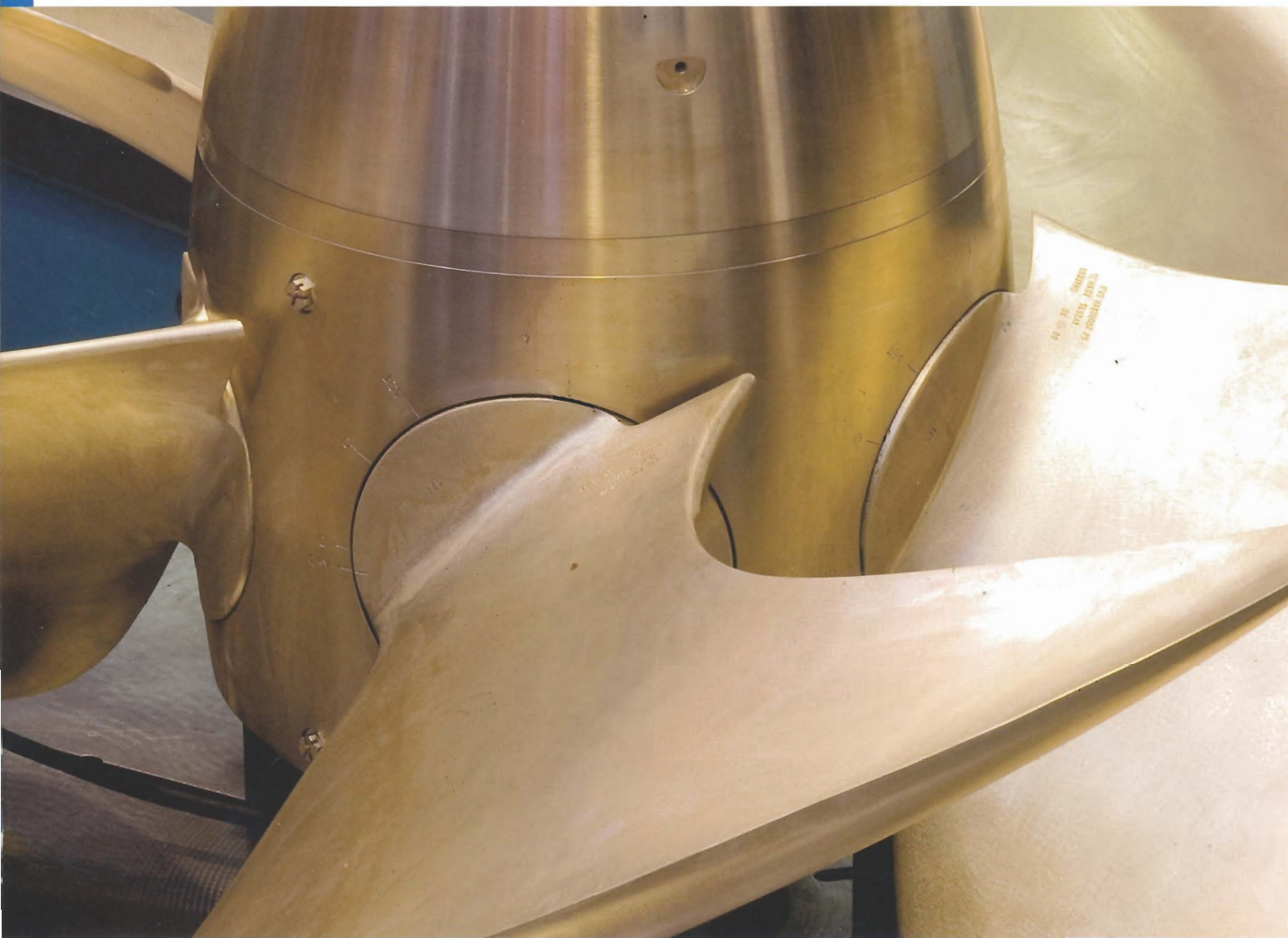


Controllable Pitch Propellers





Efficiency, Silence, Flexibility, Speed

are the four most dominant driving forces of design in shipbuilding. The challenging part is to harmonise and balance these four forces to the maximum possible extent in respect to the given requirements. It is a challenge which we at Andritz Hydro with our Escher Wyss Propellers have been able to master in many successful applications and are continuing to face for the design of our Controllable Pitch Propellers to come.

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Efficiency: In a modern world efficiency is crucial in all aspects of life. In the world of MegaYachts, Special Application-, Naval- and CoastGuard Vessels efficiency has in recent years gained more and more attention. Our propellers actively contribute towards an overall efficient propulsion system within a wide operational window and within a wide range of prime mover configurations.

Silence: Being faced with the toughest demands of the Navies and exclusive club of MegaYacht owners worldwide, our propulsion systems are capable of meeting the strictest noise and comfort requirements on the market.

Flexibility: The concept of a Controllable Pitch Propeller System as such hardly requires any further explanation when it comes to flexibility: it was born out of the need for more flexibility, manoeuvrability and convenience in ship propulsion and is continuously refined by today's requirements such as dynamic positioning and others.

Speed: Whether it is the achievable top speed of a vessel, the maintainable speed under all conditions, the cruising speed or the speed of changing the speed: our customers and ourselves are strongly focussed on speed.



Silence: standard on board of a MegaYacht

Escher Wyss Propellers

The desire to have a ship propeller with provision for varying the pitch is as old as the screw propeller itself. The initial controllable pitch propellers designed in the 19th and early 20th century, incorporating the state of the art of that time, could not give the desired performance.



Since 1934, the times of the Etzel ...



... up to the latest projects still in development: Escher Wyss Propellers

Controllable Pitch Propellers

It was not until the early Thirties, when Escher Wyss, profiting from the experience gained in the design and manufacture of Kaplan and many other types of hydraulic turbines, developed the first

practical design for a controllable pitch propeller. In 1934, the first hydraulically operated marine controllable pitch propeller was successfully commissioned in a small passenger vessel named "Etzel". The 180 kW propeller proved to be of particular advantage and reliable in operation: both the ship and the propeller are still in service.

Today our propellers are first choice for ships that need unique propulsion solutions to fulfil their special duties. That's why the World's finest megayachts and the leading naval ships use Escher Wyss CPP technology.



The Propeller Systems

The purpose of the propeller is to move the ship. The main target here is to achieve a maximum thrust for the ship while minimizing noise and vibration. The low noise level and the magnitude of the pressure pulses are the crucial points for a high quality propeller.



Frigate "Bayern" in operation, driven by Escher Wyss Propellers



F124 Frigate "Sachsen"

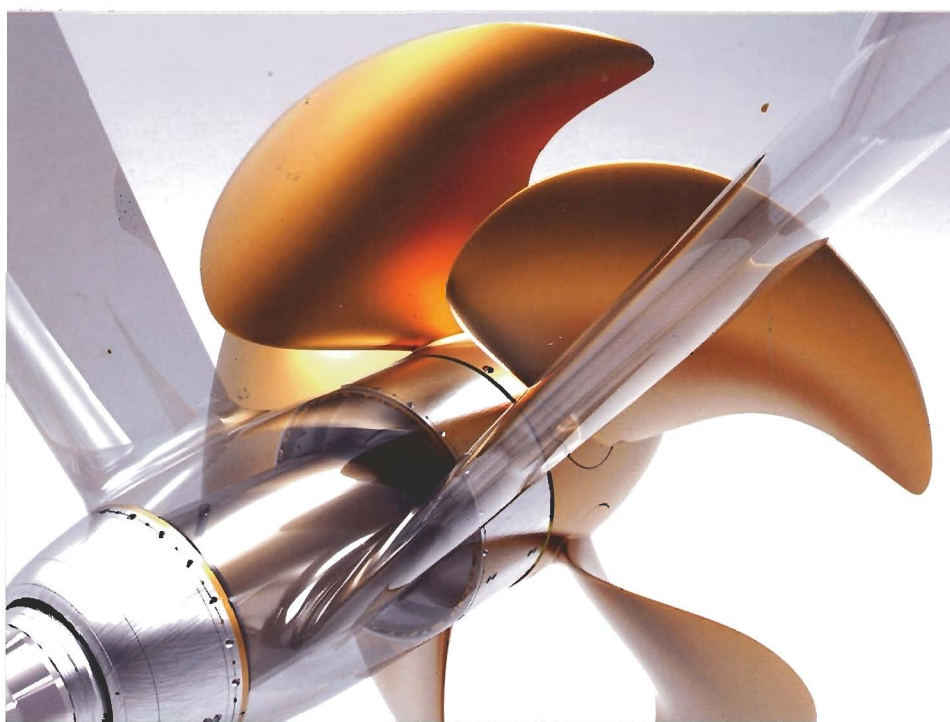
For highest demands

Our know-how and a comprehensive system of state-of-the-art computer software for analytical engineering ensure that we achieve a well-balanced solution between the conflicting requirements of propulsion efficiency, structural strength, weight and hydro acoustics. Propeller performances are verified by independent and renowned international ship model basins. Continuous evaluation and comparison of the results in calculation, model testing and

full-scale measurements are the basic requirement to maintain a top position as supplier of tailor made controllable pitch propellers. Escher Wyss Propellers gives you the opportunity to profit from our technological success and our long time experience in designing and building CP propellers for the highest demands.

Hydrodynamics

Escher Wyss Propellers are renowned for their unique type of blade fastening. Thereby the flow on the blade palm and fillets is not disturbed by any blade bolts or pockets, thus restraining the formation of root cavitation delaying the inception speed of the root cavitation by up to six knots. With a consequent in-house hydrodynamic propeller design we ensure that we stay close from first idea to final delivery of our Escher Wyss Propellers.



One of the hydrodynamic design challenges: interactions between shaftline, V-strut and propeller.

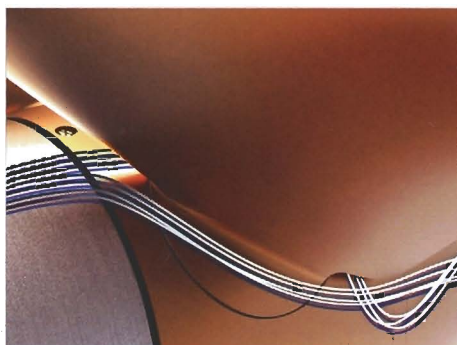
The propeller blade design

In order to reduce the level of excitation of hull vibration by the propeller Escher Wyss Propellers for megayachts and naval vessels can feature a high skew design. Pressure pulse amplitude levels below 1kPa are achievable.

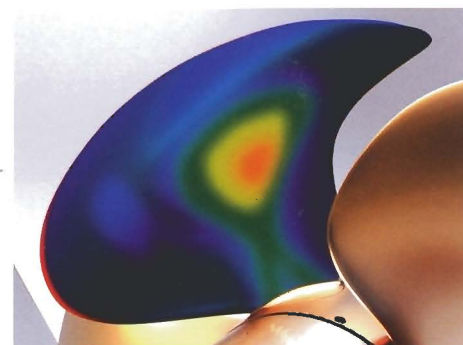
With even higher requirements regarding noise and vibrations 7 bladed propellers (including air emission system) are a conceptual option.

Hub design

The special hub shape of our propellers has been developed in order to combine minimum hub resistance with a delay of the inception of hub vortex cavitation beyond the range of operation. This is successfully confirmed by cavitation predictions in model scale as well as by full scale viewings.



Schematics of blade palm flow: undisturbed stream lines



Design criteria: low pressure area on suction side

Features and Options

In addition to our advanced technological benefits we are also able to meet most of our customers' extraordinary requirements. Full feathering: possible. Underwater blade change capability: delivered. Air emission system (Prairie): no problem. Seven bladed propellers: done.



Hub with feathering capability

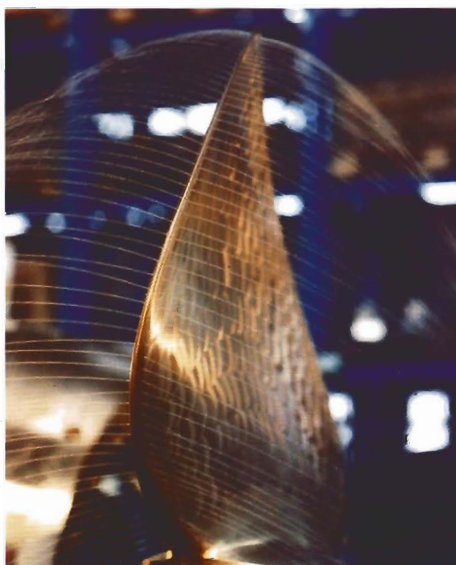
Controllable pitch propellers capable of being set to their feathered position are economic for multiple screw vessels intended to operate at reduced speeds. The reduced thrust then required can more economically be provided by operation on only one propeller, while the others are set to the feathered position and thus generate a minimum resistance.



Quality and function check after assembly

Air emission system

When noise requirements are high, especially for naval vessels, an optional air emission system may be incorporated on request. With such a system compressed air is led to channels in the leading edges of the blades and vented through a multitude of small holes at face and back, blade root and tip, thus creating an air cushion over the blade. This air cushion considerably reduces the cavitation noise.



Air emission system testing with water

Underwater blade change capability

The Escher Wyss Propellers can also be delivered with the propeller blade palm bolted to the trunnions. In addition the blade fastening can be designed to permit a replacement with the propeller immersed in water. The trunnion is sealed against the hub body and all surfaces in contact with seawater, including the thread holes, are seawater resistant.

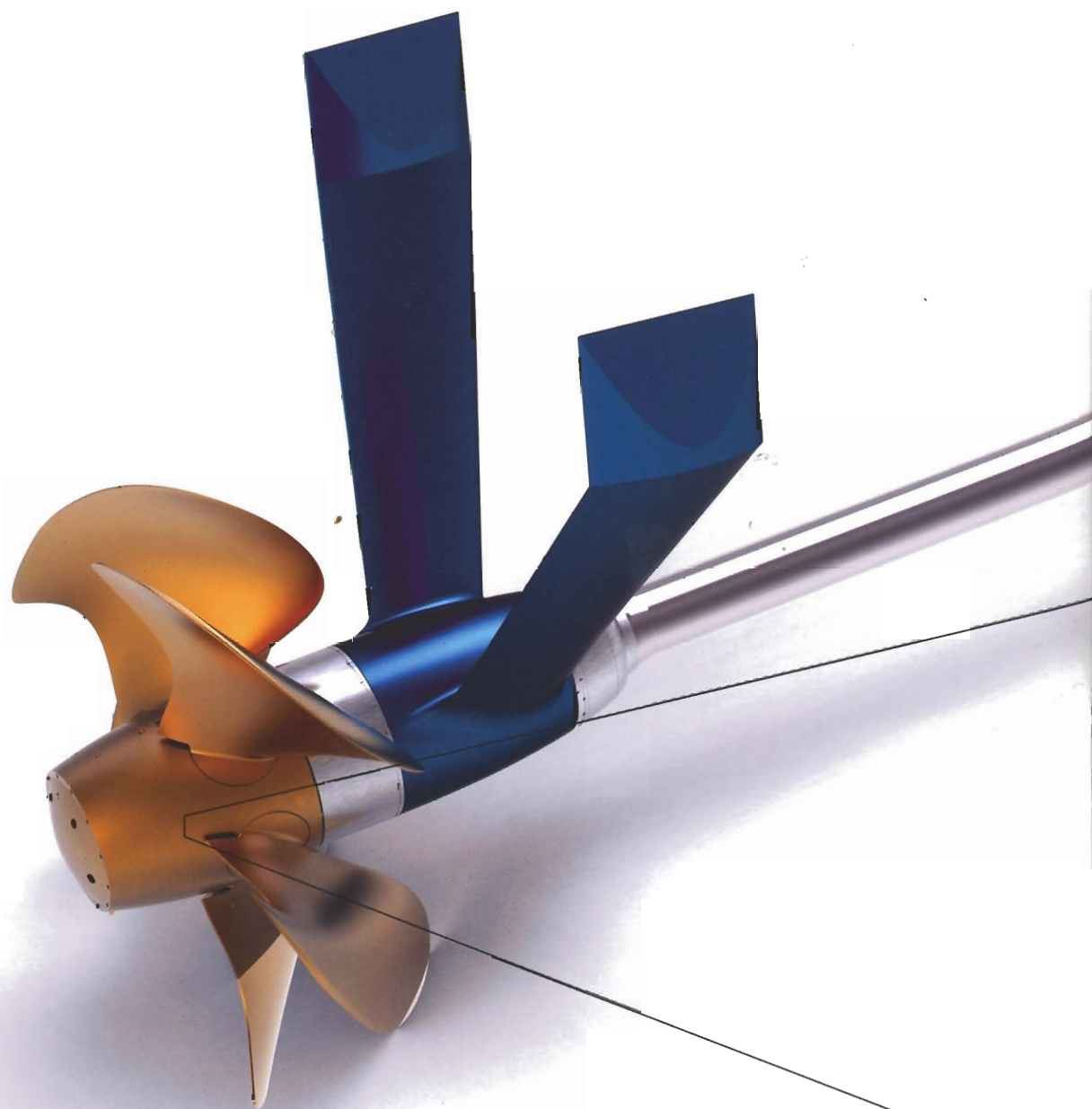
Seven-bladed propellers

For highest requirements regarding noise and vibration, we offer the possibility to select a seven-bladed propeller system. The benefits of reduced hub to propeller ratio due to the unique trunnion bearing design is put to full advantage. A combination with the air ejection system is also possible.

System Overview

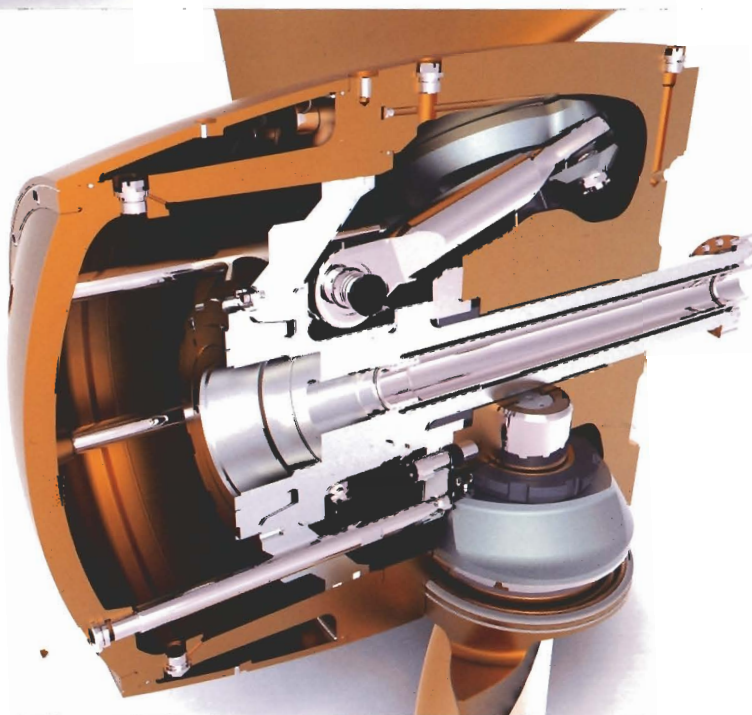
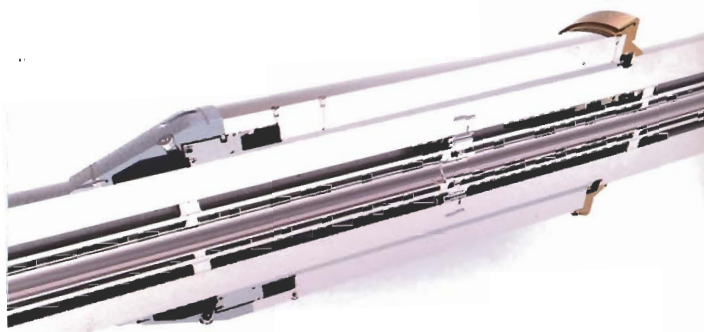
Controllable Pitch Propeller

All our efforts are dedicated to provide fully customised CPP solutions. From single equipment to full systems depending on customer requests we design and deliver complete packages.



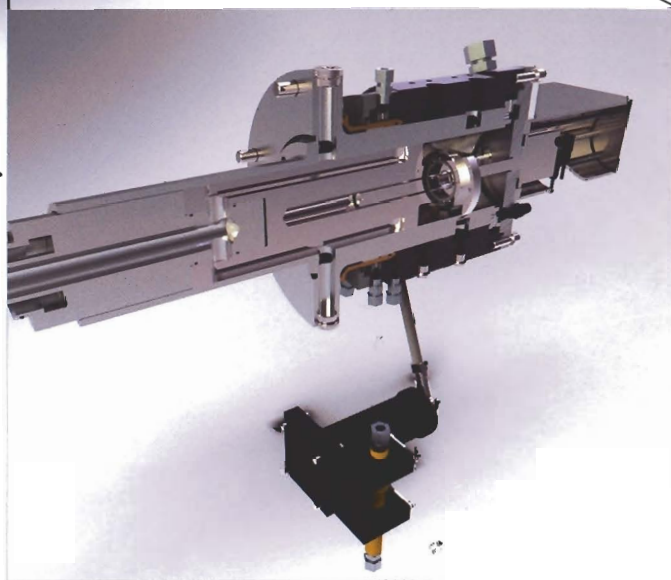
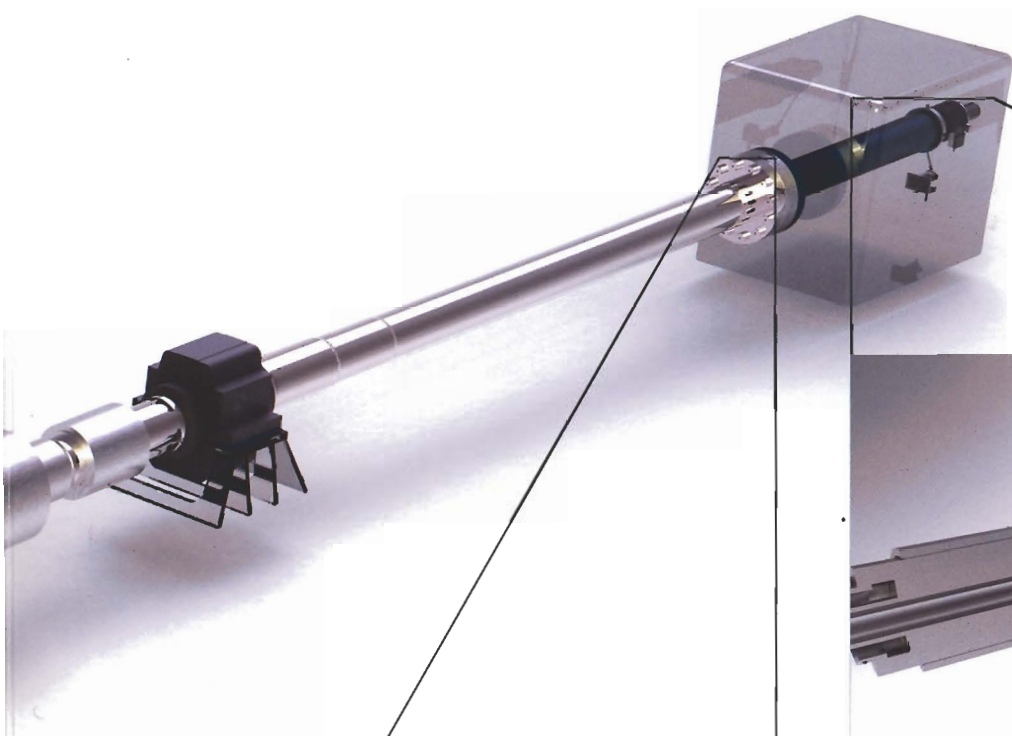
Shaft Coupling:

an important component and integral part of the shaft line. In house design and development is complemented by 3rd party compact couplings for special applications. Sleeve and Flange type couplings are put to use as conceptually appropriate.



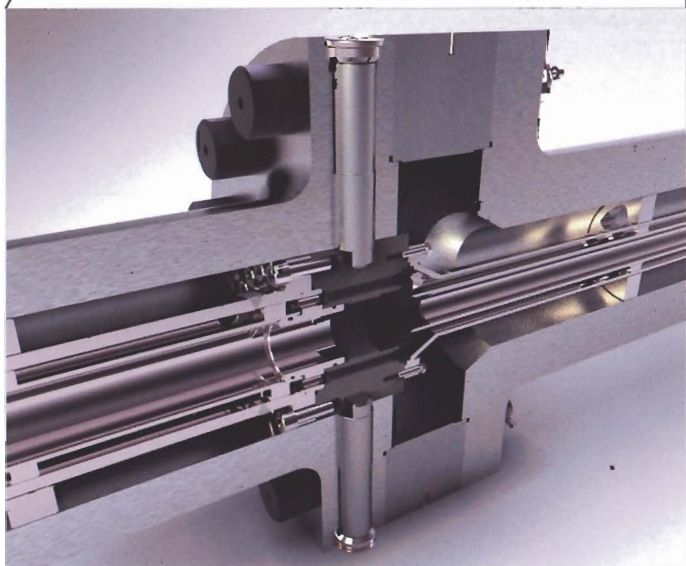
The Propeller Hub:

unique Escher Wyss design featuring the trunnion bearing concept with its well proven components levers, links and large servomotor piston. Extra large space for the hydraulic servomotor (left side) allows for minimum possible overall system pressure.



The OD Box:

Gearbox mounted "G" type (here with special features such as: shock, flooded compartment, electronic feedback sensor), compact and space saving in design featuring mechanical pitch setting feedback as well as hydraulic "pitch freeze" (optional). Depending on customer's concept and available space "R"-type OD boxes, mounted within the shaftline are available.



Mechanical pitch locking:

In terms of reliability and robustness still unprecedented: mechanical pitch locking as an emergency "take home device" maintains manoeuvrability in case of hydraulic system breakdown.

Escher Wyss System Advantages

- **Trunnion bearing system**, low stresses, even load distribution
- Moderate oil pressures for pitch control, **large servomotor piston**
- Reliable, **heavy duty** mechanical hub design, low life-cycle cost
- Excellent **hydrodynamics** and **hydroacoustics**
- **Mechanical pitch locking** in case of hydraulic failure
- **Customised** solutions based on proven technology



Quality Control

All components are made of highest quality materials in accordance with the requirements of the Classification Societies and are subjected to strict quality control. We are certified according to **ISO 9001** and **ISO 14001**.



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