Marine & Offshore

Certificate number: 27440/B1 BV
File number: ACM 223/1406/01
Product code: 9086I

This certificate is not valid when presented without the full attached schedule composed of 7 sections

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TYPE APPROVAL CERTIFICATE

This certificate is issued to

De Nora Marine Technologies, LLC

Sugar Land, TX - UNITED STATES OF AMERICA

for the type of product

BALLAST WATER MANAGEMENT SYSTEM

BALPURE® Basic Models
BP-6, BP-8, BP-12, BP-24, BP-36, BP-48, BP-60

Requirements:
- BUREAU VERITAS Rules for the Classification of Steel Ships
- IMO Res. MEPC.300(72) - Code for Approval of Ballast Water Management Systems

This certificate is issued to attest that Bureau Veritas Marine & Offshore did undertake the relevant approval procedures for the product identified above which was found to comply with the relevant requirements mentioned above.

This certificate will expire on: 10 May 2022

For Bureau Veritas Marine & Offshore,
At BV PORT EVERGLADES CENTRE, on 10 Dec 2021,
Nikolay Georgiev

Nikolay Georgiev

BUREAU VERITAS MARINE & OFFSHORE INTERNATIONAL REGISTER

THE SCHEDULE OF APPROVAL

1. PRODUCT DESCRIPTION

Ballast Water Treatment System BALPURE® Basic Models

BP-6, BP-8, BP-12, BP-24, BP-36, BP-48, BP-60

BALPURE® System Configuration

a) Distributed 6 skids, b) Hybrid 3 skids

Ballast Water Technology

- The principle of BALPURE® treatment is 1) Ballast water filtration 2) Hypochlorite generation and injection 3) Residual chlorine neutralization with sodium bisulfite (oxidant neutralization) during deballasting operation

- The sodium bisulfite (oxidant neutralization) addition is controlled with ORP (Oxidation Reduction Potential) and metering pump technology

- The operation control of the BALPURE® system is accomplished by the main control panel

- The BALPURE® system is designed to operate automatically

List of major equipments and devices which are part of this approval

- Sea water electrolyzer cells skid
- Transformer / Rectifier (Power supply) skid
- Strainer skid
- Blower/ Degas skid
- Sulfite (Neutralization) pump skid
- Ballast filter skid
- Control Panel including operator interface panel with Touchscreen
- Control devices (Transmitter, flow meter) ORP Sensors, Conductivity/Temperature Sensors
- Booster pump skid

BALPURE® Matrix

Production Model	BALPURE® Model Options	Ballast Flowrate treated (m3/h)	Max. Concentration dosage of Active Substance (ppm)	Electrolytic system # of Tubes	Electrolyzer Capacity (kg/h)
BP-60	BP8570-AL	8,570	7	3	60.7
	BP7500-A	7,500	8		
	BP7200-A	7,200	8.4		
	BP6800-A	6,800	8.9		
	BP6400-B	6,400	9.5		
	BP5000-C	5,000	12		
	BP4000-D	4,000	15		
BP-48	BP6860-AL	6,860	7	3	48.6
	BP6000-A	6,000	8		
	BP5100-B	5,100	9.5		
	BP5000-B	5,000	9.7		
	BP4000-C	4,000	12		
	BP3200-D	3,200	15		
BP-36	BP5140-AL	5,140	7	3	36.4
	BP4500-A	4,500	8		
	BP4000-A	4,000	9		
	BP3850-B	3,850	9.5		
	BP3000-C	3,000	12		
	BP2400-D	2,400	15		
BP-24	BP3430-AL	3,430	7	3 / 2	24.3
	BP3000-A	3,000	8		
	BP2500-B	2,500	9.5		
	BP2400-D	2,400	10		
	BP2000-C	2,000	12		
	BP1600-D	1,600	15		
BP-12	BP1710-AL	1,710	7	3 / 2	12.1
	BP1500-A	1,500	8		
	BP1250-B	1,250	9.5		
	BP1000-C	1,000	12		
	BP800-D	800	15		

BP-8	BP1140-AL	1,140	7	2	8.1
	BP1000-A	1,000	8		
	BP850-B	850	9.5		
	BP675-C	675	12		
	BP500-D	500	15		
BP-6	BP850-AL	850	7	1	6.1
	BP750-A	750	8		
	BP630-B	630	9.5		
	BP500-C	500	12		
	BP400-D	400	15		

Suffix AL= 7 ppm, Suffix A = 8-9 ppm, Suffix B = 9.5-10ppm, Suffix C = 12 ppm, Suffix D = 15 ppm

Ballast Water Filters for BALPURE® Ballast Water Treatment System - Filtersafe

Manufacturer	Filtersafe Automatic Screen Filtration
Mesh Size	40 µm
Maximum working pressure	6.9 bar
Material	Carbon Steel 37-2 with epoxy-phenol finish over zinc-phosphate or Carbon Steel S235JR/ SA-106-B

Compact Single screen		**Single screen**		**Multi- screen**	
Filter Model #	**TRC (m3/h)**	**Filter Model #**	**TRC (m3/h)**	**Filter Model #**	**TRC (m3/h)**
BS-031H/V	75	BS-025H/V	50	BS-603H/V	1500
BS-061H/V	150	BS-050H/V	125	BS-603H/V-T	1800
BS-061H/V-T	180	BS-070H/V	180	BS-603E-H/V	1500
BS-101H/V	250	BS-100H/V	250	BS-603E-H/V-T	1800
BS-101H/V-T	300	BS-100H/V-T	275	BS-804H/V	2000
BS-101E-H/V	250	BS-150H/V	375	BS-804H/V-T	2400
BS-101E-H/V-T	300	BS-150H/V-T	410	BS-804E-H/V	2000
BS-151H/V	375	BS-200H/V	500	BS-804E-H/V-T	2400
BS-151H/V-T	450	BS-200H/V-T	550	BS-1004H/V	2500
BS-151E-H/V	375			BS-1004H/V-T	3000
BS-151E-H/V-T	450			BS-1004E-H/V	2500
BS-201H/V	500			BS-1004E-H/V-T	3000
BS-201H/V-T	600			BS-1204H/V	3000
BS-201E-H/V	500			BS-1204H/V-T	3600
BS-201E-H/V-T	600			BS-1204E-H/V	3000
BS-300H/V	750			BS-1204E-H/V-T	3600
BS-300H/V-T	900			BS-1206H/V	3000
BS-300E-H/V	750			BS-1206H/V-T	3600
BS-300E-H/V-T	900			BS-1206E-H/V	3000
BS-400H/V	1000			BS-1206E-H/V-T	3600
BS-400H/V-T	1200			BS-1406H/V	3500
BS-400E-H/V	1000			BS-1406H/V-T	4200
BS-400E-H/V-T	1200			BS-1406E-H/V	3500
BS-500H/V	1250			BS-1406E-H/V-T	4200
BS-500H/V-T	1500				
BS-500E-H/V	1250				
BS-500E-H/V-T	1500				

Notes: V = Vertical Configuration, H = Horizontal Configuration, T = Turbo, E = Evolution

- Maximum flow rates for Filtersafe Filters based on 40 micron mesh filtration degree and backflush pump

Ballast Water Filters for BALPURE® Ballast Water Treatment System - Hydac

Manufacturer	Hydac Process Technology GmbH
Mesh Size	40 µm
Maximum working pressure	6 bar
Material	Carbon Steel, 1mm Polyurethane lining for internal housing and RAL7040 for external housing

Filter Serie RF10	TRC (m3/h)	Filter Serie RF3	TRC (m3/h)
RF10-10	100	RF3-2	180
RF10-20	250	RF3-2.5	275
RF10-23	410	RF3-3	410
RF10-25	500	RF3-4	850
RF10-30	750	RF3-5	1150
RF10-35	1000	RF3-6	1650
RF10-36	1300	RF3-7	2500
RF10-40	1500	RF3-8	3500
RF10-50	2200		
RF10-55	3000		
RF10-60	3500		

Materials according to the BOM listed in section 2.

- Manifolds to be constructed during installation: Quality marine grade of steel work or other materials approved by the Society.

Software version BPS-PLC-PRO-0.XX-MQ.XPXXXXX

BPS : BALPURE STANDARD
PLC-PRO : PLC PROGRAM
0: REVISION – MAJOR CHANGE
.XX : REVISION MINOR CHANGE
MQ.XPXXXXX – XXXXX denotes Project number. Since ship Valve I/O tags differ from vessel to vessel

2. DOCUMENTS AND DRAWINGS

2.1 For distributed configuration

Type	Drawing N°
Equipment Layout Flow Diagram	BPXX-F-50-M-USCG Rev. 1
Equipment Layout Flow Diagram - Filter	BPXX-F-50-FILTER-USCG Rev. 1
General Arrangement Electrolyzer Skid	BPXX-P-01-M-USCG Rev. 0
General Arrangement Booster Pump Skid	BPXX-P-02-M-USCG Rev. 0
eneral Arrangement Blower / Vent Stack Skid	BPXX-P-03-M-USCG Rev. 0
General Arrangement Analyzer / Neutralization Skid	BP-P-04-22-USCG Rev. 1
General Arrangement Power Supply Skid	BPXX-P-10-M-USCG Rev. 0
Electrical Panel - Electrolyzer Skid (Main Control Panel Layout Diagram)	BP-EP-01C-Z1-USCG Rev. 1
MMC / Switchgear Control Panel	BP-EP-21-FWD-Z1-USCG Rev. 1
Power Distribution Single Line Diagram	BP-ESL-Z1-USCG Rev. 1
Electrical Interconnect Electrolyzer Skid	BP-E-01-USCG Rev. 2
Electrical Interconnect (Skid to skid)	BP-E-50-Z1-USCG Rev. 2
Electrical Panel - Booster pump skid	BP-EP-02-USCG Rev. 1
Electrical Panel - Blower / Vent stack skid	BP-EP-03-USCG Rev. 1
Electrical Panel - Analyzer / Neutralization skid	BP-EP-04-USCG Rev. 1

Electrical Panel - Cargo Control room	BP-EP-50-Z1-USCG Rev. 1
Junction Box - Neutralization	BP-EP-04-JB-USCG Rev. 1
Junction Box - Main Control Panel	BP-EP-01C-JB-Z1-USCG Rev. 1
Junction Box - Flow Meter ISB	BP-EP-50-JB-ISB-USCG Rev. 1
Junction Box - Electrolyzer Skid	BP-JB-01-USCG Rev. 1
Junction Box - Power supply skid	BP-JB-10-USCG Rev. 1
Equipment Layout Assembly details	BP-DTL-50-STD Rev. 1

with XX= 6 / 8 / 12 / 24 / 36 / 48 / 60

2.2 For hybrid configuration

Type	**Drawing N°**
Equipment Layout Flow Diagram	BPXX-F-50-H-USCG Rev. 1
General Arrangement - Electrolyzer, Blower, Degas Separator, Vent Stack & Power Supply Skid	BPXX-P-01-H-USCG Rev. 0
General Arrangement – Strainer & Booster Pump Skid	BPXX-P-02-H-USCG Rev. 0
General Arrangement Analyzer / Neutralization Skid	BP-P-04-22-USCG Rev. 1
Electrical Panel - Electrolyzer Skid (Main Control Panel Layout Diagram)	BP-EP-01C-H-Z1-USCG Rev. 1
MMC / Switchgear Control Panel	BP-EP-21-FWD-H-Z1-USCG Rev. 1
Junction Box - Main Control Panel	BP-EP-01C-JB-Z1-USCG Rev. 1
Electrical Single Line Diagram	BP-ESL-H-Z1-USCG Rev. 1
Electrical Interconnect Electrolyzer Skid	BP-E-01-H-USCG Rev. 1
Electrical Interconnect (Skid to skid)	BP-E-50-H-Z1-USCG Rev. 1
Electrical Interconnect Control Architecture	BP-E-75-ARCH-H-Z1-USCG Rev. 0
Interconnect - Network Communication	BP-E-75-H-Z1-USCG Rev. 0
Electrical Panel - Booster pump skid (1 booster pump)	BP-EP-02-H-USCG Rev. 1
Electrical Panel - Blower vent stack skid (2 blowers)	BP-EP-03-H-USCG Rev. 1
Electrical Panel - Analyzer / Neutralization skid	BP-EP-04-H-USCG Rev. 1
Electrical Panel - Cargo Control Room remote	BP-EP-50-H-Z1-USCG Rev. 1
Junction Box - Main Control Panel	BP-EP-01C-JB-H-Z1-USCG Rev. 1
Junction Box - Neutralization	BP-EP-04-JB-H-USCG Rev. 0
Junction Box - Flow Meter ISB	BP-EP-50-JB-ISB-H-USCG Rev. 1
Equipment Layout Assembly Details	BP-DTL-50-STD Rev. 1

with XX= 6 / 8 / 12 / 24 / 36 / 48 / 60

2.3 List of Bill of Materials

Document N°	**Revision**
BP6-LST-BOM-MECH-H-MCA	2
BP6-LST-BOM-MECH-M-MCA	2
BP6-LST-BOM-SHLS-MCA	2
BP8-LST-BOM-MECH-H-MCA	2
BP8-LST-BOM-MECH-M-MCA	2
BP8-LST-BOM-SHLS-MCA	2
BP12-LST-BOM-MECH-H-MCA	2
BP12-LST-BOM-MECH-M-MCA	2
BP12-LST-BOM-SHLS-MCA	2
BP24-LST-BOM-MECH-H-MCA	2
BP24-LST-BOM-MECH-M-MCA	2
BP24-LST-BOM-SHLS-MCA	2
BP36-LST-BOM-MECH-H-MCA	2

BP36-LST-BOM-MECH-M-MCA	2
BP36-LST-BOM-SHLS-MCA	2
BP48-LST-BOM-MECH-H-MCA	2
BP48-LST-BOM-MECH-M-MCA	2
BP48-LST-BOM-SHLS-MCA	2
BP60-LST-BOM-MECH-H-MCA	2
BP60-LST-BOM-MECH-M-MCA	2
BP60-LST-BOM-SHLS-MCA	2

- Component Lists N° BP-LST-PIPE-PLS Rev. 0 & N° BP-LST-HAZ-COMP Rev. 3

2.4 Operation, Maintenance & Safety Manual N° BP-MAN-OPR-MCA Rev. 1 dated 15/10/2020

Above manual and procedure contain information needed for installation, commissioning and operation.

2.5 Cell assembly drawings N° 28503-0500-HCD Rev. 1, N° 28503-01000-HCD Rev. 2, N° 28503-02000-HCD Rev. 1, N° 28503-03000-HCD Rev. 1, 28503-04000-HCD Rev. 1, N° 28503-05000-HCD Rev. 1

2.6 Electrolyzer Drawings N° 28501-03000-HCD Rev. 1 & N° 28502-03000-HCD Rev. 1

2.7 Addtional Documentation

- Ballast Water Filters for BALPURE® Ballast Water Treatment System Rev. 5 dated 28/09/2020
- Scaling report N° BP-RPT-SCALING-IMO Rev. 5 dated 01/10/2020
- Software Quality Assurance Plan N° BP-QA-SQP Rev. 0 dated 15/08/2017
- Document N° BP-RPT-CLAIMS-IMO, Rev. 1 dated 21/03/2019
- GL 6-Month Corrosion Test Report No. 10537 Issue 1 February 2011
- International Paint Balpure Statement March 2011
- International Paint Notice on Ballast Water Treatment Systems utilizing "Active Substances", dated 1 December 2014

MEPC Reports

- MEPC 60/22 Basic Approval, MEPC 61/24 Final Approval, MEPC 60/2/16 (GESAMP-BWWG 12/6, annex 7)
- MEPC 75/4/4

No departure from the above documents shall be made without the prior consent of the Society named on this certificate. The manufacturer must inform the Society of any modification or changes to these documents and drawings.

3. TEST REPORTS

3.1 Certificate and reports verifying compliance with the Code for Approval of Ballast Water Management Systems (BWMS Code), Res. MEPC 300(72):

- IMO Type Approval N° 2064041TA-02 dated 25/11/2020 issued by Lloyd's Register on behalf of the Maritime and Coastguard Agency (MCA).

A copy of the Type Approval Certificate of Ballast Water Management System issued by an Administration should be carried onboard ships fitted with such a system at all times. A reference to the test protocol and a copy of the test results should be available for inspection onboard ships.

3.2 - **Land-based test**, NIVA. All land-based tests were performed with a BALPURE BP-8 BWTS with a Treatment Rated Capacity of 300m3/h consisting of one electrolysis unit and one Hydac Filter RF3-3.

- N° 7210-2017 Rev. 8.0 dated 08/11/2019

Land-based test, NIVA. All land-based tests were performed with a BALPURE BP-8 BWTS with a Treatment Rated Capacity of 300m3/h consisting of one electrolysis unit and one Filtersafe Filter BS-200 H for the two first tests and on Hydac Filter RF3-3 for the next ones.

- N° 7495-2020 dated 06/04/2020

Land-based test, NIVA. All land-based tests were performed with a BALPURE BP-8 BWTS with a Treatment Rated Capacity of 300m3/h consisting of one electrolysis unit and one Filtersafe Filter BS-200H.

- N° 7300-2018 Rev. 2.0 dated 20/08/2018

3.3 - **Shipboard test**, NIVA. All shipboard tests were performed with a BALPURE BP-36 BWTS with a Treatment Rated Capacity of 3000m3/h.

- N° 7320-2018 Rev. 6.0 dated 01/2018

3.4 - **Environmental testing**

- Test report N° ER3227-1 Rev. 2 dated 14/08/2018
- Test report N° NR3227-1 Rev. 1 dated 16/05/2018

- Test report No. NK1376-1, Issue 2 by Curtis-Straus LLC on 05/04/2011
- Diagnostic Test report No. EK1376-1, issue 2 issued by Curtis-Straus LLC on 05/04/2011
- Test report No. NN0962-1, Issue 1 by Curtis-Straus LLC on 20/11/2013
- Test report No. EN0962-1, Issue 1 by Curtis-Straus LLC on 22/11/2013
- Test report No. EO0392-1, Issue 1 by Curtis-Straus LLC on 23/06/2014
- Test report No. NO0392-1, Issue 1 by Curtis-Straus LLC on 12/09/2014
- Test report No. NO0392-1, Issue 1 by Curtis-Straus LLC on 12/09/2014
- IDX Power Supply Device DWD-900601-01: Test report No. J-40108-0 dated 12/02/2012 and TA12074M issued by NKK
- Rectifier FlexKraft Marine K700900: Test reports No. U124896 E1 (REPO-0876 Rev. 1) dated 26/03/2013 and No. E124896 E1 (REPO-0877 Rev. 1) issued by Phoenix TESTLAB GmbH, and No. REPO-0683 Rev. 2 dated 25/10/2013 issued by KraftPowercon

4. APPLICATION / LIMITATION

4.1 This certificate is issued for the BALPURE® Ballast Water Treatment System as far as the classification is concerned. The installation onboard a ship is subject to approval by the Flag Administration of that ship.

4.2 Intended for Ballast Water Treatment systems:

- Ballast water uptake: Filtration & Treatment process
- Ballast water discharge: Neutralization process

4.3 - The system can be used in the following common ambient and water conditions:

Water temperature range	No limitation
Ambient temperature range	+ to +55°C
Water salinity range	No limitation

4.4 Operating conditions for BALPURE® Ballast Water Treatment System:

TRC Range (m3/h)	400 to 8570
Salinity of feed water to electrolyzer (PSU)	> 18
Temperature of feed water to electrolyzer (°C)	8 to 45
TRO range (ppm)	7 to 15
Minimum holding time (h)	24
Minimum filter outlet pressure (during back-flushing only)	≥ 1.5 bar (Hydac Filter) ≥ 1.6 bar (Filtersafe Filter)

4.5 - The treatment rated capacity of the BWMS is not to be less than the operated flow rate of ballast pump(s).

4.6 - Ex-certification is not covered by this certificate. Application for use in hazardous areas to be approved in each case.

4.7 The system is to be operated according to the manual provided by the manufacturer including salinity and temperature specifications, TRO measurements and neutralization operations.

4.8 The following documentation is to submitted for approval on a ship case-by-case basis :

- On-board location of the complete system on single or multiple skid-units;
- All connection details of interface towards ship's ballast piping systems;
- Layout of the system;
- All associated control, alarm and monitoring equipment;
- Wiring diagrams and the cable specifications;
- Pipes with associated fittings, automatic self-cleaning filter and electrical equipment including control, sensors, H2 gas detector, safety devices and cables required to be type approved are to be in conformity with the applicable Society's Rules;
- Materials list;
- Arrangement and location of Ballast Water sampling ports.

4.9 A copy of the operating manual is to be maintained onboard.

5. PRODUCTION SURVEY REQUIREMENTS

5.1 The Ballast Water Management systems are to be supplied by **De Nora Marine Technologies, LLC** in compliance with the type and the requirements described in this certificate. This type of product is within the category IBV of Bureau Veritas Rule Note NR320.

5.2 **De Nora Marine Technologies, LLC** has declared to Bureau Veritas that the various components detailed in this certificate are manufactured/assembled at his supplier's production sites, but however always under his full responsibility and reliability.

5.3 Production surveys requested for components:

a) Filters and Pressure Vessels are classified as Class 3 pressure vessels according to the Society's Rules Pt C, Ch 1, Sec 3 [table 2].

- Housings are to be hydraulically pressure tested to 1.5 times the design pressure under witnessing of a Society’s surveyor
- Work’s certificate is to be provided for raw materials of shell assembly according to the Society's Rules [Class 3 vessels]
- Bureau Veritas certificate is required for final assembly according to the Society's Rules Pt C, Ch 1, Sec 3 [Class 3 vessels]

b) Electric and functional tests of Power and Control cabinets are to be performed to the surveyor satisfaction.

c) Production surveys for other components (class III piping and manifold, sensors, pumps, electrical cables...) are to be in compliance with the **De Nora Marine Technologies, LLC**'s regime and Society's Rules.

d) When components (non-skid) are manufactured at supplier or subcontractor workshops, production surveys are to be carried out by the BV local surveyor in charge of the survey.

5.4 Fabrication and welding requirements to comply with the Society's Rules Pt C, Ch 1, Sec 3 [4.10 Class 3 vessels]. Welding procedures and welding consumables are to be approved by the Society.

5.5 A Bureau Veritas product certificate is required for the complete system. Factory acceptance tests records, including functional tests and electrical test of the system are to be provided to the surveyor satisfaction.

5.6 Functional tests of the system to be carried out after onboard installation as required by the IMO resolution MEPC.300(72).

5.7 For information, **De Nora Marine Technologies, LLC** has declared to Bureau Veritas the following production sites:

- De Nora Water Technologies Texas, LLC: 1110 Industrial Boulevard, Sugar Land, Texas 77478 (USA)

- De Nora Elettrodi (Suzhou) Co., LTD.: No. 113 Longtan Road, Suzhou Industrial Park Jiangsu 215126 (China)

6. MARKING OF PRODUCT

Each Ballast Water Treatment System shall be marked with:

- Manufacturer's name or trade mark
- Type designation
- Serial number
- Capacity
- Society's brand as relevant

7. OTHERS

It is **De Nora Marine Technologies, LLC**'s responsibility to inform shipbuilders or their sub-contractors of the proper methods of fitting, use and general maintenance of the approved equipment and the conditions of this approval.

This certificate supersedes Type Approval Certificate No. 27440/B0 BV issued by the Society.

***** END OF CERTIFICATE *****