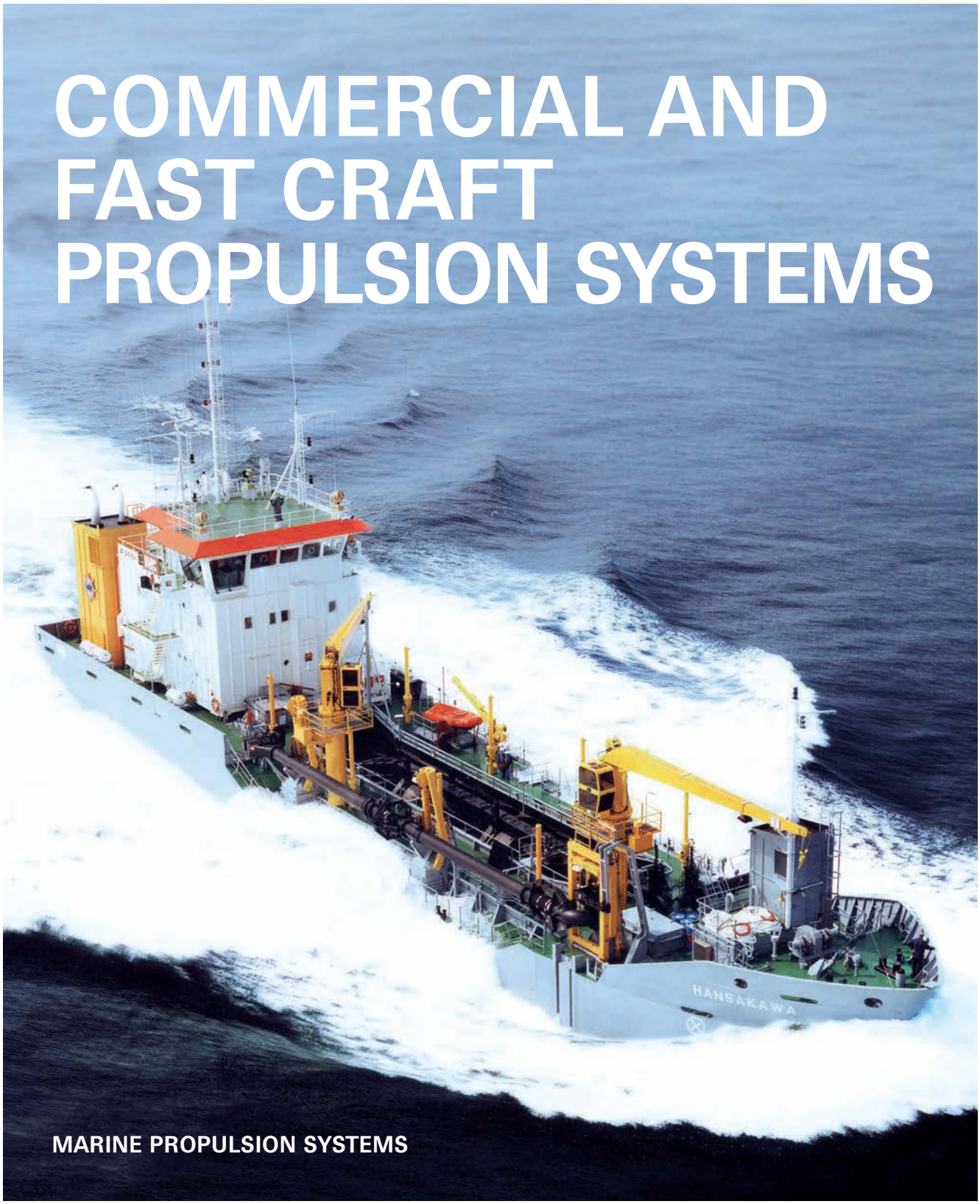
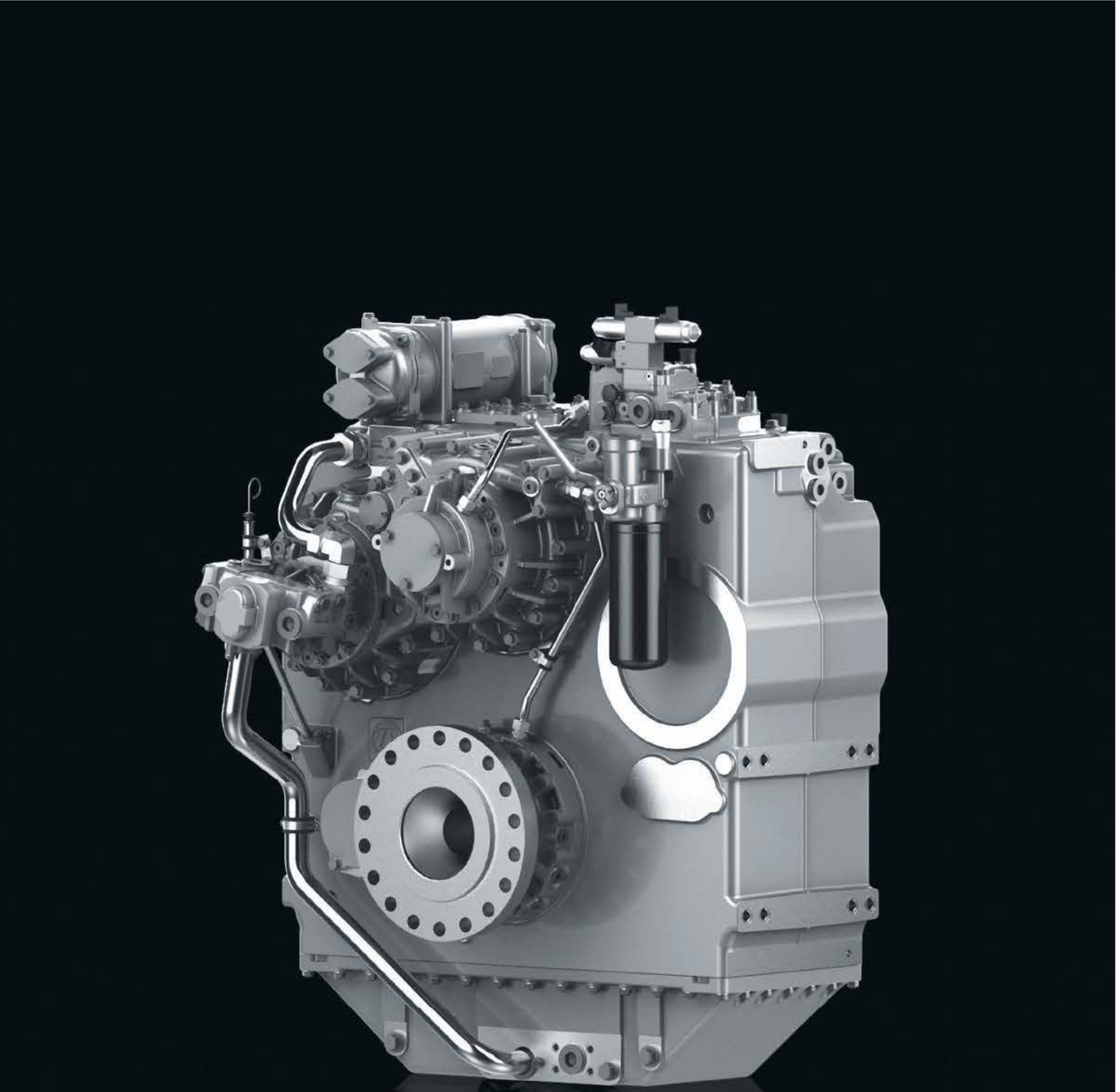
COMMERCIAL AND FAST CRAFT PROPULSION SYSTEMS



MARINE PROPULSION SYSTEMS



Content

COMMERCIAL AND FAST CRAFT PROPULSION SYSTEMS

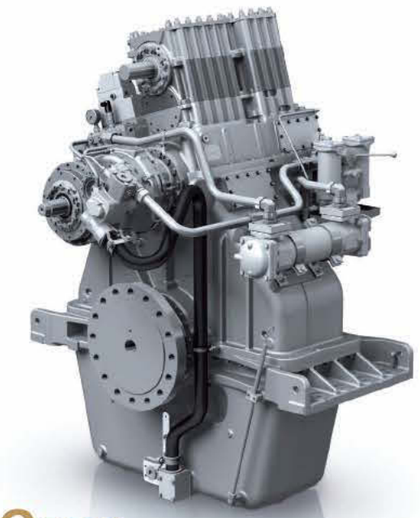
The Business Unit “Marine Propulsion Systems” of ZF Friedrichshafen AG is a leader in the marine market. ZF Marine supplies propulsion systems and components for all types of vessels – motor yachts, defense craft, high speed ferries, workboats and commercial vessels, in a power range up to 14,000 kW – 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.

TRANSMISSIONS

COMMERCIAL APPLICATIONS

With its outstanding ToughGear series ZF Marine Propulsion Systems provides a complete line of heavy duty transmissions featuring robust cast iron casings built to ZF's industry recognized "Class 1A" specification. Numerous ratios are available that perfectly match today's medium speed diesel engines.

- ZF W2300 / W2400
- ZF W3300 / W3700
- ZF W5300
- ZF W7600
- ZF W10000
- ZF W11000 / W11100 / W11200
- ZF W17000 / W17100 / W17200
- ZF W23100
- ZF W33100
- ZF W43000 / W43100
- ZF W63000
- ZF W83000 / W83100
- ZF W93100
- ZF W103100



ToughGear

FAST CRAFT APPLICATIONS

Large motor yachts, superyachts, offshore supply vessels, government vessels and fast ferries are typical applications for this series of marine transmissions, that is characterized by an optimum power to weight ratio, capable of withstanding high loads under extreme operating conditions.

- ZF 5000
- ZF 7600
- ZF 9000
- ZF 24000
- ZF 30000
- ZF 40000
- ZF 53000
- ZF 60000
- ZF 83000

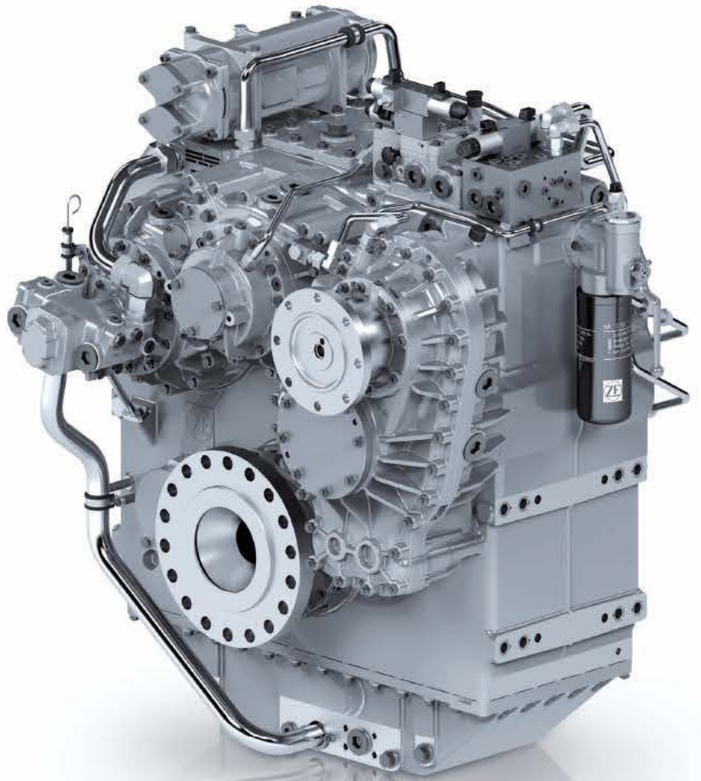
HYBRID-READY TRANSMISSIONS

For installation in medium and large vessels ZF Marine Propulsion Systems has developed a series of hybrid ready marine transmissions for Commercial and Fast Craft applications. Variants of both the ToughGear series and fast craft transmissions feature optional Power Take In (PTI) drives with various gear ratios.

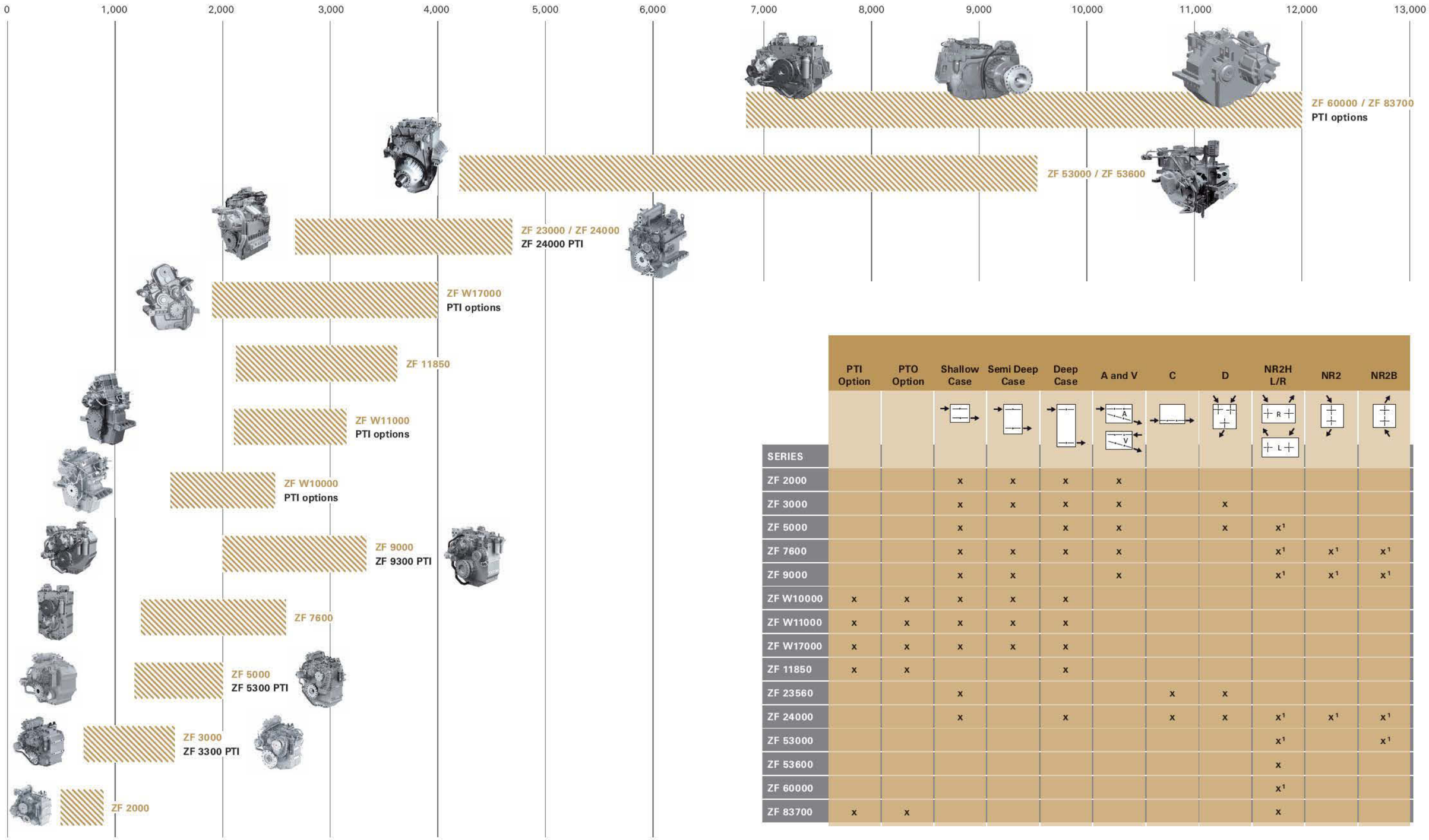
- ZF 3300 PTI
- ZF 5300 PTI
- ZF 9300 PTI
- ZF 24300 PTI

PTI options available for:

- ZF W10000
- ZF W11000
- ZF W17000
- ZF 83700



TRANSMISSIONS – COMMERCIAL AND FAST CRAFT APPLICATIONS



Engine power in kW

PTI Option	PTO Option	Shallow Case	Semi Deep Case	Deep Case	A and V	C	D	NR2H L/R	NR2	NR2B
SERIES										
ZF 2000		x	x	x	x					
ZF 3000		x	x	x	x		x			
ZF 5000		x		x	x		x	x[1]		
ZF 7600		x	x	x	x			x[1]	x[1]	x[1]
ZF 9000		x	x		x			x[1]	x[1]	x[1]
ZF W10000	x	x	x	x						
ZF W11000	x	x	x	x						
ZF W17000	x	x	x	x						
ZF 11850	x	x			x					
ZF 23560			x				x	x			
ZF 24000			x		x		x	x	x[1]	x[1]	x[1]
ZF 53000									x[1]		x[1]
ZF 53600									x		
ZF 60000									x[1]		
ZF 83700	x	x							x		

[1] Waterjet only

TRANSMISSION FUNCTIONALITIES

ZF SUPERSHIFT®

ZF Marine Propulsion Systems SUPERSHIFT® is a purely mechanical-hydraulic clutch control system operated by simple on-off solenoid valves.
The system deploys standard components only and does not require electronic controls.
Thus it represents the maximum possible robustness and dependability. SUPERSHIFT® is fitted to ZF Marine Propulsion Systems transmissions as standard equipment without any extra cost.

SUPERSHIFT®

ZF SUPERSHIFT®

- features minimum harness and plug connections
- does not depend any electric power supply
- is not rated to the limit thus avoiding problems at critical maneuvers (e.g. crash stop)
- allows for very fast shifts, limited by the risk of engine stalling only (clutch pressure modulated in two steps)
- shift quality is not effected in any emergency case
- "come home" – screws are installed in all model
- matches all requirements of any classification society
- allows for adding on other functionalities like ELECTRIC TROLL, AUTOTROLL® and DYNAMIC POSITIONING

The revolutionary 65m Fast Displacement Galactica Star – photo credits Jeff Brown – courtesy of Heesen Yachts

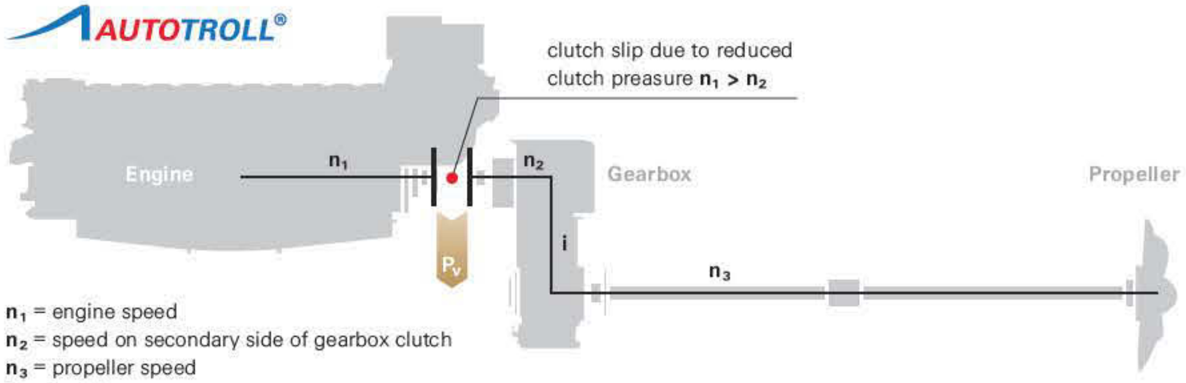
ZF AUTOTROLL®

The ZF AUTOTROLL® device provides infinitely variable propeller speed control when there is a need to run slower than the engine's idling speed will allow.
This may be necessary in case the craft's speed is still too high, even with the engine running at its minimum permissible speed.

Typical applications are:

- slow-speed running
- maneuvering in harbors and at moorings
- assisting DP-systems of authority vessels, rescue vessels, etc.
- towing small boats
- sport fishing at the optimum trolling speed

AUTOTROLL®



n_1 = engine speed
n_2 = speed on secondary side of gearbox clutch
n_3 = propeller speed
P_v = heat loss
i = gearbox ratio

DYNAMIC POSITIONING CAPABILITIES

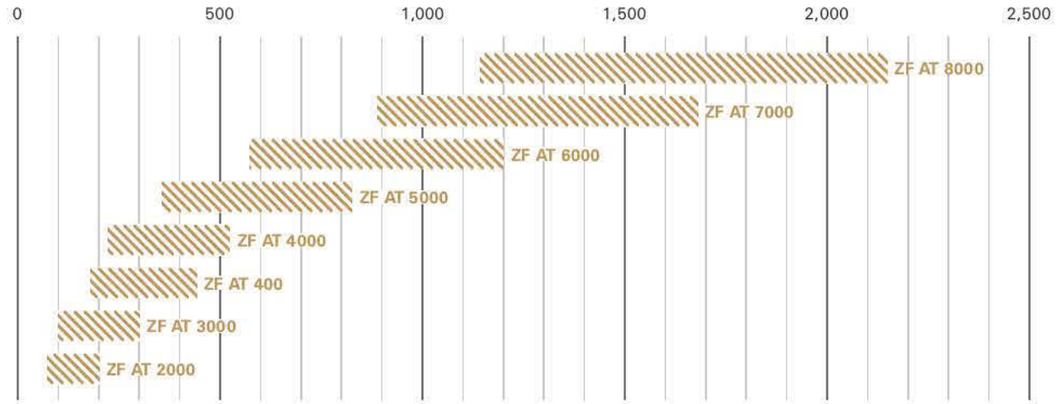
ZF Marine Propulsion Systems transmissions are designed to work in the most demanding applications.
Our systems are designed for the tough duty cycles that workboats face. The SUPERSHIFT® and AUTOTROLL® features, combined with ZF Marine Propulsion Systems controls enable the propulsion system to respond quickly and with the right amount of thrust to hold the vessel's position even in challenging weather conditions.
All without risking damage to the transmission, and for as long as the vessel needs to be on station.

THRUSTER SYSTEMS

COMMERCIAL APPLICATIONS

With a comprehensive portfolio of thruster systems ZF Marine Propulsion Systems demonstrates its position as leading supplier to the marine industry.

Azimuth and tunnel thrusters in virtually any configuration are available up to an input power of 2,150 kW.



Power range of ZF Azimuth Thrusters without classification restrictions

Engine power in kW

Series ZF AT 2000 – 8000 WM-FP
Well mounted (placed below deck) steerable azimuth thrusters, fixed pitch propeller, diesel or electric drive, 180 kW – 2,000 kW input power

Versions
- Z-drive (horizontal input shaft)
- L-drive (vertical input shaft)

Series ZF AT 2000 – 5000 WM-CR
Steerable azimuth thruster with contra-rotating propellers for higher efficency and comfort on board, 150 kW – 770 kW

Versions
- Z-drive and L-drive

Series ZF AT 2000 – 8000 RT-FP
Retractable azimuth thruster, mostly used as auxiliary or back up propulsion, designed for offshore applications like OSVs and PSVs, 180 kW – 2,000 kW

Versions
- Z-drive and L-drive

ZF AT 2000 8000 WM FP Z Drive

ZF AT 2000 8000 WM FP L Drive

ZF AT 2000 5000 WM CR

ZF AT 2000 8000 RT FP

Series ZF TT 1000 – 8000 FP
Fixed pitch tunnel thruster, 100 kW – 2,000 kW

Series ZF TT 4000 – 5000 CP
Controllable pitch tunnel thruster, 500 kW – 850 kW

Versions
- Z-drive and L-drive

Series ZF SDT 2000 – 6000 FP
Shallow draught thrusters, for use in shallow waters, 100kW – 825 kW

Versions
- Z-drive and L-drive

Series ZF AT 2000 – 6000 DM-FP
Deck-mounted azimuth thruster placed on deck, containerized prime mover, 180 kW – 1,200 kW

Versions
- Z-drive only

ZF TT 1000 – 8000 FP

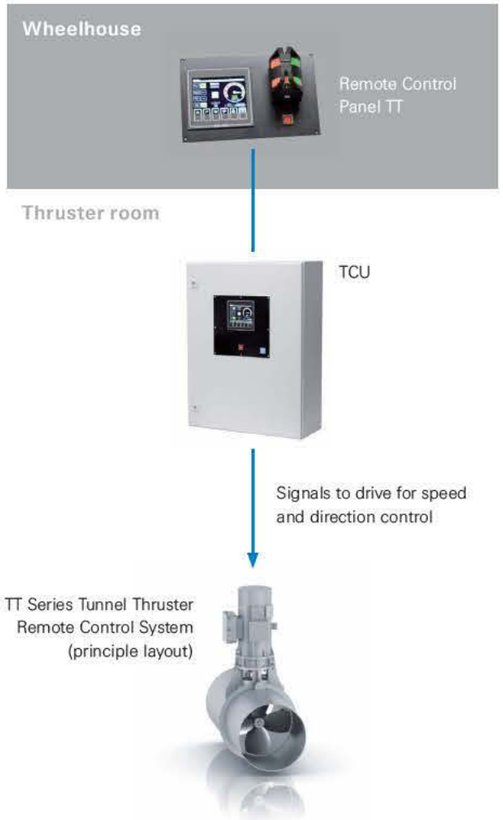
ZF SDT 2000 – 6000 FP

ZF AT 2000 – 6000 DM-FP

CONTROL SYSTEMS

ZF Marine Propulsion Systems manufactures multiple levels of commercial grade propulsion control systems to meet the various needs and requirements of commercial vessel operators.
Whatever the application – from the most basic tug boat to large offshore supply vessels with highly sophisticated Dynamic Positioning equipment – we provide the suitable propulsion control systems for mechanical or electronic engine and transmission operation. Our systems are designed for the harsh engine room environment and comply with stringent classification standards.

When it comes to ZF thruster systems, complete remote control systems are standard in the scope of supply. The control system is designed to control a single azimuth thruster, providing follow-up steering- and propulsion control, as well as independent backup- and emergency stop functionality. Moreover, it is capable of interfacing with diesel engines and electric or hydraulic motors as power source for propulsion.
For steering the system interfaces with a hydraulic or electric steering system.



ZF TT Series Tunnel Thruster Remote Control System (principle layout)

REFERENCES


Photo credits Jeff Brown courtesy of Heesen Yachts

ALUMINIUM YACHT "GALATICA STAR"
Shipyard : Heesen Yachts – Netherlands
Main engines : 2x MTU 20V 4000 M93L
Max. power : 2x 4,300 kW
Gear type : 2x ZF 23560C
Bowthruster : ZF TT 2001 FP ALU, electric
Length o.a. : 65.00 m / 213 ft 2 in
Beam o.a. : 11.30 m / 37 ft 7 in


Courtesy of AUSTAL

JOINT HIGH SPEED VESSEL (JHSV)
Shipyard : Austal – Australia
Main engines : 4 x MTU 20V8000 M71L
Power : 4x 9.1 MW
Gear type : 4x ZF 60000NR2H
Waterjets : 4x Wartsila WLD 1400 S

OFFSHORE SUPPLY VESSEL 65M, HYBRID PROPULSION, (DIESEL / ELECTRIC)
Shipyard : Megaride – Italy
Diesel engines : 2x CAT3516B (1,864 kW)
Electric motor : 2x Siemens (180 kW)
Gear type : ZF 9300 PTI

45 TONS BOLLARD PULL TUG "SHUSWAP"
Shipyard : Sylte Shipyard Ltd – Canada
Main engines : MTU 12V 4000 M81R
Power : 2x 1,200 kW
Gear type : 2x ZF 6311WM
Length o.a. : 17.67 m / 58 ft
Beam o.a. : 8.58 m / 28 ft 2 in

OFFSHORE PATROL VESSEL „CAPE CLASS"
Shipyard : Austal – Australia
Main engines: 2x Caterpillar C18
Max. power : 2x 2,525 kW
Propulsion : 2x ZF9050A
2x ZF Shaft brakes – SB32
1x ZF tunnel thruster – 2001-FP
Controls : ZF ClearCommand

32M MULTIPURPOSE VESSEL DP-2 "ANNA-B"
Shipyard : Neptune Shipyards B.V. – Netherlands
Bow : 2x ZF SDT 4010 (250 kW, electric)
Stern : 2x ZF AT 6311 WM (1,140 kW, diesel)
Length o.a. : 32.00 m / 105 ft
Beam o.a. : 12.00 m / 39 ft 4 in

RIVER PUSHER TUG "M/V AMERICAN WAY"
Shipyard : Steiner Shipyard Inc. – USA
Engines : 2x Caterpillar C32
Max. power : 2x 1,400 kW
Propulsion : 2x ZF AT 5111 WM FP
Length o.a. : 23.00 m / 75 ft 6 in
Beam o.a. : 9.00 m / 29 ft 6 in

81M WIND FARM INSTALLATION VESSEL "ZARATAN"
Shipyard : Lamprell plc – Dubai
Propulsion : 2x ZF AT 8011 RT (2,000 kW)
3x ZF AT 7011 WM (1,500 kW)
Length o.a. : 81.00 m / 265 ft 9 in
Beam o.a. : 41.00 m / 134 ft 6 in

SURVEY VESSEL „SEA SCOUT"
Shipyard : All American Marine Inc. – USA
Engines : 2x Caterpillar C32
2x Caterpillar C18
Gear types : 2x ZF 3055A
2x ZF 550V
Propulsion : 4x ZF propellers
Controls : ZF Smart Command Controls

MULTI-PURPOSE CARGO VESSEL "ABIS DOVER"
Shipyard : Shipkits B.V. – Netherlands
Bow : 2x ZF TT 4004 (400 kW)
Stern : 2x ZF AT 7111 WM (1,445 kW)
Length o.a. : 107.95 m / 354 ft 2 in
Beam o.a. : 16.00 m / 52 ft 6 in

THE ZF GROUP

Shaping the future responsibly

Our enthusiasm for innovative products and processes and our uncompromising pursuit of quality have made us a global leader in driveline and chassis technology. We are contributing towards a sustainable future by producing advanced technology solutions with the goal of improving mobility, increasing the efficiency of our products and systems, and conserving resources.

Our customers in the automotive and industrial sectors welcome our determined focus on products and services, which provide great customer value. Improvements in energy efficiency, cost-effectiveness, dynamics, safety, and comfort are key to our work. Simultaneously, we are aiming for continuous improvement in our business processes and the services we provide. As a globally active company, we react quickly and flexibly to changing regional market demands with the goal of always providing a competitive price/performance ratio.

Our independence and financial security form the basis of our long-term business success. Our profitability allows us to make the necessary investments in new products, technologies, and markets, thus securing the future of our company on behalf of our customers, market affiliates, employees, and the owners of ZF.

Our tradition and values strengthen our managerial decisions. Together, they are both an obligation and an incentive to maintain a reliable and respectful relationship with customers, market affiliates, and employees. Our worldwide compliance organization ensures that locally applicable laws and regulations are adhered to. We accept our responsibility towards society and will protect the environment at all of our locations.

Our employees worldwide recognize us as a fair employer, focusing on the future and offering attractive career prospects. We value the varied cultural backgrounds of our employees, their competencies, and their diligence and motivation. Their goal-oriented dedication to ZF, beyond the borders of their own field of work and location, shapes our company culture and is the key to our success.

MOTION AND MOBILITY

Pkw Antriebstechnik
Car Powertrain Technology

Pkw Fahrwerktechnik
Car Chassis Technology

Nutzfahrzeugtechnik
Commercial Vehicle Technology

Industrietechnik
Industrial Technology

Lenksysteme
Steering Systems

ZF Lenksysteme GmbH ist ein Gemeinschaftsunternehmen der ZF Friedrichshafen AG und der Robert Bosch GmbH.
ZF Lenksysteme GmbH is a joint venture of ZF Friedrichshafen AG and Robert Bosch GmbH.

SACHS · LEMFÖRDER · BOGE · ZF Parts · ZF Lenksysteme

ZF Services

Learn more about ZF

ZF Padova s.r.l.
Via Penghe, 48
35030 Caselle di Selvazzano (PD)
Italy
Phone +39 049 8299 311
Fax +39 049 8299 550
info.zfmarine@zf.com

ZF Friedrichshafen AG
Marine Propulsion Systems
Ehlersstr. 50
88046 Friedrichshafen
Germany
Phone +49 7541 77 2207
Fax +49 7541 77 4222
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
Fax +31 180 331099
info.zfmarine@zf.com

www.zf.com/marine

August 2014

MOTION AND MOBILITY