Certificate No:
TAP00002BA

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Sewage Treatment Plants

with type designation(s)
ECOmar 20 SX, ECOmar 32 SX, ECOmar 45 SX, ECOmar 70 SX, ECOmar 145 SX, ECOmar 230 SX, ECOmar 340 SX, ECOmar 545 SX

Issued to
TECNICOMAR S.P.A.
Marsala TP, **Italy**

is found to comply with
IMO MEPC Circ. 227(64) "GUIDELINES ON IMPLEMENTATION OF EFFLUENT STANDARDS AND PERFORMANCE TESTS FOR SEWAGE TREATMENT PLANTS" with the exception of Section 4.2

Application :

Product(s) approved by this certificate may be accepted for installation on all vessels to demonstrate compliance with MARPOL Annex IV Reg.9. Acceptance is subject to confirmation from the Flag Administration of the vessel the product is installed on.

Limitations imposed are described in this document.

Note: For vessels with EU Flag, EU Marine Equipment Directive (MED) certificates are required instead of this Type Approval certificate.

Issued at **Høvik** on **2021-07-01**
This Certificate is valid until **2026-06-30**.
DNV local station: **Italy FIS**

Approval Engineer: **Thomas Grafton**

for **DNV**

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.

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 ECOmar SX series treats batches of sewage using the following process: i) transfer of a fixed amount of sewage from a holding tank to a treatment tank, ii) chemical treatment and addition of a flocculant, iii) maceration and return to treatment tank, iv) filtration and UV treatment prior to overboard discharge, v) washing of the tank and discharge of the waste (sewage sludge).

Periodically, a special washing cycle is performed using water to backflush the filter and fill the treatment tank. The special washing cycle begins with an empty treatment tank and uses the following process: i) Backflush the filter with water and fill the treatment tank, ii) chemical treatment and addition of a flocculant, iii) maceration and return to treatment tank, iv) filtration and UV treatment prior to overboard discharge, v) washing of the tank and discharge of the waste (sewage sludge).

The filter may also be backwashed manually using water (e.g. during commissioning, after changing the filter, or for maintenance) and the waste water may be discharged overboard.

The chemical treatment and flocculation processes uses hydrogen peroxide and ECOFLOC (*).

(*) ECOFLOC is a Tecnicomar S.p.A. brand product.

Application

Model	*Hydraulic Loading (l/day)*	*Organic Loading, BOD_5 without nitrification (kg/day)*
ECOmar 20 SX	3,931	1.49
ECOmar 32 SX	5,847	2.21
ECOmar 45 SX	7,453	2.82
ECOmar 70 SX	10,985	4.15
ECOmar 145 SX	19,196	7.26
ECOmar 230 SX	36,172	14.84
ECOmar 340 SX	53,989	22.14
ECOmar 545 SX	84,748	34.75

Limitations

Condition of heel up to (max angle of pitch and roll):	22.5 degrees
Range of environmental temperature	0 to 55 degrees Celsius
Maximum environmental humidity	95%

The ECOmar SX series shall not be used on Passenger Ships in Special areas (ref. IMO Res. MEPC.227(64) Section 4.2).

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

The design of structural tanks and piping constructed by the shipyard (e.g. sewage collecting tanks, sludge tanks, piping marked as “yard supply”, etc.) are not evaluated as part of the type examination.

Toilet cleaning products that affect the ECOFLOC and/or Hydrogen Peroxide treatment efficiency shall not be used. In case of doubt, the compatibility of toilet cleaning products should be checked and confirmed by Tecnicomar.

Installation requirements

Sewage Sludge shall be directed to a sludge tank/holding tank, as shown in the Flow Diagrams listed in the Type Examination documentation. The sludge holding tank may be independent or included as a separate tank inside the sewage collecting tank.

The washing water connection shall be supplied by clean (filtered) sea water or fresh non-chlorinated water.

Electrical and control components

The units are controlled through a main control box containing a Printed Circuit Board (PCB). The PCB is approved with the following control firmware:

Control Box Firmware:	Tecnicomar_TMM_ECOmar V7.6 – 24.11.20

Changes in the firmware which can alter the performance of the system shall be approved by DNV. Note that testing of the system with the revised firmware may be required. Documentation confirming the approval (and any testing) shall be kept together with the certificate, or the certificate shall be updated.

Type Examination documentation

Piping and Instrumentation Diagrams (P&ID):

Drawing Title:	*Drawing Number:*	*Revision:*
ECOmar 20 SX to 145 SX -P&ID	110221-F02R2	2 (28.04.2021)
ECOmar 230 SX to 545 SX -P&ID	120221-F02R2	2 (28.04.2021)

Arrangement Drawings and Parts Lists:

Drawing Title:	*Drawing Number:*	*Revision:*
Ecomar 20 SX PP Overall dimensions	101220-D01R2	31.03.2021
Ecomar 20 SX S.S. Overall dimensions	141220-D01R2	31.03.2021
Ecomar 32 SX PP Overall dimensions	141220-D02R2	31.03.2021
Ecomar 32 SX S.S. Overall dimensions	141220-D03R2	31.03.2021
Ecomar 45 SX PP Overall dimensions	141220-D04R2	31.03.2021
Ecomar 45 SX S.S. Overall dimensions	141220-D05R2	31.03.2021
Ecomar 70 SX Overall dimensions	161220-D01R2	31.03.2021
Ecomar 145 SX Overall dimensions	161220-D02R2	31.03.2021
Ecomar 230 SX Overall dimensions	161220-D03R2	31.03.2021
Ecomar 340 SX Overall dimensions	161220-D04R2	31.03.2021
Ecomar 545 SX Overall dimensions	171220-D01R2	31.03.2021
Main Equipment List for Tecnicomar S.T.P., Model: ECOmar 20 SX to 145 SX	EQ.Lis-20.145-ECOSX-R0	00 (18.02.2021)
Main Equipment List for Tecnicomar S.T.P. Model: ECOmar 230 SX to 545 SX	EQ.Lis-230.545-ECOSX-R0	00 (18.02.2021)

Flow Diagrams:

Drawing Title:	*Drawing Number:*	*Revision:*
ECOmar SX – Cycle Scheme	090320-F01R4	4 (18.11.2020)
ECOmar SX – Maintenance Cycle Scheme	191120-F01R1	19.11.2020
ECOmar 20 SX to 145 SX - Flow Diagram	110221-F01R2	2 (28.04.2021)
ECOmar 230 SX to 545 SX - Flow Diagram	120221-F01R2	2 (28.04.2021)
Manual backwash scheme for ECOmar 20-145 SX	120421-D06R1	12.04.2021
Manual backwash scheme for ECOmar 230-545	130421-D01R1	13.04.2021
Emptying scheme for treatment tank ECOmar 20-145 SX	120421-D05R1	12.04.2021
Emptying scheme for treatment tank ECOmar 230-545 SX	120421-D04R1	12.04.2021
Filling pump-installation scheme sample 20-145	080421-D01R1	08.04.2021
Filling pump installation-scheme sample 230-545	090421-D01R1	09.04.2021
Washing pump-installation scheme sample 20-145	080421-D02R1	08.04.2021
Washing pump-installation scheme 230-545	090421-D02R1	09.04.2021

Electrical Drawings:

Drawing Title:	*Drawing Number:*	*Revision:*
ECOMAR from 20 SX to 145 SX - Connection Diagram - 3ph - 2 tanks	231120-E01R1	23.11.2020
ECOMAR from 20 SX to 145 SX - Connection Diagram - 3ph - 1 tank	231120-E02R1	23.11.2020
ECOMAR 230 SX - Multi-Wire Electrical Drawing - 1-2 TANK	231120-E03R1	23.11.2020
ECOMAR 340 SX - Multi-Wire Electrical Drawing - 1-2 TANK	231120-E04R1	23.11.2020
Level Probes Inputs Control Diagram	231120-E05R1	23.11.2020
Multi-level Sensor Connections	231120-E06R1	23.11.2020
ECOMAR 545 SX - Multi-Wire Electrical Drawing 1-2 TANK	231120-E07R1	23.11.2020
Level Probe control Box connections	231120-E08R1	23.11.2020

Junction Box for Lateral Sensor Connections	231120-E09R1	23.11.2020
Level Dosing Control Box	231120-E10R1	23.11.2020
ECOMAR from 20 SX to 145 SX - Connection Diagram -1ph - 1 Tank	231120-E11R1	23.11.2020
ECOMAR from 20 SX to 145 SX - Connection Diagram - 1ph - 2 tanks	231120-E12R1	23.11.2020
ECOMAR 230 SX - Multi-Wire Electrical Drawing -1ph- 1-2 TANK	231120-E13R1	23.11.2020

Operational and Maintenance Manuals:

Drawing Title:	*Drawing Number:*	*Revision:*
Instructions for the installation, use and maintenance of Tecnicomar system for sewage water treatment. Models ECOmar 20 SX to 145 SX	MAN-ECOSX-20-145-R0	00 (30.03.2021)
Instructions for the use and maintenance of Tecnicomar system for sewage water treatment. Models: ECOmar 230 SX to 545 SX	MAN-ECOSX-230-545-R0	00 (30.03.2021)

Other Drawings:

Drawing Title:	*Drawing Number:*	*Revision:*
Scaling considerations for ECOmar SX corresponding to old ECOmar unit complete with additional SX Kit	SCA-C-M-20-545-SX-R1	1 (01.12.2020)
Validation of the Scaling Methods for ECOmar SX STP units	SCA-M-VAL-20-545-SX-R1	23.02.2021
Lateral level sensors - installation indications	060421-D02R1	06.04.2021
Rods level sensor - cutting indications	060421-D01R1	06.04.2021

Performance Test Plans:

Title:	*Revision:*
Test Plan for ECOmar 45 SX unit S.T.P. (corresponding to ECOmar 45 unit complete with additional SX2 Kit)	2 (01.12.2020)
Test Plan for Confirmatory test on ECOmar 230 SX unit S.T.P.	2 (01.12.2020)

Basis of acceptance

Tests reports

Performance Test:

- Testing Report for ECOmar 45 SX unit S.T.P. (corresponding to ECOmar 45 unit complete with additional SX2 Kit), OTR-ECO-45-SX-R0, Revision 0, dated 22.02.2021.

Confirmatory Test:

- Testing Report for Confirmatory test on ECOmar 230 SX unit S.T.P., OCTR-ECO-230-SX-R0, Revision 0, dated 22.02.2021.

Environmental Test: -

- Environmental Test for Tecnicomar S.p.A, Report no. 18B292A, dated 30.11.2018, TesLab, Livorno, Italy.
- Validation of the Environmental Test for ECOmar S/SX STP units, dated 30.04.2021.

Marking of product

For traceability to this type approval, each unit is to be marked with: -

- Manufacturer's name or trade mark
- Type and Model
- Serial No. and date of manufacture
- Hydraulic Loading
- Any 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 above described sewage treatment plant.

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.

Periodical assessment

For retention of the Type Approval, a DNV surveyor shall perform periodical assessments (refer to Type Approval program DNVGL-CP-0338). The main scope of the periodic assessment will normally include:

- Verification of the Type Approval applicant's production and quality system with relation to ensuring continued consistent production of the type approved products at the applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the documentation and checking that this is still used as basis for the production.
- Review of possible changes to the design, material and performance of the product.
- Verification of the product marking.

This certificate is valid for five years and periodical assessments will be required after 2 years (+/- 90 days) and 3.5 years (+/- 90 days). The date defining the beginning of as the validity period is 2021-05-03.

Places of manufacture

- TECNICOMAR S.P.A., Contrada Berbaro 78, Marsala, Italy.

Revision history

Revision	*Issue Date*	*Reason for revision*
-	01.07.2021	Initial certificate.

APPENDIX TO CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS

Test results and details of tests conducted on samples from the sewage treatment plant in accordance with resolution MEPC.227(64) excluding Section 4.2 for Passenger Ships in Special Areas:

Sewage treatment plant type:

Manufactured by:

Organization responsible for the test:

Organization responsible for handling the samples and laboratory analysis:

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:

BOD5 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 BOD5 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:

a) Total Residual Oxidant (TRO) based on 47 samples:
   - Geometric mean:
   - Maximum:

b) One sample of effluent was taken after the “Special Washing Cycle”:
   - Geometric mean of total suspended solids:
   - Geometric mean of the thermotolerant coliform count:
   - Geometric mean of BOD5 without nitrification:
   - Geometric mean of COD:
   - pH:

c) The effect of the time that a sample is taken during the discharge was tested using three effluent samples drawn at the beginning, middle and end of the discharge period (*):

- Geometric mean of total suspended solids:
- Geometric mean of the thermotolerant coliform count:
- Geometric mean of BOD5 without nitrification:
- Geometric mean of COD:
- Maximum pH:
- Minimum pH:
- Total Residual Oxidant (TRO):

APPENDIX TO CERTIFICATE OF TYPE APPROVAL FOR SEWAGE TREATMENT PLANTS – CONFIRMATORY TEST

Test results and details of tests conducted on samples from the sewage treatment plant in accordance with resolution MEPC.227(64) excluding Section 4.2 for Passenger Ships in Special Areas:

Sewage treatment plant type:

Manufactured by:

Organization responsible for the test:

Organization responsible for handling the samples and laboratory analysis:

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:

BOD5 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 BOD5 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:

a) Total Residual Oxidant (TRO) based on 13 samples:
   - Geometric mean:
   - Maximum: