

EC-TYPE EXAMINATION CERTIFICATE (MODULE B)

Certificate No:
MEDB0000768

Application of: Directive 2014/90/EU of 23 July 2014 on marine equipment (MED), issued as "Forskrift om Skipsutstyr" by the Norwegian Maritime Authority. This Certificate is issued by DNV AS under the authority of the Government of Norway.

This is to certify:

That the Sewage systems (for use by passenger ships in all areas, including a MARPOL Annex IV special area)

with type designation(s)
MBR-NP Series

Issued to

CSSC Nanjing Luzhou Machine Co.,Ltd
NANJING, JIANGSU, China

is found to comply with the requirements in the following Regulations/Standards:

Regulation (EU) 2021/1158,

Annex A.1 item No. MED/2.6a, Marpol 73/78 as amended, Annex IV Regulation 9, IMO Res. MEPC.227(64)
including section 4.2.

Further details of the equipment and conditions for certification are given overleaf.

This Certificate is valid until **2026-11-02**.

Issued at **Høvik** on **2021-11-03**

DNV local station:
Nanjing NB & CMC

Approval Engineer:
Wenjun Wu



Notified Body
No.: **0575**

for **DNV AS**

Sverre Olav Bergli
Head of Notified Body



The mark of conformity may only be affixed to the above type approved equipment and a Manufacturer's Declaration of Conformity issued when the production-surveillance module (D, E or F) of Annex B of the MED is fully complied with and controlled by a written inspection agreement with a Notified Body. The product liability rests with the manufacturer or his representative in accordance with Directive 2014/90/EU.

This certificate is valid for equipment, which is conform to the approved type. The manufacturer shall inform DNV AS of any changes to the approved equipment. This certificate remains valid unless suspended, withdrawn, recalled or cancelled.

Should the specified regulations or standards be amended during the validity of this certificate, the product is to be re-approved before being placed on board a vessel to which the amended regulations or standards apply.

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 MBR-NP series marine sewage treatment plant is intended for installation onboard ships to provide sewage treatment for the protection of the marine environment. The MBR-NP series sewage treatment system adopts combined biochemical and physicochemical treatment, and membrane separation to treat the sanitary sewage produced onboard ships or offshore platforms.

The plant mainly consists of three watertight compartments: an equalization tank, an anoxic tank, and an aerobic MBR tank. In addition, there are auxiliary components to support mixing and monitoring functions, such as air supply system, dosing and pH adjusting system, pumps, etc.

The plant adopts the Biotreatment-Flocculation-MBR treatment principle. Sewage firstly enters the Equalization tank for pre-filtration and homogeneous water quality. After this pre-treatment, sewage flows into an Anoxic tank for removal of nitrogen and phosphorus by anoxic denitrification and adding chemicals for flocculation. From the Anoxic tank, the treated sewage flows into an aerobic MBR tank, which is an immersed flat membrane module and is the core of sewage treatment. The organic pollutants in the sewage are digested by aerobic bacteria and microorganisms which are promoted in the sewage by active aeration, into carbon dioxide and water. The aerobic bacteria floc (activated sludge) is returned to Anoxic tank by a sludge return pump mounted outside the MBR tank, so that a smaller amount of sludge needs to be discharged (while sludge concentration exceeds 12000 mg/L). The amount of sludge in MBR tank should be checked every 15 days, and excessive sludge should be discharged from the MBR tank.

Application/Limitation

Applicable models covered in this certificate are listed below:

Model	Design capacity (m ³ /h)	Designed Organic Load (Kg BOD ₅ /day)
MBR-NP-2	3.7	1.85
MBR-NP-3	4.5	2.25
MBR-NP-4	7.4	3.7
MBR-NP-6	11.1	5.55
MBR-NP-8	14.8	7.4
MBR-NP-10	18.5	9.25
MBR-NP-12	22.2	11.1
MBR-NP-15	28	14
MBR-NP-20	37	18.5
MBR-NP-30	55.5	27.75
MBR-NP-40	74	37

Operational conditions applicable to all models are listed below:

Ambient temperature (°C)	5 – 50
Inlet water temperature (°C)	2 – 32
Inlet water salinity (mg/L)	≤35000
Operating humidity (%)	≤90
Power supply	380/440 V AC, 50/60 Hz

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

Control and monitoring equipment

Software version

The MBR-NP sewage treatment system is type approved with the system control software version V02.02.00.00_01.74 or higher. Any changes to the software are to be recorded as long as the MBR-NP sewage treatment system is in use onboard. The records of all changes are to be forwarded to DNV for evaluation. Major changes in the software, which can alter the performance of the system, require approval. Testing of the application functions of the revised software may be required.

Electrical and electronic components

The type approved MBR-NP sewage treatment system shall include the following control and monitoring equipment indicated on the P&ID (W3131-W3138-00LC and W3139-W3141-00LC) and specified on the equipment list (W3131-W314100CL, rev. A, 2020.10.20). Except for the components listed below, alternate models to the ones specified on the component lists may be used provided that information regarding the selected components is part of the documentation related to the specific installation, by providing either a reference to a valid type approval certificate or technical documentation demonstrating that the selected component was subject to environmental testing as per IACS UR E10.

For the following electrical and electronic components, only the models specified in the component lists shall be used. Changes made to these components shall be approved by DNV in advance:

Name	Manufacturer	Model
PLC	SIEMENS	6ES7 288-ESR60-0AA0
HMI	Artrich	MT8102iE
Power supply	ABB	ABL2REM24045

Type Examination documentation

Drawings and system documents

Type	Title	Drawing no.	Rev.
Flow diagram	P&ID	W3131-W3138-00LC and W3139-W3141-00LC	Rev. Initial 2020.10.20
General Arrangement and Assembly drawings	Assembly	W3131-00~W3141-00	Rev. Initial 2020.10.20
Drawings of components	Welding Drawing	W3131-01-0~W3141-01-0	Rev. Initial 2020.10.20
Electrical schematic diagram	Electrical Principal Drawing/ Interconnect Wiring Drawing	Q1127C-00YL/Q1127C-00JX2	Rev. Initial 2020.10.20
Equipment list	MBR-NP SERIES MAIN COMPONENTS LIST	W3131~W314100CL	Rev. A 2020.10.20
Operation and Maintenance Manuals	MBR-NP SERIES MARINE SEWAGE TREATMENT PLANT Instruction Manual	W3131-W314100SM	Rev. Initial 2020.10.20

Test plans and reports

- Test Report for Performance Test of MBR-NP Sewage Treatment System model MBR-NP-4, Water Environment Testing Center of Lower Yangtze River (China), report no. CHXYSHJ2019-04, 2019-11-07 (Witnessed by China Classification Society)
- Test Report for Environmental Test of el-control box of MBR-NP Sewage Treatment System, China Shipbuilding Industry Environmental and Reliability Test Center for Electric and Electronic Equipment, report no. Ship Test ER 2019-047, September 24, 2019

Tests carried out

Performance tests

- Sewage Treatment System Type Approval Test, model MBR-NP-4, at Water Environment Testing Center of Lower Yangtze River (China), 2019-11-07 witnessed by China Classification Society (CCS).

Environmental tests

- Environmental testing in accordance with CCS Guideline GD22-2015 for Type Approval Test of Electric and Electronic Products, September 24, 2019 witnessed by China Classification Society (CCS).

Basis of acceptance

Performance testing was conducted on the MBR-NP-4 model ashore in accordance with IMO Resolution MEPC.227(64) Section 4.1, 4.2, and 5.2 to 5.7. the test reports are listed in the "Test plans and reports" section of this certificate and the results are given in the Appendices.

Tilt testing was conducted to show the effect of inclination described in Resolution MEPC.227(64) Section 5.9.1. During factory testing the MBR-NP-4 model was inclined 22.5 degrees on both the X-axis and Y-axis and a function test was performed to confirm that the unit would operate properly.

Environmental testing was carried out on the EI-control box of the system in according with MEPC.227(64) Section 5.9.3 and the test report is listed in the "Test plans and reports" of this certificate.

Scaling of the whole product series was evaluated in accordance with IMO Resolution MEPC.227(64) Section 5.8 based on performance testing of MBR-NP-4 model, document of design calculations and acceptance from CCS.

The testing described above was done under the authority of China Classification Society (CCS) who are a notified body according to EU MED (NoBo 2676) and are authorized to witness testing of Sewage Treatment Plants by the People's Republic of China. The following IMO type approval certificate was issued by CCS based on these tests:

- JS20PTB00317_01, issued on 2021.03.19

Marking of product

The marking shall give the following information:

- Manufacturer's name or trademark
- Type designation
- Serial number
- Any operational or installation limits considered necessary by the manufacturer or the Administration

Revision history

Rev.	Date of issuance	Description
-	2021-11-03	Initial certificate in compliance with MEPC.227(64)

Copy of the certificate and operation and maintenance manual

A copy of this certificate should be carried on board any ship equipped with the MBR-NP sewage water treatment system described above.

The ship should have on board at all times a manual detailing the operational and maintenance procedures for the sewage treatment plant, including safety information about the chemicals and materials actually used in the operation of the sewage treatment plant.

APPENDIX – SUMMARY OF TESTING

Test results and details of tests conducted on samples from the sewage treatment plant in accordance with resolution MEPC.227(64):

Sewage treatment plant type:	MBR-NP-4
Manufactured by:	CSSC Nanjing Luzhou Machine Co., Ltd.
Organization conducting the test:	CSSC Nanjing Luzhou Machine Co., Ltd.
Organization handling the samples:	Water Environment Testing Center of Lower Yangtze River (China)
Test Location:	CSSC Nanjing Luzhou Machine Co., Ltd.
Designed hydraulic loading:	7.4 m³/day
Designed organic loading:	3.7 kg/day BOD₅
No. of effluent samples tested:	52
No. of influent samples tested:	52
Total suspended solids influent quality:	664 mg/l
Total nitrogen influent quality:	
- Geometric mean:	72 mg/l
- Maximum:	N/A
- Minimum:	N/A
Total phosphorus influent quality:	
- Geometric Mean:	9.07 mg/l
- Maximum:	N/A
- Minimum:	N/A
BOD ₅ without nitrification influent quality:	1056.9 mg/l
Maximum hydraulic loading:	7.758 m³/day
Minimum hydraulic loading:	7.494 m³/day
Average hydraulic loading (Qi):	7.628 m³/day
Effluent flow (Qe):	7.55 m³/day
Dilution compensation factor (Qi/Qe):	1.0
Geometric mean of total suspended solids:	11.3 mg/l
Geometric mean of the thermotolerant coliform count:	1 coliforms/100 ml
Geometric mean of BOD ₅ without nitrification:	3.3 mg/l
Geometric mean of COD:	15 mg/l
Geometric mean of total nitrogen: (or Percentage reduction of total nitrogen)	16 mg/l
Geometric mean of total phosphorus: (or Percentage reduction of total phosphorus)	0.22 mg/l
Maximum pH:	7.61
Minimum pH:	6.51
Type of disinfectant used:	MBR cleaning water: Chlorine
If Chlorine - residual Chlorine:	

Maximum: **0 mg/l**
 Minimum: **0 mg/l**
 Geometric mean: **0 mg/l**

Was the sewage treatment plant tested with:

Fresh water flushing? ☒ Yes ☐ No
 Salt water flushing? ☒ Yes ☐ No
 Fresh and salt water flushing? ☒ Yes ☐ No
 Grey water added? **Yes, proportion 1:2.29**

Was the sewage treatment plant tested against the environmental conditions specified in section 5.9 of resolution MEPC.227(64):

Temperature: ☒ Yes ☐ No
 Humidity: ☒ Yes ☐ No
 Inclination: ☒ Yes ☐ No
 Vibration: ☒ Yes ☐ No
 Reliability of Electrical and Electronic Equipment: ☒ Yes ☐ No

Limitations and the conditions of operation are imposed:

Salinity: **≤35000 ppm**
 Temperature: **Ambient: 5 – 50 °C; Flushing water: 2 – 32 °C**
 Humidity: **Max. 90% RH**
 Inclination: **≤22.5 °**
 Vibration: **2 – 13.2 Hz**

Results of other parameters tested: **Amplitude: ±1 mm, 13.2 – 100 Hz; Acceleration: ±6.9 m/s²**