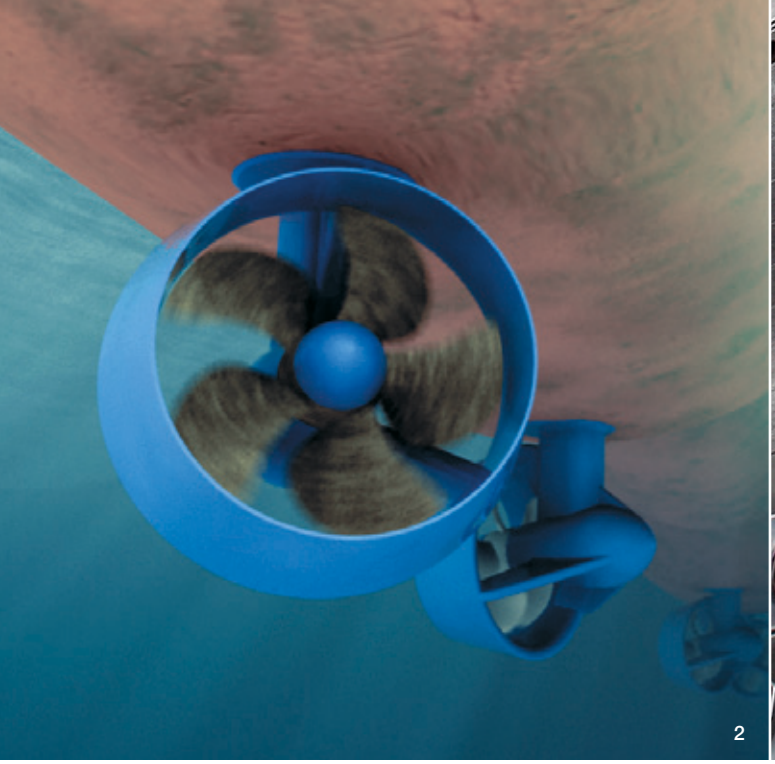
VOITH

Fast and Safe Operation.
Voith Radial Propeller

Semisubmersible platform with
Voith Radial Propellers.

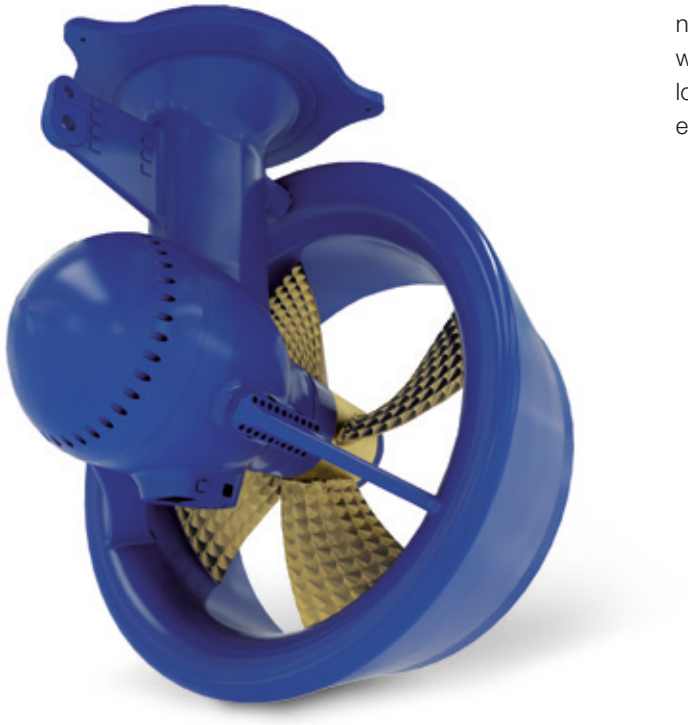
Voith Radial Propeller (VRP) for the Offshore Industry.

The Voith Radial Propeller (VRP) is a 360° thruster specially designed for the requirements of large offshore vessels as semisubmersibles or monohull drill-ships. Special features include underwater-mounting, pressurized lubrication system and bearings for DP requirements. Retraction systems are optionally available. Hydrodynamically the 8°-axis tilt by special gear technology ensures more useful thrust by losses avoided due to interaction effects. Patented high lift nozzles and individually optimized propellers ensure best propulsion efficiency.



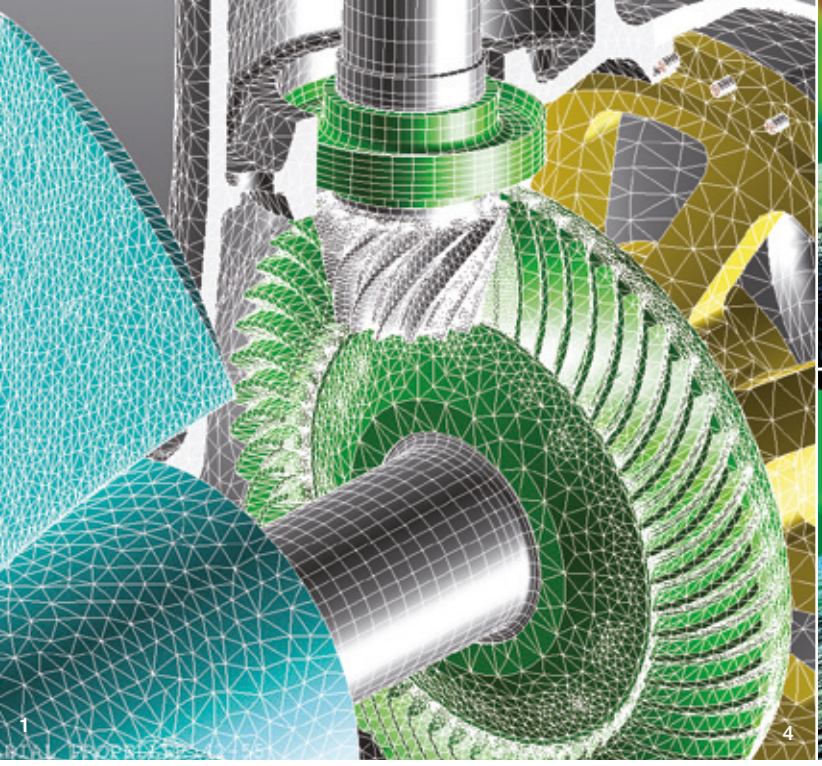
2 Underwater-mounted VRP

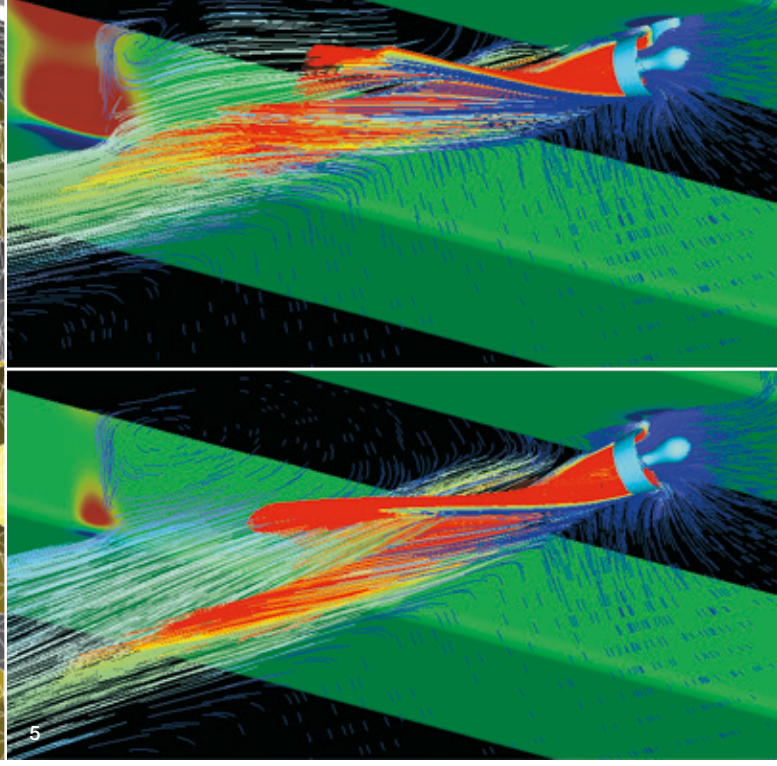
3 Klingelnberg gear-cutting machine.



Voith Radial Propeller (VRP)

Voith has decades of experience in designing and producing marine propulsion systems, such as propellers for commercial and military vessels. Examples are offshore supply vessels, tugs and ferries, which operate with Voith Schneider Propellers (VSP). Other typical marine products are shaftline components for ice going vessels. The first semisubmersible vessel was fitted with Voith Radial Propellers (VRP) in 1975. Voith can look back on decades of in-house operating and maintenance experience for thrusters.





4 FEM analysis for VRP.

5 UCFD analysis for thruster below semisubmersible vessel.

Capacity

For producing very large water turbines Voith has various workshops for welding, casting, forging and machining. Kaplan turbines (similar to CPP) with diameters significantly above that of the thrusters are regularly produced. The backbone of the Voith thruster production is our own manufacturing capacity. All core components are produced in-house without the involvement of sub-suppliers.

Voith operates one of the world's largest Klingelnberg gear-cutting machines in Heidenheim, Germany. Special casting components can be produced in Voith's own casting workshops. The Voith welding facility is equipped with large turntables for manufacturing thruster nozzles.

Research and Development

For basic research Voith has been operating a model-scale circulation tank for decades. In-house expertise for hydrodynamic optimization assures customers of operational benefits.

In addition, Voith operates one of the world's most advanced computational fluid dynamics (CFD) centers. Using the COMET computer code on large clusters, flows including free surfaces around ships in waves, as well as thrusters, can be simulated.

Cooperation with partners such as universities and model test tank facilities ensures consistent benchmarking and further development of our research tools.

The calculated hydrodynamic loads are used as an input for the detailed FEM analysis of all thruster components to ensure best weight-to-load ratios.

Voith Radial Propeller Features and Function

Underwater mountable L-drive

- 2 x 4 azimuth drives. Driven by electro-hydraulic system
- Azimuth bearing, roller bearing type
- Rotary feed through for leakage chamber of propeller shaft sealing
- Optimized bearing configuration of pinion shaft for maximum gear safety
- Cyclo-palloid gear manufactured by Voith
- Pressurized, oil filled gear housing. Manufactured as a one-piece grey cast iron part
- Double ceramic face seal
- 8 ° tilted axis of under water gear box to minimize thruster-hull interaction
- High-lift nozzle and high performance propeller optimized for DP-operation

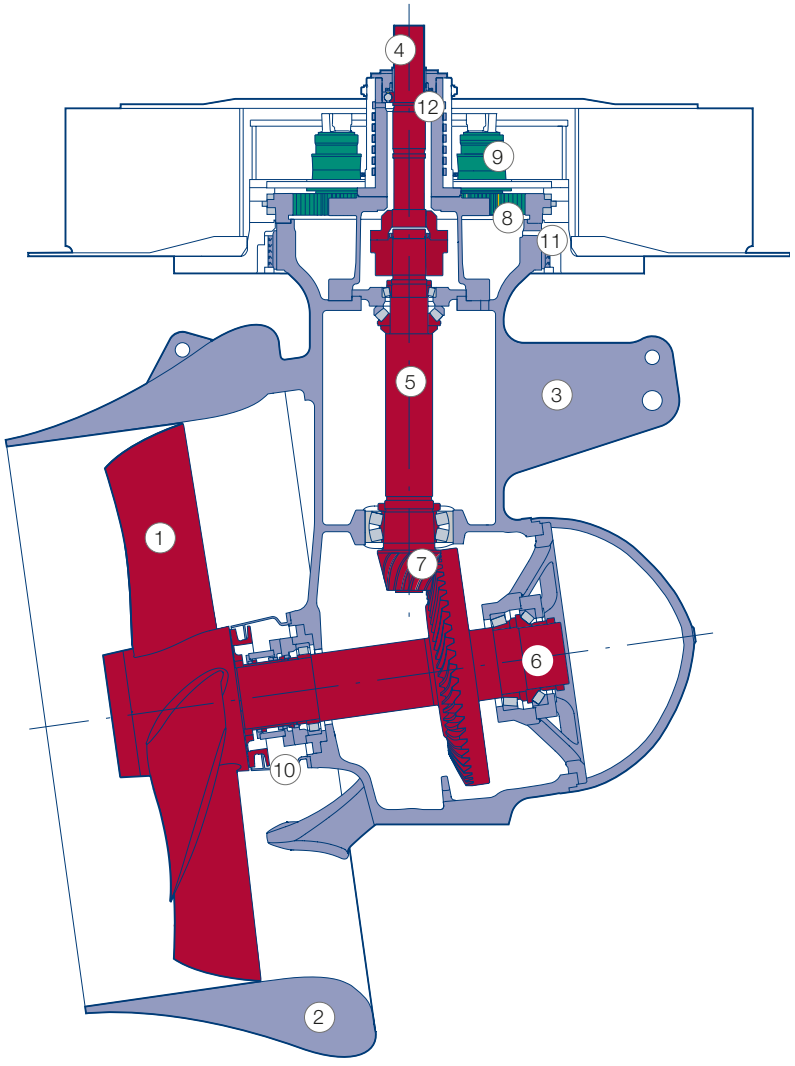
Features

- Fixed Pitch Propeller optimized for dynamic positioning
- 360° rotateable underwater unit
- Underwater mountable
- Power range 3 500 kW to 5 000 kW
- High lift nozzle for maximum thrust performance
- reduction of fuel consumption
- Reliable and eco-friendly sealing system
- Reduction of thruster-hull-interaction
- Worldwide network for service and spare parts maintenance

Voith Radial Propeller Standard Sizes

VRP-Type	VRP 3.5-34	VRP 4.5-38	VRP 5.5-42
Nominal input power	3 500 [kW]	4 500 [kW]	5 500 [kW]
Propeller diameter	3.4 m	3.8 m	4.2 m

Cross section and function



1 Propeller
2 Nozzle
3 Housing
4 Drive shaft
5 Pinion shaft
6 Propeller shaft
7 Propulsion gear
8 Azimuth gear
9 Azimuth drive
10 Propeller shaft sealing
11 Azimuth sealing
12 Rotary union
■ rotating parts
■ steering parts

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Engineered Reliability