

EC-TYPE EXAMINATION CERTIFICATE (MODULE B)

Certificate No:
MEDB000076D

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)

ST-10NP, ST-15NP, ST-20NP, ST-25NP, ST-35NP, ST-55NP, ST-80NP, ST-100NP, ST-140NP, ST-180NP, ST-200NP

Issued to

Hansun (jiangsu) Marine Technology Co., Ltd
QIDONG, Jiangsu, China

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

Regulation (EU) 2022/1157,

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

Manufacturers authorised representative

Brannstrom Sweden AB
GÖTEBORG, Sweden

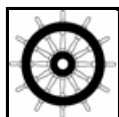
Further details of the equipment and conditions for certification are given overleaf.

This Certificate is valid until **2027-09-13**.

Issued at **Høvik** on **2022-09-14**

DNV local station:
Nantong

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 This certificate remains valid unless suspended, withdrawn, recalled or cancelled.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 ST-xNP series sewage treatment plant (STP), manufactured by Hansun (Jiangsu) Marine Technology Co., Ltd, applies advanced membrane bioreactor (MBR) technology and is designed for treating both black water and grey water. The ST-xNP STP has the function of nitrogen and phosphorus removal.

The ST-xNP STP treatment includes anoxia tank (No. I), membrane tank (No. II), effluent tank (No. III) and UV sterilizer.

Anoxia tank (No. I)

Sewage is macerated in the No. I tank by a macerating pump. Denitrification and phosphorous removal occur in the No. I tank, and Ferric Sulphate ($\text{Fe}_2(\text{SO}_4)_3$) is added as phosphorous removal chemical. Nitrogen is dissolved from sewage as N_2 gas and removed through ventilation system, phosphorus is attached to sludge (in No. II tank) and removed during sludge discharge.

Membrane tank (No. II)

In No. II tank, organic compounds in the sewage are adsorbed and oxidized by the active sludge, and carbon dioxide and excess sludge are produced. Solid particles, a part of bacteria and viruses are removed by membrane modules. After treatment, filtered clean water is transferred by a process pump to effluent tank through membrane cartridges.

The membranes should not be exposed to air for long time. After long exposure, the MBR should be emptied, cleaned with cleaning chemicals, and flushed with clean water. A chemical dosing unit is provided for chemical cleaning of membrane modules when the trans-membrane pressure (TPM) reaches 0.45 bar.

UV sterilizer:

A UV sterilizer is installed on the pipeline between process pump and effluent tank. Filtered water from the Membrane tank flows into this Ultra-violet sterilizer where coliform, virus and other harmful bacteria are killed by UV ray before entering the Effluent tank. The UV sterilizer includes stainless steel UV tank, UV lamp, quartz jacket.

Effluent tank (No. III)

UV-treated water is pumped from into the Effluent tank, and eventually discharged overboard by a discharge pump.

Application/Limitation

Application

Applicable models covered in this certificate are listed below:

Model	Design Hydraulic Load (m^3/day)	Designed Organic Load (Kg BOD_5/day)
ST-10NP	1.84	0.56
ST-15NP	2.76	0.84
ST-20NP	3.68	1.12
ST-25NP	4.6	1.40
ST-35NP	5.75	1.75
ST-55NP	8.05	2.45
ST-80NP	12.65	3.85
ST-100NP	17.25	5.25
ST-140NP	23.0	7.0
ST-180NP	29.9	9.1
ST-200NP	36.8	11.2

Limitations

Limitations applicable to all models are listed below:

Ambient temperature ($^{\circ}\text{C}$)	0 – 55
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Inlet water temperature (°C)	2 – 32
Inlet water salinity (mg/L)	≤35000
Operating humidity (%)	≤90
Inclination range (degrees)	0 – 22.5
Power supply	380 V AC, 50Hz; 440 V AC, 60 Hz

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

Sewage sludge shall be discharged according to the procedures described in the Operation and Maintenance Manual.

Basis of acceptance

Performance testing was conducted on the ST-20NP 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.

Environmental testing was carried out on the electrical Control box of the STP 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 ST-20NP model and document of design calculations.

Control and monitoring equipment

Software version

The ST-xNP series STP is type approved with the system control software version 2401.01Pxx (where xx shall be 01 or higher). Any changes to the software are to be recorded as long as the ST-xNP series STP 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 ST-xNP series STP shall include the following control and monitoring equipment indicated on the P&ID (324xx-00LC) and specified on the equipment list (324xx-00). 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
Control Box	Hansun	ECP-ST-01
PLC	Siemens AG	SIMATIC S7-200 SMART
HMI	Siemens AG	SIMATIC SMART LINE

Type examination documentation

Drawings and system documents

Drawing type	Title	Drawing no.	Rev.
Flow diagram	ST-xNP FLOW DIAGRAM	324XX-00LC	A.0 (2020-03-20)
Assembly drawing	ST-10NP Assembly Drawing	32410-00	A.0 (2020-08-12)
	ST-15NP Assembly Drawing	32415-00	A.0 (2020-08-12)
	ST-20NP Assembly Drawing	32420-00	A.0 (2020-08-12)
	ST-25NP Assembly Drawing	32425-00	A.0 (2020-08-12)
	ST-35NP Assembly Drawing	32435-00	A.0 (2020-08-12)
	ST-55NP Assembly Drawing	32455-00	A.0 (2020-08-12)
	ST-80NP Assembly Drawing	32460-00	A.0 (2020-08-12)
	ST-100NP Assembly Drawing	32465-00	A.0 (2020-08-12)
	ST-140NP Assembly Drawing	32470-00	A.0 (2020-08-12)
	ST-180NP Assembly Drawing	32475-00	A.0 (2020-08-12)
	ST-200NP Assembly Drawing	32480-00	A.0 (2020-08-12)
Tank drawing	ST-10NP Tank Drawing	22510-00	A.0 (2020-08-12)
	ST-15NP Tank Drawing	22515-00	A.0 (2020-08-12)
	ST-20NP Tank Drawing	22520-00	A.0 (2020-08-12)
	ST-25NP Tank Drawing	22525-00	A.0 (2020-08-12)
	ST-35NP Tank Drawing	22535-00	A.0 (2020-08-12)
	ST-55NP Tank Drawing	22555-00	A.0 (2020-08-12)
	ST-80NP Tank Drawing	22560-00	A.0 (2020-08-12)
	ST-100NP Tank Drawing	22565-00	A.0 (2020-08-12)
	ST-140NP Tank Drawing	22570-00	A.0 (2020-08-12)
	ST-180NP Tank Drawing	22575-00	A.0 (2020-08-12)
	ST-200NP Tank Drawing	22580-00	A.0 (2020-08-12)
Electrical drawing	ST-xNP ELECTRIC DRAWING	224xx-80-0DL	A.0 (2020-03-25)
Operation and Maintenance Manuals	Marine Sewage Treatment Plant Instructions for ST-xNP models	—	V1.0 (2020-08-12)
Component list	List of qualified suppliers for main components	32400-01CL	V1.0 (2020-08-12)

Test plans and reports

- Type Test Outline, Marine Sewage Treatment Plant, Model: ST-xM Series, ST-xNP Series, June 2021
- Test Report for Performance Test of Hansun ST-xNP Marine Sewage Treatment Plan model ST-20NP, SHE21-12707/12708/12709/12710 R3, SHE21-12711/12713/12715/12717/12971/12973/12975/12977 R5, SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd., 2021.12.31
- Test Report for Environmental Test of Control Box of Hansun Marine Sewage Treatment Plan, A22-001-ZC, Shanghai Inspection and Testing Institute of Instruments and Automatic Systems Co., Ltd. (SITIIAS), 2022.02.18

Tests carried out

Performance tests

- Performance test of Hansun ST-xNP Marine Sewage Treatment Plan model ST-20NP, 2021.11.11-24 witnessed by DNV.

Environmental tests

- Environmental testing in accordance with CCS GD22-2015, IMO Resolution IMO MEPC.107 (49), and IACS UR E10 Rev. 7, 2022.01.12-24.

Marking of product

The marking shall give the following information:

- Manufacturer's name or trademark
- Type designation
- Serial number
- Designed Hydraulic Load and Organic Load, and any other operational or installation limits considered necessary by the manufacturer or the Administration

Copy of the certificate and operation and maintenance manual

A copy of this certificate should be carried on board any ship equipped with the sewage treatment plant 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.

Revision history

Rev.	Date of issuance	Description
-	2022-09-14	First issuance

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:	.....
Manufactured by:	.....
Organization conducting the test:	.....
Organization handling the samples:	.....
Test Location:	.....
Designed hydraulic loading:	.....
Designed organic loading:	.....
No. of effluent samples tested:	.....
No. of influent samples tested:	.....
Total suspended solids influent quality:	.....
Total nitrogen influent quality:	.....
- Geometric mean:	.....
- Maximum	.....
- Minimum	.....
Total phosphorus influent quality:	.....
- Geometric Mean:	.....
- Maximum:	.....
- Minimum:	.....
BOD ₅ without nitrification influent quality:	.....
Maximum hydraulic loading:	.....
Minimum hydraulic loading:	.....
Average hydraulic loading (Qi):	.....
Effluent flow (Qe):	.....
Dilution compensation factor (Qi/Qe):	.....
Geometric mean of total suspended solids:	.....
Geometric mean of the thermotolerant coliform count:	.....
Geometric mean of BOD ₅ without nitrification:	.....
Geometric mean of COD:	.....
Geometric mean of total nitrogen:	.....
Percentage reduction of total nitrogen:	.....
Geometric mean of total phosphorus:	.....
Percentage reduction of total phosphorus:	.....
Maximum pH:	.....
Minimum pH:	.....
Type of disinfectant used:	.....
If Chlorine - residual Chlorine:	.....

Maximum:

Minimum:

Geometric mean:

Was the sewage treatment plant tested with:

Fresh water flushing?

Salt water flushing?

Fresh and salt water flushing?

Grey water added?

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

Temperature:

Humidity:

Inclination:

Vibration:

Reliability of Electrical and Electronic Equipment:

Limitations and the conditions of operation are imposed:

Salinity:

Temperature:

Humidity:

Inclination:

Vibration:

Results of other parameters tested: