



Marine & Offshore

Certificate number: 50132/A0 BV

File number: ACM 223/1430/01

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

WARTSILA ENVIRONMENTAL SYSTEMS LTD
POOLE - UNITED KINGDOM

for the type of product

BALLAST WATER MANAGEMENT SYSTEM
Wärtsilä Aquarius UV BWMS

Requirements:

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

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: 08 Feb 2023

For Bureau Veritas Marine & Offshore,

At BV LONDON, on 08 Feb 2018,

Spencer Yule



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 7 page(s)

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

AQUARIUS® UV Ballast Water Management System for safe area

AQUARIUS® UVX Ballast Water Management System for hazardous area

1.1 Ballast Water Technology

- Treatment Rated Capacity from 50 to 1000 m³/h with capacities up to 6000 m³/h achieved by using multiple units installed in parallel.

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

- a) Mechanical Filtration by 40 microns 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 AQUARIUS® UV BWMS is operated from a control panel, which starts the automated ballasting and deballasting processes. Automatic and/or manual operation is controlled through PLC and monitoring equipment (UV sensor, temperature sensor, pressure sensor, flow meter).

1.2 AQUARIUS® UV Range Description

BWMS	Max TRC*	Filtration Unit (40µm)		UV Reactor		UV Lamps	
Model	(m ³ /h)	Filter Type (Single Basket)	Flange DN	Model	No.	Model	Power (kW)
AQ-50-UV (X)	50	BS-025H/V-03	80	BWT IL +125 (X)	6	BS2020H	2.3
AQ-80-UV (X)	80	BS-050H/V-04	100				
AQ-125-UV (X)	125	BS-050H/V-06	150				
AQ-180-UV (X)	180	BS-070H/V-06	150	BWT IL +250 (X)	12	B3535LV	2.7
AQ-250-UV (X)	250	BS-100H/V-08	200				
AQ-300-UV (X)	300	BS-150H/V-10	250	BWT IL +300 (X)**	12	B3535LV	3.2
AQ-375-UV (X)	375			BWT IL +375 (X)	12	B3535H	3.2
AQ-430-UV (X)	430			BWT IL +430 (X)	12	B3535H	3.6
AQ-500-UV (X)	500			BS-200H/V-12	300	BWT IL +500 (X)	12
AQ-550-UV (X)	550	BS-200H/V-T-12	300	BWT IL +750 (X)	18	B5050LV	3.8
AQ-750-UV (X)	750	BS-300H/V-14	350				
AQ-850-UV (X)	850	BS-300H/V-T-14	350	BWT IL +1000 (X)	18	B5050H	4.7
AQ-1000-UV (X)	1000	BS-400H/V-T-14	350				

*Min TRC is 10% of the maximum TRC for good operation of the BWMS

**AQ-300-UVX uses BWT IL+375(X) UV reactor for current limitation reasons

1.3 Technical characteristics of filters

All models listed in 1.2 above are part of this Type Approval.

Maker	FilterSafe (Israel) or Suzhou (China)
Filtration size	40µm screen, automatic self-cleaning
Working pressure	6 bar Max. differential pressure: 0.5 bar; Min. operating pressure: 1.6 bar
Mounting	vertical or horizontal
Material of Filter housing	Carbon Steel

1.4 Technical characteristics of UV assembly

Maker	Hanovia Ltd (UK)
Operating Pressure	6 bar
Power Supply	400-440VAC; 50-60 Hz, 3-Phase
Mounting	Horizontal or vertical
Material	SS316L / SMO254

1.5 Piping material

- Pipes: ASTM A0106 Grade B - Mild Steel Hot Dip Galvanized according to EN ISO 1461
- Flanges: BS EN 1092-1 / DIN 2501-1 PN10

1.6 Control and Monitoring

- UV Control Panel as per wiring diagram BWCPxxxxx, Revision 0, dated 21/03/2017.
- Power Supply Cabinet as per drawing BWTxxx, Revision 0, dated 30/06/2016

2. DOCUMENTS AND DRAWINGS

2.1 System Description N° BD00107 issue N°7 dated 21/03/2017 including:

- Technical overview, detailed description, system controls, P&ID, BOM & construction

2.2 Filter drawings for safe area:

Filter Module/Kit (Single Basket)			
BWMS Model	Module/Kit	Issue No.	Date
AQ-50-UV	H0050FK-xxx-171	2	03/11/2017
AQ-80-UV	H0080FK-xxx-171	2	03/11/2017
AQ-125-UV	H0125FK-xxx-171	2	03/11/2017
AQ-180-UV	H0180FK-xxx-171	2	03/11/2017
AQ-250-UV	H0250FK-xxx-171	2	03/11/2017
AQ-300-UV	H0375FK-xxx-171	2	03/11/2017
AQ-375-UV			
AQ-430-UV	H0500FK-xxx-171	2	03/11/2017
AQ-500-UV			
AQ-550-UV			
AQ-750-UV	H0750FK-xxx-171	2	03/11/2017
AQ-850-UV	H1000FK-xxx-171	2	03/11/2017
AQ-1000-UV			

2.3 Filter drawings for hazardous area:

Filter Module/Kit (Single Basket)			
BWMS Model	Module/Kit	Issue No.	Date
AQ-50-UVX	H0050FXK-xxx-171	2	06/11/2017
AQ-80-UVX	H0080FXK-xxx-171	2	06/11/2017
AQ-125-UVX	H0125FXK-xxx-171	2	06/11/2017
AQ-180-UVX	H0180FXK-xxx-171	2	06/11/2017
AQ-250-UVX	H0250FXK-xxx-171	2	06/11/2017
AQ-300-UVX	H0375FXK-xxx-171	2	06/11/2017
AQ-375-UVX			
AQ-430-UVX	H0500FXK-xxx-171	2	06/11/2017
AQ-500-UVX			
AQ-550-UVX			
AQ-750-UVX	H0750FXK-xxx-171	2	06/11/2017
AQ-850-UVX	H1000FXK-xxx-171	2	06/11/2017
AQ-1000-UVX			

2.4 UV Module drawings for safe & hazardous area:

UV Module/Kit (Safe area)				UV Module/Kit (Hazardous area)		
BWMS Model	Module/Kit	Issue No.	Date	Module/Kit	Issue No.	Date
AQ-50-UV(X)	H0125UVK-xxx-172	1	04/12/2017	H0125UVXK-xxx-172	1	06/12/2017
AQ-80-UV(X)						
AQ-125-UV(X)						
AQ-180-UV(X)	H0250UVK-xxx-172	1	04/12/2017	H0250UVXK-xxx-172	1	06/12/2017
AQ-250-UV(X)						
AQ-300-UV(X)	H0300UVK-xxx-172	1	04/12/2017	H0375UVXK-xxx-172	1	06/12/2017
AQ-375-UV(X)	H0375UVK-xxx-172	1	04/12/2017			
AQ-430-UV(X)	H0430UVK-xxx-172	1	04/12/2017	H0430UVXK-xxx-172	1	06/12/2017
AQ-500-UV(X)	H0500UVK-xxx-172	1	04/12/2017	H0500UVXK-xxx-172	1	06/12/2017
AQ-550-UV(X)	H0750UVK-xxx-172	1	04/12/2017	H0750UVXK-xxx-172	1	06/12/2017
AQ-750-UV(X)						
AQ-850-UV(X)	H1000UVK-xxx-172	1	04/12/2017	H1000UVXK-xxx-172	1	06/12/2017
AQ-1000-UV(X)						

2.5 Standard Installation P&IDs:

P&ID	Description	Issue No.	Date
UV-T-001-171	Typical Install Arrangement AQUARIUS® UV Single System	1	13/02/2017
UV-T-002-171	Typical Install Arrangement AQUARIUS® UV Multiple System.	1	13/02/2017
UV-T-003-171	Typical P&ID Symbols	1	13/02/2017
UV-T-004-171	Typical Install Arrangement AQUARIUS® UVX – EX (Hazardous Area) Single System	1	13/02/2017
UV-T-005-171	Typical Install Arrangement AQUARIUS® UVX – EX(Hazardous Area) Multiple System	1	13/02/2017
UV-T-006-171	Typical Install Arrangement AQUARIUS® UV – Submerged Pump Ex Single System	1	13/02/2017
UV-T-007-171	Typical Install Arrangement AQUARIUS® UV – Single System Loose	1	13/02/2017
UV-T-008-171	Typical Install Arrangement AQUARIUS® UV – Single System Skidded	1	13/02/2017
UV-T-009-171	Typical Install Arrangement AQUARIUS® UV – Single System Loose Ex	1	13/02/2017
UV-T-010-171	Typical Install Arrangement AQUARIUS® UV – Single System Filter & UV Skidded, Power & Control Panels Loose	1	13/02/2017
UV-T-011-171	Typical Install Arrangement AQUARIUS® UV – Single System Loose Filter	1	13/02/2017

2.4 Scaling Summary N° BD00301 issue N°1 dated 04/04/2017

2.5 Technical Manuals:

Title	Manual Number	Issue N°	Date
System Description	BD00107	7	21/03/2017
Installation Instructions	BD00198	2	06/04/2017
Commissioning Record	BD00121	4	20/04/2016
Filter Module Commissioning Record	BD00114	3	20/04/2016
UV Module Commissioning Record	BD00115	3	20/04/2016
Alarm and Function Test Procedure	BD00217	5	02/11/2016
Installation completion and commissioning readiness report	BD00199	1	15/04/2014
Technical Manual	AQ-XXXX-UV Ship Manual	3	/

2.6 Technical specifications of components (data sheets of pumps, valves, sensors,...) as provided.

2.7 Control Panel drawing:

- UV Control Panel as per wiring diagram BWCPxxxxx, Revision 0, dated 21/03/2017.

BWMS Model	Non Ex Power Panel		Ex Power Panel	
	440V /60 Hz	400V /50Hz	440V /60 Hz	400V /50Hz
AQ-50-UV	BWCP10001	BWCP15001	BWCP30001EX	BWCP35001EX
AQ-80-UV				
AQ-125-UV				
AQ-180-UV	BWCP10003	BWCP15003	BWCP30003EX	BWCP35003EX
AQ-250-UV	BWCP10005	BWCP15005	BWCP30005EX	BWCP35005EX
AQ-300-UV	BWCP10007	BWCP15007	BWCP30007EX	BWCP35007EX
AQ-375-UV	BWCP10007T	BWCP15007T	BWCP30007TEX	BWCP35007TEX
AQ-430-UV	BWCP10009	BWCP15009	BWCP30009EX	BWCP35009EX
AQ-500-UV	BWCP10009T	BWCP15009T	BWCP30009TEX	BWCP35009TEX
AQ-550-UV	BWCP10011	BWCP15011	BWCP30011EX	BWCP35011EX
AQ-750-UV	BWCP10011T	BWCP15011T	BWCP30011TEX	BWCP35011TEX
AQ-850-UV	BWCP10013	BWCP15013	BWCP30013EX	BWCP35013EX
AQ-1000-UV	BWCP10013T	BWCP15013T	BWCP30013TEX	BWCP35013TEX
	BWCP10015	BWCP15015	BWCP30015EX	BWCP35015EX

2.8 Power Panel drawings:

BWMS Model	Non Ex Power Panel			Ex Power Panel		
	Drawing No.	Issue No.	Date	Drawing No.	Issue No.	Date
AQ-50-UV	BWT125	3	30/06/2016	BWT125	3	30/06/2016
AQ-80-UV						
AQ-125-UV						
AQ-180-UV AQ-250-UV	BWT250	3	30/06/2016	BWT250 ATEX	3	24/06/2016
AQ-300-UV	BWT300	3	30/06/2016	BWT300	3	30/06/2016
AQ-375-UV	BWT375	3	30/06/2016	BWT375	3	30/06/2016
AQ-430-UV	BWT430	3	30/06/2016	BWT430	3	30/06/2016
AQ-500-UV	BWT500	3	30/06/2016	BWT500	3	30/06/2016
AQ-550-UV AQ-750-UV	BWT750 A BWT750 B	3	30/06/2016	BWT750 A BWT750 B	3	30/06/2016
AQ-850-UV AQ-1000-UV	BWT1000 A BWT1000 B BWT1000 C	3	30/06/2016	BWT1000 A BWT1000 B BWT1000 C	3	30/06/2016

2.9 EC-Type Examination Certificate N° BVS 14 ATEX E 012 X dated 21/02/2014

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 No. 8328/2017 dated 13/07/2017 issued by The Minister of Infrastructure and the Environment.

3.2 Reports verifying compliance with IMO Res. MEPC.174(58) Guidelines for approval of ballast water management systems (G8):

Type of test	Laboratory	Report number	Date
Land based tests*	NIOZ	2012-1	27/06/2012
- Toxicity test from land based test	IMARES	C105/11	12/09/2011
Shipboard tests	GoConsult	Final report (MV Twister)	04/05/2012
Environmental tests: - Temperature & Humidity - Vibration - Inclination (Static & Dynamic)	mi Technology Group	HWS0101 Issue 2	22/11/2012
- Power supply variation	TRAC	TRA-009930-36-00B	26/11/2012
- EMC	MS Testing	TL15076-EMC	08/09/2015

* Note 1: The BWMS was tested in Brackish water and Marine water, with min. UV-Transmittance of 54%.

3.3 QMP & QAPP Version 2 dated 22/08/2011

4. APPLICATION / LIMITATION

4.1 This certificate is issued for the **AQUARIUS UV BWMS & AQUARIUS UVX 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 common ambient and water conditions

Water temperature range	-2 to +45 °C
Ambient temperature range	0 to +55 °C
Water salinity range	No limitation

4.3 Operating Conditions

Treatment Rated Capacity	50~6000 m3/h
Minimum Operating Pressure	1.6 bar
Maximum Operating Pressure	6 bar

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 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 **AQUARIUS UV BWMS**. It shall be the duty of **WARTSILA WATER SYSTEMS LTD**'s customers to submit for approval the following documents to the Society for each installation intended for retrofits or new construction:

- On-board location of the BWMS (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;
- Pipes with associated fittings, automatic self-cleaning filter, UV reactor and electrical equipment including control, sensors, safety devices and cables are to be approved according to the applicable Society's Rules and subject to review by the Society;
- Materials list;
- Arrangement and location of Ballast Water sampling ports;
- ATEX certificate as applicable.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 The Ballast Water Management systems are to be supplied by **WARTSILA WATER SYSTEMS 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 **WARTSILA WATER SYSTEMS LTD** has declared to Bureau Veritas that some components detailed in this certificate can be manufactured/assembled at the suppliers's production sites, but however always under their full responsibility and reliability.

5.3 Production surveys requested for components:

- a) Filters are classified as Class 3 pressure vessels according to the Society's Rules Pt C, Ch 1, Sec 3 [table 24].
 - Each filter is 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 and head of filter according to the Society's Rules [Class 3 vessels];
 - Bureau Veritas certificate is required for final assembly of the filter 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 **WARTSILA WATER SYSTEMS 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 [4.10 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 of the system 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.174(58).

For information, **WARTSILA WATER SYSTEMS LTD** has declared to Bureau Veritas the following production sites:

- **WARTSILA WATER SYSTEMS LTD: Fleets Corner, POOLE, Dorset, UNITED KINGDOM**
- **WARTSILA Suzhou Ltd: No. 77 Hongxi Road, New District of Suzhou, 215151 PR China**

6. MARKING OF PRODUCT

Each Ballast Water Management system shall be marked with:

- Manufacturer's name or trade mark
- Type designation
- Serial number
- Ex marking, as relevant
- Society's brand as relevant

7. OTHERS

7.1 This approval is given on the understanding that the manufacturer will accept full responsibility for informing shipbuilders or their sub-contractors of the proper method of fittings and general maintenance of the Ballast Water Management system and of the conditions of this approval.

7.2 A copy of the Type Approval Certificate of Ballast Water Management System issued by an Administration should be carried on board a ship 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 on board the ship.

7.3 A copy of the operating manual is to be maintained onboard.

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