No. 180 (Apr 2024) Recommendation for conducting commissioning testing of Ballast Water Management Systems

1 Application

1.1 This recommendation provides guidance for conducting a biological commissioning test of a Ballast Water Management Systems (BWMS) in accordance with IMO BWM.2/Circ.70/rev.1.

The commissioning test shall demonstrate that the BWMS is working properly by verifying that the ballast water discharge is in accordance with the D-2 standard and by an assessment of self-monitoring parameters.

These Guidelines have been developed using the best information currently available on procedures, methods, and practices for commissioning testing of BWMS.

1.2 According to regulation E-1.1.1 and E-1.1.5 of the BWM Convention, compliance commissioning testing shall be conducted during an initial survey and during an additional survey if this additional survey is triggered from a significant change, replacement and or repair of the BWMS. Further clarification of when a change, replacement and or repair to a BWMS is significant is further described in IMO BWM.2/Circ.66 Rev 5.

1.3 The statutory requirements from relevant Flag Administrations are to be considered in combination with these guidelines. Alternative approaches may also be considered as equivalent to those specified in this document. Acceptance of any such equivalent approach rests with the Society (acting as RO) and/or Flag Administrations.

1.4 Chapter 3, 4, 6, 7, 8, 9 and 10 are primarily intended for Service suppliers performing commissioning testing and Class surveyors witnessing and approving the results. Chapter 5 and 6 is primarily intended for Owners and Yards in connection with preparation for commissioning testing.

1.5 Section 18 of the Annex to IACS UR Z17, provides requirements for Approval of Firms engaged in Commissioning Testing of BWMS. The recommendations in this document provide supplementary guidance to the requirements in the mentioned UR.

2 Definitions

2.1 Ambient water is the water from a natural and local source water in which the ship is submerged into.

2.2 Commissioning test is used to validate the installation of BWMS by demonstrating that its mechanical, physical, chemical and biological processes are working properly in accordance with BWM.2/Circ.70/rev.1.

2.3 Service supplier is a person or company, not employed by an IACS Member, who at the request of an equipment manufacturer, shipyard, vessel's owner or other client acts in connection with inspection work and provides services for a ship or a mobile offshore unit such as measurements, tests or maintenance of safety systems and equipment, the results of which are used by surveyors in making decisions affecting classification or statutory certification and services.

No. 180 (Apr 2024)

2.4 Technical assessment is the assessment for installing BWMS onboard in accordance with the BWMS Code, paragraph 8.3.

3 Test analysis method.

3.1 According to IMO BWM.2/Circ.70, rev.1 the analysis should be conducted using indicative analysis, with the intention of providing quick analysis results. However, some service suppliers are more experienced/comfortable with detailed analysis and finds this method efficient and accurate.

3.2 Both indicative and detailed methods should be accepted by the Societies. Guidelines from IMO on verification of ballast water compliance monitoring devices (CMD) may be used as basis for accepting an indicative analysis equipment in line with BWM.2/Circ.78.

3.3 For systems that render organisms non-viable (e.g UV systems), it must be evaluated if the method selected is suitable. If the method applied evaluates if organisms are living instead of viable, a suitable hold time should be selected to reduce the risk that non-viable but still living organisms are falsely identified as viable organisms at the time of analysis. Service supplier has to provide this information prior commencement of the process and compliance is to be detailed in the report.

3.4 Table 1 below lists examples of indicative analysis methods. Table 2 lists examples of the detailed analysis methods.

Table 1 Indicative analysis method and determination method for analysis results (examples)

<table>
<tr><th>Indicative analysis methods</th><th colspan="2">Characteristics</th><th colspan="2">Determination method</th></tr>
<tr><td rowspan="9">Adenosine triphosphate (ATP)</td><td colspan="2">Adenosine triphosphate (ATP) is a biochemical compound found in living cells and quantifying the amount of ATP in organisms is thus an indicator of the concentration of living organisms.</td><td colspan="2">Below table shows the correlation between ATP quantities found in samples and compliance with the D-2 standard as determined through validations of CMD. Depending on the applied analysis methods or pre-processing methods, the ATP quantities that indicate D-2 compliance may be different. Thus, the analysis methods and the ATP threshold suggested by the manufacturer of the applied CMD should be confirmed during the testing.

For the range of ATP quantities indicating compliance or non-compliance, the below thresholds for ATP are based on three literatures studies. Each study used different protocol for ATP analysis, such as extraction and homogenization method.</td></tr>
<tr><td>Size faction of organisms</td><td>ATP values</td><td>Compliance (C) or Non-compliance (NC)</td><td>Remarks</td></tr>
<tr><td rowspan="2">≥50 µm</td><td><10,000 pg/m^3</td><td>C</td><td>- 1) Curto et al., 2018
- Equivalent to < 10 inds/m^3</td></tr>
<tr><td>≥750,000 pg/m^3</td><td>NC</td><td>- Curto et al., 2018</td></tr>
<tr><td rowspan="4">≥10, <50 µm</td><td><500 pg/mL</td><td rowspan="3">C</td><td>- Curto et al., 2018
- Equivalent to < 10 inds/mL</td></tr>
<tr><td><788 pg/mL</td><td>- 2) Hyun et al., 2018</td></tr>
<tr><td><50 RLU</td><td>- 3) van Slooten et al., 2015
- Detection limit: 2.5±0.5 cells/mL</td></tr>
<tr><td>≥1,500 pg/mL</td><td>NC</td><td>- Curto et al., 2018</td></tr>
</table>

No. 180 (Apr 2024)

		>98,610 pg/mL		- Hyun et al., 2018
		≥6,000 RLU		- van Slooten et al., 2015
	Bacteria	<1,000 pg/100 mL	not likely NC	- Curto et al., 2018 - Equivalent to < 1000 CFU/100mL of heterotrophic bacteria
		≥5,000 pg/100mL	NC	- Curto et al., 2018
	References: 1) Curto, A.L., P. Stehouwer, C. Gianoli, G. Schneider, M. Raymond, and V. Bonamin. 2018. Ballast water compliance monitoring: A new application for ATP. J. Sea Research, 133, 124-133. 2) Hyun, B., H.-G. Cha, N. Lee, S. Yum, S.H. Baek, and K. Shin. 2018. Delevopment of an ATP assay for rapid onboard testing to detect living microorganisms in ballast water. Journal of Sea Research, 133, 73-80. 3) van Slooten, C., T. Wijers, A.G. Buma, and L. Peperzak. 2015. Development and testing of a rapid, sensitive ATP assay to detect living organisms in ballast water. Journal of Applied Phycology, 27(6), 2299-2312.			
Pulse amplitude-modulation (PAM)	The following items are measured and analysed: 1) Photochemical efficiency of photosystem II (PS II) which is the fluorescence characteristic of particles in phytoplankton having chlorophyll. 2) Photosynthetic activity and phytoplankton biomass as indicators for living cells 3) Living cells based on the fluorescence change of chlorophyll of living algae	The analysis results are normally determined by using a method to display measurement results as green, yellow or red on an indicative analysis device.		
Single Turnover Active Fluorometry (STAF)	Phytoplankton Primary Productivity (PhytoPP) is measured on much wider spatiotemporal scales than is possible with more direct methods such as 14C fixation.	The analysis results are normally determined by using a method to display the measurement results as pass, fail or non-determined on indicative analysis device, see example below.		
	Standard parameter		***T. Punctigera* (≥ 50 µm)**	***D.salina* (≥ 10 µm and < 50 µm)**
	F_v (Fixed level of Variable fluorescence)		0.254	0.263
	Cells per mL			
	Level 1		111 (FAIL)	94 (FAIL)
	Level 2		8.8 (PASS)	360 (FAIL)
	Microscope		7.0 (PASS)	427 (FAIL)
	SCF (Standardized Cell Fluorescence)		0.0288	0.0007
Flow cytometry	Light scattering and fluorescence are used to detect live and dead micro-organisms. It is more appropriate to apply this method to the analysis of ≥ 10 and < 50 µm organisms than to the analysis of ≥ 50 µm organisms[1)]. Reference: 1) Hoell, I.A., R.O. Olsen, O.-K. Hess-Erga, and G. Thuestad. 2017. Application of flow cytometry in ballast	Directly confirms whether the analysed concentration is compliance with the regulation D-2. - Since FCM (Flow Cytometry Method) measures aggregated cells as a single cell, the measurement results may be underestimated when measuring the number of algae and bacteria forming colonies. Thus, it is recommended to analyse living organisms by using FCM with Scanning Flow Cytometry (SCM) which provides picture of the measured organisms. - In the above case, it is necessary to compare the measured number of organisms and pictures to ensure that there is no underestimation.		

	water analysis – biological aspects. Management of Biological Invasions, 8(4), 575-588.	

Table 2 Detailed analysis method and determination method for analysis results (example)

Detailed analysis methods	Characteristics	Determination method
Microscopy of organisms ≥ 10 µm and < 50 µm	The concentration of living organisms is analysed by using Bogorov chamber and FDA/CMFDA staining method.	Living organisms are analysed by using FDA/CMFDA staining of the sample and counting organisms with green fluorescence using epifluorescence microscopy. In addition, motile organism without fluorescence should be added to the organism's count. Reference: PPR 4/7, appendix 1; PPR 4/INF.10
MPN Dilution Culture + Motility for organisms ≥ 10 µm and < 50 µm	The concentration of viable algae is analysed by culturing while living autotrophs are analysed with epifluorescent microscopy.	Viable organisms are analysed by culturing a matrix of dilutions and replicates in favourable media, light and temperature conditions, and scoring them for growth to determine the most probable number (MPN) of viable autotrophs. Growth of autotrophs in MPN matrix subsamples is detected via measurable increases in chlorophyll fluorescence over the course of the incubation. The MPN is accurately calculated when the matrix includes dilutions that contain a single viable autotroph. Additionally, a subsample of the original sample is examined using epifluorescent microscopy to count heterotrophs (those organisms that do not show red chlorophyll auto-fluorescence). Reference: PPR 4/7, appendix 2
Microscopy of organisms ≥ 50 µm	The concentration of live organisms is analysed by visual counts using stereomicroscopy.	The organisms shall be concentrated using a mesh with holes no greater than 50 µm in the diagonal dimension. Only organisms greater than 50 µm in minimum dimension shall be enumerated. The concentration of live organisms is analysed by observation of motility or response to stimuli by stereomicroscopy. Reference: OECD Test Guideline for Testing of Chemicals 202, "Daphnia sp. acute immobilization test and reproduction test" Code for approval of ballast water management systems (BWMS Code) (Res.MEPC.300(72))

4 Recommended preparations by the service supplier before a commissioning test

4.1 The service supplier shall be approved by an IACS Class Society, in accordance with UR Z17. By approval, the Classification Society delegates the responsibility for operating in line with an adequate process and quality management system.

4.2 The Society (acting as RO) verifying the commissioning test, has the responsibility to verify that the test is conducted according to procedures developed by the service supplier and as approved by the Society under UR Z17. The following information should be available at the time of the commissioning test as necessary:

- Procedures for sampling collection, handling and analysis. (this may vary basis type of ship, location of installation, type of BWMS installed etc)
- Procedures for assessment of BWMS operation and reporting.
- QA records, including chain of custody for sample handling
- Operating procedures for the ballast water monitoring device, or other analysis equipment, including calibration, adjustment and maintenance.

The Society(acting as RO) will verify that all basic measurements and data are correctly taken and recorded as described.

4.3 The service supplier performing the commissioning test should receive relevant information from the ship regarding the BWMS installation to get familiar with the system and to prepare for sampling in accordance with the BWM.2/Circ.42/Rev.2 and G2 Guidelines of the Convention. The following information should be available as necessary:

- The type and model of the BWMS that is installed.
- The treatment rated capacity (TRC) and other system design limitations (SDL) of the BWMS. (such as holding time, inlet water temperature etc)
- The location and details (pipe diameter and sample probe diameter) of any sampling port or other sample arrangement that may be used to sample uptake water.
- The location and details (pipe diameter and sample probe diameter) of the sampling port that is used for sampling of discharged ballast water.
- Previous commissioning test results if any since the BWMS was installed.
- Place where the test is to be carried out (berth/anchorage). Ambient water condition used for commissioning and testing.
- Available amount of time for testing.
- Other operations planned by the ship such as repairs, bunkering, storing, etc.

4.4 The service supplier performing the BWMS commissioning testing should be able to perform both biological sampling and analysis as well as assessing the correct operation of self-monitoring parameters at the same BWMS operation cycle.

5 Recommended preparations by the ship before a commissioning test

5.1 Removal of existing untreated water and sediments in all ballast water tanks will minimize the risk of non-compliance with the D-2 standard. After installation of a BWMS the ship should flush ballast water pipelines and tanks to remove untreated ballast water and sediments. Any flushing should be conducted with treated water using the BWMS. Removing sediments should be performed in suitable areas (i.e. preferably disposing to reception facilities in controlled conditions in port, at a repair facility, in dry dock, or alternatively be disposed at sea in areas outside 200 nm from land and in water depths of over 200 m) as described by regulations paragraph 1.3.5 and 1.3.6 of Guidelines G4 MEPC.127(53) as amended to the BWM Convention.

5.2 Before a commissioning test, the technical assessment of the BWMS installation and initial survey in accordance with the HSSC Guidelines shall have been completed to ensure that the BWMS works as intended.

5.3 In case of the commissioning testing with surveyor’s presence, the following information shall be submitted to the Classification Society (acting as RO), before initiating the commissioning testing:

- Information of date and location of the test.

No. 180 (Apr 2024)

- Responsible person onboard the ship.
- The commissioning test procedure

6 Recommended practices for conducting the commissioning test

6.1 Illustrations of the steps involved in a commissioning test are provided in Annex 2.

6.2 Ballasting and deballasting during the test shall be conducted in accordance with the approved ballast water management plan and the operation, maintenance and safety manual of the BWMS.

6.3 To verify that the BWMS is able to operate as intended without failures, it is recommended to operate the system for at least one hour or for a complete ballasting event. The installed BWMS should be running at full capacity with stable operating parameters.

6.4 Some BWMS are type approved with several treatment modes of operation, e.g., operation mode approved by US Coast Guard and operation mode approved for the rest of the world (IMO). The commissioning testing has the purpose of validating the BWMS as it is type approved in accordance with the IMO BWMS Code. Therefore, the IMO mode of operation should be selected for the BWMS commissioning test. In cases where the IMO type approval includes two or more modes of treatment, the most conservative mode of operation (e.g. lowest UV dose/IMO mode) can be considered representative for all operating modes.

6.5 The uptake water for testing shall be ambient water, meaning local and natural water that is not prepared, augmented or pre-treated.

6.6 The ambient uptake water should have water quality characteristics that are suitable for the BWMS to be tested, e.g. salinity or UV transmission characteristics should be within the system design limitations (SDL). If the commissioning test is conducted with water quality characteristics outside the SDL (challenging condition of uptake water), the following actions are recommended:

- If the BWMS activates an alarm due to challenge water quality and/or the BWMS triggers a shutdown, the test cannot be performed. It is recommended to find a new location for testing or wait until the water quality changes. The flag of the ship may need to be contacted if testing get delayed.
- If the BWMS activates an alarm due to challenge water quality but the BWMS does not trigger a shutdown, the test can be completed, although this is not recommended. If the testing and analysis atdischarge are completed successfully under the challenging condition of uptake, the test may be conservatively considered as successful for validating the BWMS installation.

6.7 The IMO BWM.2/Circ.70/rev.1 includes the possibility of collecting a sample for analysis of the ambient uptake water. IACS recommends that the ambient uptake water is analysed in order to evaluate density and type of living organisms in which the BWMS is challenged with.

For commissioning testing, the ambient water should be considered suitable when the analysis indicates organisms densities (or concentrations) higher than the D-2 standard, specifically, when the densities (or concentrations) are at least >100 organisms/m^3 for size class ≥ 50 µm.

If the density is lower, it is recommended to find a new location for testing or wait until the water quality and/or organism density changes. If testing is anyway conducted, the test may reveal if there is contamination of any remaining untreated water in the ballast tanks, but the

No. 180 (Apr 2024)

test will not be adequate to validate the performance of the BWMS with associated piping and valves, even it the discharge meet D-2 compliance.

6.8 Ballast water holding time between treatment of ballast water and deballasting during testing should be in line with the SDL included in the type approval certificate.

7 Sampling

7.1 Obtaining a representative sample directly from a ballast tank when they vary so much in size, shape, complexity and position is challenging. Sampling from a number of different locations, both spatially and with depth, and also from different tanks, should be considered. Two or more samples are preferred to single or composite samples. Detailed sampling and analysis for compliance with D-2 from manholes, sounding pipes or air pipes is not recommended as it is challenging to obtain sufficient sample sizes and it does not give accurate results.

7.2 When more than one BWMS is installed, the service supplier and the ship shall prepare for multiple sampling during commissioning testing to ensure all main components are validated. This may involve some of the following options:

- Ballasting utilising several BWMS in parallel and by mixing the treated water into ballast tanks. During discharge, sampling can be performed from one sample point located at a common overboard line, resulting in one sample representing treated water from all the respective BWMS, or;
- Ballasting by sequentially utilising each BWMS to dedicated ballast water storage tanks. During discharge, sequential sampling can be performed from each dedicated tank resulting in two or more samples representing the respective BWMS.

Illustrations of the two alternatives for commissioning testing involving two or more BWMS are provided in Annex 3.

7.3 Samples should be collected from a sampling point as described in the Guidelines for ballast water sampling, G2. According to G2, the sample port shall be 1.5 – 2.0 times the isokinetic sample port size. The appropriate sampling flow rate in accordance with the requirements should be determined using the equation included in G2. The appropriate sampling flow rate will depend on the actual deballast flow rate, ballasting pipe diameter and sample probe diameter (see Figure 1). A look-up table or calculation sheet may be developed for calculating the isokinetic sampling flow rate. In addition, as recommended by the EMSA /Reference 8/ guidance for best practices on sampling, the sampling flow rate should not exceed 50 litres/min, as this may impair organism survival when sampling with a plankton net or any other method for concentrating the sample for organisms ≥50 μm.

No.
180
(Apr 2024)

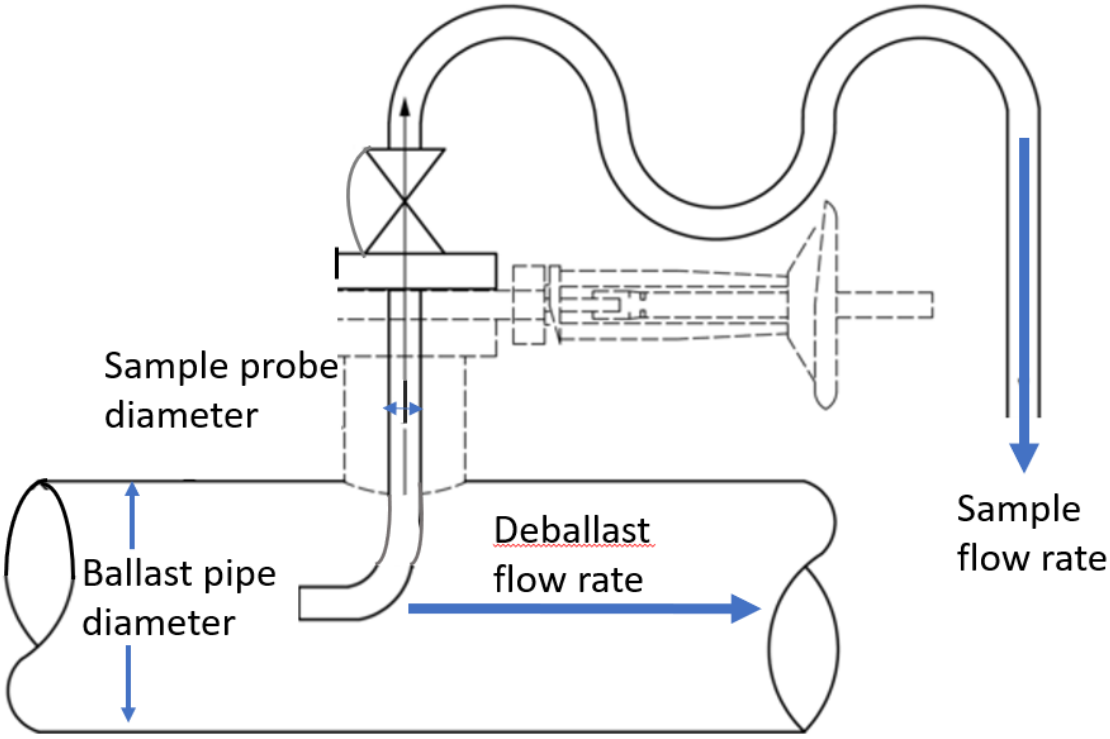


Figure 1 Example of a sample probe in a ballast pipe

7.4 An example of a recommended range for a sampling flow rate is given in Table 3. The sampling flow rates are calculated based on two different ballasting flow rates with a given sample pipe diameter.

7.5 To maintain the recommended sample flow rates, a diaphragm valve or similar type of valve should be used (see Figure 2). Ball valve, gate valve and butterfly valve types should be avoided as they may cause significant shear forces which may result in organism mortality. Therefore, the ball valve of the ship's sample port must be opened fully, and an additional diaphragm valve should be used to adjust the sampling flow rate as necessary to ensure isokinetic sampling. ISO standard 11711-1 and 11711-2 provides further guidance on sample port design.

7.6 According to BWM.2/Circ.70/rev.1, a representative sample should be collected during the corresponding ballast water discharge after the full treatment has been applied, and the total sample volume should be at least 1 m^3. If a smaller volume is validated to ensure representative sampling of organisms, it may be used.

7.7 Normally, one main sample hose from the sample port is used for collection of organisms size class: ≥ 50 μm. The hose is supplemented by a separate smaller hose to collect the organisms size class ≥ 10 μm and < 50 μm. See Figure 2 for an illustrative example. The sample hoses shall be cleaned and flushed before the samples are taken.

No. 180
(Apr 2024)

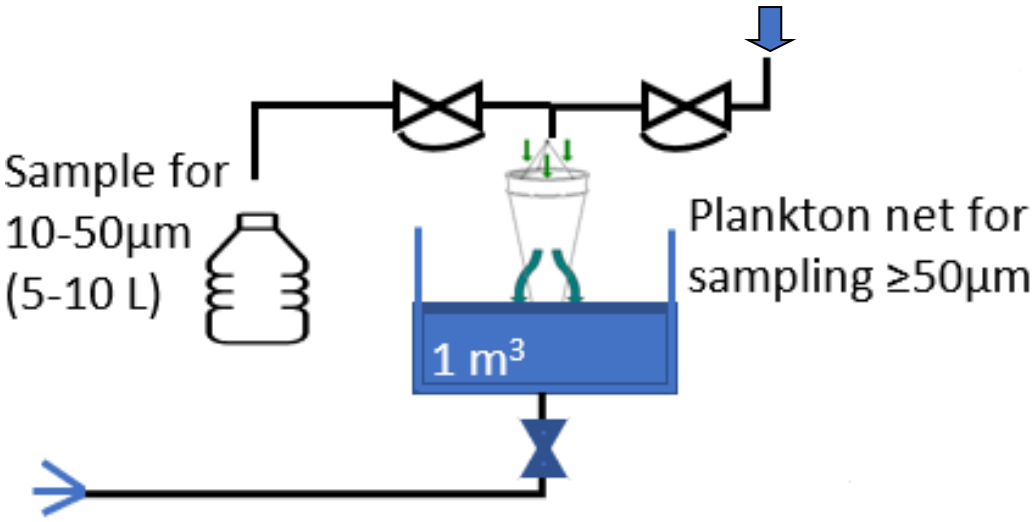


Figure 2 Illustration of the sampling hose for organisms ≥50µm supplemented with a smaller hose for sampling of 10-50µm organisms

7.8 Sampling duration should be sufficient to allow a representative sample. The EMSA Guidance /**Reference 8**/, recommend at least 10 minutes each in the beginning, middle and end of a complete ballast event. The sampling duration should not be longer than the expected survival rate in a sample. For instance, Table 3 illustrates that the sampling duration may exceed 2 hours to collect a representative sample from a 16 mm sample port. In such cases, it's advisable to use a larger sample probe diameter, such as 45 mm, to shorten the sampling duration.

Table 3 Example calculation of iso-kinetic sample flow rates

System (m^3/h)	Main pipe diameter (mm)	Sample pipe diameter (mm)	Min sample flow rate (m^3/h)	Maximum sample flow rate (m^3/h)	Minimum time to collect 1 m^3 (minutes)
300	300	16.0	0.2	0.4	150
200	300	16.0	0.1	0.3	200
300	300	45.0	1,7	3,0	20
200	300	45.0	1,1	2,0	30

7.9 The sample of organisms size class ≥ 50 µm shall be collected through a plankton net or a sampling device to concentrate a sample of at least 1 m^3 (1000 litres) to approximately 1 litre. No concentration of the sample collected for the organisms size class ≥ 10 µm and < 50 µm is required. See Figure 3 below for illustration.

7.10 Sampling of organisms in a dry plankton net increases the mortality due to mechanical pressure and exposure to air. The sampling hose tip, the plankton net and cod-end should thus be submerged before sampling starts and remain submerged during sampling. After completion of sampling, the bottom of the plankton net should be flushed with a squeeze bottle (or similar of appropriate salinity)to ensure all organisms are collected in the cod end container. See Figure 3 for illustration of the concentration and flushing.

7.11 Subsamples may be used to analyse the sample water. The subsamples should be well mixed and be representative of the sample water. In this regard, it is recommended to perform subsampling according to paragraph 2.8.6 in Annex of BWMS Code

No. 180
(Apr 2024)

(Res.MEPC.300(72)). See Figure 4 for illustration of the subsampling for organism size class ≥ 50 µm and ≥ 10 µm - < 50 µm.

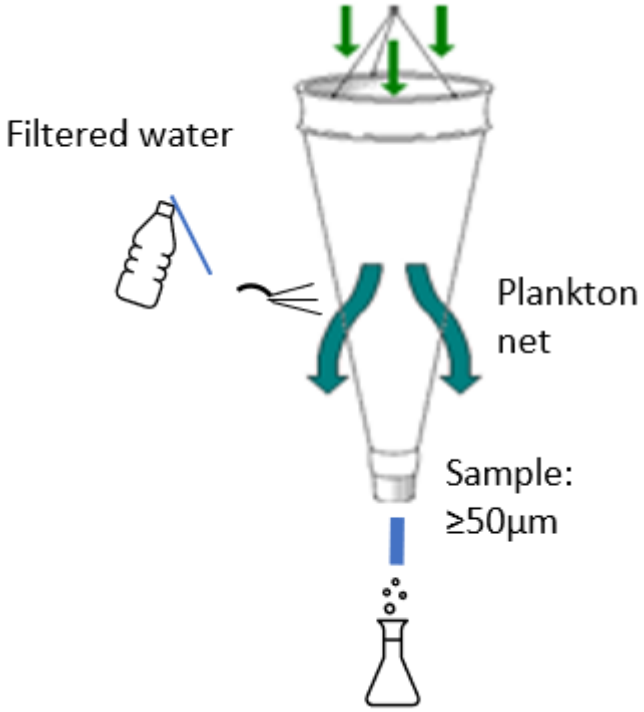


Figure 3 Illustration of plankton net being flushed with a squeeze bottle (or similar) to ensure all organisms are collected in sample bottle for analysis of ≥50µm

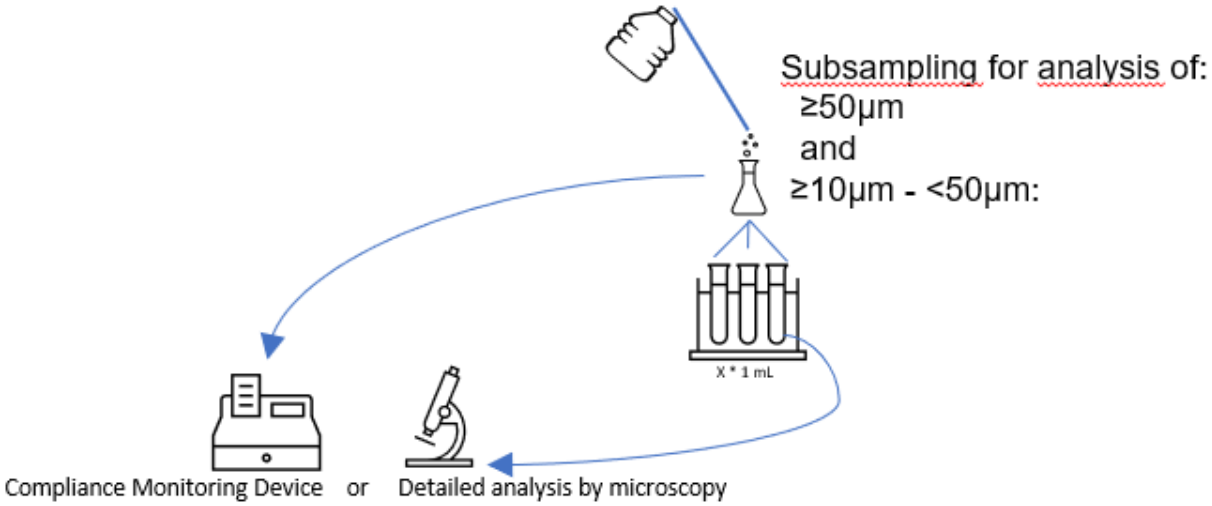


Figure 4 Illustration of sample handling before analysis of organisms ≥50µm and ≥10µm - < 50µm

No. 180 (Apr 2024)

7.12 Sample preservation may only be used for analysis of ambient uptake water or in cases where the indicative method requires preservation.

8 Analysis assessment

8.1 Sample collection, storage and transport is included in the total time until a sample analysis is completed and is relevant for the validity of the results. The service supplier is responsible for completing the analysis within sufficient time before mortality of the sample organisms may be expected. In this regard, it is recommended that the samples are analysed as soon as possible after sampling, and no later than six hours.

8.2 The BWMS commissioning test is considered successful when the analysis results of discharge samples and the operation of the BWMS comply with paragraph 5 of the Annex of BWM.2/Circ.70/Rev.1. When the indicative test methods do not report an organisms count, but reports according to other indicative measures, a clear interpretation guideline should be given for when a result is considered to not exceed the D-2 standard. ATP is an example of such indicative method. See Table 1 for suggested measurable ranges for compliance.

8.3 When indicative analysis indicates non-conclusive test results, detailed analysis should be conducted.

9 Self-monitoring parameters

9.1 The applicable self-monitoring parameters (e.g. flow rate, pressure, TRO concentration, UV transmittance/intensity, etc.) of the BWMS should be assessed during uptake and discharge operation of the commissioning. It is expected that the service supplier studies the recorded parameters from the uptake before the discharge operation is conducted with sampling and testing. It is not expected that the service supplier performs independent measurements of self-monitoring parameters. The assessments should at least include:

- The recorded self-monitoring parameters should be verified and assessed that they are not beyond the SDL as stated in the type approval certificate.
- Evaluation if the sensors and related equipment indicates correct operation.
- The BWMS should be operated with flow rates typical for the ballast operations on board the vessel where the commissioning test is performed. If the system is purposely operated with a flow rate significantly below target flow rate, it may lead to overdosing which is not recommended for a proper verification test.
- For BWMS applying active substances, an independent measurement of residual active substance (e.g. TRO) could be carried out to confirm that the BWMS complies with the accepted discharge limit (e.g. 0.1 mg/L TRO as Cl2).

9.2 The accuracy of instruments utilized for measuring self-monitoring parameters does not require verification during the installation commissioning test. However, calibration certificates must be provided in accordance with BWM.2/Circ.66/Rev.5. In case of a sensor failure or inaccuracies in readings/operation, the installation commissioning test will be suspended until the issue is resolved.

10 Reporting

See the Annex 1 for a sample reporting form meeting the minimum requirements of UR Z17, paragraph 18.6.

No. 180
(Apr 2024)

11 References

Reference 1: IMO circular BWM.2/Circ.70/rev. 1 - Guidance for the Commissioning Testing of Ballast Water Management Systems.

Reference 2: IMO Resolution MEPC.173(58) — Guidelines for Ballast Water Sampling (G2)

Reference 3: IMO Circular BWM.2/Circ.42/Rev. 2 -Guidance on Ballast Water Sampling and Analysis for Trial Use in accordance with the BWM Convention and Guidelines (G2)

Reference 4: IMO Circular BWM.2/Circ.61 - Guidance on Methodologies that may be used for Enumerating Viable Organisms for Type Approval of Ballast Water Management Systems

Reference 5: IMO Resolution MEPC.300(72) — Code for Approval of Ballast Water Management Systems (BWMS Code)

Reference 6: IMO Circular BWM.2/Circ.69 - Guidance on System Design Limitations of Ballast Water Management Systems and their Monitoring

Reference 7: BWM.2/Circ.78 - Protocol for the Verification of Ballast Water Compliance Monitoring Devices

Reference 8: EMSA BWM - Guidance for best practices on sampling (Version of February 2019)

Reference 9: BWM.2/Circ.66/Rev.5 - Unified interpretations to the BWM Convention

Reference 10: IMO Resolution MEPC.127(53) as amended - Guidelines for ballast water management and development of ballast water management plans (G4)

Reference 11: IMO Resolution MEPC.325(75) – Amendments to the International Convention for the Control and Management of the ships' ballast water and sediments

No. 180 (Apr 2024)

Annex 1 – SAMPLE FORM FOR REPORTING FROM COMMISSIONING TEST

INTRODUCTION

This report is written in accordance with BWM.2/Circ.70/Rev.1 on “Guidance for the commissioning testing of ballast water management systems”.
The purpose of the report is to meet the requirements of Resolution MEPC.325(75) with amendment to Regulation E-1 of the Ballast Water Management Convention and paragraph 1.1.3.20 of annex 4 of the HSSC Guidelines (Resolution A.1156(32)).

This report lists the methods used and the results of the biological efficacy testing at the BWMS commissioning. Demonstration of self-monitoring parameters are included with an evaluation of the correctness.

DESCRIPTION OF THE SHIP and BWMS

Ship	
IMO number	
Port of uptake water	
Port of sampling during discharge	
BWMS Manufacturers Name	
BWMS Model Name	
Number of BWMS installed	<EXAMPLE: One>
Technology	<EXAMPLE: UV + Filter>
BWMS treatment mode of operation	<EXAMPLE: IMO-mode, fresh water mode>
Treatment rated capacity (TRC) in m^3/h	
BWMS Technology limiting operating conditions and system design limitations	
Type Approval issued by and Certificate No.	
RESPONSIBLE PERSON of Service supplier:	

BALLAST WATER SAMPLING

Sample of ambient water

A sample of ambient water was collected through:

- ☐ in-line sample port
- ☐ direct harbour sample
- ☐ other Please specify:

☐ No sampling of ambient water was performed along with the reason and acceptance from flag administration.

No. 180
(Apr 2024)

Sample of treated ballast water (at discharge)

For this vessel, the following ballast water tank(s) were sampled:

For this vessel, the following sampling method was applied:

Sampling of the discharge of treated ballast water from tank(s) using:

- ☐ The dedicated discharge sample port of the vessel
- ☐ another sample port, as approved by RO/flag (Please specify location:……)
- ☐ In-tank sampling, as applicable basis the technology used by the BWMS

The sampling during discharge followed the G2 Guidelines with regards to iso-kinetic sampling with the following parameters:

Sample port diameter	
Ballast pipe diameter	
Ballast flow rate	
Sample flow rate	

Analysis of samples

The following methods were used for analysing samples for the two size classes ≥ 50 µm and ≥10 µm - < 50 µm:

Size class	Indicative/detailed analysis method	Type of method	Method reference standard	Reference to applicable standard operating procedure (SOP) of test facility
Organisms ≥50 µm*	☐ Indicative ☐ Detailed			
Organisms ≥10 - <50 µm*	☐ Indicative ☐ Detailed			
Sample concentration for ≥50 µm	Plankton net or any other			

No. 180 (Apr 2024)

DESCRIPTION OF RELEVANT PERFORMANCE PARAMETERS

During uptake and discharge, the following performance parameters were recorded and compared with the system SDL:

BWMS operating parameters and SDL as per IMO TAC (de-ballasting)	**Self-monitoring parameters**	**SDL** as per IMO TAC	**Recorded during uptake water (average value)**	**Recorded during discharge (average value)**
	<EXAMPLE Flow rate (m^3/h)>	<EXAMPLE TRC>		
	<EXAMPLE TRO or UV intensity>			
	<EXAMPLE Pressure>			
Volume	Total volume ballasted/ de-ballasted (m^3)			
Hold time	Time ballast water is held in ballast tank(s) prior to de-ballasting			
Operation	Did the self-monitoring equipment indicate correct operation (Yes/No) If not, please describe the alarms that occurred during deballast operations.	<EXAMPLE Yes/No>		
Data downloaded	From recording device: During ballast: During deballast:			

Ambient water

Ambient water*	Location(s) of ballasting ambient water		
	Salinity (PSU)		
	Temperature at uptake (°C)		
	UV transmission (%)		
		Organisms ≥50 µm	**Organisms ≥10 - <50 µm**
Sampling of ambient water	Volume of sample(s) collected (indicate L or m^3)		
	Was the sample(s) concentrated before analysis? (Y/N)		
Analysis of ambient water samples	Number of subsamples analysed		
	Period of time within analysis was completed after sampling (hours)		
Organism densities	Ambient water sample	<EXAMPLE XX per m^3>	<EXAMPLE XX per mL>

*In the case that the ambient water is not appropriate for the operational testing during the commissioning of the BWMS (e.g. salinity of ambient water is outside the system design limitations (SDL) of the BWMS), testing should be evaluated to the satisfaction of the Administration.

No. 180
(Apr 2024)

Treated ballast water (at discharge)

		Conversion method and correlation (if not direct count)	Organisms ≥50 µm	Organisms ≥10 - <50 µm
Sampling of treated ballast water	Volume of sample(s) collected (indicate L or m^3)			
	Was the sample(s) concentrated before analysis? (Y/N)			
Analysis of treated ballast water	Number of subsamples analysed			
	Period of time within analysis was completed after sampling (hours)			
Organism densities	Treated discharge sample		<EXAMPLE XXX> per m^3	<EXAMPLE XXX> per mL
	D-2 standard requirement		*< 10 oganisms. per m^3*	*< 10 organisms. per mL*

Declaration and Signatures

The BWMS model _____

manufactured by _____

installed onboard the vessel _____

with IMO number _____

has been tested by the service supplier _____

and is verified by the Society and found to be in order/testing to be carried out again (along with reason in case failed).

This declaration confirms the manufacturer has not been involved in any part of the sampling and analysis described in this report.

this report confirms that the validation of the biological efficacy was carried out by the service supplier in accordance with BWM.2/Circ.70/Rev.1 on “Guidance for the commissioning testing of ballast water management systems” and that this report contains no known errors, omissions or false statements.

_____
signature of the service supplier, place and date

No. 180 (Apr 2024)

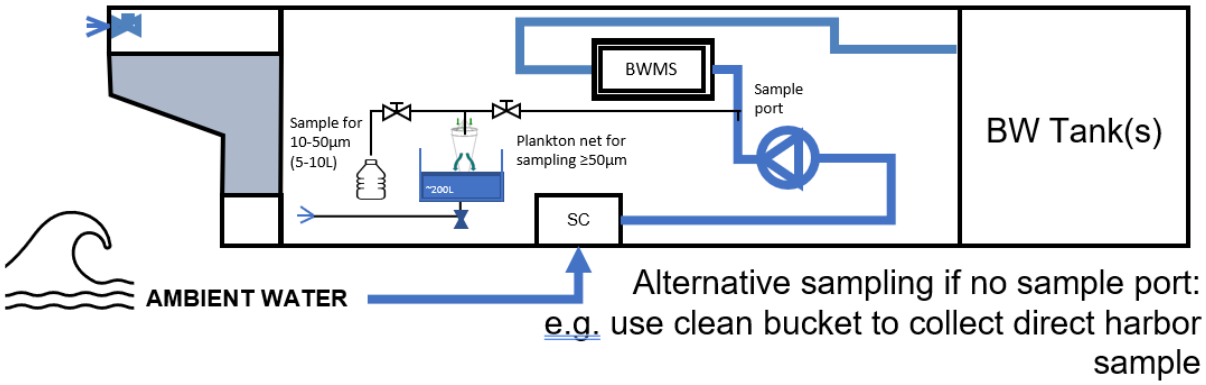
APPENDICES TO BE INCLUDED IN THE REPORT:

<EXAMPLE
A: BWMS DATA LOG DURING BALLAST AND DISCHARGE OPERATION OF THE TEST
B: COPY OF CHAIN OF CUSTODY
C: PHOTOS
D: Test methods of used by the service supplier (or organization), including applicable SOPs
E: Specification and operational manual for Compliance Monitoring Device (CMD), if applicable>

No. 180
(Apr 2024)

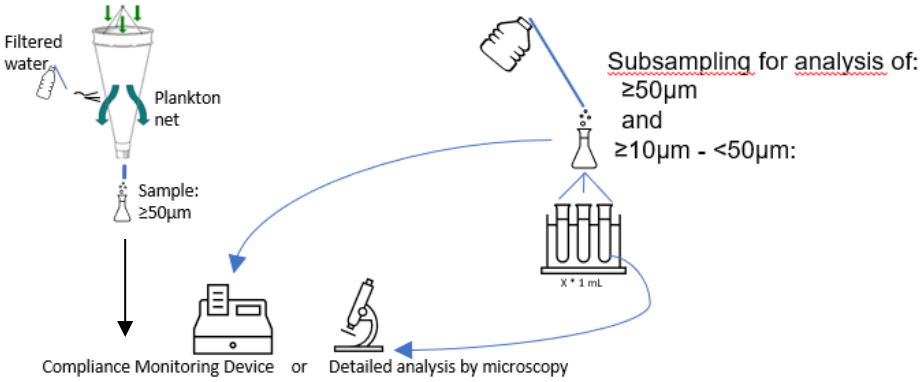
Annex 2 – ILLUSTRATION OF STEP BY STEP FOR COMMISSIONING TEST

Step 1: Ballasting with sampling of inlet ambient water:



Step 2: Sample handling:

Flush plankton net with a squeeze bottle (or similar) to ensure all organisms are collected in sample bottle for analysis of ≥50µm:



Expected analysis results: ≥ 50µm :

> 100 organisms/m^3 or an indication of D-2 non-compliance

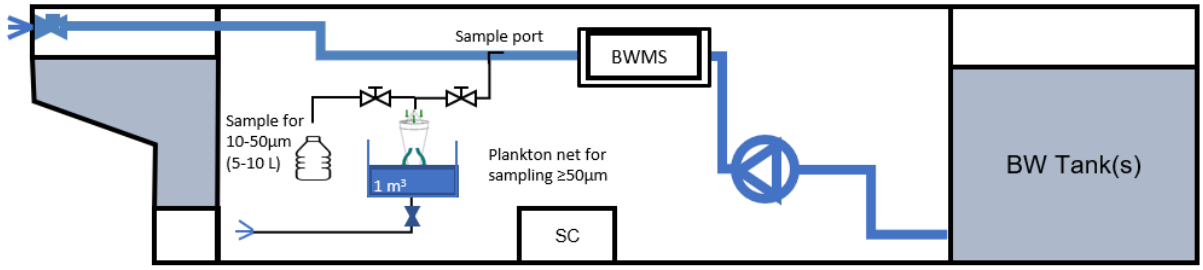
≥ 10µm and < 50µm :

> 10 organisms/mL or an indication of D-2 non-compliance

Step 3: Holding the ballast water in the ballast tank(s) for sufficient time and in accordance with IMO TAC.

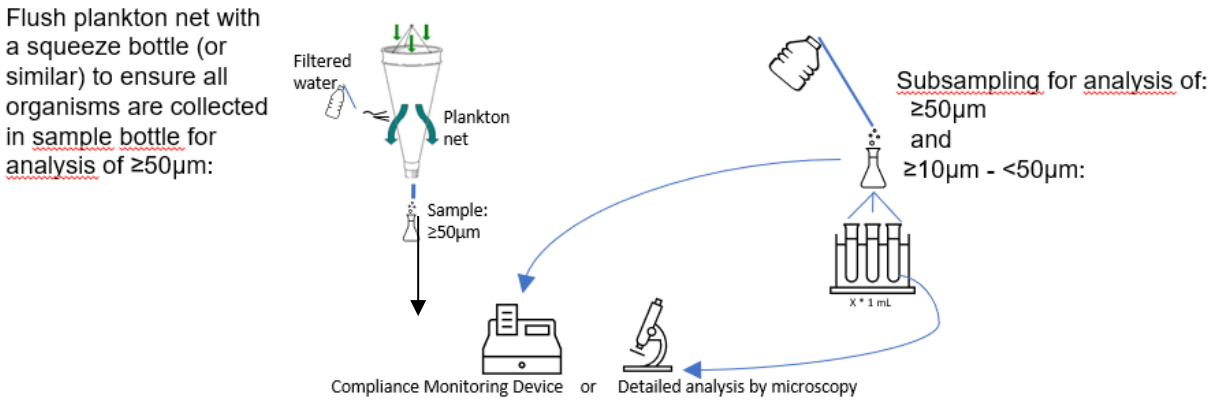
No. 180
(Apr 2024)

Step 4: Deballasting according to IMO type approval – sampling is required:



1) A representative sample should be collected during ballast water discharge after the full treatment and minimum holding time has been applied. Samples should be collected from the sampling port as described in the Guidelines on ballast water sampling (G2). If the continuous sampling method is used, the total sampling time may be calculated using the total water volume to be sampled at a calculated sampling flow rate using the isokinetic sampling port equation described in the G2 guidelines.
2) The total sample volume should be at least 1 m^3. A smaller volume may only be used if validated to ensure representative sampling and analysis of organisms.

Step 5: Sample handling:



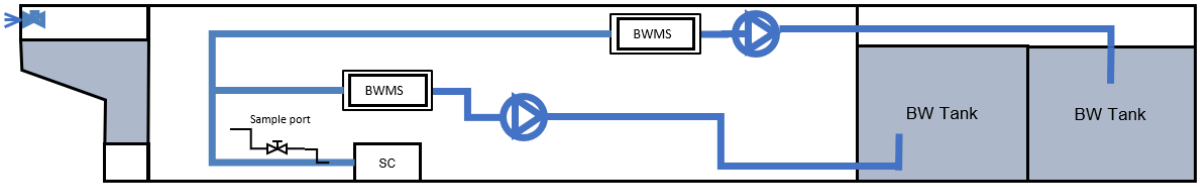
Successful analysis results:

≥ 50µm :	**≥ 10µm and < 50µm :**
< 10 organisms/m^3 or an indication of D-2 compliance	< 10 organisms/mL or an indication of D-2 compliance

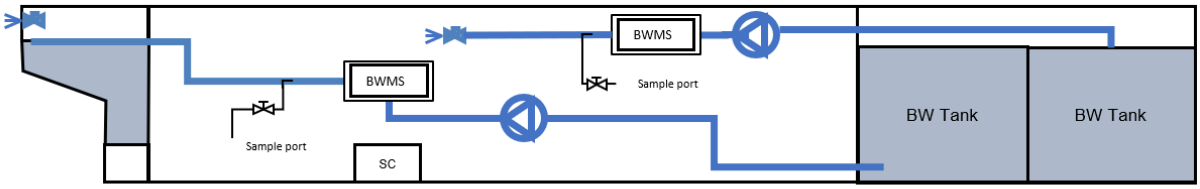
No. 180
(Apr 2024)

Annex 3 – COMMISSIONING TEST WITH SEVERAL BWMS

Alternative 1: Sequentially ballasting using two or more BWMS

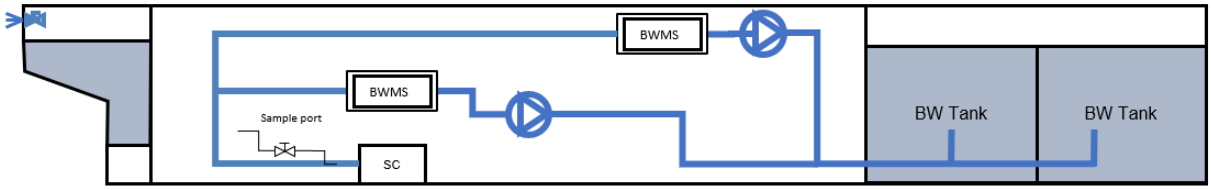


Ballasting by sequentially utilising each BWMS to dedicated ballast water storage tanks.

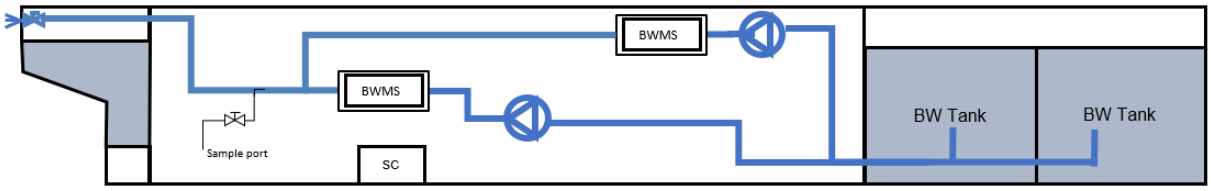


During discharge, sequential sampling can be performed from each dedicated tank resulting in two or more samples representing the respective BWMS

Alternative 2: Mixing water from two or more BWMS



Ballasting utilising several BWMS in parallel and by mixing the treated water into ballast tanks.



During discharge, sampling can be performed from one sample point located at a common overboard line, resulting in one sample representing treated water from all the respective BWMS