

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Design of the Wind assisted propulsion system**with type designation(s)
ECO-FLETTNER - EF18

Issued to

ECO FLETTNER GmbH
Leer (Ostfriesland), Niedersachsen, Germanyis found to comply with
DNV GL standard DNVGL-ST-0511 – Wind assisted propulsion systems**Application :****Design Assessment of:****Wind assisted Propulsion System for installation on ships not purely relying on the additional thrust generated by those, being able to safely navigate with them in operation and also without them contributing, in all possible operational and environmental situations, as outlined and limited on page 2 of this certificate and in the design documentation.**Issued at **Hamburg** on **2021-05-05**This Certificate is valid until **2026-05-04**.for **DNV GL**DNV GL local station: **Hamburg – CMC North/East**Approval Engineer: **Hasso Hoffmeister**.....
Andree Orth
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 GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") 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

ECO-FLETTNER-EF18, Wind assisted Propulsion System

Application

General:

ECO-FLETTNER EF18 Rotor Sail underwent a **design assessment** according to DNVGL Rules for classification RU-SHIP Pt.1 Ch.3 Sec.5 [2.6].

The Type Approval Design Certificate is valid for the type and version described and the conditions defined in the design documentation.

Structural parameters

The design of the ECO-FLETTNER EF18 Rotor Sail with a maximum rotational speed of 280 rpm has been approved with regards to an installation on ships, on which the envelope accelerations at any point of the rotor sail does not exceed the following values, as per definition of Rules for Classification: Ships – DNVGL-RU-Ship Pt.3 Ch.4 Sec.3 [3.3.4]:

Linear accelerations:

Longitudinal: +/- 3.88 m/s²

Transverse: +/- 14.67 m/s²

Vertical: +/- 19.62 m/s² (gravity included)

Installed electrical propulsion:

Cage motor with gearbox and forced cooling.

Motor controlled by frequency converter

P=75 kW @ 1488 rpm

Electrical system parameters:

Line voltage	AC400 V 3ph. 50Hz
Capacity	86.6 kVA
Short circuit capacity	150 kA
Operating current	125 A
Control voltage	DC24 V / AC230 V 1ph. 50Hz

Fire detection and fire fighting:

For the accessible space inside the Flettner rotor, appropriate means for fire detection and firefighting shall be installed. The space is regarded as auxiliary machinery space.

Limitations

The Type Approval Design Certificate is not covering:

- The ship-specific foundation of the rotor sail
- Requirements arising from Classification aspects of the ship on which the rotor sail will be installed on, i.e. type approval of rotor sail associated equipment, materials and others, as laid out in DNVGL Rules for Classification RU-Ship Pt.6 Ch.2 Sec.12 [2]
- Supervision on construction
- Supervision of testing

Type Approval Design documentation