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格式/Form: CP384.2

中国船级社  
CHINA CLASSIFICATION SOCIETY

编号/No. GB21PTB00013\_02

压载水管理系统型式认可证书  
TYPE APPROVAL CERTIFICATE OF BALLAST WATER MANAGEMENT SYSTEM

兹证明, 已按压载水管理系统认可规则 (MEPC. 300 (72) 决议) 要求和规定, 对下列压载水管理系统进行了检查和试验。本证书仅对下列压载水管理系统有效。

This is to certify that the ballast water management system listed below has been examined and tested in accordance with the requirements of the specifications contained in the Code for Approval of Ballast Water Management Systems(resolution MEPC.300(72)). This certificate is valid only for the Ballast Water Management System referred to below.

压载水管理系统名称: CompactClean BWMS

Name of Ballast Water Management System:

CompactClean BWMS

压载水管理系统制造商: DESMI Ocean Guard A/S

Ballast Water Management System manufactured by:

DESMI Ocean Guard A/S

指定类型和型号: CompactClean BWMS 340/510/1000 m3/h;

Under type and model designation(s) \_\_\_\_\_

CompactClean BWMS 35/50/55/85/100/135/170/190/250/500/750/1500/2100 m3/h;

并包括:

and incorporating: \_\_\_\_\_

设备/组件图号 441366,441367,441368,441369,441370,441371,441480,441481,441482,441483,441484,441485,441388 日期 2022-02-22

To equipment/assembly drawing No.: \_\_\_\_\_ date: \_\_\_\_\_

其他设备制造商: DESMI Pumping Technology A/S  
DESMI Pumping Technology(Suzhou) Co., Ltd.

Other equipment manufactured by : \_\_\_\_\_

设备/组件图号: 441366,441367,441368,441369,441370,441371,441480,441481,441482,441483,441484,441485,441388 日期

To equipment/assembly drawing No.: \_\_\_\_\_ date: 2022-02-22

额定处理能力:

Treatment Rated Capacity (m3/h): 35 - 2500

安装了压载水管理系统的船上应备有一份型式认可证书的副本供船上检查。如果型式认可证书的签发是基于另一国主管机关的认可，则应参照该型式认可证书。

A copy of this Type Approval Certificate shall be carried on board a ship fitted with this ballast water management system, for inspection on board the ship. If the Type Approval Certificate is issued based on approval by another Administration, reference to that Type Approval Certificate shall be made.

规定的操作限制条件:

Limiting Operating Conditions imposed are described in this document.

**1. Temperature: No limitation**

The CompactClean BWMS can treat all normal seawater temperatures from arctic temperatures below 0 ° C, as long as the water remains in fluid form, to equatorial temperatures up to 50 ° C.

**2. Salinity: All salinities**

The CompactClean BWMS is intended to be used for treatment of all 3 water salinities: fresh water with a PSU of 0, brackish water and high saline salt water with a PSU of 40 or more.

**3. Holding time: No limitation**

There is no minimum required holding time for all salinities and temperatures in IMO areas.

其他的限制包括:

Other restrictions imposed include the following:

N.A.

本设备的设计满足下列运行条件的要求:

This equipment has been designed for operation in the following conditions:

额定处理能力, 紫外装置, 过滤装置及压力等系统设计限制详见型式认可证书GB21PTB00013\_01。

System design limitations of Treatment Rated Capacity, UV-unit, Filter and Pressure refer to type approval certificate GB21PTB00013\_01.

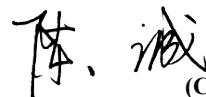
发证日期  
Date of issue

2022年02月25日

有效期  
valid until

2026年02月25日



  
(Chen Cheng)

中国船级社  
China Classification Society



## SUMMARY OF TEST RESULTS

### Land-based testing

CompactClean BWMS with a TRC of 340 m<sup>3</sup>/h operated in US mode and equipped with a UV unit V20086 and a Filtrex ACB-945-200 filter

**Table 1** Inlet Test water conditions in Fresh, Brackish and Marine water Test Cycles.

Test cycle	Sample	TSS [mg/L]	POC [mg/L]	DOC [mg/L]	Temp [C]	UV-T [%]	Salinity [PSU]	UVI [mW/m <sup>2</sup> ]	Flow rate Treated [m <sup>3</sup> /h]	Holding time [day]
F-3	Inlet	59	5.4	6.7	13	54	0.37	541-570	169	5
F-4	Inlet	59	5.4	6.7	13	54	0.37	539-559	171	5
F-5	Inlet	59	6.2	11	8.9	47	0.36	311-326	89	1
F-6	Inlet	59	6.2	11	9	47	0.36	310-322	91	1
F-7	Inlet	51	5.9	11	6.9	45	0.36	269-285	76	5
B-1	Inlet	60	9.4	18	15	42	18	227-251	92	1
B-2	Inlet	58	7.2	13	12	56	19	489-501	164	5
B-3	Inlet	58	7.2	13	12	56	19	491-503	166	5
B-4	Inlet	54	7.1	7.6	4.9	65	19	839-899	299	1
B-5	Inlet	54	7.1	7.6	5	65	19	769-937	306	1
M-1	Inlet	61	6.4	7.3	6.3	68	29	825-986	296	1
M-2	Inlet	61	6.4	7.3	6.3	68	29	829-995	301	1
M-3	Inlet	81	10	7.6	1.2	62	28	835-943	296	5
M-4	Inlet	81	10	7.6	1.3	62	28	789-938	295	5
M-5	Inlet	58	8	7	2.5	71	28	970-1094	305	6

**Table 2** Average numbers of live organisms in Inlet, Treated and Control discharge waters. Live organisms  $\geq 10$  and  $< 50 \mu\text{m}$  were quantified by microscopy counting after staining with CMFDA/FDA. All counts of pathogenic bacteria (*E. coli*, enterococci and *Vibrio cholerae*) in the test cycles were below the ballast water discharge standard.

Test cycle	Organisms $\geq 50 \mu\text{m}$ [organisms/m <sup>3</sup> ]	Organisms $\geq 10$ and $< 50 \mu\text{m}$ [organisms/mL]	Organisms $\geq 50 \mu\text{m}$ [organisms/m <sup>3</sup> ]		Organisms $\geq 10$ and $< 50 \mu\text{m}$ [organisms/mL]	
	Inlet	Inlet	Treated discharge	Control discharge	Treated discharge	Control discharge
F-3	502350	1108	0.00	258169 <sup>(1)</sup>	0.83	1159 <sup>(1)</sup>
F-4	523742	1179	0.00	258169 <sup>(1)</sup>	1.30	1159 <sup>(1)</sup>
F-5	468556	3456	4.60	208074 <sup>(1)</sup>	7.00	2014 <sup>(1)</sup>
F-6	311073	3091	0.57	208074 <sup>(1)</sup>	8.00	2014 <sup>(1)</sup>
F-7	346614	2936	0.00	177753	5.00	1850
B-1	244114	1373	1.00	96060	9.30	890
B-2	188653	1097	0.00	62781 <sup>(1)</sup>	3.50	1941 <sup>(1)</sup>
B-3	232694	1183	0.33	62781 <sup>(1)</sup>	4.80	1941 <sup>(1)</sup>
B-4	251153	1424	0.00	50519 <sup>(1)</sup>	6.50	790 <sup>(1)</sup>
B-5	191233	1073	0.00	50519 <sup>(1)</sup>	5.00	790 <sup>(1)</sup>
M-1	174522	2100	4.00	60671 <sup>(1)</sup>	6.00	1466 <sup>(1)</sup>
M-2	158542	1807	0.00	60671 <sup>(1)</sup>	4.70	1466 <sup>(1)</sup>
M-3	229531	6839	0.00	135936 <sup>(1)</sup>	0.17	771 <sup>(1)</sup>
M-4	221678	7750	0.00	135936 <sup>(1)</sup>	0.83	771 <sup>(1)</sup>
M-5	286653	3976	0.00	69507	0.00	741

(1) Two test cycles were performed on the same day using the same control water tank.

### Additional Land-based testing

CompactClean BWMS with a TRC of 340 m<sup>3</sup>/h operated in US mode and equipped with a UV unit V20086 and a BOLLFILTER aquaBoll BWT DN200 filter

**Table 3** Inlet Test water conditions in Fresh, Brackish and Marine water Test Cycles.

Test cycle	Sample	TSS [mg/L]	POC [mg/L]	DOC [mg/L]	Temp [c]	UV-T [%]	Salinity [PSU]	UVI [mW/m <sup>2</sup> ]	Flow rate Treated [m <sup>3</sup> /h]	Holding time [day]
F-2	Inlet	64	9.5	8.6	21	49	0.42	417 ± 2	141	1
F-3	Inlet	62	7.3	8.6	18	50	0.37	435 ± 2	151	1
F-5	Inlet	60	6.1	13	16	41	0.42	244 ± 1	71	1
B-1	Inlet	67	10	18	17	43	18	231 ± 5	69	1
B-2	Inlet	67	8.5	11	19	60	18	582 ± 5	212	1
B-3	Inlet	67	8.5	11	19	60	18	582 ± 4	211	1
M-1	Inlet	63	7.9	10	18	62	28	649 ± 11	235	1
M-2	Inlet	37	6.0	7.2	19	76	28	1061 ± 7	332	1
M-3	Inlet	37	6.0	7.2	19	76	28	1037 ± 9	335	1

**Table 4** Average numbers of live organisms in Inlet, Treated and Control discharge waters. Live organisms ≥10 and <50 μm were quantified by microscopy counting after staining with CMFDA/FDA. All counts of pathogenic bacteria (E. coli, enterococci and Vibrio cholerae) in the test cycles were below the ballast water discharge standard.

Test cycle	Organisms ≥50μm [organisms/m <sup>3</sup> ]	Organisms ≥10 and <50μm [organisms/mL]	Organisms ≥50μm [organisms/m <sup>3</sup> ]		Organisms ≥10 and <50μm [organisms/mL]	
	Inlet	Inlet	Treated discharge	Control discharge	Treated discharge	Control discharge
F-2	384167	1222	0	166194	0.83	867
F-3	539911	1778	0.52	224049	3.8	1376
F-5	199944	1589	0	92333	2.3	1614
B-1	347194	1221	1.7	218283	0.33	807
B-2	149392	1195	0.33	83495 <sup>(1)</sup>	2.2	1886 <sup>(1)</sup>
B-3	177631	1213	1.7	83495 <sup>(1)</sup>	1.7	1886 <sup>(1)</sup>
M-1	192889	2627	2.7	85452	1.2	808
M-2	127372	939 <sup>(2)</sup>	1.3	83272 <sup>(1)</sup>	0.50	683 <sup>(1)</sup>
M-3	133011	1052	0	83272 <sup>(1)</sup>	0.33	683 <sup>(1)</sup>

(1) Two test cycles were performed on the same day using the same control water tank.

(2) The density of organisms in the size class ≥10-<50 μm in test cycle M-2 was below the requirements of MEPC.300(72) (see Deviation No. 1). After evaluation, found that the density of organisms in the size class ≥10-<50 μm in the source water in this test cycle does not constitute a significant reduction in challenge conditions.

### Additional Land-based testing

CompactClean BWMS with a TRC of 510 m<sup>3</sup>/h operated in IMO mode and equipped with a UV unit V20086 and a Filtrex ACB-955-250 filter

**Table 5** Inlet Test water conditions in Fresh, Brackish and Marine water Test Cycles.

Test cycle	Sample	TSS [mg/L]	POC [mg/L]	DOC [mg/L]	Temp [c]	UV-T [%]	Salinity [PSU]	UVI [mW/m <sup>2</sup> ]	Flow rate Treated [m <sup>3</sup> /h]	Holding time [day]
F-2	Inlet	63	5.3	8.8	9.3	59	0.41	631± 5	401	5
F-3	Inlet	63	5.3	8.8	9.5	59	0.41	626± 3	398	5
F-5	Inlet	54	7.8	16	9	39	0.42	180± 0.6	95	1
F-6	Inlet	64	7.3	15	12	42	0.44	221± 0.8	123	1
B-1	Inlet	63	12	16	4.3	38	19	175± 3	89	5
B-4	Inlet	71	5.7	12	4.1	55	20	441± 2	272	1
B-5	Inlet	71	5.7	12	4.3	55	20	438± 2	269	1
B-6	Inlet	71	9.4	16	5.4	43	19	224± 2	125	5
M-1	Inlet	46	5.8	7.0	8.8	77	29	987± 3	513	5
M-2	Inlet	46	5.8	7.0	8.9	77	29	987± 3	512	5
M-5	Inlet	70	5.4	10	17	66	28	527± 2	330	1
M-6	Inlet	70	5.4	10	17	66	28	526± 2	329	1

**Table 6** Average numbers of live organisms in Inlet, Treated and Control discharge waters. Live organisms ≥10 and <50 μm were quantified by microscopy counting after staining with CMFDA/FDA. Viable organisms ≥10 and <50 μm in discharge water were quantified by MPN Dilution Culture + Motility. All counts of pathogenic bacteria (E. coli, enterococci and Vibrio cholerae) in the test cycles were below the ballast water discharge standard.

Test cycle	Organisms ≥50μm [organisms/m <sup>3</sup> ]	Organisms ≥10 and <50μm [organisms/mL]	Organisms ≥50μm [organisms/m <sup>3</sup> ]		Organisms ≥10 and <50μm [organisms/mL]	
	Inlet	Inlet	Treated discharge	Control discharge	Treated discharge	Control discharge
F-2	90889 <sup>(1)</sup>	2144	0.33	75310 <sup>(2)</sup>	3.0	>2700 <sup>(2)</sup>
F-3	109111	2018	0	75310 <sup>(2)</sup>	6.5	>2700 <sup>(2)</sup>
F-5	148211	2143	0	101338	1.1	>2700
F-6	295250	1987	4.0	172150	1.5	>2700
B-1	276217	2453	0	33441	<0.06	770
B-4	114567	1833	9.0	59647 <sup>(2)</sup>	1.9	>2700
B-5	176850	1869	4.7	59647 <sup>(2)</sup>	3.2	>2700
B-6	180570	1547	3.0	50163	0.25	450
M-1	213500	1722	0	134107 <sup>(2)</sup>	<0.06	440 <sup>(2)</sup>
M-2	201583	1504	0	134107 <sup>(2)</sup>	<0.06	440 <sup>(2)</sup>
M-5	230111	1720	0	134132 <sup>(2)</sup>	0.12	920 <sup>(2)</sup>
M-6	267167	1436	0.33	134132 <sup>(2)</sup>	0.46	920 <sup>(2)</sup>

(1) Density of organisms ≥50 μm was below the BWMS Code requirements for BE test cycle F-2 on Inlet to BWMS (see Deviation No. 1). After evaluation, found that the density of organisms within the 10% deviation in the size class ≥50 μm in the source water in this test cycle does not constitute a significant reduction in challenge condition, test cycle F-3 provided similar evaluation to test cycle F-2.

(2) Two test cycles were performed on the same day using the same control water tank.

**Additional Land-based testing**

CompactClean BWMS with a TRC of 510 m<sup>3</sup>/h operated in IMO mode and equipped with a UV unit V20086 and a BOLLFILTER aquaBoll BWT BB DN250 filter

**Table 7** Inlet Test water conditions in Fresh, Brackish and Marine water Test Cycles.

Test cycle	Sample	TSS [mg/L]	POC [mg/L]	DOC [mg/L]	Temp [c]	UV-T [%]	Salinity [PSU]	UVI [mW/m <sup>2</sup> ]	Flow rate Treated [m <sup>3</sup> /h]	Holding time [day]
F-7	Inlet	70	7.7	18	19	41	0.46	240 ± 1	138	1
F-8	Inlet	70	7.7	18	20	41	0.46	240 ± 2	137	1
B-7	Inlet	63	9.2	9.4	22	69	16	722 ± 7	461	1
B-8	Inlet	63	9.2	9.4	22	69	16	709 ± 7	452	1
M-7	Inlet	48	6.8	8.0	19	75	28	934 ± 2	513	1
M-8	Inlet	48	6.8	8.0	19	75	28	930 ± 2	513	1

**Table 8** Average numbers of live organisms in Inlet, Treated and Control discharge waters. Live organisms ≥10 and <50 μm were quantified by microscopy counting after staining with CMFDA/FDA. Viable organisms ≥10 and <50 μm in discharge water were quantified by MPN Dilution Culture + Motility. All counts of pathogenic bacteria (E. coli, enterococci and Vibrio cholerae) in the test cycles were below the ballast water discharge standard.

Test cycle	Organisms ≥50μm [organisms/m <sup>3</sup> ]	Organisms ≥10 and <50μm [organisms/mL]	Organisms ≥50μm [organisms/m <sup>3</sup> ]		Organisms ≥10 and <50μm [organisms/mL]	
	Inlet	Inlet	Treated discharge	Control discharge	Treated discharge	Control discharge
F-7	654450	2858	1.7	271653 <sup>(1)</sup>	0.25	>2700 <sup>(1)</sup>
F-8	593472	2996	0.33	271653 <sup>(1)</sup>	0.11	>2700 <sup>(1)</sup>
B-7	503900	1139	1	318727 <sup>(1)</sup>	0.49	>2700 <sup>(1)</sup>
B-8	460552	1252	0.33	318727 <sup>(1)</sup>	0.66	>2700 <sup>(1)</sup>
M-7	141536	1658	0.33	85067 <sup>(1)</sup>	3 <sup>(2)</sup>	>2700 <sup>(1)</sup>
M-8	157247	1540	0	85067 <sup>(1)</sup>	5	>2700 <sup>(1)</sup>

(1) Two test cycles were performed on the same day using the same control water tank.

(2) The MPN determined in the treated discharge water of test cycle M-7 was considered invalid due to a contamination. Therefore, the result from quantifying life organisms ≥10-<50 μm by microscopy counting after staining with CMFDA/FDA was applied for evaluation of test cycle M-7.

**Shipboard testing**

CompactClean BWMS with TRC of 1000 m<sup>3</sup>/h operated in US mode and equipped with a UV unit V35246 and a Filtrex filter ACB-999-350 on board the general cargo ship PROVIDANA (IMO No. 9380788)

**Table 9** Inlet Test water conditions during ballast operations.

Test cycle	Sample	TSS [mg/L]	POC [mg/L]	DOC [mg/L]	Temp [c]	UV-T [%]	Salinity [PSU]	UVI (average at ballasting) [W/m <sup>2</sup> ]	Flow rate before filtration [m <sup>3</sup> /h]	Holding time [hours]
1	Inlet	11	<0.17	3.7	11	86	7.9	1,062	993	23:25
2	Inlet	10	0.34	1.2	16	93	28	1,027	983	142:44
3	Inlet	30	0.35	1.2	15	93	28	1,061	986	131:10
4	Inlet	54	0.33	1.0	24	91	37	702	836	67:36
5	Inlet	48	0.21	0.99	23	95	37	840	991	45:10

**Table 10** Average numbers of live organisms in inlet and treated discharge water during shipboard testing. Live organisms  $\geq 10$  and  $< 50 \mu\text{m}$  were quantified by microscopy counting after staining with CMFDA/FDA. All counts of pathogenic bacteria (E. coli, Enterococci and Vibrio cholerae) in treated water were below the ballast water discharge standard.

Test cycle	Organisms $\geq 50 \mu\text{m}$ [organisms/m <sup>3</sup> ]		Organisms $\geq 10$ and $< 50 \mu\text{m}$ [organisms/mL]	
	Inlet	Discharge	Inlet CMFDA/ FDA	Discharge CMFDA/ FDA
1	15396	1.3	114	0.17
2	10911	1.1	153	0.33
3	12749	2.4	106	0.17
4	32677	1.2	109	0.17
5	29207	5.0	106	0.17

-----End of Certificate-----