



Marine & Offshore

Certificate number: 64992/A1 BV

File number: .

Product code: 90861

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

NORWEGIAN GREENTECH AS
FOSNAVÅG - NORWAY

for the type of product

BALLAST WATER MANAGEMENT SYSTEM

NGT BWMS models DL1-BK273, DL2-BK273, DL3-BK324, DL4-BK324, DL4-BK356, DXL6-BK356, DXL9-BK356, DXL9-BK419, DXL12-BK419, D4XL8-BK419, D4XL10-BK419, D4XL10-BK521, D4XL10-BK600, D4XL12-BK600, D4XL12-BK750, D5XL14-BK750, D5XL16-BK750 and D5XL18-BK750.

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: 11 Oct 2026

For Bureau Veritas Marine & Offshore,

At BV OSLO, on 22 Sep 2022,

Rune MARSTEIN

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 8 page(s)

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

NGT BWMS models DL1-BK273, DL2-BK273, DL3-BK324, DL4-BK324, DL4-BK356, DXL6-BK356, DXL9-BK356, DXL9-BK419, DXL12-BK419, D4XL8-BK419, D4XL10-BK419, D4XL10-BK521, D4XL10-BK600, D4XL12-BK600, D4XL12-BK750, D5XL14-BK750, D5XL16-BK750 and D5XL18-BK750.

1.1 Ballast Water Technology

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

- a) Mechanical Filtration by 20 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. The BWMS has two control modes, IMO Mode or USCG Mode. IMO Mode is used for ballasting and de-ballasting operations outside US waters. For any ballasting or de-ballasting operation in US waters, the USCG Mode must be activated. USCG Mode must also be activated before treating any ballast water that is planned discharged in US waters.

1.2 Table for NGT BWMS Range Description

UV Chamber model	TRC (m3/h)	Number of UV lamps
DL1	30	1
DL2	60	2
DL3	90	3
DL4	150	4
DXL6	200	6
DXL9	260	9
DXL12	350	12
D4XL8	460	8
D4XL10	600	10
D4XL12	750	12
D5XL14	1005	14
D5XL16	1180	16
D5XL18	1323	18

aquaBoll filter model	TRC (m3/h)
273	62
324	94
356	204
419	378
521	518
600	614
750	1274

1.3 Technical characteristics of filters

Maker	Boll & Kirch
Filtration size	20µm screen, automatic backflush
Working pressure	10 bar Max. differential pressure: 1.0 bar; Backflush triggering pressure: 0.3 bar
Material of Filter housing	Cast iron

1.4 Technical characteristics of UV assembly

Maker	BestUV
Flow rate per UV reactor	30 to 1323 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

1.5 Control and Monitoring

- PLC Program V4.6.X

The NGT BWMS is type approved with the system control software version 4.6.X. In the software version the "4" represents the major version number of the software. A major revision of the software will be any change to the control and operating

philosophy of the NGT BWMS. The “6” represents the minor version number of the software and is reserved for new or changed features which do not affect core functionality. The “X” represents the patch level which is reserved for bug fixes and graphical user interface changes.

Any changes to the software are to be recorded as long as the system is in use onboard. Records of any software changes resulting in a revision of the major or minor version number or any changes to the hardware are to be forwarded to BV for evaluation. Testing of the application functions of the revised software may be required.

2. DOCUMENTS AND DRAWINGS

2.1 - P&ID for NGT BWMS :

Model	Drawing N°	Revision
DL1-BK273	P0050	A
DL2-BK273	P0100	B
DL3-BK324	P0200	B
DL4-BK324	P0210	B
DL4-BK356	P0300	B
DXL6-BK356	P0400	B
DXL9-BK356	P0410	B
DXL9-BK419	P0420	B
DXL12-BK419	P0500	B
D4XL8-BK419	P0600	B
D4XL10-BK419	P0610	B
D4XL10-BK512	P0700	B
D4XL10-BK600	P0800	A
D4XL12-BK600	P0810	A
D4XL12-BK750	P0900	A
D5XL14-BK750	P1000	A
D5XL16-BK750	P1100	A
D5XL18-BK750	P1200	A

2.2 - General arrangement drawings for NGT BWMS :

Model	Drawing N°	Revision
DL1-BK273	D0050-11-02	A
DL2-BK273	D0100-11-02	A
DL3-BK324	D0200-11-02	A
DL4-BK324	D0210-11-02	A
DL4-BK356	D0300-11-03	A
DXL6-BK356	D0400-11-02	A
DXL9-BK356	D0410-11-02	A
DXL9-BK419	D0420-11-01	A
DXL12-BK419	D0500-11-01	A
D4XL8-BK419	D0600-11-01	A
D4XL10-BK419	D0610-11-01	A
D4XL10-BK512	D0700-11-01	A
D4XL10-BK600	D0800-11-01	A
D4XL12-BK600	D0810-11-01	A
D4XL12-BK750	D900-11-01	A
D5XL14-BK750	D1000-11-01	A
D5XL16-BK750	D1100-11-01	A
D5XL18-BK750	D1200-11-01	A

2.3 - Bill of materials for NGT BWMS :

Model	Drawing N°	Revision	Date
DL1-BK273	D0050	C	30/03/2021
DL2-BK273	D0100	C	30/03/2021
DL3-BK324	D0200	C	30/03/2021
DL4-BK324	D0210	C	30/03/2021
DL4-BK356	D0300	C	30/03/2021
DXL6-BK356	D0400	C	30/03/2021
DXL9-BK356	D0410	C	30/03/2021
DXL9-BK419	D0420	C	30/03/2021
DXL12-BK419	D0500	C	30/03/2021
D4XL8-BK419	D0600	C	30/03/2021
D4XL10-BK419	D0610	C	30/03/2021
D4XL10-BK512	D0700	C	30/03/2021
D4XL10-BK600	D0800	C	30/03/2021
D4XL12-BK600	D0810	C	30/03/2021
D4XL12-BK750	D0900	C	30/03/2021
D5XL14-BK750	D1000	C	30/03/2021
D5XL16-BK750	D1100	C	30/03/2021
D5XL18-BK750	D1200	C	30/03/2021

2.4 - Technical specifications for NGT BWMS :

- Rev. A dated 12/04/2021 for model DL1 -BK273
- Rev. A dated 06/05/2021 for model DL2 -BK273
- Rev. A dated 06/05/2021 for model DL3 -BK324
- Rev. A dated 12/04/2021 for model DL4 -BK324
- Rev. A dated 12/04/2021 for model DL4 -BK356
- Rev. A dated 12/04/2021 for model DXL6 -BK356
- Rev. A dated 06/05/2021 for model DXL9 -BK356
- Rev. A dated 06/05/2021 for model DXL9-BK419
- Rev. A dated 12/04/2021 for model DXL12-BK419
- Rev. A dated 06/05/2021 for model D4XL8-BK419
- Rev. A dated 06/05/2021 for model D4XL10-BK419
- Rev. A dated 06/05/2021 for model D4XL10-BK512
- Rev. A dated 06/05/2021 for model D4XL10-BK600
- Rev. A dated 12/04/2021 for model D4XL12-BK600
- Rev. A dated 12/04/2021 for model D4XL12-BK750
- Rev. A dated 12/04/2021 for model D5XL14-BK750
- Rev. A dated 12/04/2021 for model D5XL16-BK750
- Rev. A dated 06/05/2021 for model D5XL18-BK750

2.5 - UV Units as per following documents:

- UV unit user manual Rev. A dated 08/04/2021
- UV Unit drawings :

Model	Drawing N°	Revision	Date
DL1	005873	00	26/02/2020
DL2	005873	00	18/02/2020
DL3	007590	00	26/02/2020
DL4	005602	00	28/02/2020
DXL6	005814	00	19/02/2020
DXL9	005813	01	20/02/2020
DXL9	005627	01	19/02/2020
DXL12	00513	01	20/02/2020
D4XL8	007571	00	25/02/2020
D4XL10	007551	X00	28/02/2020
D4XL12	007548	00	28/02/2020
D5XL14	007581	00	26/02/2020
D5XL16	007583	X00	26/02/2020
D5XL18	007584	X00	26/02/2020

UV unit and UV electrical drawings reference number, revision number and date may vary depending on the wiper option and/or the supply voltage.

- Electrical drawings of UV Units Rev. 00 dated 09/02/2021
- Handling of broken UV lamps Rev. A dated 20/04/2021

2.6 - Electrical Diagrams of control cabinet :

Model	Drawing N°	Revision
DL1-BK273 - DXL9-BK356	C3100-04 (380-440V) C3100-06 (690V)	A
DXL9-BK419 - D4XL12-BK600	C3200-04 (380-440V) C3200-06 (690V)	A
D4XL12-BK750 - D5XL18-BK750	C3300-04 (380-440V) C3300-06 (690V)	A

2.7 - Wiring diagram N° E3XX0-04-1800 (380-440V) and E3XX0-06-1800 (690V) Rev. A

2.8 - Installation, Operation & Maintenance Manuals:

- Operation, Safety & Maintenance manual Rev. E1 dated 07/03/2022
- Installation manual Rev. C dated 16/08/2021
- Operating instructions for automatic filter Rev. 001 dated 05/2020 for filters aquaBoll 6.18.3
- Installation, Operation & Maintenance for backflush pumps Rev. 2 dated 04/11/2019
- Tightening of bolted connections and installation of seals in flanged connections Rev. A dated 24/09/2020
- Functional test procedure Rev. B dated 24/03/2021
- Alarm list Rev. E dated 06/05/2021
- Software Handling procedure Rev. A dated 09/03/2021

2.9 - Others:

- Scaling report of NGT BWMS N°27934666/DNVGL Dated 31/05/2021

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 - Certificate and reports verifying compliance with the Code for Approval of Ballast Water Management Systems (BWMS Code), Res. MEPC 300(72):

- IMO Type Approval Certificate N° TAP000028V Rev. 2 issued on 18/03/2022 by DNV GL on behalf of the Norwegian Maritime Authority.

A copy of the Type Approval Certificate of Ballast Water Management System issued by an Administration should be carried onboard ships fitted with such a system at all times. A reference to the test protocol and a copy of the test results should be available for inspection onboard ships.

3.2 - **Land-based tests**, NIVA. All land based tests were performed with a NGT BWMS DXL9-419 with a Treatment Rated Capacity of 260m³/h consisting of one 260 m³/h Best UV DXL9.1500. UVunit and one 378 m³/h B&K aquaBoll 419.200 filter.

- Report N°7488-2020 dated 18/11/2020

3.2 - **Shipboard tests**, NIVA. All land based tests were performed with a NGT BWMS DXL12-BK419 with a Treatment Rated Capacity of 350m³/h consisting of one 350 m³/h Best UV DXL12.1500. UVunit and one 378 m³/h B&K aquaBoll 419.200 filter.

- Report N° 7528-2020 dated 09/11/2020

3.3 - **Environmental tests:**

- Test report N° 30484 Rev. 0 dated 08/12/2020 performed by Applica Test & Certification AS, type testing of Flowmeter.

- Test report N° 30484 Rev. 1 dated 08/12/2020 performed by Applica Test & Certification AS, type testing of Ballast Water Management System - BWMS.

- Test for Marine Type Approval of MMC Ballast Water Management System performed by DELTA N° DANAK-19/12610 dated 15 11/2012

4. APPLICATION / LIMITATION

4.1 This certificate is issued for the ballast water treatment system "NGT BWMS" as far as the classification is concerned. The installation onboard a ship is subject to approval by the Flag Administration of that ship.

4.2 - 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

Ballast water temperature range	No limitation
Ambient temperature range	0 to +55 °C
Water salinity range	No limitation
Minimum UV transmittance	60%

4.3 - Operating Conditions for NGT BWMS

Treatment Rated Capacity	30~1323 m ³ /h
Minimum Operating Pressure	1.5 bar
Maximum Operating Pressure	10 bar

UV Dose & Flow rate to be operated

UV Chamber model by bestUV	UVI limit for power reduction [W/m ²]	UVI limit for at maximum flow rate [W/m ²]*	Low UVI limit at minimum flow rate [W/m ²]	Minimum flow rate for a Salinity # 1PSU [m ³ /h]	Minimum flow rate for a Salinity < 1PSU [m ³ /h]
DL1	2 033	1 369	450	10	7.4
DL2	N/A	7 097	3 200	28	20
DL3	4 042	2 722	2 066	37	26
DL4	21 004	14 144	7 443	71	51
DXL6	12 768	8 598	3 173	81	58
DXL9	27 346	1 845	8 694	92	65
DXL12	23 639	15 919	6 209	178	127
D4XL18	7 918	5 332	280	180	128
D4XL10	16 559	11 151	4 023	237	169

D4XL12	25 077	16 887	7 014	310	221
D5XL14	15 297	10 301	4 109	433	308
D5XL16	17 340	11 677	4 700	518	369
D5XL18	21 525	14 495	5 515	654	414

*Determined as per CFD analysis, depending on the UV chamber model.

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

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

4.6 - The following documentation is to be 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.
- 4.7 - A copy of the operating manual is to be maintained onboard.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 - The Ballast Water Management systems are to be supplied by **NORWEGIAN GREENTECH 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 **NORWEGIAN GREENTECH 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.300(72).

5.6 - For information, **NORWEGIAN GREENTECH AS** has declared to Bureau Veritas the following production site:

NORWEGIAN GREENTECH 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 **NORWEGIAN GREENTECH 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.

This certificate supersedes the Type Approval Certificate 64992/A0 BV issued by the Society.

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