Certificate No:
TAP00002CN

TYPE APPROVAL CERTIFICATE

This is to certify:

That the 5 ppm Bilge Water Separator

with type designation(s)
Alfa Laval PureBilge Compact OWS model 0605

Issued to
Alfa Laval Technologies AB
Tumba, Stockholms Län, Sweden

is found to comply with
DNV class programme DNV-CP-0208 – Type approval – 5 ppm bilge water separators

Application :

Products approved by this certificate are accepted for installation on all vessels classed by DNV with optional notation Clean (Design).
Capacity: 0.6 m3/h

Issued at **Høvik** on **2023-02-09**
This Certificate is valid until **2028-02-08**.
DNV local unit: **Sweden CMC**

Approval Engineer: **Wenjun Wu**

for **DNV**

Dag Sæle-Nilsen
Head of Section

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to 300,000 USD.

Product description

The Alfa Laval PureBilge Compact 0605 Oily Water Separator is intended for installation onboard ships or other marine units for oily bilge water separation to less than 5 ppm at discharge overboard. The equipment is designed and tested to meet the requirements of the IMO Resolution MEPC.107(49).

The PureBilge Compact 0605 OWS is a centrifugal separation system for treatment of bilge water. Oily bilge water is directed by a feed pump from the bilge water settling tank or equivalent to the separator. Bilge water firstly passes through a strainer which traps large particles from the fluid, and then an optional heater if the fluid is not heated to pre-set temperature. Bilge water can enter the separator when all process conditions fall within preset process values.

A high-speed centrifugal separator continuously processes the bilge water, with a polishing filter installed after the separator to ensure continuous performance below 5 ppm. The oil outlet continuously discharges separated oil and emulsions. Solids that collect at the separator bowl periphery are discharged intermittently. A built-in water pump, or paring disc, continuously discharges separated bilge water through the clean water outlet to the oil content monitor.

If oil content is measured below 5 ppm, the separated bilge water can be pumped either directly overboard or to a 'clean' bilge water holding tank for discharge overboard later. If oil content exceeds 5 ppm, the effluent is re-circulated, preferably to the cleanest part of the bilge water settling tank for re-processing.

Place of production

This product may be manufactured at:

- Alfa Laval S.p.A., Via Pusiano 2, Monza, Italy
- MONTECO S.R.L., Via delle Rovedine n 48, Robbiate (Lc), Italy
- HYDROALP S.R.L., Via Dossi, 46- 25050 Pian Camuno BS, Italy

Application/Limitation

Applications

Applicable models covered in this certificate are listed below :

Model	Max throughput capacity (m^3/h)	Operating range (m^3/h)
PureBilge Compact 0605	0.6	0.3 – 0.6

Applicable to all models	
Working Pressure:	Normal 3 – 4 bar, max. 6 bar
Ambient temperature:	5 – 55 ˚C
Air supply pressure:	5 – 8 bar
Power Supply:	380 – 690 V, 50/60 Hz
Inclination Range:	0 to 22.5 degrees

A copy of Operating Instructions and Technical Manual shall be on board vessel at all times. Oily water shall be discharged according to the procedures described in the Manual.

The capacity of the supply pump should not exceed 110% of the rated capacity of the bilge separator.

A heater is optional to the 5 ppm bilge separator to heat up the fluid from bilge water settling tank or equivalent before entering the separator.

An approved 5 ppm bilge alarm is fitted to the 5 ppm bilge separator.

The following shall be verified during installation:

1. The alarm is always activated whenever clean water is used for cleaning or zeroing purposes;
2. The alarm is always activated whenever no flow of sample through the oil-content meter is detected by the flow sensor;
3. Any alarm will activate the Automatic Stopping Device and lead to recirculation;
4. The overall response time (including the response time of the alarm) between an effluent discharge exceeding 5 ppm oil and to the Automatic Stopping Device preventing the overboard discharge is less than 20 s;
5. By-passing the alarm during normal operation shall by no means be possible.

6. Every access of the alarm (beyond check on instrument drift, repeatability of the instrument reading, and the ability to re-zero the instrument) requires the breaking of a seal.

Limitations

The sampling pipe should be installed in a vertical section of the water effluent piping as close as practicable to the 5 ppm Bilge Separator outlet (MEPC.107(49) paragraph 6.1.1).

The equipment is not permitted to be installed in spaces subject to explosion hazards.

Control and monitoring equipment

The PureBilge Compact 0605 OWS is controlled through automation systems of a type tested and accepted by a nationally recognized testing agency, according to international standards. Critical components are listed in the table below:

Component	Model	Maker
Programmable Logic Controller (PLC)	9041611	B&R Automation
Human Machine Interface (HMI)	597033	B&R Automation

Changes to these components shall be approved by DNV. Documentation confirming the approval shall be kept together with the certificate, or the certificate shall be updated.

The software and firmware versions are listed in the table below:

Component	Software/Firmware version
Programmable Logic Controller (PLC)	9041609/2.00.00
Human Machine Interface (HMI)	N/A

Changes in the software which can alter the performance of the system shall be approval by DNV. Note that testing of the system with the revised software may be required. Documentation confirming the approval (and any testing) shall be kept together with the certificate, or the certificate shall be updated.

Basis of acceptance

Type examination documentation

Drawings and system documents

Type	Title	Doc. No.	Revision
System drawings	Flow chart	9039017	9
	Dimension drawing	9050190	0
	Assembly drawing	9591250	0
Assembly drawing	Basic size drawing	9041582	0
	Separator bowl	9031211	0
	In- and outlet device	568271	7
Filter drawings	Polishing filter	9040690	0
	Filter element	9040689	0
Electrical drawings	Electrical drawings	9040887	3
Detail mechanical drawing – Separator Bowl	Separator bowl	9031211	0
	Bowl body complete	561072	2
	Distributing ring lower	586259	2
	Valve plug	545871	2
	Operating slide	545654	10
	Distributing ring upper	589395	0
	Cap nut	562036	2
	Sliding bowl bottom	544392	7
	Distributor	9041506	2
	Bowl disc	9035494	1
	Bowl disc	9035471	1
	Top disc	9041502	4
	Bowl hood	544391	9
	Inlet pipe complete	9031684	1

Type	Title	Doc. No.	Revision
	Cover	562118	2
	Gravity disc	9041324	2
	Paring chamber cover	559110	4
Detail mechanical drawing – In & Outlet	Frame hood	567642	4
	In / outlet complete	568271	7
	Connection housing	564404	2
	Paring disc	563760	0
	Safety device	559182	5
	Support ring	559052	4
	Height adjustment ring	559161	2
IMO test rig	MiniBilge System – P&ID (IMO)	9054617	1
	IMO rig P&ID	9055146	1
	Rig description	DT00005990	2
Common drawings and documents	PureBilge Compact Bilgewater Cleaning System – Operating instructions	200005850-1-EN-GB	1

Test plans and reports

- Test Plan for PureBilge Compact OWS according to MEPC.107(49), Alfa Laval, DT00005983, Rev. 003, 2021-09-11
- Type Test report 15 ppm / 5 ppm Bilge Separator PureBilge Compact by Alfa Laval, PIA - Prüfinstitut für Abwassertechnik GmbH, Report No. SKA21-051B01-V02, Rev. 02, 2022.09.05
- Vibration Type Test 15 ppm / 5 ppm Bilge Separator Control cabinet PureBilge Compact by Alfa Laval, FORCE Technology, Report no.: 122-23460-1, Rev. 1, 2022.10.03
- EMC test and Cold test of MiniBilge Controller, DELTA Development Technology AB, 620-20118-10-R0, Rev. 0, 2022.01.26
- Assessment Report of MiniBilge Control Cabinet, DELTA Development Technology AB, 620-20045-00-R1, Rev. 1, 2020.08.14

Tests carried out

Performance tests

- Type test with 15 ppm/5 ppm PureBilge Compact OWS model 0615 and 0605 in accordance with MEPC.107(49), 46 CFR 162.050 and DNVGL-CP-0208, PIA - Prüfinstitut für Abwassertechnik GmbH, 2022.02.01-02

Environmental tests

- Vibration test with control cabinet of PureBilge Compact OWS in accordance with MEPC.107(49) and amendment MEPC.285(70), USCG 46 CFR 162.050-37, IACS E10 Rev.8, DNVGL-CP-0208 Appendix B Section 2.2.1. FORCE Technology, 2022.08.29 – 2022.09.01
- EMC test and Cold test of MiniBilge Controller in accordance with IACS E10 Rev.7 and Rev. 8, EN/(IEC) 61000-6-2:2019 and EN/(IEC) 61000-6-4:2019. DELTA Development Technology AB, 2021.12.06 – 2021.12.10

Marking of product

The marking shall give the following information:

- Identification of manufacturer
- Equipment type designation or model identification
- Maximum throughput and maximum influent pressure at which the separator is designed to operate
- Serial number
- Revision information, as applicable, for all firmware or software modules installed per hardware unit, necessary to identify the equipment

Periodical assessment

For retention of the Type Approval, DNV surveyor shall perform periodical assessments to verify that the conditions of the TA are not altered since the certificate was issued. The scope of periodical assessment includes:

- Review of the TA documentation and verification that the documentation is still used as basis for the production
- Review of possible changes in design, material and performance of the product
- Verification of the company's production and quality systems ensuring continued consistent production of the type approved products to the required quality
- Verification that the product marking for identification and traceability to the TA Certificate is not altered

Revision history

Rev.	Date of issuance	Description
-	2023-02-09	Initial certificate

A copy of this certificate should be carried on board any ship equipped with the Alfa Laval PureBilge Compact 0605 OWS described above.

APPENDIX – Performance test results

Test data and results of tests conducted on the 5 ppm Oily Water Separator in accordance with Part 1 of the Annex to the Guidelines and Specifications contained in IMO Resolution MEPC.107(49).

5 ppm Oily Water Separator submitted by:	**Alfa Laval Technologies AB, Sweden**
Tested type:	**PureBilge Compact OWS 0605**
Test location:	**Alfa Laval test facility, Tumba, Sweden**
Date:	**2022.02.02**
Organisation conducting the test:	**PIA – Prüfinstitut für Abwassertechnik GmbH, Germany**
Method of sample analysis:	**ISO 9377-2 mod.**
Test rig according to drawing:	**IMO Rig MiniBilge**
Samples analysed by:	**PIA and sub-contractors**

Environmental testing of the electrical and electronic sections of the 5 ppm Oily Water Separator has been carried out in accordance with part 3 of the annex to the guidelines and specifications contained in IMO Resolution MEPC.107(49). The equipment functioned satisfactorily on completion of each test specified on the environmental test protocol.

Environmental test carried out at **FORCE Technology, Venlighedsvej 4, 2970 Hørsholm, Denmark**, and **DELTA Development Technology AB, Elektronikgatan 47, 721 36 Västerås, Sweden**. Test report No: **122-23460-1** and **620-20118-10-R0** issued on **2022.10.03** and **2022.01.26**, respectively.

Manufacturer's recommendations and information concerning the use of cleansing agents:
N/A

Test fluid "A"

Density at 15 °C:	989.6 kg/m^3
Viscosity at 50 °C:	377.9 mm^2/s
Flashpoint:	>100 °C
Ash content:	0.06 %
Water content at start of test:	0.5 %

Test fluid "B"

Density at 15 °C:	833.2 kg/m^3
Viscosity at 40 °C:	3.05 mm^2/s
Flashpoint:	72.4 °C
Ash content:	<0.001 %
Water content at start of test:	0.003 %

Test fluid "C"

Surfactant:	Sodium dodecylbenzene sulfonate
Iron Oxides:	Fe_3O_4

Test water

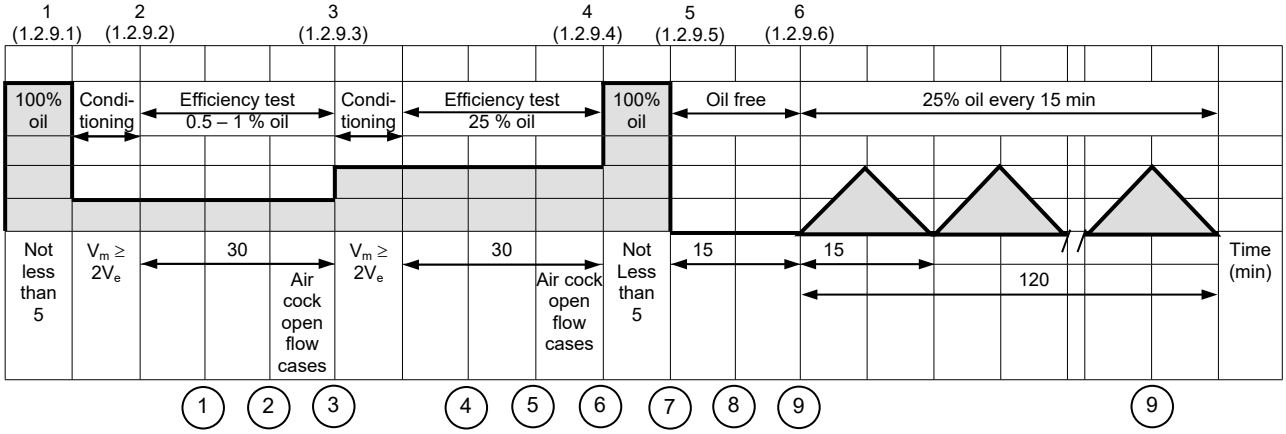
Density at 20 °C:	1 014.0 kg/m^3
Solid matter present:	No

Test temperatures

Ambient:	20 – 27 °C
Test fluid "A":	79 – 82 °C
Test fluid "B":	41 – 47 °C
Test fluid "C":	69 – 96 °C
Test water:	41 – 91 °C

TEST RESULTS (IN PPM) AND TEST PROCEDURES – PureBilge Compact OWS 0605

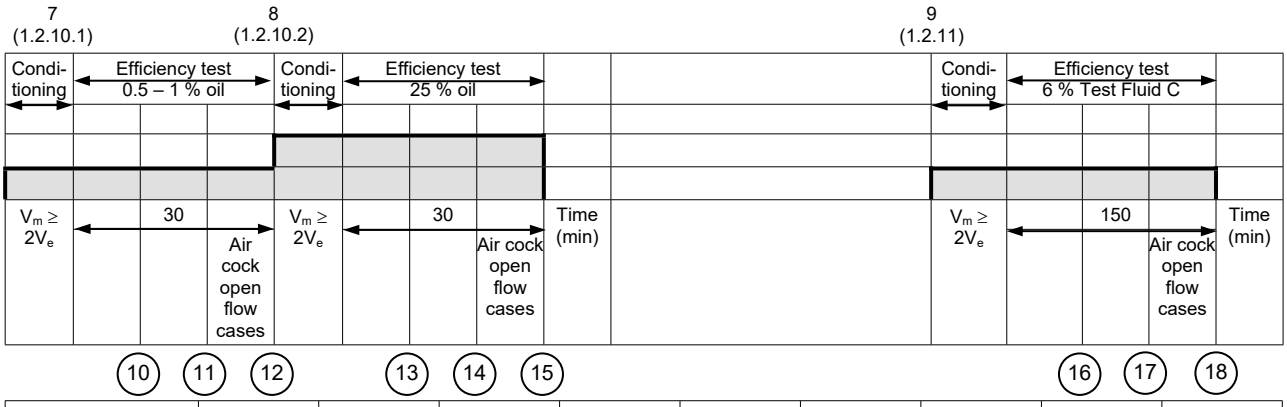
TEST FLUID "A"



Test sample 9 (taken at the end of auto test, paragraph 1.2.9.6 Annex to resolution MEPC.107(49))

	1	2	3	4	5	6	7	8	9
Influent (%)	1.0	1.0	1.0	25.0	25.0	25.0	0	0	25.0
Effluent (ppm)	0.23	0.38	0.19	0.22	<0.1	0.59	0.53	0.62	1.0

TEST FLUID "B" TEST FLUID "C"



	10	11	12	13	14	15	16	17	18
Influent (%)	0.1	0.1	0.1	25.0	25.0	25.0	6.0	6.0	6.0
Effluent (ppm)	0.43	0.25	0.36	0.41	0.29	0.31	1.2	0.82	0.83

V_e - volume of oily water separator (OWS)
V_m - oil/water mixture passed through OWS