

Schiffsklassifikation „unter Wind“

Regulatorische Anforderungen an
Windantriebssysteme

Gefördert durch:



aufgrund eines Beschlusses
des Deutschen Bundestages

Überblick



BV's Beitrag zum Verbundprojekt FlettnerFleet

- Risiko-Analyse - Definition und Untersuchung von "Normalbedingungen" und "worst case" Szenarien, Auswirkungen auf Stabilität, Manövrierfähigkeit und Navigation (Sicht, Radar)
- Prüfung/Plangenehmigung des vorgegebenen Antriebskonzepts für einen Ammoniak-Tanker
- Prüfung vorhandener Klassifikationsregeln und gesetzlicher Anforderungen auf Unklarheiten und/oder Optimierungsbedarf
- Lösungsansätze zur Erfüllung regulatorischer Anforderungen inkl. Nachweis der Manövrierfähigkeit

BV's Portfolio im Zusammenhang mit Windantriebssystemen

BV's Referenzen im Bereich Windantriebssysteme



BUREAU
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Risiko-Analyse



- HAZID Workshop Tanker Design
 - Teilnahme der Verbundpartner (Reederei, Hersteller, Designer, Hochschule, Klassifikation)
 - Studie zur Installation von 4 Flettner-Rotoren (36 m hoch x 6 m Durchmesser)
 - Studie zu 106 verschiedenen gemeinschaftlich identifizierten Szenarien
 - davon 93 risikobewertet
 - 2 Hochrisikoszenarien im Zusammenhang mit Helikopteroperationen und potenziellen Interferenzen mit den Rotoren
 - 28 Mittelrisikoszenarien im Zusammenhang mit dem Betrieb und der Wartung des Systems
 - 63 Niedrigrisikoszenarien aller Art
 - 36 Empfehlungen hinsichtlich Designvalidierung, Auslegung von Sicherheitssystemen, zur Definition von Notfallverfahren und zum Thema Cybersicherheit
 - HAZID für MPV erbrachte keine wesentlichen neuen Erkenntnisse auf Grund geringerer Sicherheitsrisiken i. Vgl. zum Tanker

P24-292 WAPS flettner rotor - FlettnerFLEET - Ammonia Tanker
Hazard Identification (HAZID)



Terms of Reference

P24-292 WAPS flettner rotor - FlettnerFLEET
Ammonia Tanker
Hazard Identification Workshop

Dates: 16th to 17th of September 2025

Location: NSB Niedersächsische Schifffahrtsgesellschaft GmbH & Co. KG
Harburger Str. 47
21614 Buxtehude

1. Workshop schedule

Day 1 – September, 16th

Time (approx.)	Topic
9:00 – 10:00	• Introduction and preliminaries (10') • Presentation of Project, WAPS design and ship integration (FlettnerFleet members) (40') • HAZID Methodology and scope presentation (BVS) (20')
10:00 – 12:00	• Assessment of node 1 (2h)
12:00 – 13:00	Lunch Break
13:00 – 17:00/18:00	• Assessment of node 1 (2h) • Assessment of node 2 (2/3h)

Day 2 – September 17th

Time (approx.)	Topic
09:00 – 12:00	• Assessment of node 2 (3h)
12:00 – 13:00	Lunch Break
13:00 – 18:00	• Assessment of node 2 (4h)

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FlettnerFleet
MPV
Flettner Rotor
Sails Integration
HAZID study

Technical Report

PROJECT No. P24-292
RSM 250521-APT REV B
DATE: 22/04/2024

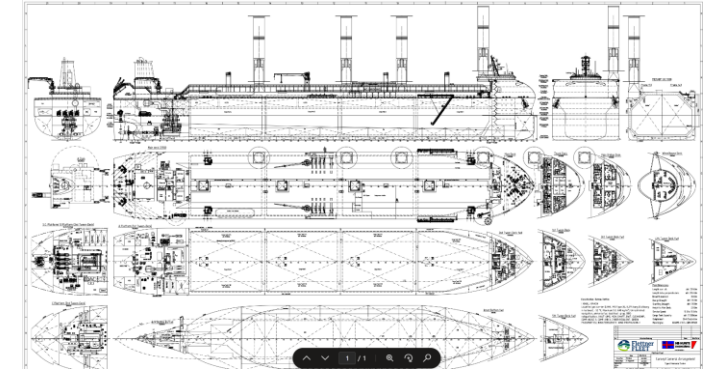


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Prüfung des Antriebskonzeptes

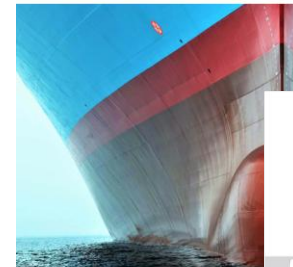


- Prüfung der vorliegenden Tankerschiffsauslegung (Ammoniak)
- Plangenehmigung/Prüfumfang gemäß:
 - BV Rules 467 Part B Hull & Stability
 - BV Rules 467 Part C Fire Protection (Fire & Safety Plan, Fire Division)
 - BV Rules 467 Part D Service Notations (Liquefied Gas Tanker - Fire Protection & Extinction)
 - BV Rules 671 Ammonia-fuelled Ships
 - BV Rules 206 Wind Propulsion Systems
 - BV Rules 216 Materials & Welding
- Geprüfte Dokumente
 - General Arrangement - Tanker
 - Propulsion Concept
 - Project Description and Specification with WAPS
 - Schottel - Forces and Moments - Rotors 36m x 6m
 - Hazardous Gas Areas
 - Flettner Rotor Interface (Internal)
 - Flettner Rotor Interface (External)
 - FE Analysis - Flettner Rotor Foundation
 - Fire Control and Safety Plan
 - Fire Division Plan
 - Navigation Lights, Signals, and Radar Plan
 - Bridge Visibility Plan
- 85 Kommentare/Empfehlungen seitens BV für künftige Designs



RULES FOR THE CLASSIFICATION OF STEEL SHIPS

PART B
HULL AND STABILITY
NR467 B DT R20
EDITION JANUARY 2025



Prüfung des aktuellen Klasse-Regelwerkes & Optimierungsansätze



Empfehlungen zur Weiterentwicklung des aktuellen Klasse-Regelwerkes von BV – NR206 hinsichtlich:

1) Strukturelle Lasten und Trägheitskräfte

- Lasten aus Schiffsbewegungen inkl. Heave, Pitch, Roll
- Rumpfbiegung – Kombination von Lasten aus Wind- und Schiffsbewegungen sowie Rotor-Segel-Eigenschwingungen
- Einführung einer Ermüdungsanalyse

2) Stabilitätsanforderungen

- konkreten Krängungsgrenzen für verschieden Schiffstypen

3) Luftfahrtsicherheit und Medevac

- Helikopter-Einsätze

4) Gasdetektion und Explosionsschutz

- Ex-Zonen
- Erdung und Blitzschutz

Prüfung des aktuellen Klasse-Regelwerkes & Optimierungsansätze



Empfehlungen zur Weiterentwicklung des aktuellen Klasse-Regelwerkes von BV – NR206 hinsichtlich:

5) Sensorredundanz und Fail-Safe-Logik

- Positionierung redundanter Windmesser
- Fail-Safe-Mechanismen für Kommunikationsausfälle
- Präzise Auslöseschwellen und Reaktionszeiten

6) Notfallverfahren

- Explizite Notfallverfahren: Crash-Stop, Man-over-Board, Helikopter-Einsätze

7) Optimierungen und Best Practices

- Detaillierte Wartungsintervalle

Lösungsansätze zur Erfüllung regulatorischer Anforderungen

Identifizierte Abweichungen von regulatorischen Anforderungen

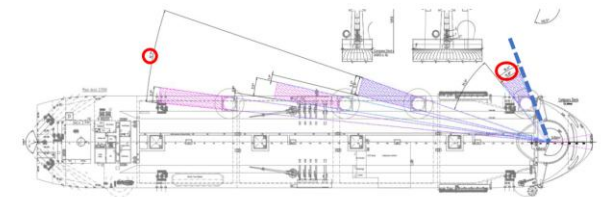
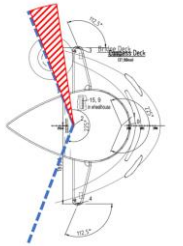
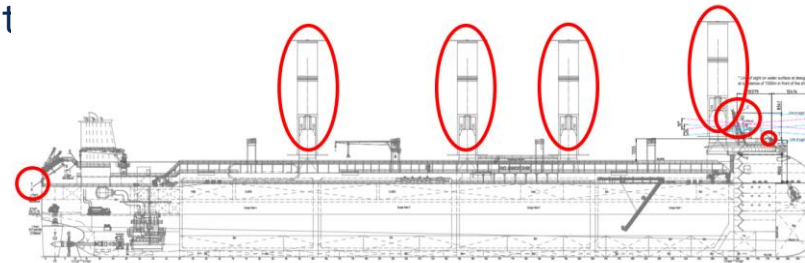
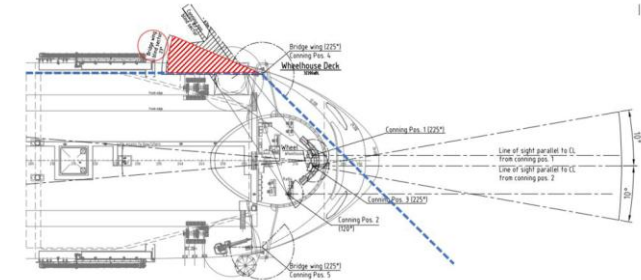
- Prüfung gemäß SOLAS V Reg. 22, COLREG, SN.1/Circ. 2713
- Sichtfeld der Brücke (toter Winkel)
- Navigationslichter (Abstände & Sichtbarkeit)
- Radarabdeckung (toter Winkel)

Lösungsansätze

- Installation CCTV
- Zusätzliches X-Band Radar
- Ausnahmegenehmigung der Flagge

Nachweis Manövrierfähigkeit

- Stabilität: maximale Krängung, maximaler Trimm
- Installation von automatischen Sicherheitssystemen und Stabilitätsüberwachung



BV's Portfolio - Windantriebssysteme



1886



First Modern Oil tanker with
Steam and Sails propulsion

1985



Experimental ship
equipped with
Turbovoile®

2021



World's first Wind-
assisted Cargo ship
L>100m

2024



World's first
Primarily Wind-
Propelled Cargo
ship L> 50m

2025

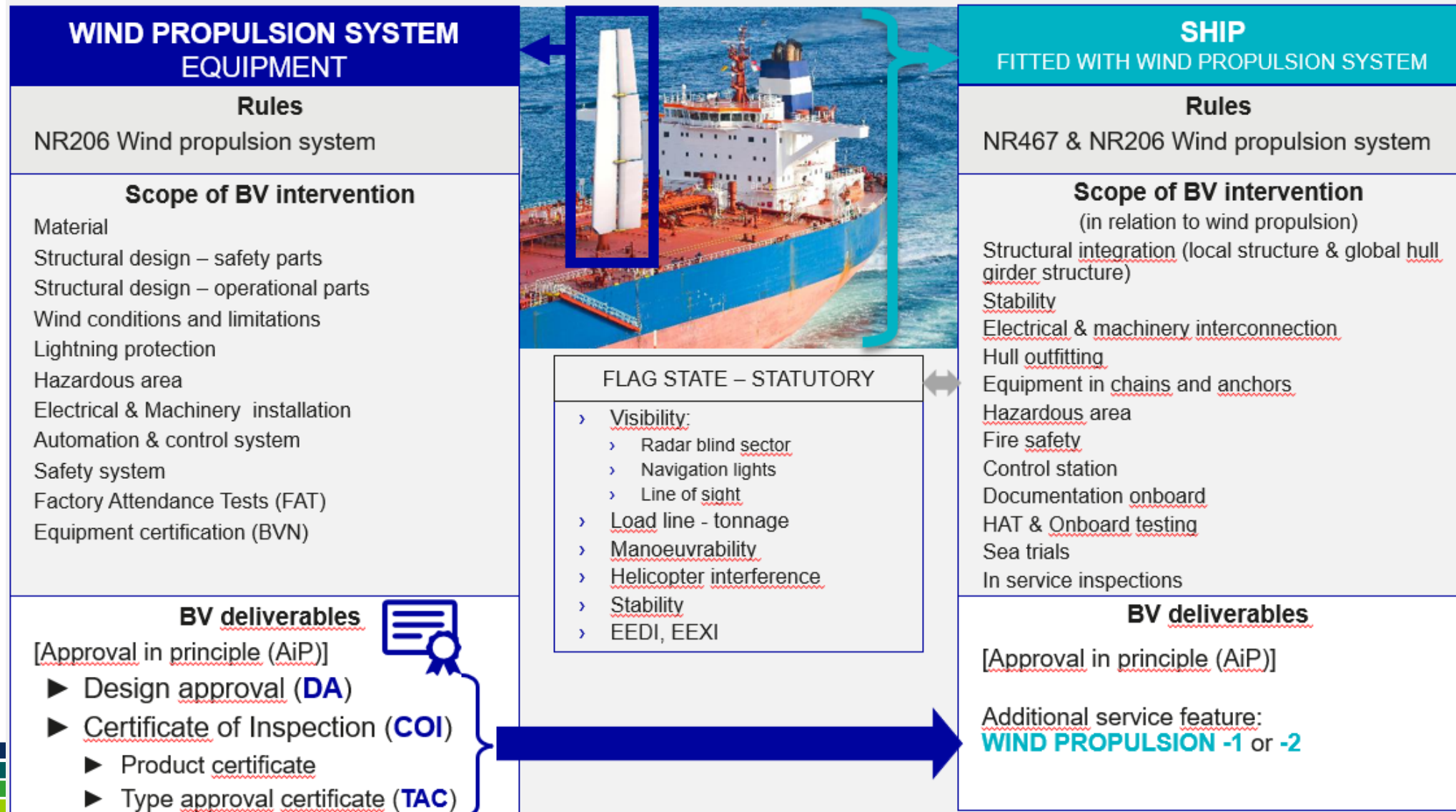


World's first
Primarily Wind-
Propelled Cargo
ship L> 100m



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BV's Portfolio - Windantriebssysteme



BV Class Approval

Dedicated BV Rule Note NR206 Wind propulsion system to support approval:

- wind propulsion system (equipment)
- ship with wind propulsion



EARLY PHASE



Approval in
principle
AIP

DESIGN PHASE



Design approval
or
Basic approval
DA

PRODUCTION PHASE



Attestation
**Product
certificate**
Type approval
certification
TAC

CLASSIFICATION



Class notation
**WIND
PROPULSION**
Ship
classification
**Ship
classification**

Risikoanalysen durch BV



- **Hazardous Area Classification**
 - Wind propulsion system in normal operational position
 - Wind propulsion system moved, lowered, tilted...
- **Bridge Visibility and Navigation Systems**
 - Bridge visibility in all operational and fail-safe configurations.
 - Obstruction or interference with navigation lights and radar systems.
- **Mooring and Manoeuvrability**
 - Identify risks related to vessel handling during:
 - Port operations.
 - Mooring, tug assistance, and restricted water navigation.
 - Emergency manoeuvres (Man over board)
- **Emergency Situations**
 - Fire/explosion near or involving the system.
 - Vessel evacuation, emergency crash stop, and man-overboard recovery.
 - Sudden heading changes, collisions, and grounding.
 - Gas release/venting and alarm scenarios (if applicable).
 - Black out
- **Aerial and Harbor Environments**
 - Interaction with port infrastructure, tug operations, and pilotage.
 - Risks during confined maneuvers in harbor conditions.
- **System Integration on Vessel**
- **Deck and Foundation Structure**
 - Structural integrity of the foundation under operational and extreme loads.
 - Risks of overload, fatigue, or structural failure.
- **Wheelhouse Control Panel (HMI)**
 - Integration of the system's control panel into the wheelhouse.
 - Risks of human error, loss of control, and HMI reliability.
- **Cabling and Electrical Systems**
 - Risks of water ingress, damage, and failure of electrical cabling.
 - Safety implications of electrical shocks or component failures.
- **Interaction with Vessel Systems**
 - Loss of electrical or hydraulic power and corresponding system behavior.
 - Fail-safe system transition to a neutral/passive configuration.
 - Interaction with:
 - Main propulsion and steering systems.
 - Navigation equipment (e.g., radar blind spots, visibility obstructions).
 - Nearby deck equipment and vessel structures.
- **Stability of the Vessel**
 - Analyze vessel stability in all scenarios:
 - Normal operation.
 - Fail-safe configuration during loss of power.
 - Extreme weather or dynamic conditions.
- **Maintenance and Operational Risks**
 - Risks during system maintenance or repairs while at sea or in port.
 - Impact on surrounding systems and safety during operations.

BV's Referenzen

Wing sail

Designed approved:

Cormoran - Ship St –
Solar wingsail 36m

BAR Technology -
WindWings 37,5m &
24m

GT Wings – AirWing20
(in progress)

CWS – Airfin350 (in
progress)

Michelin - WISAMO
170PL (in progress)

AIP:

Oceanwings – OW 363

GT Wings – AirWing20

CWS – Airfin350

Naos – WSM module 44

DSIC – Aerofoil



Rotor sail



Design approved:

Norsepower – 24x4 & 20x4
& 35 x5

Anemoi – 35 x5 &
24.5x3.5m (in progress)

AIP: Farwind – 20m

Hanwha

Sunrui

SMERI tiltable rotor

Rig

Approved:

Lorima - Modern rig

**Chantiers de
l'Atlantique** – SolidSail

AIP:

ADD Technologies –
sails on cranes



Suction wing



Designed approved:

Bound4blue – eSail
model2 & model3 (in
progress)

eConowind - VentoFoil

AIP:

ECO Flettner
REEL (Crain) – SW270

Kite

Design approved:

Beyond the Sea – SeaKite
100m² (in progress)

AIP:

Beyond the Sea - SeaKite
OceanicWings (ex Airseas)
– Seawing 500m²



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Newbuildings

Cargo

Balestron rig – rigid sail

Neoliner, roro cargo equipped by 2 x SolidSail from Chantiers de l'Atlantique in 2025

World's First Primarily Wind-Propelled Cargo ship

Suction wing

Amadeus Saffier, cargo equipped by 2 x VentoFoil from eConowind in 2024

Rotor

Cemcommander, cargo equipped by 1 x rotor 24x4m from Norsepower in 2024

Wingsail

Canopée (Alizes), roro cargo equipped by 4 x OceanWings 36m height from Ayro in 2023

World's First roro cargo with wind propulsion (assistance)!

Soft sail

Anemos & Artemis cargo equipped by 2x soft sail from Lorima

Grain de Sail II cargo equipped by 2x soft sail from Lorima

Tanker

Rotor

Buran & Ostro & Bise & Zonda (Union Maritime Line) – chemical tankers equipped by 2x rotors from Norsepower in 2025

Tern Vik (Terntank)– Tanker equipped by 4 x Ventofoil from eConowind



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BV's Referenzen

Retrofits

Cargo

Suction wing

Ville de Bordeaux (LDA) - Roro cargo equipped by 3 x eSails from Bound4Blue in 2024

Odda Marie (Rabn Rederi ab Nathalie) – Cargo equipped by 2 Ventifoils from eConowind

EEMS Traveller (Amasus Shipping), cargo equipped by 2 x eSails from Bound4Blue

Wingsail

Vectis Progress (Carisbrooke) – Cargo equipped by 1 x Airwing from GT Wing

Rotor

Annika Braren , cargo equipped by 1 x rotor from EcoFlettner

Kite

Ville de Bordeaux, Roro cargo equipped by 1 SeaWing from Airseas (tested in 2022 - 2023)

Supply vessel

Kite

Jason (Les Abeilles), anchor handling tug equipped 1 x SeaKite 50m² by Beyond The Sea (demonstrator)

Fishing vessel

Kite

Cap Kersaint - fishing vessel retrofitted with 1x SeaKite from Beyond the Sea



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Vielen Dank für Ihre
Aufmerksamkeit!

Kontakt

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