

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Ballast Water Management System

with type designation(s)

Optimarin Ballast System, Optimarin Ballast System Ex

Issued to

Optimarin AS
SANDNES, Norway

is found to comply with

Resolution MEPC.174(58)

DNV GL class programme DNVGL-CP-0209 – Type approval – Ballast water management systems

DNV GL rules for classification – Ships

Application :

This is to certify that the Ballast Water Management System listed above has been examined and tested in accordance with the requirements of the specifications contained in Guidelines contained in Resolution MEPC.174(58) and DNV GL Rules stated above. This Certificate is valid only for the Ballast Water Management System referred to above.

For compliance with Resolution MEPC.174(58), the Certificate is issued on behalf of the Norwegian Maritime Authority.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL, unless otherwise instructed by the relevant Maritime Administration.

Type: **Optimarin Ballast System**
Optimarin Ballast System Ex

Operating media:

Issued at **Høvik** on **2019-11-11**

for **DNV GL**

This Certificate is valid until **2020-10-28**.

DNV GL local station: **Stavanger**

Approval Engineer: **Ingrid Sigvaldsen**

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.



Job Id: **262.1-004395-15**
Certificate No: **TAP000006X**
Revision No: **2**

Ballast water management system supplier

Optimarin AS

Type and model designation

Optimarin Ballast System (OBS), Optimarin Ballast System Ex (OBS Ex)

Place of production: Sandnes, Norway

Equipment / Assembly drawings

Ballast Water Management System (BWMS) shall be installed in accordance with the relevant piping and instrumentation diagrams and relevant wiring diagram listed below.

Description	Title	Drawing No.	Rev.
Piping and instrumentation diagram	Flow Diagram	300000	Rev. 02 dated 20.06.2017
Piping and instrumentation diagram	Flow Diagram (stripping with filter)	300000	Rev. 02 dated 20.06.2017
Piping and instrumentation diagram	Flow Diagram (stripping without filter)	300000	Rev. 03 dated 22.10.2019
Piping and instrumentation diagram	Flow Diagram EX	300000	Rev. 02 dated 20.06.2017
Wiring diagram	Control Panel, Filter Control Incl BFP01, Sensor Box 1, UV Power Cabinet Type NED, Terminal Box,	500000	Rev. 03 dated 20.06.2017
Wiring diagram	Control Panel, Filter Control Incl BFP01, Sensor Box 1, Terminal Box, UV Power Cabinet Type ETA	500000	Rev. 03 dated 20.06.2017

Product description

The Operation, maintenance and safety Manual for Optimarin Ballast System, Rev 4, Template dated 2/20/2018. This manual is specific to BK (IMO, USCG) or FX (IMO) or FS (IMO) filters, approved by DNV GL.

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Treatment sequence

- Ballast water uptake: Filtration/UV disinfection
- Ballast water discharge: UV disinfection

OBS is approved with three alternative filters;

- FilterSafe Automatic Back-flush filter BSFc-H-16 (Micro-Kill BSF Filter) with 40µm mesh
- Filtrex Automatic Filter ACB-935-200 with 40µm mesh
- Boll & Kirch Automatic Selfclean Filter type 6.18, 6.18.2 or 6.18.3 BWT with 40µm mesh

Application/Limitation

Temperature and salinity

Temperature is no limiting condition.
The system has not been tested in fresh water.

UV intensity

UV intensity below 100 W/m² implies that the ballast water is not treated in accordance with this certificate.

Treatment Rated Capacity (TRC) of UV

Operational range of one UV-chamber is 20 m³/h – 167 m³/h.

A combination of UV-chambers is accepted under the following criteria:

- Chambers mounted in parallel (vertically or horizontally)
- The construction of the chambers (i.e. dimensions, form and material) is exactly the same
- The construction of the two manifolds (i.e. dimensions, form and material) is exactly the same

Any other construction that does not fit to the above must be approved by DNV GL before allowed to be considered as part of this Type Approval Certificate.

Treatment Rated Capacity (TRC) of Filters

Filter Type Filter Safe (FS)

Based on statement and documentation received from FilterSafe, all filters capacities listed below are covered by this Type Approval:

Model	Flow Rate (m ³ /h)		Minimum back-pressure	Max. pressure drop allowed
	Min	*Max		
Single	Min	*Max		
BS-025H/V	10	50	1.7 bar	0.5 bar
BS-050H/V	30	125	1.7 bar	0.5 bar
BS-070H/V	30	180	1.7 bar	0.5 bar
BS-100H/V	40	250	1.7 bar	0.5 bar
BS-150H/V	50	375	1.7 bar	0.5 bar
BS-200H/V	60	500	1.7 bar	0.5 bar
BS-300H/V	60	750	1.7 bar	0.5 bar
BS-400H/V	80	1000	1.7 bar	0.5 bar
BS-603H/V	150	1500	1.7 bar	0.5 bar
BS-804H/V	180	2000	1.7 bar	0.5 bar
BS-1004H/V	180	2500	1.7 bar	0.5 bar

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BS-1204H/V	200	3000	1.7 bar	0.5 bar
BS-1206H/V	250	3000	1.7 bar	0.5 bar

*With 40µm screen and according to IMO G8 Guidelines

Differential pressure for back-flush to be initiated at 0.5 bar.

Filter Type Filtrex (FX)

Based on statement and documentation received from Filtrex ACB Scaling and Guiding Principles of Ballast Water Filters, all filter capacities listed below are covered by this Type Approval:

Model	Flow range (m ³ /h)	Minimum back-pressure	Max. pressure drop allowed
ACB-903-65	8 – 35	1.5 bar	0.5 bar
ACB-904-80	10 – 55	1.5 bar	0.5 bar
ACB-906-100	15 – 87	1.5 bar	0.5 bar
ACB-910-150	25 – 135	1.5 bar	0.5 bar
ACB-915-150	35 – 190	1.5 bar	0.5 bar
ACB-935-200	35 – 255	1.5 bar	0.5 bar
ACB-945-200	45 – 340	1.5 bar	0.5 bar
ACB-955-250	50 – 515	1.5 bar	0.5 bar
ACB-985-300	65 – 770	1.5 bar	0.5 bar
ACB-999-350	95 – 1040	1.5 bar	0.5 bar
ACB-9100-400	126 – 1500	1.5 bar	0.5 bar
ACB-9120-500	126 – 2100	1.5 bar	0.5 bar
ACB-9200-600	126 – 3000	1.5 bar	0.5 bar

Differential pressure for back-flush to be initiated at 0.3 bar.

Boll and Kirch Filter (BK)

Based on DNV GL report No. 38FIST1303515 2 and statement and documentation received from Boll & Kirch "Table from Bollfilter" dated 25-10-2016 and "Cross Sectional Drawings & Candle Placement", all filter capacities listed below are covered by this Type Approval:

Model	Flow range (m ³ /h)	Minimum back-pressure	Max. pressure drop allowed
MK1 6.18	14 – 40	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18	24 – 100	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	74 – 220	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	110 – 400	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	124 – 600	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	150 – 800	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	182 – 1200	2 or 1.5 bar with suction	0.5 bars

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		pump	
MK1 6.18.2	204 – 1600	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	271 – 2500	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	446 – 3300	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	558 – 4300	2 or 1.5 bar with suction pump	0.5 bars
MK1 6.18.2	581 – 5400	2 or 1.5 bar with suction pump	0.5 bars
MK2 6.18.3	83 - 370	1.5 bar	0.5 bars
MK2 6.18.3	85 - 500	1.5 bar	0.5 bars
MK2 6.18.3	85 - 750	1.5 bar	0.5 bars
MK2 6.18.3	168 - 1400	1.5 bar	0.5 bars
MK2 6.18.3	205 - 2100	1.5 bar	0.5 bars
MK2 6.18.3	214 - 2500	1.5 bar	0.5 bars
MK2 6.18.3	326 - 3800	1.5 bar	0.5 bars

Differential pressure for back-flush to be initiated at 0.38 bar.

Operational specifications for the different components

UV-intensity meter

Acceptable range: 100 – 2500 W/m²

The system includes UV-lamp power control. UV-lamp power is reduced in favorable water conditions based on measured UV-intensity. The control equipment has power regulation and has been designed and tested to keep the measured UV intensity above 800 W/m².

Control and monitoring equipment

The type approved system includes a UV-intensity meter, a temperature sensor, pressure sensor, flow meter and a flow pressure valve. The control equipment has been designed and tested to keep the flow rate between 20 m³/h – 167 m³/h per UV-chamber. Acceptable range for the UV-intensity meter is 100 – 2500 W/m².

The system also includes a temperature switch in the UV chamber, arranged with an independent shutdown functionality.

Information regarding the selected components shall be part of the documentation related to the specific installation, either by a reference to valid Type approval certificate or technical documentation.

The type approved system includes the following control units and sensors:

Name	Model	Software revision
Control Panel	CP	1.5x
Control Panel MK2	CP MK2	2.0x
Filter Control	FC	NA
Sensor Box	SBx	NA
Terminal Box	TBxx	NA
Back Flush Cabinet	BFC	NA

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Fresh Water Panel	FWP	NA
Interlock Panel	IP	NA
UV Power Type TT	Desiteck GmbH, UVPxx TT	NA
UV Power Type NED	Nedap N.V., UVPxx NED	A
UV Power Cabinet Type ETA	UVPC PE35B	NA
UV sensor	IL-Metronic , SUV 20.2.Y2C	NA
Ex Interlock Panel	EXIP	NA
Ex Sensor Box	EXSBx	NA
El. Act. Power Distribution Panel	EAPDP	NA

All changes in software are to be recorded as long as the system is in use onboard. The records of all changes are to be forwarded to DNV GL for evaluation and approval. Major changes to the software are to be approved before installed in the computer.

A Certification of Application Functions may be required for the particular vessel.

Explosion proof version OBS Ex

The model OBS Ex is prepared for installation in zone 1 hazardous areas. In case of location in the pump room of a tanker, the tanker must have zone classification of the pump room acc to DNV GL rules from July 2006 and later.

The ex certification of the system has been reviewed and found acceptable as part of the Type Approval. Ref. DNV GL Rules Pt.4 Ch 8 Sec.11.

Documentation related to Ex certification is to be delivered to yard/owner. It is to be submitted for approval and subsequent survey for each ship acc. to normal procedures:

- Schedule of ex certificates
- Ex certificates
- Loop calculation of intrinsically safe circuits

The Ex certified components are listed in the manufacturers document:
Bill of Materials BOM EX installation Rev 1.

Documents approval

The following documentation is to be submitted for approval in each case:

- Piping and Instrumentation Diagram (P&ID) of the ballast system including the treatment system installation
- Wiring diagram
- An overview of all controlled and monitored points, (I/O list)
- Description confirming the arrangement of alarms for bypass of the BWMS
- List of ex equipment according to DNVGL Pt.4 Ch.8 Sec.11, 2.1.1 and if the system is to be installed in hazardous zone. Procedures for approval of OBS Ex is further described in the section above.

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Type Approval documentation

Land-based testing of the Optimarin ballast water management system of Optimarin AS – Final Report, Report SNO 5643-2008 approved by DNV on 2009-11-05.

Shipboard testing of the Optimarin Ballast System of Optimarin AS, Report SNO 5828-2009 approved by DNV on 2009-10-21.

Additional land-based testing of the Optimarin BWMS with alternate filter, Report L.NR. 5840-2009 approved by DNV on 2009-11-12.

Additional land-based testing of the Optimarin BWMS with alternate filter, Report SNO 6284-2012 approved by DNV on 2012-05-04.

EMC and Environmental testing of Optimarin Ballast Water Control System, Report No. 2009-3397 approved by DNV on 2009-11-11.

EMC test report of the UV Power Cabinet, Report No. 9505 330 462XX 002, rev. 3 approved by DNV on 2012-08-23.

Mechanical and Climate test report of the UV Power Cabinet, Report No. 9505 330 462XX 001 approved by DNV on 2012-08-23.

QAPP for shipboard testing approved by DNV on 2009-04-27.

QAPP for land-based testing approved by DNV on 2008-02-01.

QAPP for full scale testing of the Optimarin BWMS – tests of alternate filters approved by DNV on 2009-10-01.

QAPP for full scale testing of the Optimarin BWMS – tests of alternate filter approved by DNV on 2012-05-03.

Pre-test evaluation documentation approved by DNV on 2007-12-06.

Survey report of the land-based tests, dated 2008-03-12.

Survey report of the shipboard tests, dated 2009-04-08.

Survey report of the land-based tests with alternate filter, dated 2009-10-01.

Survey report of the function testing of the control and automation system, dated 2009-10-19.

Survey report for verification and testing of Flow Pressure Valve, dated 2009-10-21.

Type Approval Initial survey report of OptiMarin AS, dated 2009-10-27.

Survey report for verification and testing of the automatic control of UV intensity, dated 2010-09-02.

Survey report for verification and testing of addition of Back Flush Cabinet, Fresh Water Panel and Interlock Panel, dated 13-12-09.

EMC and Environmental testing of Gönzheimer Elektronik GmbH Control unit F850S and power supply for Optimarin AS, Report 20226, Rev. 1.

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DNV GL Type Approval Certificate A-14198 issued to Eta plus electronic gmbh for UV Power Cabinet Type Eta.

Filtrex ACB Scaling and Guiding Principles of Ballast Water Filters, St. 73, Rev 6, Report dated Nov. 2016

Filter 1500M3H DN400 PN10 Type FX, Drawing No 145839, Rev 1

Filter 2100M3H DN500 PN10 Type FX, Drawing No 146517, Rev 1

Filter 3000M3H DN600 PN10 Type FX, Drawing No 146518, Rev 1

Class survey checklist for Optimarin Ballast System, Rev 1, Template dated 2/20/2018

Class survey checklist for Optimarin Ballast System Ex version, Rev 1, Template dated 2/20/2018

Bill of Material 1, Ex certified components rev.1. Approval date 11.12.2017

Operation, maintenance and safety Manual for Optimarin Ballast System, Rev 4, Template dated 2/20/2018. This manual is specific to BK (IMO, USCG) or FX (IMO) or FS (IMO) filters

Operation, maintenance and safety Manual for Optimarin Ballast system Ex Version, Rev 4, Template dated 2/20/2018

Applica Technical Report Optimarin AS Environmental testing of Temperatures Switches, Report No. 21250 Rev 1

Applica Technical Report Optimarin AS Environmental testing of Temperatures Switches, Report No. 20597 Rev 0

UV chamber with instrumentation, Illustration for DNVGL dual safety layer requirement, Drawing No. 100000, Rev -

Tests carried out

- Land-based testing in accordance with Resolution MEPC.174 (58) witnessed by DNV GL
- Shipboard testing in accordance with Resolution MEPC.174 (58) witnessed by DNV GL
- Land-based testing for alternate filter witnessed by DNV GL
- Factory Acceptance Test of the control and automation system witnessed by DNV GL
- Environmental testing in accordance with Environmental test specification for instrumentation and automation equipment, DNV GL CG-0339 and Resolution.174(58)

Marking of the product

For the traceability of this Type Approval, each treatment system is to be marked with:

- Manufacturer's name or trade mark
- Type designation
- Serial number

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Periodical assessment

For retention of the Type Approval, DNV GL Surveyor shall perform a Periodical Assessment 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 companys 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.

Copy of type approval certificate

A copy of this Type Approval Certificate should be carried on board a vessel fitted with this ballast water management systems at all times. A reference to the test protocol and a copy of the test results should be available for inspection onboard the vessel.

END OF CERTIFICATE