

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Wind assisted propulsion system**

with type designation(s)

Norsepower Oy. Ltd. Rotor Sail 35 x 5

Issued to

**Norsepower Oy
Helsinki, Finland**

is 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 **2020-09-15**This Certificate is valid until **2025-09-14**.for **DNV GL**DNV GL local station: **Hull Structure & Outfitting**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.

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Product description

Rotor Sail 35 x 5, Wind assisted propulsion system

Application

General:

Norsepower Rotor Sail 35 x 5 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 Rotor Sail 35 x 5 with a maximum rotational speed of 180 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: +/- 10m/s²

Transverse: +/- 20m/s²

Vertical: +/- 20m/s² (gravity included)

Installed electrical propulsion:

Direct drive permanent magnet motor

P = 134 kW @ 180 RPM

Electrical system parameters:

Line voltage	AC380V 3ph. 50Hz
Capacity	203 kVA / each Rotor
Short circuit capacity	145kA
Operating current	257A / each Rotor
Control voltage	DC24 / AC230V 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

(will not be shown on published certificate)

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Status

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