec Us3 NW300 PN10 Q200 16476 Rev.X00 dated 16/05/2017 for D4XL12.3000
- Drawing N° Mechanical DXL12.1500 Mc Us3 NW200 PN10 Q200 16970 Rev.X00 dated 04/12/2017 for DXL12.1500

2.6 Power Cabinet as per drawing N° 12_1500_L5_690V_50Hz Rev.X01

2.7 Control Cabinet as per document N° E1061-28.05.18

2.8 Electrical and Electronic Wiring Diagrams as per drawings N° E1449-1800 to 1805

2.9 Operation & Maintenance Manuals:

- for 50 m3/h Rev.0 dated 02/03/2018
- for 500 m3/h Rev.0 dated 12/02/2018

2.10 Technical specifications for Skid mounted version dated 18/10/2017 (100m3/h), 05/12/2017 (300m3/h) & 17/11/2017 (600m3/h)

2.11 Others:

- Technical manuals for major components supplied by manufacturers (filters, and flow meter) as reviewed on 02/10/2018
- Technical specifications of major components (Filters, UV reactors, pumps, valves, sensors) as reviewed on 02/10/2018

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 Biological Performance Evaluation - Land-based testing

- Tested model : MMC BWMS model 300 (300m3/h) - NIVA
- Report N° 6297-2012 dated 08/02/2012 (including Test plan and QAPP version 2.8 dated 09/2011)

3.2 Biological Performance Evaluation - Shipboard testing

- Tested model : MMC BWMS model 300 (300 m3/h) - (on board Havila Subsea)
- Report N° 6362-2012 v.2.0 dated 05/11/2012 (including Test plan and QAPP version 2.8 dated 09/2011)

3.3 Environmental tests

- Environmental tests report N° DELTA-T202671 dated 15/11/2012 issued by DELTA (FORCE Technology) including: Visual inspection and performance test, External power supply failure, Power supply variations (permanent/transient), Low temperature, Dry heat, Damp heat (cyclic), insulation resistance (UN > 65V), High voltage, Vibration, Electrostatic discharge, Radiated radio frequency interference, Conducted low frequency, fast/slow transient, radiated/conducted emission & Inclination test.

4. APPLICATION / LIMITATION

4.1 Intended for Ballast Water Treatment:

- Ballast Water Uptake: Filtration / UV-disinfection
- Ballast Water Discharge: UV-disinfection
- The system can be used in the following common ambient and water conditions

Water temperature range	No limitation
Ambient temperature range	0 to +55 °C
Water salinity range	No limitation
Minimum UV transmitance	55%

4.2 Operating Conditions for MMC BWMS

Treatment Rated Capacity	50~1400 m3/h
Minimum Operating Pressure	1 bar
Maximum Operating Pressure	10 bar
Minimum UV intensity	7500 W/m2
Minimum UV dose	100 mJ/cm2
Enclosure Protection	IP 54

4.3 The treatment rated capacity of the BWMS is not be less than the operated flow rate of ballast pump(s).

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

4.5 The following documentation is to submitted for approval on a ship case-by-case basis :

- On-board location of the BWTS skid-unit;
- All connection details of interface towards ship's ballast piping systems;
- Management of stripping operations;
- Layout of the system;
- All associated control, alarm and monitoring equipment;
- Wiring diagrams and the cable specifications;
- 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 **MMC GREEN TECHNOLOGY AS** 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 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 of the filters 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 **MMC GREEN TECHNOLOGY AS**'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.

5.3 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.

5.4 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.

5.5 Functional tests of the system to be carried out after onboard installation as required by the IMO resolution MEPC.174(58).

For information, **MMC GREEN TECHNOLOGY AS** has declared to Bureau Veritas the following production site:
MMC GREEN TECHNOLOGY AS: Mjølstadneset, 6092 FOSNAVÅG, NORWAY

6. MARKING OF PRODUCT

Each Ballast Water Treatment System is to be marked with:
- Manufacturer's name or logo
- Serial number
- Type designation
- Society's brand as relevant

7. OTHERS

It is **MMC GREEN TECHNOLOGY AS'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.

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