



TYPE APPROVAL CERTIFICATE

Certificate No. : CPH39327-BT001 **Initial Approval** : 1st April, 2019
Product : Ballast Water management System
Manufacturer : Optimarin AS
Sjoveien 34, 4315 Sandnes, Norway

Product Description : Ballast Water Management System
- Type : Optimarin Ballast System(OBS)
Optimarin Ballast System Ex(OBS Ex)
Treatment sequence:
- Ballast water uptake : Filtration and UV Disinfection
- Ballast water discharge: UV Disinfection
" See Appendix 1 "

Approval Condition : Ballast water management systems approved as per the Guidelines (G8) adopted by resolution MEPC.174(58) should only be installed on board ships before 28 October 2020.
" See Appendix 1 "

THIS IS TO CERTIFY that the above-mentioned product has been approved in accordance with the relevant requirement of this Society's Rules and / or of the recognized standards as follows and entered in the "List of Approved Manufacturers and Type Approved Equipment".

Resolution MEPC.174(58), Guidelines for Approval of Ballast Water Management System(G8), Part 5 & 6 Rules for the Classification of Steel Ships and Guidance of Approval of Manufacturing process and Type Approval, Etc.

This Certificate is valid until 31st March, 2024

Issued at Busan, Korea on 1st April, 2019



This certificate is signed electronically in accordance with IMO FAL.5/Circ.39/Rev.2. Validation and authentication of the certificate can be confirmed from "<http://e-cert.krs.co.kr>" by using the tracking No (ME19006103706) and certificate No.(CPH39327-BT001).



KOREAN REGISTER OF SHIPPING

*General Manager of
Marine & Ocean Equipment Team*

Note : 1. This certificate will be valid subject to complying with the approval conditions described on the certificate and/or on the Rules of this Society.
2. This certificate will be invalid from the expiry date aforementioned unless the extension or renewal has been granted to the applicant or the manufacturer.
3. Any significant modifications or changes in design or construction to the above product without approval from this Society will render this certificate invalid.
4. Should the specified rules, regulations or standards be amended during the validity of this certificate, the product is to be re-approved by this Society in accordance with the requirements as amended.

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Product Description and/or Approval Condition

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A. Product Description

1. Product Specification

1) System Description (Type: OBS and OBS Ex)

The Optimarin OBS and OBS Ex is a ballast water management system. The treatment sequence of OBS and OBS Ex under ballast water uptake mode is filtration and UV disinfection and UV disinfection mode is operated at the discharge mode without filtration.

2) System Comprising

Model	TRC (m ³ /h) (Ballasting)	TRC (m ³ /h) (De-Ballasting)	UV Chamber Quantity	Filter Model
167/100BK	50 ~ 100	50 ~ 167	1 UV Chamber	Bollfilter100
167/220BK	94 ~ 167	50 ~ 167	1 UV Chamber	Bollfilter220
334/220BK	114 ~ 220	50 ~ 334	2 UV Chamber	Bollfilter220
334/400BK	150 ~ 334	50 ~ 334	2 UV Chamber	Bollfilter400
500/400BK	170 ~ 400	60 ~ 500	3 UV Chamber	Bollfilter400
500/600BK	184 ~ 500	60 ~ 500	3 UV Chamber	Bollfilter600
667/600BK	204 ~ 600	80 ~ 667	4 UV Chamber	Bollfilter600
834/800BK	230 ~ 667	80 ~ 667	4 UV Chamber	Bollfilter800
1000/1200BK	250 ~ 800	100 ~ 834	5 UV Chamber	Bollfilter800
1167/1200BK	302 ~ 1000	120 ~ 1000	6 UV Chamber	Bollfilter1200
1334/1200BK	322 ~ 1167	140 ~ 1167	7 UV Chamber	Bollfilter1200
1334/1200BK	342 ~ 1200	160 ~ 1334	8 UV Chamber	Bollfilter1200
1334/1600BK	634 ~ 1334	160 ~ 1334	8 UV Chamber	Bollfilter1600
1500/1600BK	384 ~ 1500	180 ~ 1500	9 UV Chamber	Bollfilter1600
1667/1600BK	404 ~ 1600	200 ~ 1667	10 UV Chamber	Bollfilter1600
1667/2500BK	471 ~ 1667	200 ~ 1667	10 UV Chamber	Bollfilter2500
1834/2500BK	491 ~ 1834	220 ~ 1834	11 UV Chamber	Bollfilter2500
2000/2500BK	511 ~ 2000	240 ~ 2000	12 UV Chamber	Bollfilter2500
2167/2500BK	531 ~ 2167	260 ~ 2167	13 UV Chamber	Bollfilter2500
2334/2500BK	551 ~ 2334	280 ~ 2334	14 UV Chamber	Bollfilter2500
2500/2500BK	571 ~ 2500	300 ~ 2500	15 UV Chamber	Bollfilter2500
167/370BK2	103 ~ 167	50 ~ 167	1 UV Chamber	Bollfilter MK2 370
334/370BK2	123 ~ 334	50 ~ 334	2 UV Chamber	Bollfilter MK2 370
500/370BK2	143 ~ 370	60 ~ 500	3 UV Chamber	Bollfilter MK2 370
500/500BK2	145 ~ 500	60 ~ 500	3 UV Chamber	Bollfilter MK2 500
667/750BK2	165 ~ 667	80 ~ 667	4 UV Chamber	Bollfilter MK2 750
834/750BK2	185 ~ 750	100 ~ 834	5 UV Chamber	Bollfilter MK2 750
834/1400BK2	268 ~ 734	100 ~ 834	5 UV Chamber	Bollfilter MK2 1400
1000/1400BK2	288 ~ 1000	120 ~ 1000	6 UV Chamber	Bollfilter MK2 1400
1167/1400BK2	308 ~ 1167	140 ~ 1167	7 UV Chamber	Bollfilter MK2 1400
1334/1400BK2	328 ~ 1334	160 ~ 1334	8 UV Chamber	Bollfilter MK2 1400
1500/1400BK2	348 ~ 1400	180 ~ 1500	9 UV Chamber	Bollfilter MK2 1400
1500/2100BK2	385 ~ 1500	180 ~ 1500	9 UV Chamber	Bollfilter MK2 2100
1167/2100BK2	405 ~ 1667	200 ~ 1667	10 UV Chamber	Bollfilter MK2 2100
1834/2100BK2	425 ~ 1834	220 ~ 1834	11 UV Chamber	Bollfilter MK2 2100
2000/2100BK2	445 ~ 2000	240 ~ 2000	12 UV Chamber	Bollfilter MK2 2100
2167/2100BK2	465 ~ 2100	260 ~ 2167	13 UV Chamber	Bollfilter MK2 2100
2167/2500BK2	474 ~ 2167	260 ~ 2167	13 UV Chamber	Bollfilter MK2 2500
2334/2500BK2	494 ~ 2334	280 ~ 2334	14 UV Chamber	Bollfilter MK2 2500
2500/2500BK2	514 ~ 2500	300 ~ 2500	15 UV Chamber	Bollfilter MK2 2500
2667/3800BK2	646 ~ 2667	320 ~ 2667	16 UV Chamber	Bollfilter MK2 3800
2834/3800BK2	666 ~ 2834	340 ~ 2834	17 UV Chamber	Bollfilter MK2 3800
3000/3800BK2	686 ~ 3000	360 ~ 3000	18 UV Chamber	Bollfilter MK2 3800
167/50FS	50 ~ 50	50 ~ 167	1 UV Chamber	BS-025H/V
167/125FS	50 ~ 125	50 ~ 167	1 UV Chamber	BS-055H/V
167/180FS	50 ~ 167	50 ~ 167	1 UV Chamber	BS-070H/V
334/180FS	70 ~ 180	50 ~ 334	2 UV Chamber	BS-070H/V
334/250FS	80 ~ 250	50 ~ 334	2 UV Chamber	BS-100H/V

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Model	TRC (m ³ /h) (Ballasting)	TRC (m ³ /h) (De-Ballasting)	UV Chamber Quantity	Filter Model
334/375FS	90 ~ 334	50 ~ 334	2 UV Chamber	BS-150H/V
500/375FS	110 ~ 375	60 ~ 500	3 UV Chamber	BS-150H/V
500/500FS	120 ~ 500	60 ~ 500	3 UV Chamber	BS-200H/V
667/750FS	140 ~ 667	80 ~ 667	4 UV Chamber	BS-300H/V
834/750FS	160 ~ 750	100 ~ 834	5 UV Chamber	BS-300H/V
834/1000FS	180 ~ 834	100 ~ 834	5 UV Chamber	BS-400H/V
1000/1000FS	200 ~ 1000	120 ~ 1000	6 UV Chamber	BS-400H/V
167/87FS	50 ~ 87	50 ~ 167	1 UV Chamber	ACB-906-100
167/135FS	50 ~ 135	50 ~ 167	1 UV Chamber	ACB-910-150
167/190FS	55 ~ 167	50 ~ 167	1 UV Chamber	ACB-915-150
334/190FS	75 ~ 190	50 ~ 334	2 UV Chamber	ACB-915-150
334/255FS	75 ~ 255	50 ~ 334	2 UV Chamber	ACB-935-200
334/340FS	85 ~ 334	50 ~ 334	2 UV Chamber	ACB-945-200
500/340FS	105 ~ 340	60 ~ 500	3 UV Chamber	ACB-945-200
500/515FS	110 ~ 500	60 ~ 500	3 UV Chamber	ACB-955-250
667/515FS	130 ~ 515	80 ~ 667	4 UV Chamber	ACB-955-250
667/770FS	145 ~ 667	80 ~ 667	4 UV Chamber	ACB-985-300
834/770FS	165 ~ 770	100 ~ 834	5 UV Chamber	ACB-985-300
834/1040FS	195 ~ 834	100 ~ 834	5 UV Chamber	ACB-999-350
1000/1040FS	215 ~ 1000	120 ~ 1000	6 UV Chamber	ACB-999-350
1167/1040FS	235 ~ 1040	140 ~ 1167	7 UV Chamber	ACB-999-350

- 3) Operational Range of one UV-Chamber : 20m³/hr ~ 167m³/hr
 - A combination of UV-chambers is accepted under the following criteria :
 a) Chambers mounted in parallel (vertically or horizontally)
 b) The construction of the chambers (i.e. dimensions, form and material) is exactly the same.
 c) The construction of the two manifolds (i.e. dimensions, form and material) is exactly the same.

4) Filter

- a) Filtrix Filter, 40µm wire mesh (Min. Back-Pressure:1.7bar / Max.Pres.Drop:0.3Bar)

Type	Flow range (m ³ /hr)	Type	Flow range (m ³ /hr)
ACB-906-100	15 ~ 87	ACB-945-200	45 ~ 340
ACB-910-150	24 ~ 135	ACB-955-250	50 ~ 515
ACB-915-150	35 ~ 190	ACB-985-300	65 ~ 770
ACB-935-200	35 ~ 225	ACB-999-350	95 ~ 1040

- b) Filtersafe Filter, 40µm wire mesh (Min. Back-Pressure:1.7bar / Max.Pres.Drop:0.5Bar)

Type	Flow range (m ³ /hr)	Type	Flow range (m ³ /hr)
BS-025H/V	10 ~ 50	BS-050H/V	30 ~ 125
BS-070H/V	30 ~ 180	BS-100H/V	40 ~ 250
BS-150H/V	50 ~ 375	BS-200H/V	60 ~ 500
BS-300H/V	60 ~ 750	BS-400H/V	80 ~ 1000

- c) Boll & Kirch Filter (MK), 40µm wire mesh
 (Min. Back-Pressure:2 or 1.5bar / Max.Pres.Drop:0.5Bar)

Type	Flow range (m ³ /hr)	Type	Flow range (m ³ /hr)
Bollfilter 100	24 ~ 100	Bollfilter 220	74 ~ 220
Bollfilter 400	110 ~ 400	Bollfilter 600	124 ~ 600
Bollfilter 800	150 ~ 800	Bollfilter 1200	182 ~ 1000
Bollfilter 1600	204 ~ 1600	Bollfilter 2500	271 ~ 2500

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- d) Boll & Kirch Filter (MK2), 40 μ m wire mesh
(Min. Back-Pressure:1.5bar / Max.Pres.Drop:0.5Bar)

Type	Flow range(m ³ /hr)	Type	Flow range(m ³ /hr)
Bollfilter MK2 370	83 ~ 370	Bollfilter MK2 500	85 ~ 500
Bollfilter MK2 750	85 ~ 750	Bollfilter MK2 1400	168 ~ 1400
Bollfilter MK2 2100	205 ~ 2100	Bollfilter MK2 2500	214 ~ 2500
Bollfilter MK2 2500	326 ~ 2500		

- 5) Control Equipment & Monitoring Equipment
- Control Panel – Model : CP
 - Filter Control – Model : FC
 - Sensor Box – Model : SBx / EXSBx
 - Terminal Box – Model : TBxx
 - Back Flush Cabinet – Model :BFC
 - Fresh Water Panel – Model : FWP
 - Interlock Panel – Model : IP / EXIP
 - UV Power Type TT – Model : UVPxx TT
 - UV Power Type NED – Model : UVPxx NED
 - UV Power Cabinet Type ETA – Model : UVPC PE35B
 - UV Sensor – Model : IL-Metronic, SUV 20.2.Y2C
 - El. Act. Power Dis. Panel – Model : EAPDP
 - Software Version of OBS – Type : PBS PLC/OP 1.5x

2. Approved Drawings and Documents

- BOM of Standard OBS system and common components
- Complete BOM of all items in OBS Ex and Ex Certified Components with certificate
- (Bollfilter) Operation, Maintenance and safety Manual for OBS Rev.1, dated 2016-11-17
- (Filtersafe) Operation, Maintenance and safety Manual for OBS Rev.1, dated 2016-11-17
- (Filtrex) Operation, Maintenance and safety Manual for OBS Rev.1, dated 2016-11-17

3. Test Reports, etc.

- Land-Based Testing Report
 - Final Report No. SNO 5643-2008 issued by NIVA, dated 2008-07-02
 - Additional Land-Based Testing Report No. 5840-2009 issued by NIVA, dated 2009-09-07
 - Additional Land-Based Testing Report No. 6284-2012 issued by NIVA, dated 2012-02-09
- Shipboard Testing Report
 - Final Report No. SNO 5828-2009 issued by NIVA, dated 2009-08-18
- Environment Testing Report
 - Test Report No. 20597 issued by Applica, dated 2016-09-02
 - Test Report No. 20226 issued by Applica, dated 2014-06-11
 - Test Report No. 2009-3397 approved by DNVL, dated 2009-11-11
 - Test Report No. 9505 330 462XX 002 issued by THALES NEDERLAND, dated 2012-06-27
 - Test Report No. 9505 330 462XX 001 issued by THALES NEDERLAND, dated 2012-07-16
- Simulation Tests have been performed on 12 December, 2018 and 1 March, 2019 witnessed by this Society's Surveyor.

B. Approval Condition

1. Application & Limitation

- This approval is granted on the basis of the test reports and the documentation type-approved by Norway Administration (Date: 15 Jan, 2015 / Certificate No : TAP000006X)
- Ballast water management system should be approved as per BWMS Code to install on board ships on or after 28 October 2020.
- The manufacturer should inform this Society of all kinds of revisions of the equipment including software. If the changes are recognized to affect functionality of the approved equipment, type test to confirm the reliability of the revised equipment may be performed

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in the presence of our surveyor.

- 4) This approval is not to be construed as a substitute for the Administration's approval and it shall comply with requirements' of Vessel's Flag.
- 5) This certificate will be automatically revoked when the type approval certificate issued by Norway Administration is not valid.
- 6) Any latest conventions or requirements setted by International Maritime Organization or Administrations should be retroactively applied at the earliest possibility, if any.
- 7) The above models may be installed on board in parallel, provided that the ultimate functioning and effectiveness of the system on board a ship of the type and size for which the equipment will be certified will not be adversely affected.
- 8) Acceptable range of UV intensity sensor is $100 \sim 2300W/m^2$ and the low warning value of UV Intensity is $100W/m^2$. Power control is a function that controls the power to each lamp to keep the consumption at the lowest possible level. The power to the lamp is controlled to maintain a UV intensity measured by the UV sensors. And the target UV intensity can be set within the range $800 \sim 2300W/m^2$. Recommended setting is $800W/m^2$.
- 9) Explosion-proof certification by a notified/recognized certification body is not covered by this certificate. Ratings and special condition for safe use in hazardous areas are to be obtained from the relevant valid Ex-certificate.

2. Individual Product Cert. and Drawing Approval Requirement

- 1) Individual product certification is required.
- 2) In case where this system is installed on board, the system drawings for individual vessel are to be approved by this Society.
 - Piping diagram of ballast system including ballast water management system
 - Installation & outline drawings of ballast water management system
 - Drawings of main instruments of ballast water management sytem
 - Instrument lists of ballast water management system
 - Power and communication diagram
 - Operation and maintenance manual
 - Other documents requested by this Society
- 3) Each component of explosion proof grade is to be confirmed by system drawing approval.

3. Marking

- 1) The product or packing is to be marked with the manufacturer's name and type designation on a suitable position.

4. Others

- 1) Test condition of Electric Equipment

Test	Condition	Remark
EMC	All locations excluding the bridge and deck zone	-
Temperature	+5 ~ +55°C	-
Vibration	Acceleration $\pm 0.7g$	-

< End of Certificate >