



Certificate no.:
TAP000035F

TYPE APPROVAL DESIGN CERTIFICATE

This is to certify:

that the **Change over and blending system for liquid fuel**

with type designation(s)

BioHFO – Bio Hybrid Fuel Optimizer system

issued to

Tecnoveritas - Servicos de Engenharia e Sistemas Tecnologicos, Lda.
Mafra, Portugal

is found to comply with

DNV rules for classification – Ships Pt.6 Ch.2 Propulsion, power generation and auxiliary systems

DNV rules for classification – Ships Pt.4 Ch.9 Control and monitoring systems

DNV rules for classification – Ships Pt.4 Ch.6 Piping systems

Application:

Max. working pressure: 10 bar

Max. working temperature: + 100 °C

Issued at **Hamburg** on **2026-04-01**

This Certificate is valid until **2031-03-31**.

for **DNV**

DNV local unit: **Lisbon FIS**

Approval Engineer: **Jörg Hille**

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 BioHFO – Bio Hybrid Fuel Optimizer is an inline blending system composed of three primary sections, with an additional optional section:

- Mixing
- Processing
- Evaluation
- Improvement (optional)

The entire system is operated via a PLC control cabinet equipped with a touch panel.

Application

The Bio Hybrid Fuel Optimizer found compliant with the functional requirements for automated fuel changeover and fuel blending operations. The system enables the controlled combination of first- and second-generation biofuels with conventional marine fuels, facilitating the production of hybrid fuels that meet all applicable international standards.

The Bio Hybrid Fuel Optimizer employs a controlled cavitation process to generate a uniform molecular emulsion, thereby enhancing combustion efficiency, mixture stability, and overall fuel performance.

Prior to the blending of fuels of differing types or qualities, a compatibility test shall be carried out in accordance with the procedures specified in the system's Operational Manual.

For vessel fuel piping systems originally designed to operate with conventional fuels such as HFO or MDO, when used in combination with alternative fuels, the Bio Hybrid Fuel Optimizer is to be installed and operated in a bypass circuit.

Limitation

This Type Approval Design applies exclusively to the design, it does not apply to the end product, but may serve as a basis for obtaining a product certificate.

Technical data

Fuel mixing capability

Type of fuel ²	According to standard
Residual marine fuels (RMA 20, RME 180, RMG 380, RMK 500)	ISO 8217
Distillate marine fuels (DMA, DMZ, DMB)	ISO 8217
Fatty Acid Methyl Ester (FAME or B100)	EN-14214, ASTM D6751
Hydrotreated Vegetable Oil (HVO)	EN 15940
Advanced paraffinic or synthetic fuels (e.g., Biomass-to-Liquid, gasification or pyrolysis derivatives)	EN 15940

Notes

¹ Dependent upon the base fuel selected, the mixed products are classified in accordance with ISO 8217

² All of the above listed fuel with a minimum flash point of 60 °C

Connection parameter

Input/output	Temperature		Pressure	
	minimum	maximum	minimum	maximum
Fuel inlet A	*	100 °C	0 bar(g)	10 bar(g)
Fuel inlet B	*	100 °C	0 bar(g)	10 bar(g)
Mixed fuel outlet	*	100 °C	0 bar(g)	10 bar(g)
Electrical power input	380 V up to 690 V @ 50/60 Hz			

Note

* Minimum temperature is at which the product remains in the liquid phase

PLC control software

Processing unit	Software revision	Dated
PLC Siemens S7 1500	Firmware version V3.1	11/2023
HMI Siemens TP1200 Comfort	Version 17	05/2021

Location classes according to DNV CG 0339 – Section 2

Temperature	B
Humidity	B
Vibration	A
EMC	A
Enclosure	B

Type Approval documentation

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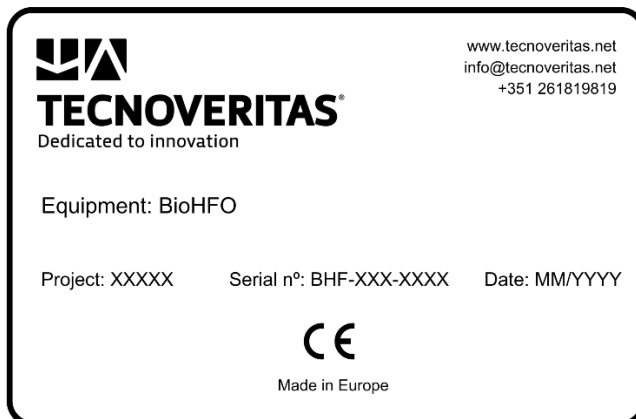
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Tests carried out

None.

Marking of product

To ensure traceability to this type approval, the products must be marked at least as follows:



Manufactured by:

Production place and responsibility:

TecnoVeritas - Services of Engineering and Systems Technology, Ltd., Av. Dr. Francisco Sá Carneiro, Núcleo Empresarial de Mafra, Pavilhão 36-A, 2640-486 Mafra.

Periodical assessment

For retention of the Type Approval, a DNV Surveyor shall perform periodical assessment to verify that the conditions for the Type Approval are complied with. Refer to the Class Program DNV-CP-0338, Section 4.

To check the validity of this certificate, please look it up in <https://approvalfinder.dnv.com>

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