

Fixed Pitch Propellers

Marine Propulsion Systems







ZF is a leader in the marine market supplying propulsion systems and components for all types of vessels – motor yachts, defense craft, high-speed ferries, workboats and commercial vessels, in a power range from 10 to 14,000 kW – to customers including major shipyards and engine manufacturers worldwide.

The product portfolio includes a comprehensive range of transmissions (reversing, non-reversing and hybrid), propellers, POD-drive systems, steering systems and CANbus-compatible, electronic control systems, azimuth thrusters, tunnel thrusters and sail drives.

For over 25 years ZF has produced propellers for the Commercial & Fast Craft and Pleasure Craft markets. Our close association with some of the leading schools of hydrodynamic design has helped shape our propeller families to be some of the industry's best in efficiency and design.

ZF Marine has in-house naval architects ready to assist customers with the most challenging of applications and hull designs. Our manufacturing facility can produce propellers in a multitude of configurations, in a range of diameters from 50 centimeters (20") to 2 meters (79") or greater.

The right propeller for your application



ZF Propellers

ZF Marine offers both standard and custom designed propellers utilizing CAD-CAM design technology. From yachts to ferries, cruisers to fishing vessels, whether it's a pleasure or commercial application, ZF Marine can provide "off the shelf" products, or can custom design propellers to meet specific performance criteria.

Custom designed for individual applications

Our flexibility in being able to partner with naval architects, engineers, and end customers to design and manufacture propellers that are

unique to a single application is what sets ZF apart. Our in-house naval architects can work side by side with your project team to analyze your hull design and help maximize the performance and efficiency of the vessel's propulsion system. ZF offers complete flexibility in the diameter, number of blades, blade area ratio, section shape, skew, rake, and cupping. Our propellers can be designed to meet your exact specifications.



Design and manufacturing

ZF propellers are manufactured to ISO 484/2 tolerance standards and can be ordered to meet any classification society requirements.

Design

ZF Marine's team of design engineers offer close customer support throughout the lifecycle of a project. Once input from the customer about application and performance specification has been established, our design team runs simulations through our in-house software to complete an optimal propeller design. The design is presented to the customer and must be approved for manufacturing to commence.

Casting

High quality alloys are chosen with the exact composition to meet both ZF's quality standards and any classification society requirements. The chemical composition and physical properties of the materials are precisely controlled and tested for each cast.

Machining

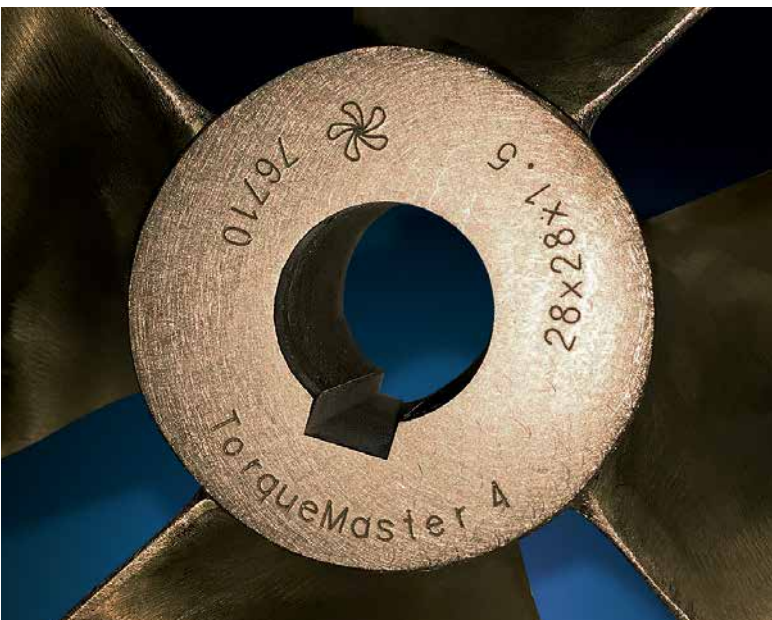
Numerical Control machining centers are linked to the designer's 3D CAD geometry files to machine the propeller to a high tolerance. ZF Marine propellers can be machined to meet the highest geometrical tolerances required by the ISO 484/2 Class S standard.

Dynamic Balance

Every propeller is dynamically balanced to ensure smooth operation. Dynamic balancing considerably reduces noise and vibration.

Inspection

The propellers are scanned by industry leading measurement devices to verify every aspect of the geometry and ensure design compliance.



All of our series and custom designed propellers are serialized for easy tracking. In the event that a propeller is damaged beyond repair, a replacement can be manufactured to the original specification.

Pleasure Craft Propellers

Pleasure Craft propellers from ZF are designed for maximum comfort and efficiency for various pleasure craft applications. Whether a sailboat, sportfish, or mega yacht, ZF has a product for the application. In addition to "standard" sized propellers ZF can create custom solutions for unique applications.



SailMaster



CruiseMaster



FishMaster

Application	Sailing Vessels	Cruisers/ Trawlers	Sportfish Boats (> 30 knots)
Number of blades	3	4, 5	4, 5
DAR range*	0.5-0.55	0.55-0.80	0.8-1.20



YachtMaster



SpeedMaster



TorqueMaster



SurfMaster

Application	Displacement Yachts	Planing Hulls (> 25 knots)	Planing Hulls (< 25 knots)	Surface Drives
Number of blades	4, 5	4, 5	4	5,6
DAR range*	0.55-1.20	0.8-1.20	0.6-0.9	0.8-1.20

Progressive Pitch

Constant Pitch

Commercial & Fast Craft Propellers

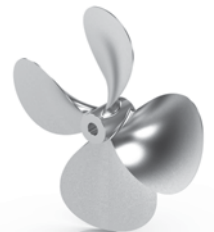
Commercial & Fast Craft propellers from ZF are designed to meet the rigours of medium and continuous duty work applications. ZF offers a wide range of options, whether in commercial or government applications, or in nickel aluminium bronze, manganese bronze or stainless steel material -- it's all about getting the work done. In addition to standard and commercial thickness options, ZF offers DuraEdge, which increases prop thickness at the tip of the blade. DuraEdge also offers increased durability and longevity for continuous duty applications.



CrewMaster



TowMaster



WorkMaster

Application	Crew Boats	Tugs/Push Boats	General Workboat
Number of blades	4	3, 4, 5	4
DAR range*	0.8-0.85	0.55-0.75	0.7

Kaplan



SurfMaster



SpeedMaster



TorqueMaster

Application	Surface Drives	Planing Hulls (> 25 knots)	Planing Hulls (< 25 knots)
Number of blades	5, 6	4, 5	4
DAR range*	0.8-1.20	0.8-1.20	0.6-0.9

Progressive Pitch

Constant Pitch

*Other DARs are available upon customer request.

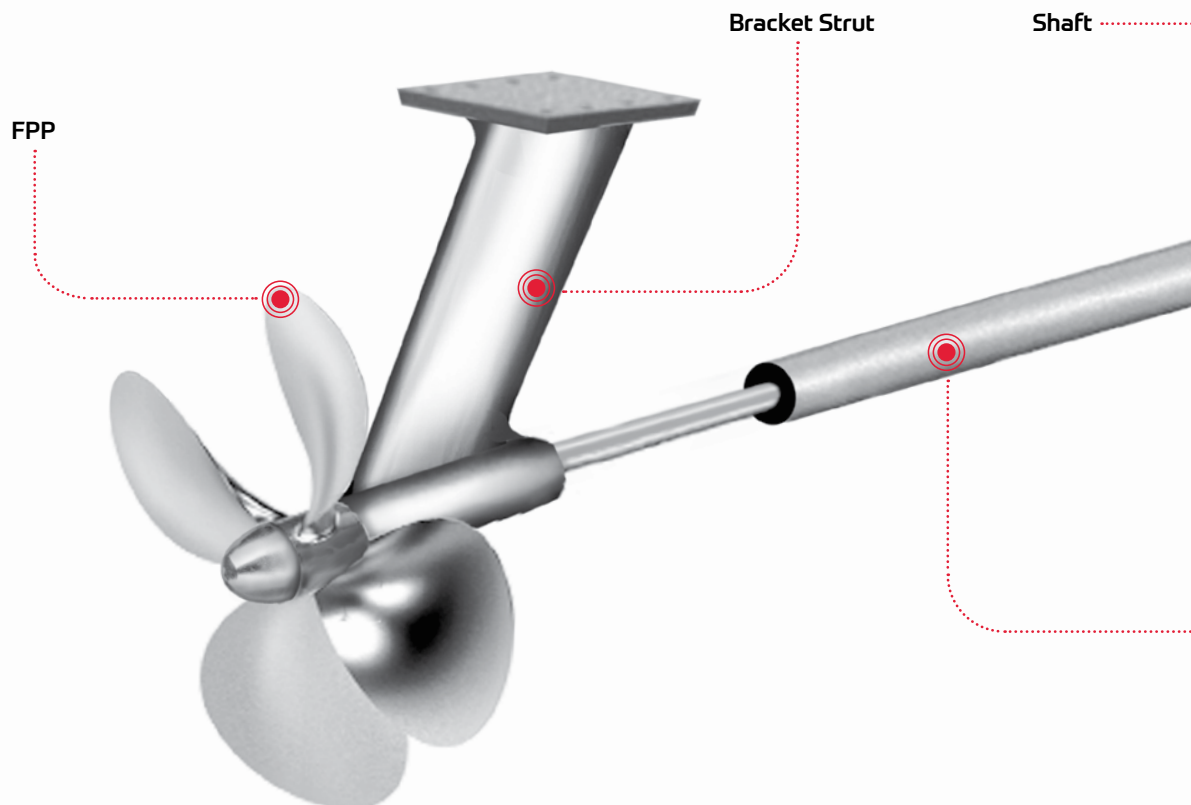
Shafting Design & Manufacture

ZF design strategy is a holistic approach to the propulsion system. We don't only make propellers, we analyse entire propulsion system of each boat starting from hull resistance prediction and hull propulsive factors. We select most efficient gear ratio, recommend changes if needed and analyse flow in every point under the hull using the most advanced CFD tools developed specifically to our requirements. This approach gives us the widest picture of possibilities we can use to run your boat more efficiently, quietly and fast or to any other specific, most demanding requirements

Propulsion Shafting Design

In order to extract the full power of the engines, ZF is able to offer a large variety of essential parts starting from the gearbox all the way to the custom designed propellers. Being able to provide shafting designs by using the required shafting calculations means that ZF is able to suit each customer's different needs of performance, price and purpose. All our proposals offer the full ZF package from gearbox, couplings, seals, bearings, sterntubes, shafts, brackets to the propellers.

All these parts are machined and matched perfectly in our ZF FPS factory in Kaohsiung to offer the highest quality standards adhering to any IACS societies rules. Additionally propellers blade thickness and stress level can be checked using our purpose built software taking into consideration non-uniform loading over the blade. This method is approved by most IACS societies and can be used as an alternative to the rules to make propeller blade thinner and more efficient.



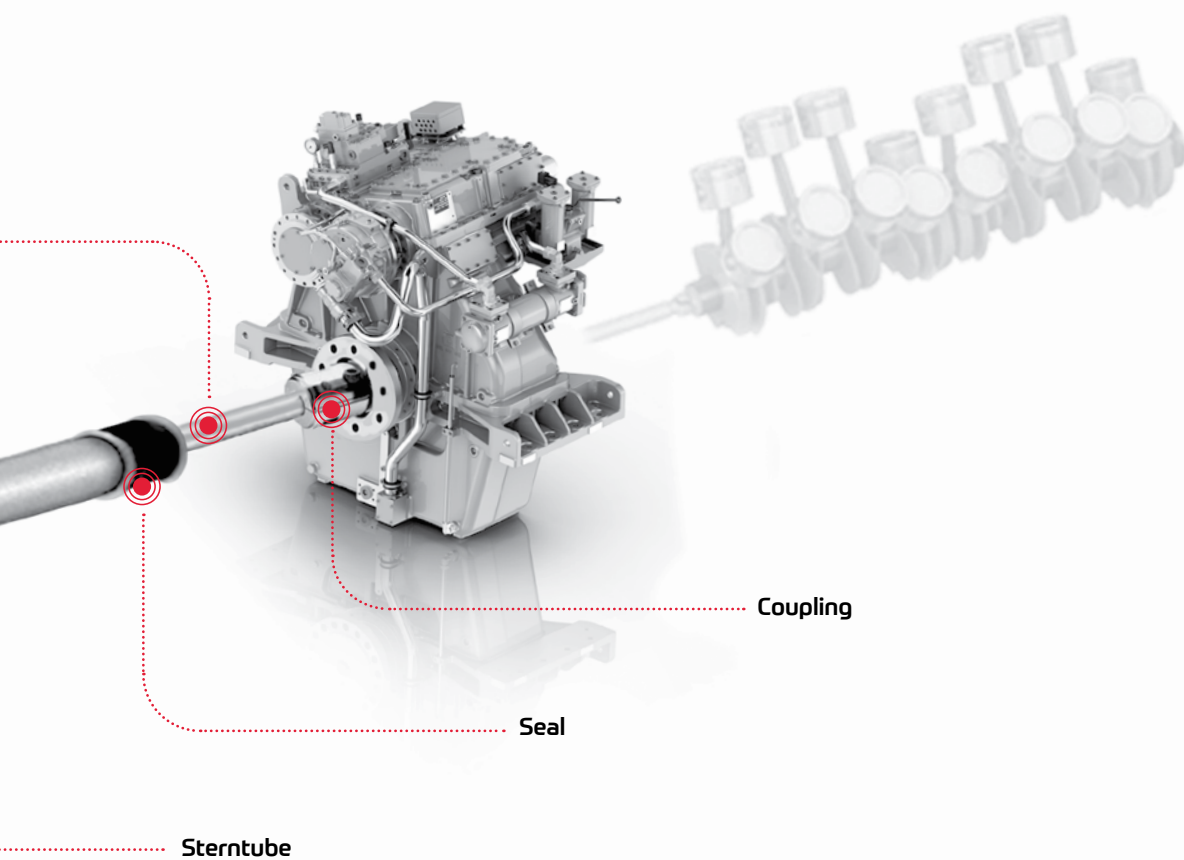
Current Range of Products

Custom Design Propeller

- Nickel Aluminium Bronze (NiAlBr)
- Manganese Bronze (MnBr)
- Stainless Steel (SS)

Shafting Packages – Parts

- Shaft – Forged Steel, SS316L, Duplex 2205, SS630 (SS17/4PH), Aqualoy Steel, etc. with taper machined at both ends including keys (or keyless), nuts and coupling c/w connection bolts and nuts.
- Bracket – Custom design and manufacture “V” and “I” Bracket boss with or without struts by fabrication or casting.
- Sterntube – Custom design and manufacture Sterntube system including pipes, bearing houses, stuffing box, Water and Oil Lubricated bearings, seals, etc.
- Additional products and services - Intermediate shaft with coupling and integral flange, nozzle, rudder stock, shaft earthing device, plummer block, shaft stopper, shaft brake, temperature sensor, etc.



References

1. 27 m Aluminum Catamaran Windfarm supply vessel "WEM3"

Main Engine

Caterpillar C32,
2 x 1081 kw @ 2300 rpm

Gear Box Ratio

ZF 3050 V, 2.75 : 1

Propeller

TorqueMaster, Diameter 1050mm x 5 Blades

Vessel Speed

26.3 knots @ 100% MCR

2. 18 m GRP Pleasure Boat "Good Newz"

Main Engine

Scania, DI16 093M,
2 x 882 kw @ 2300 rpm

Gear Box Ratio

ZF 2000 A, 2.467 : 1

Vessel Speed

32.6 knots @ 90% MCR

Propeller

TorqueMaster, Diameter 914.4mm x 5 Blades

3. 15 m Aluminum Hybrid Launch Boat "Penguin Tenaga"

Main Engines

Cummins QSC 8.3, 2 x 368 kw @ 2600 rpm

Gear Box Ratio

ZF 325-1A, 2.037 : 1

E-Motor Power

2 x 38kw

Vessel speed

7 knots @ Electric mode
24 knots @ Engine mode

Propeller

TorqueMaster, Diameter 711.2mm x 4 Blades

4. Ocean Alexander Yacht OA120 Series

Main Engines

2 x 2600HP

Gear Box Ratio

ZF5000A, 2.962:1

Design speed

20 knots

Propeller

YachtMaster, diameter 1320mm x 5 blades



Shipyard	
Boat's name or project no.	
Contact	
Phone	
Fax	
E-mail	
	Project no.: FPS
	Date

The propeller suggestion can only be as accurate as the information that you provide.

Boat information

Type of analysis	Powerboat <input type="checkbox"/>	Sailboat <input type="checkbox"/>	Re-power <input type="checkbox"/>	Year	New _____	Old _____	Years _____	
Boat use	Work/commercial <input type="checkbox"/>	Towing <input type="checkbox"/>	Pleasure <input type="checkbox"/>	Hull type	Displacement <input type="checkbox"/>	Semi-Disp. <input type="checkbox"/>	Planing <input type="checkbox"/>	
Bottom design	Open <input type="checkbox"/>	Tunnel <input type="checkbox"/>	Pocket <input type="checkbox"/>	Appendage	Skeg <input type="checkbox"/>	Wedge <input type="checkbox"/>	Stabilizer <input type="checkbox"/>	Rope cutter <input type="checkbox"/>
Hull material	Fiberglass <input type="checkbox"/>	Wood <input type="checkbox"/>	Aluminum <input type="checkbox"/>	Classification	_____			

1. Hull data

Light load displacement _____ Half load displacement _____ Full load displacement _____

Length overall _____ Length waterline _____ Bpx (max. chine beam) _____

LCG from transom _____ Deadrise angle at midship _____°, at transom _____°

Draught at full load _____ Draught at midship _____ Shaft angle _____

Max. diameter _____ Clearance _____ Distance between hull and center of prop. shaft _____

Shaft diameter SAE Metric Size _____ Sterntube lub Water Oil

Shaft Material _____ Bracket V P

2. Existing or new engine data

Number of engines Single Twin Triple Other Manufacturer _____ Model _____

Maximum engine rating _____ HP KW Cv @ _____ rpm

Make and type of gearbox _____ Reduction ratio _____ : 1

Demand speed, or not Yes _____ knots @ _____ tons No if no, suggested by ZF-FPS

If re-power, fill in the above with NEW engine data and try your best to fill in the item 3 for existing propeller data and item 4 for repower data.

3. Existing propeller data

Manufacturer _____ Model/series _____ Material MnBr NiAlBr Stainless Steel

Propeller Size Diameter _____ x Pitch _____ x Blade _____ x Area Ratio _____

Existing performance Full throttle ship speed _____ mph knots @ _____ tons (sea trial disp.)

Full throttle engine rpm _____ rpm @ engine load _____ %

4. Re-power data (old engine information)

Number of engines Single Twin Triple Other Manufacturer _____ Model _____

Maximum engine rating _____ HP KW Cv @ _____ rpm

Make and type of gearbox _____ Reduction ratio _____ : 1

Existing performance Full throttle ship speed _____ mph knots @ _____ tons (sea trial disp.)

Full throttle engine rpm _____ rpm @ engine load _____ %

ZF Group

ZF Faster Propulsion System Co. Ltd.

Sales of Fixed Pitch Propellers
17, Dayou 1st Street
Dafa Industrial District, Daliao District,
83163 Kaohsiung City
Taiwan, R.O.C.
Phone +886 7 7871831
info.kaohsiung@zf.com

ZF Friedrichshafen AG

Marine & Special Driveline Technology
Ehlersstr. 50
88046 Friedrichshafen
Germany
Phone +49 7541 77-2207
info.zfmarine@zf.com

ZF Marine Krimpen B.V.

Zaag 27, P.O. Box 2020
2930 AA Krimpen aan de Lek
The Netherlands
Phone +31 180 331000
info.zfmarine@zf.com

ZF Padova s.r.l.

Via Penghe, 48
35030 Caselle di Selvazzano (PD)
Italy
Phone +39 049 8299 311
info.zfmarine@zf.com

www.zf.com/marine



twitter.com/zf_group
facebook.com/zffriedrichshafen
youtube.com/zffriedrichshafenag