Seagoing rudder systems

SETTING COURSE FOR THE FUTURE

MARINE SYSTEMS
VAN DER VELDEN®
REGISTERED TRADEMARK OF DAMEN MARINE COMPONENTS

DAMEN
MARINE COMPONENTS

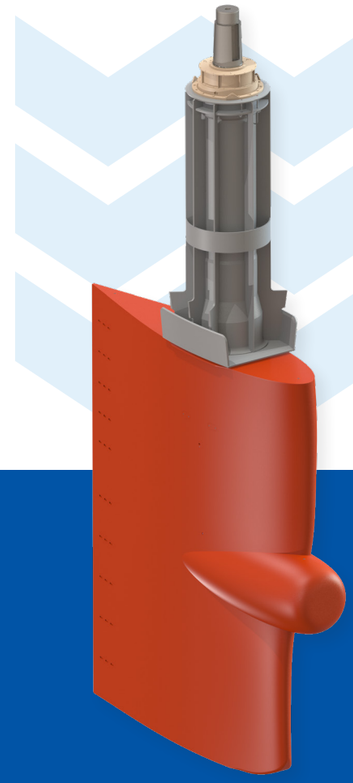
Full spade rudders

ESPAC (Energy Saving Package)

Propeller manufacturer Mecklenburger Metallguss (MMG) and Damen Marine Components (DMC) have founded a partnership to join their knowledge to develop a highly efficient propulsion package; ESPAC.

MMG and DMC have combined the advantages of an optimised fixed pitch propeller with a slip-stream adapted asymmetric leading edge rudder, a rudder bulb and adapted hub caps.

Together with the ship owner, naval architect and/or the shipyard, our front end engineering design identifies the needs according to the ship's operational profile. Also, they optimise the propeller-rudder arrangement depending on particular criteria such as high manoeuvrability, fuel efficiency, and minimising cavitation and vibration. The ESPAC ensures a well-balanced propulsion and steering system.

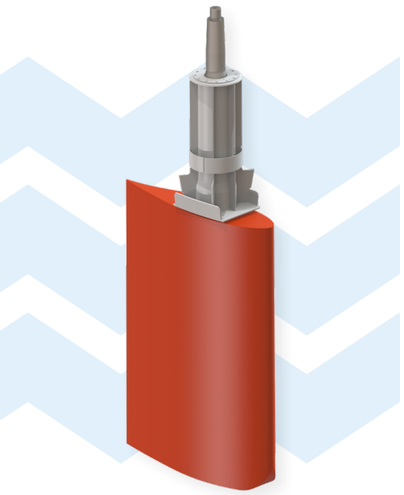


KEY FEATURES

- Reduces cavitation, vibration and noise
- Reduces energy losses due to the adaptation to the propeller slipstream
- Avoids large rudder angles, which leads to resistance reduction
- Increases rudder efficiency (approx. 3.5% compared to a conventional rudder, up to 8 % as retrofit)

ESPECIALLY SUITED FOR

- Container vessels
- Ro-Ro, RoPax, and PCTC vessels
- Ferries, cruise vessels and yachts
- Fixed propeller systems by MMG



Van der Velden® ATLANTIC

The ATLANTIC rudder is a full spade rudder designed without movable parts. This rudder delivers excellent course-keeping with optimal performance on straight ahead journeys.

The slim trailing profile of the ATLANTIC rudder ensures minimal resistance and is especially suited to medium and high speed vessels. This rudder system is frequently combined with energy saving devices such as the Van der Velden® Silent Bulb and ART™.

DMC's rudder systems comply with all classification societies. Each rudder profile is custom-built to match specific vessel requirements.

KEY FEATURES

- Minimal resistance
- Excellent course-keeping
- Custom-built to fit vessel hull
- Designed without movable parts
- Optimal performance on straight-ahead journeys

ESPECIALLY SUITED FOR

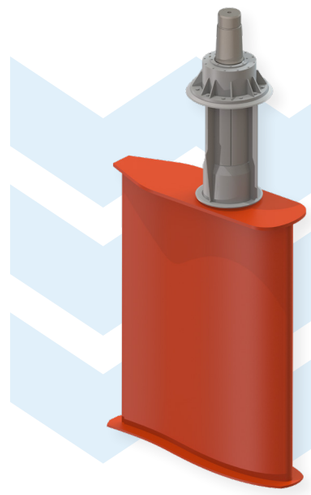
- Container vessels
- General cargo vessels
- Navy vessels: patrol, frigates, corvettes

OPTIONAL FEATURES

- Van der Velden® Silent Bulb
- Rudder trunk extension into rudder blade
- Van der Velden® Asymmetric Rudder Technology (ART™)

Van der Velden® MASTER

Characterised by its fishtail shaped trailing edge, the high-lift MASTER rudder offers good manoeuvring performance and smooth course-keeping. These key elements make this rudder type especially suitable for vessels that travel relatively short distances and frequently have to come in and out of harbours or change position. The absence of moving parts in this robust full spade design significantly reduce wear and tear.



KEY FEATURES

- High performance rudder
- Rudder angles up to 65°
- Optimised fishtail profile
- Designed without movable parts
- Good manoeuvrability

ESPECIALLY SUITED FOR

- Tugs
- Tankers
- Dredgers
- Bulk carriers
- Fishing vessels
- Short sea multi-purpose vessels
- Offshore vessels (AHTS, OSV and PSV)

OPTIONAL FEATURES

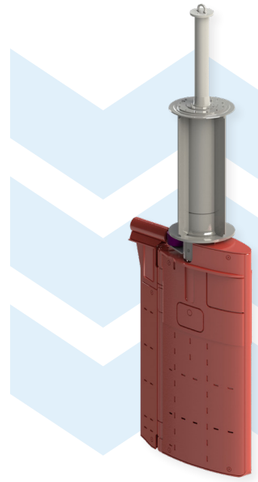
- Van der Velden® Silent Bulb

Flap rudders

Van der Velden® TIMON

The TIMON rudder is designed with a linear flap with a 90° angle, which provides an excellent manoeuvring and course-keeping performance, especially for medium to high speed vessels. This rudder is characterised by its open linkage system and side bar flap system. It has a wide range of sizes, which makes it the ideal rudder for larger vessels such as offshore and container vessels.

One of the optional features of the TIMON rudder is to extend the trunk into the rudder blade, which reduces stresses and bending torques in the trunk and stock. Another optional feature is to add heel bearing support to the rudder, which reduces the load in the neck bearing.



KEY FEATURES

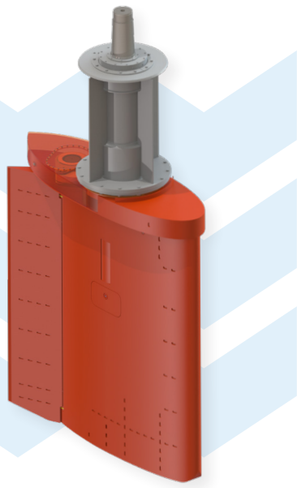
- Linear flap
- 90° flap angle
- Wide range of sizes
- Open linkage system
- Excellent manoeuvring and course-keeping performance

ESPECIALLY SUITED FOR

- Tugs
- Fishery
- Ferries
- Offshore
- Ro-Ro
- Multi-purpose
- Container

OPTIONAL FEATURES

- Van der Velden® Silent Bulb
- Heel bearing support (fishing vessels)
- Rudder trunk extension into rudder blade
- Van der Velden® Asymmetric Rudder Technology (ART™)



Van der Velden® BARKE®

The BARKE® rudder has a progressively moving flap, which reaches a total angle of more than 100°. This rudder offers premium manoeuvrability and course-keeping.

The flap mechanism of the BARKE® rudder is protected in a closed linkage system. This guarantees high durability and eliminates the entry risk of sand, floating objects and ice. Another feature of this rudder type is reduced noise and vibration during operation.

To achieve maximum safety, the BARKE® rudder has overload protection, which prevents mechanism damages and inoperability. This reliable system performs best during challenging manoeuvring situations.

KEY FEATURES

- Over 100° flap angle
- Overload protection
- Closed linkage system
- Reduces noise and vibration
- Premium manoeuvring and course-keeping

ESPECIALLY SUITED FOR

- Tugs
- ConRo and RoRo vessels
- Dredgers and fishing vessels
- Oceanographic and research vessels
- Ferries, yachts and passenger vessels

OPTIONAL FEATURES

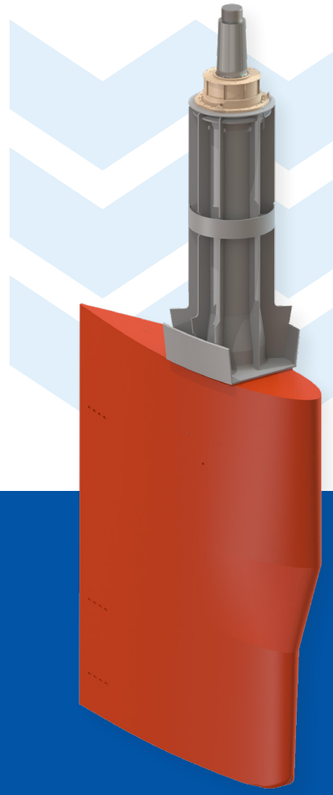
- Van der Velden® Silent Bulb
- Heel bearing support (fishing vessels)
- Van der Velden® Asymmetric Rudder Technology (ART™)

Van der Velden® Asymmetric Rudder Technology (ART™)

ART™ technology is adapted to the angles of the propeller to create smooth water inflow. This technology is developed to reduce resistance and cavitation, and to increase the operational profile of a vessel.

When ART™ technology is applied, the shape of the rudder is adapted to the angles of the propeller. The profile above and below the centreline of the propeller is specifically modified to counter the rotation effects of the propeller slipstream.

ART™ technology is available in a Z- or S-shape and is especially suited for seagoing vessels sailing above 20 knots. It is frequently combined with the Van der Velden® ESPAC, TIMON and ATLANTIC rudders.



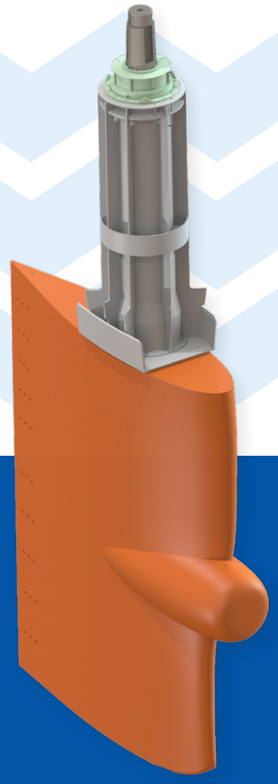
KEY FEATURES

- Smoothens water inflow
- Reduces resistance
- Minimises cavitation
- Available in Z- or S-shape
- Increases operational profile

ESPECIALLY SUITED FOR

- Seagoing vessels with a high propeller load (above 20 knots)

Additional features



Van der Velden® Silent Bulb

The Silent Bulb helps to reduce rotational losses of the hub vortex. This optional, and also retrofittable, bulb performs best when combined with a bespoke propeller hub cap. Enhanced propulsion efficiency leads to notable fuel savings.

KEY FEATURES

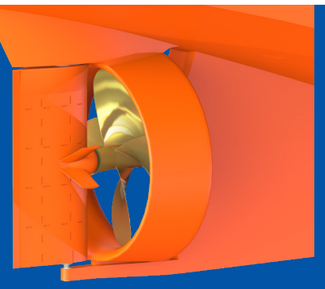
- Significant fuel savings up to 1,5%
- Increased thrust at high loads
- Reduces cavitation risk and noise
- Excellent cost-performance ratio (amortization < 1 year)
- Applicable to every full spade rudder type (special consideration for semi-spades)

ESPECIALLY SUITED FOR

- Speeds from 14 knots upwards
- Container vessels and feeders
- (Ro-Pax) ferries
- Cruise Liners and yachts
- Fishing and offshore vessels

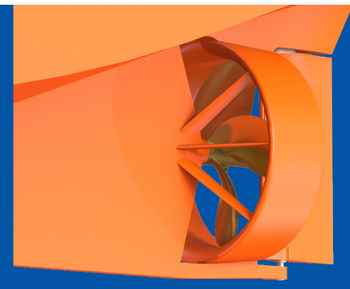
Van der Velden® Rudder fins

The rudder fins, or thrust fins, guide the post-swirl and, when combined with a rudder bulb, reduce the rotational losses of the propeller.



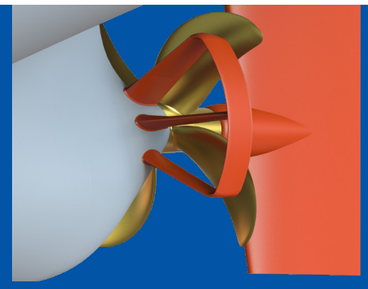
Van der Velden® Nozzle Fins

The nozzle fins, or pre-swirl stator fins, are mounted on the propeller nozzle and equalise the wake of the hull. This improves the inflow towards the propeller.

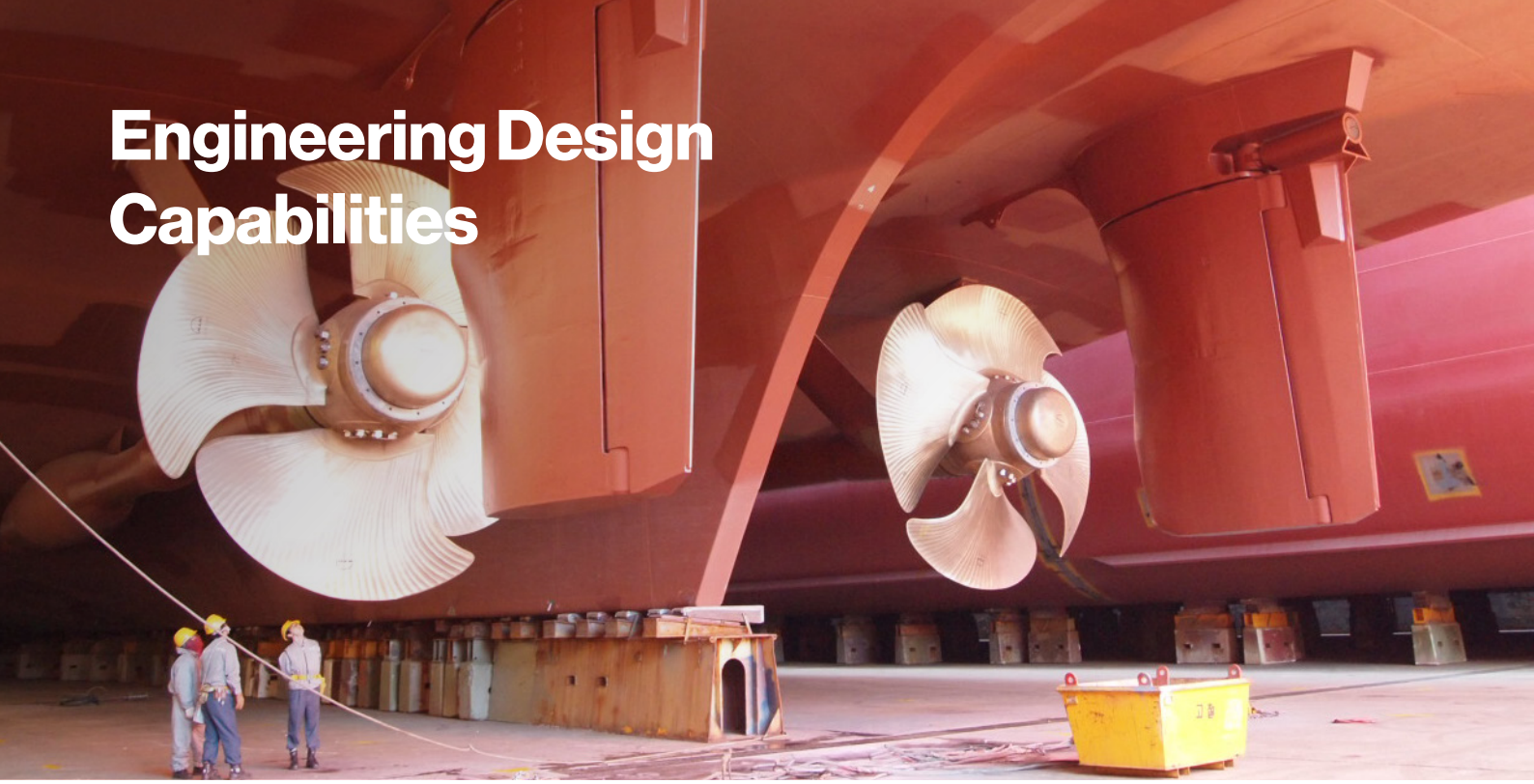


Van der Velden® EQUAL Duct

This pre-swirl device is capable of significantly cutting fuel-costs. There is an inherent asymmetry in the thrust generated by a propeller between the starboard and port side. The EQUAL Duct modifies the water inflow into the propeller disc area, thereby reducing this asymmetry, which leads to increased thrust. This higher propulsion efficiency delivers notable fuel savings.



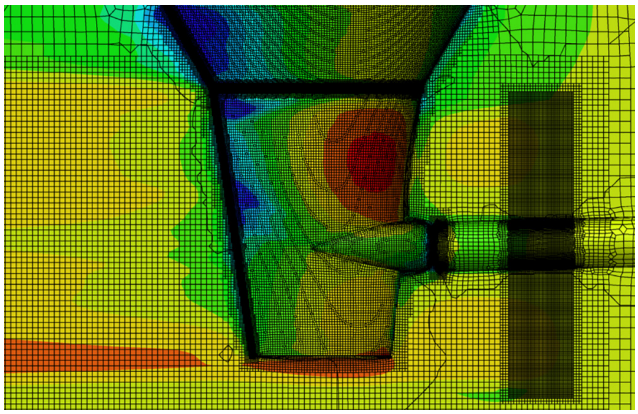
Engineering Design Capabilities



Computational Fluid Dynamics (CFD)

CFD methods are applied for hydrodynamic calculations. The main areas of research and usage are hydrodynamic performance, manoeuvring, cavitation, resistance and propulsion.

CFD methods range from in-house Boundary Element Codes (BEM) for design purposes and cavitation prediction to time domain slender body theory methods for prediction of manoeuvring behaviour.

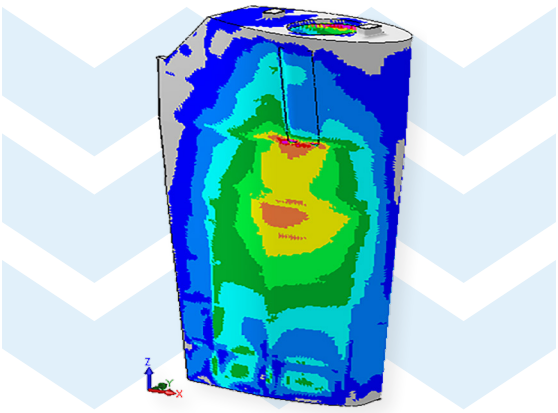


Rans simulations to verify rudder performance

Finite Element Method (FEM)

FEM is a numerical method mainly used for strength calculation of structures under external loads. It is applied to measure stress levels and displacements under external loads (rudder blades, stocks and trunks).

With FEM, the blades of post or pre-swirl devices can be measured. This method is applied to solve complications such as buckling or structural analysis up to yield stress in case of e.g. ice loads. FEM is also used for time dependent complications such as vibrations.



FEM stress check rudder

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