



BUREAU

VERITAS

BUREAU VERITAS MARINE & OFFSHORE

WIND PROPULSION

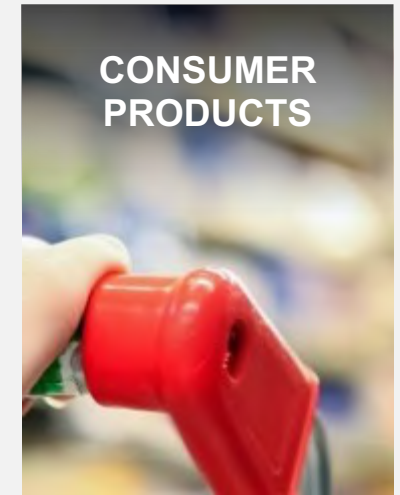
SUSTAINABLE SHIPPING

2023

BUREAU VERITAS

SERVICES IN TESTING, INSPECTION AND CERTIFICATION

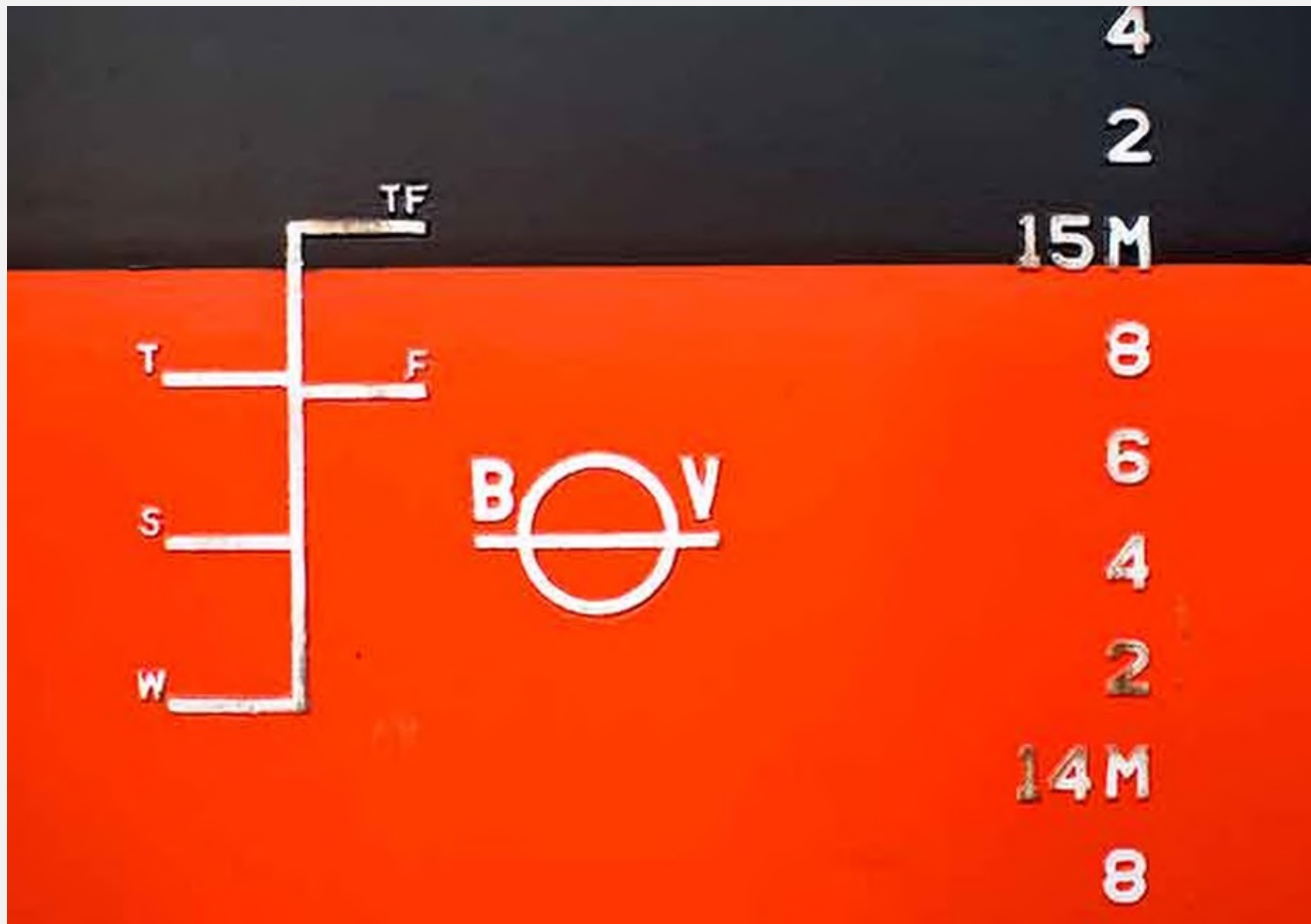
“CONTRIBUTING TO TRANSFORM THE WORLD WE LIVE IN”



BUREAU VERITAS MISSION **SHAPE A WORLD OF TRUST**

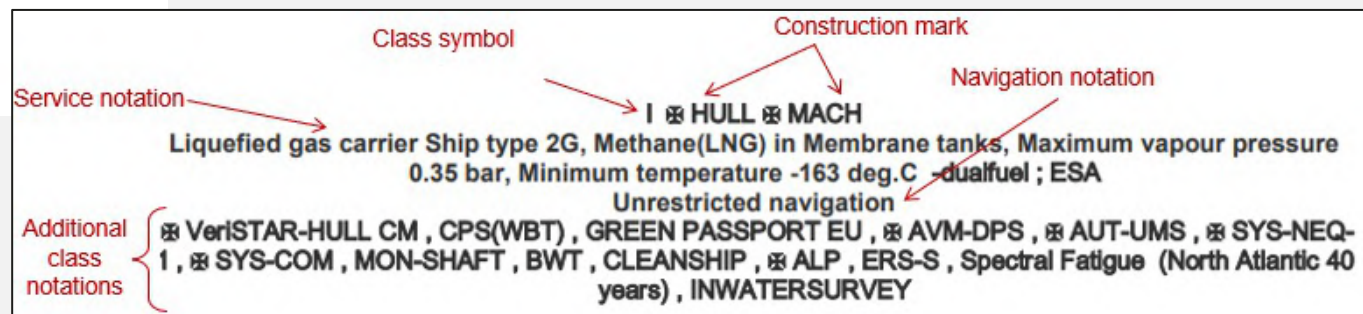
We help our clients innovate to **meet challenges** in quality, health & safety, environmental protection and social responsibility.

As a Business to Business to Society company, we are dedicated to **building trust** between client companies, public authorities and consumers.



WHAT DO WE DO AS A CLASSIFICATION SOCIETY ?

We assist our clients in improving their performance by offering services and innovative solutions ensuring that our clients' products, infrastructure and processes meet standards and regulations in terms of quality, health and safety, environmental protection and social responsibility



WHY WIND PROPULSION FOR SHIP?

- **Absolute zero onboard in operation (or close to ... barring active wind system)**
- **Wind : free source of energy, available onboard, with minimum energy conversion onboard**
- **What do we do as Classification society ?**

Wind Propulsion

A VARIETY OF TECHNOLOGIES



Rotor sail

Active system



Suction wing

Active system



Wing sail



Kite



Hybrid sail



Soft sail



Traditional rig

A large variety of solution:

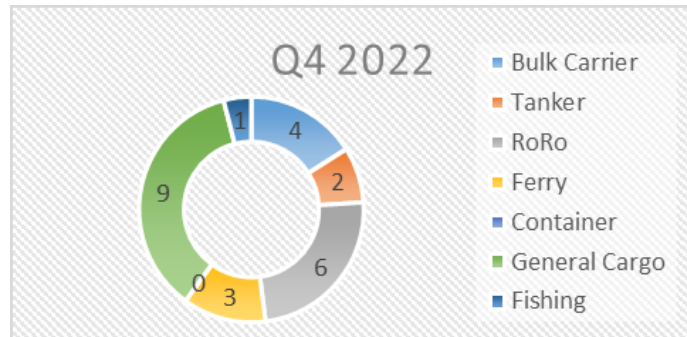
- | Rotation system, automation
- | Telescopic, tiltable, foldable, inflatable, lowerable...
- | Steel, aluminium, composite material
- | Free standing rig, rig shored up with shrouds and stays

Active system

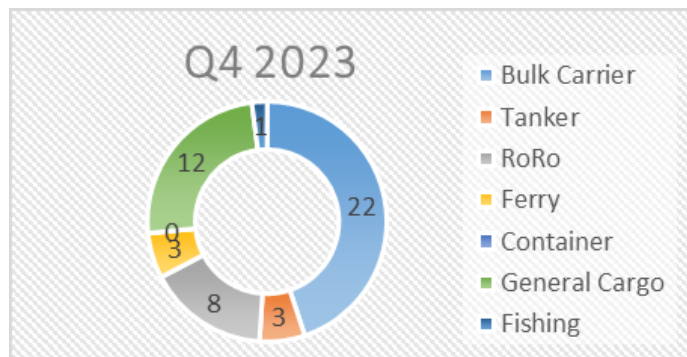
Need additional energy to perform

A GROWING MARKET

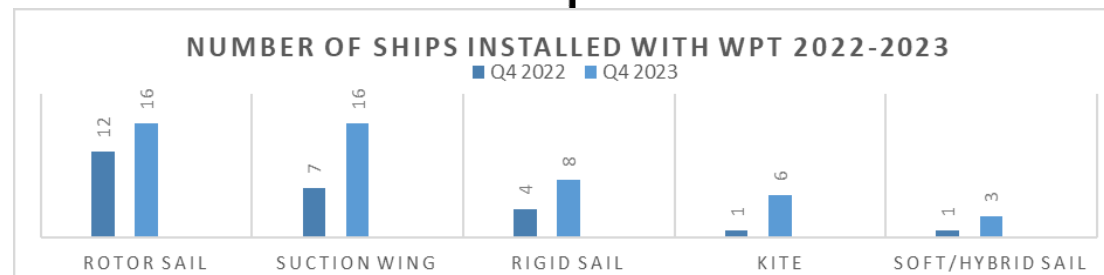
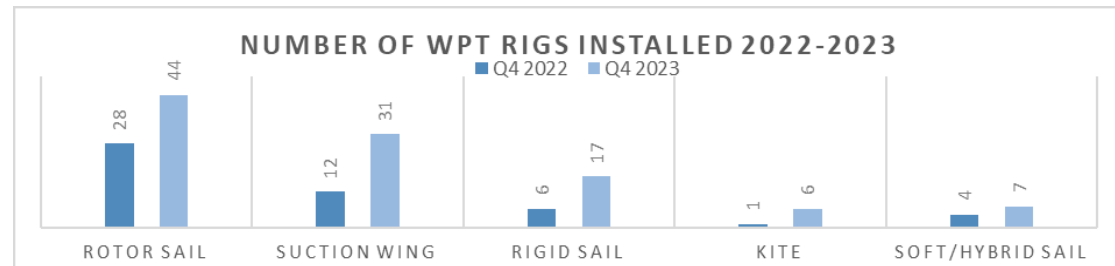
Number of Wind Propulsion Technology (WPT)



25 Vessels with WPT in 2022



49 Vessels with WPT in 2023



Source: IWSA – April 2023

Wind Propulsion

DESIGN IMPACT OF A WIND PROPULSION SYSTEM

Operational impacts:

- Radar blind sector
- Navigation lights (blocked sectors)
- Bridge visibility (line of sight)
- Deadweight
- Air Draft (bridge, canal passage)
- Source of power
- EEDI / EEXI
- Maneuverability
- Helicopter interference / evacuation procedures

Equipment
in chains
and
anchors

Wind propulsion system

Arrangement
Hazardous area
Fire safety

Control
station

Rudder
Steering gear

Propeller

Structural integration
Local structure reinforcement
Global hull girder structure

Ship
stability

Electrical
installation &
machinery



200 YEARS OF SUPPORT TO SHIPPING



1886

ORIGINS IN SHIPPING

Bureau Veritas classes the first oil tanker *Glückauf* with steam and sails propulsion



1987

BV NR206 publication

First rule note dedicated to wind propulsion plants onboard ships – **NR206** – introducing additional service feature notations:

WAP – Wind Assisted Propulsion

EAWP – Engine Assisted Wind Propulsion



2021

BV NR206 update

New release of **NR206** for Wind Propulsion Systems (WPS), introducing additional class notations :

WPS1 – Standing rigging

WPS2 – Standing and running rigging

20th CENTURY

MODERN INDUSTRIAL REVOLUTION & POSTWAR BOOM

growth of automotive and rail industries and safety in ship construction materials

energy efficiency and modernization of ship building standards.

21th CENTURY

DIGITALIZATION & TECHNICAL PROGRESS ENERGY TRANSITION

advanced ship modeling and 3D classification

growth in renewables and decarbonized propulsion in shipping

NOTATIONS FOR WIND PROPULSION SYSTEM

WPS1

Wind propulsion system including fixed part only

- | Standing rigging part of the wind propulsion system
- | Global hull structure, and the local hull structure supporting the forces and moments induced by the standing rigging
- | Mast rotating system and its equipment, the system of, measurement of the strain gauge and all the systems provided as automatic release systems to avoid wind
- | Overload on the wind propulsion system when taken into account for the scantling of the standing rigging
- | Systems playing an essential part in the safety and integrity of the wind propulsion system
- | It includes elements essential to the overall integrity and safety of the wind propulsion system

WPS2

Wind propulsion system including fixed and moving parts

- | WPS2 = WPS1 + elements for which the deficiency leads to the impossibility of using the WPS
- | Running rigging part:
 - | elements used for setting, furling, shaping, trimming and controlling the wind propulsion system and accessories
 - | fixed to the hull use to support these elements. It includes elements the failure of which might induce only localized effects
 - | Hull structure supporting running rigging
- | Drive unit
- | Elements essential to the overall integrity and safety are to be considered as standing rigging

WIND PROPULSION DOCUMENTATION

| RISK ANALYSIS

HAZID



- | HAZID
 - | further risk analysis, (e.g. FMEA) depending on Hazid results
- | Required for new technology and/or special configuration:
 - | suction sail, rotor sail, wing sail, kite...
- | Critical conditions:
 - | Accidental cases
 - | Safety risks and their mitigation measure

| WPS MANUALS

Operating manual



- | Operational limitations
 - | Maximum wind speed and direction
 - | Wind propulsion system configuration/mode

Maintenance manual



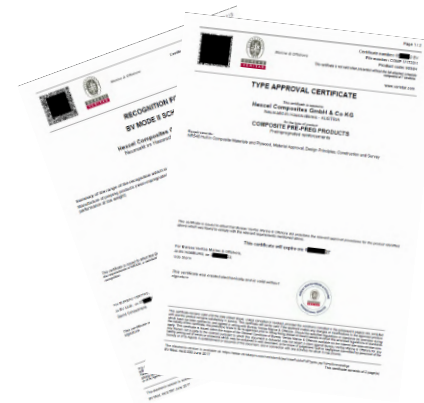
- | Maintenance instruction
 - | repairs and criteria for replacement

| PRODUCT CERTIFICATES

Material certificates



Equipment certificates



| CALCULATION NOTES & DRAWINGS

Technical data



- | General arrangement
- | Determination of loads:
 - | reaction forces depending on wind conditions / sails configuration
 - | inertial loads induced by ship motions
- | FEM calculation
- | Ship strength (hull girder, local reinforcement)
- | Definition of automation and release system
- | Stability

HOW CAN WE GO FURTHER ?

How can we go further in our support ?

Observations

- Wind Technologies constantly improving
- Uptake by the shipping community

Actions:

- Need to give assurance to owner / stakeholders (role as class society)
- More class involvement regarding the use onboard of wind as a source of energy
- Demonstration of integration in “ship’s system” of the wind as a fluctuating power input : impact on stability, impact on power systems

 IN PROGRESS

MORE EXCHANGE ?

Podcasts



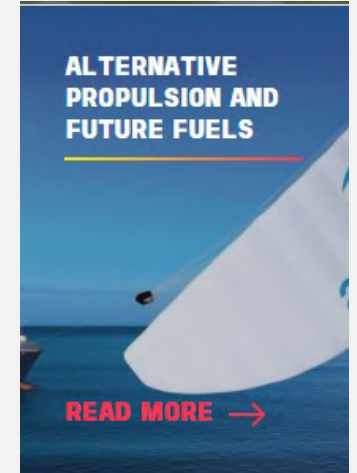
WIND PROPULSION PAPER IN PROGRESS

**CHECK OUR
WEBSITE!**

marine-offshore.bureauveritas.com



Insights



**GET OUR LATEST
INSIGHTS IN YOUR INBOX**

SUBSCRIBE TO OUR NEWSLETTER



**BUREAU
VERITAS**

THANK YOU

LET'S WORK TOGETHER !



JULIEN BOULLAND

Commercial department – Sustainable Shipping

+ 33 (0)7 79 86 26 15
Julien.Boulland@bureauveritas.com

BUREAU VERITAS MARINE & OFFSHORE