



Propeller & Aft Ship solutions

MAN Energy Solutions
Future in the making

Highly efficient
MAN Alpha propulsion





Future in the making

Our engineers and digital specialists focus on crosslinking engineering with the possibilities of today's world: we shape the advancement of power generation, marine transport and industrial engineering. Whether engines, components or complex systems – we aim to deliver intelligent solutions that assure your competitiveness for years to come.

This mission is reflected in our new company name: MAN Energy Solutions. Our products and services utilize the latest technologies. We don't react to trends; we create the next step. As your partner, we connect the dots in an ever-changing world, providing you with long-term solutions that boost your business and help to bring the world a step closer to carbon neutrality.

MAN Energy Solutions: Future in the making.

To follow, or to lead?





The world in which we live is changing more rapidly than ever. A growing population and increasing demand for energy requires the shift towards more sustainable forms of energy generation. We are ready to tackle this challenge.

With the invention of the diesel engine, our visionary founder transformed the entire industry by creating a mechanism of – at the time – unknown efficiency. Transformation is in our genes. Today, the setting has changed, yet our pioneering spirit remains. We lead the industrial world towards a more sustainable future by combining our world-class engines, turbines, turbochargers, compressors, propellers, and reactors with the possibilities of the digital era. And we want you to join us. As your partner, we create customized solutions for your specific needs and support you in this time of change and transition. Together, we can pave the way for a climate-neutral yet economically successful future. Let's get started.



Envisioning tomorrow

The starting point of all our innovation is you. We focus on the individual requirements and goals of our customers and work on solutions to meet even the most specific needs. We benefit from our in-depth knowledge in the sectors of mobility, transport and energy, and draw from decades of technical and operational experience.

We are known for offering the industry's most advanced products, which boast legendary quality. Closing supporting our customers with expert advice when it comes to developing the best possible solutions is one of our core competencies. When it gets tricky, we start to feel at ease.

Converting companies to more environmentally friendly and cost-efficient operation is a key issue for most of our clients. Our goal is to provide our customers with solutions that gradually reduce the consumption of fossil fuels. We don't think "product"; we envision holistic solutions that meet our clients'

requirements and comply with even the most stringent legal regulations.

If you are looking to make your company future-proof, count us in.



Pushing the limits

To think ahead means to think holistically. That's why we offer complete systems that are uniquely reliable for lasting performance. We support our clients to help them achieve their goals in rapidly changing environmental and regulatory conditions.

Digital and data-based technologies are the cornerstones for the development of future-proof drive and power generation systems. Take our intelligent energy management solutions for example. The energy management system in our battery-hybrid propulsion solutions controls the generation, storage and distribution of power onboard the ship. This optimizes the overall performance, further increases safety and system reliability, and results in maximum efficiency and lower operational costs.

Another application is to improve the availability of renewable energy: wind and solar power can be made more reliable by storing surplus power and using instant power top-ups from engine and turbine gensets fuelled by gas or bio fuels. Renewable energy systems can even be added to power plants to act as fuel savers and hybrid island power systems – digital solutions that will drastically help to reduce the carbon footprint.



Propulsion systems for low emissions and high cost efficiency





Our propeller and aft ship products offer a wide range of high-efficiency propulsion solutions and services – attractive for both current, new and future ship designs, and for retrofit upgrading of existing propeller and aft ship installations.

To realize environmentally friendly – yet reliable – energy systems, different methods need to be combined and managed. With a close eye on our customers' needs, we develop key components and smart management solutions that interact effortlessly to allow these systems to be operated both sustainably and efficiently – at a very high level.

MAN Energy Solutions is the world's leading provider of large-bore diesel engines, turbomachinery, and integrated power systems. We produce four-stroke and two-stroke engines for marine and stationary applications, turbochargers, propellers and aft ship systems, gas and steam turbines, compressors and chemical reactors. Our system expertise is focused on emission reduction, complete propulsion packages, diesel-mechanical,

diesel-electrical, electrical and hybrid propulsion, dual fuel, LNG and digitized services.

It is our goal to minimize fuel consumption while complying with the most advanced emission regulations. MAN PrimeServ supports our customers all around the world with a comprehensive range of after-sales services.

When it comes to energy transition at sea, we are here to help: our latest series of LNG engines significantly reduces emissions. We are constantly committed to increasing the performance and the energy efficiency of our solutions. Increased propulsive efficiencies provide savings and reduced environmental footprints via lower fuel oil consumptions and reduced exhaust gas emissions. Our hybrid-propulsion solutions offer a

maximum of efficiency and extremely flexible use of power in all different working mode – whatever you are up to.

With growing concern about the state of our oceans, the marine industries are facing new challenges and increasingly tough regulations. With MAN ECO CONTROL, we provide you with all the key technologies to keep emissions, efficiency and operation under control – and you one step ahead. Whether you are operating your fleet in environmentally sensitive areas, under strict safety regulations or working under harsh conditions far out on the ocean; whether you are navigating the continents with valuable freight and changing fuel prices or protecting your homeland – MAN Energy Solutions is your partner of choice when failure is not an option.

Moving forward



Propelling ships and trade on all seas and waterways

From the early days of invention and shipboard deployment of a 'screw propeller', the principle of which can be dated back to Archimedes – the propellers have just developed decade by decade and grown in size, power density and design complexity. The propellers' transmission of rotational power and torque into thrust and ship propulsion turned out more and more efficiently.

Today's propeller demands and propulsion benchmarks for the individual ship applications have become very specific, further refined and optimized than ever before. Be it for example rough pulling power required by anchor handling tug supply vessels or efficient and super silent high-comfort sailing for cruise liners.

MAN Energy Solutions has delivered more than 7,000 propellers for the propulsion of ships at all corners of the globe – operating under various and extreme environments ranging from tropical fresh water to ice-packed arctic climates, and the more ordinary and dominating trades in oceanic, coastal, inland waterway shipping or workboat services via shallow waters, lakes, channels, rivers and harbors. With our MAN Alpha propeller designs, we are ready for the future challenges and demands regarding climate change, development of new ship designs and changes to global shipping.

Contents

MAN system expertise



Propulsion
optimization

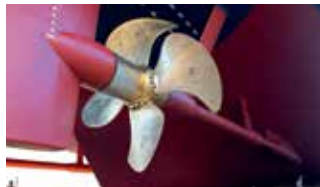
14



Hybrid
propulsion

18

MAN Alpha Propeller & Aft Ship solutions



Controllable
pitch

20



Clean shipping is
the future

32



Fixed
pitch

24



Efficiency
improving devices

34



Kappel
design

28



Propeller
nozzle

38

MAN PrimeServ



Alphatronic 3000 **42**



Service with passion **54**



System competence **46**



Worldwide service **56**



Retrofit and upgrade **52**

Turning power into movement

Propulsion optimization

Your ship's operational profile is determinant. We adapt our packages to your needs and ensure that all of the components match optimally with the main engines, while you get all components from a single supplier. Moreover, when a ship's profile changes, we can also retrofit propulsion packages.

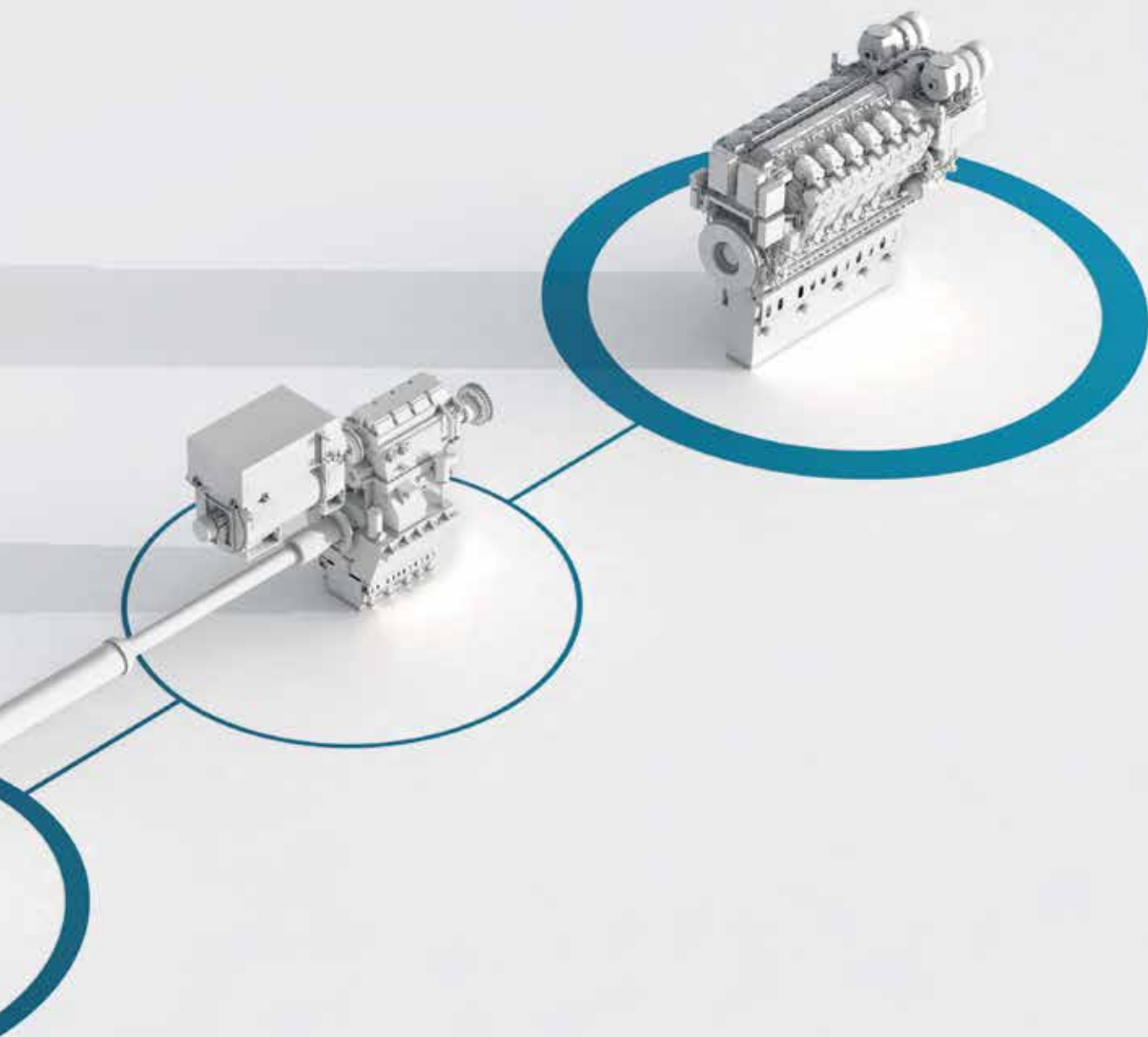


In constant pursuit of energy efficiency

Our expertise in complete propulsion packages goes back to 1902, when we produced the first Alpha controllable pitch propeller. Starting from a complete understanding of the ship's operational profile, we can now optimize all the relevant components: engine, gearbox, PTO, propeller blades, nozzle, rudder, and propulsion control system.

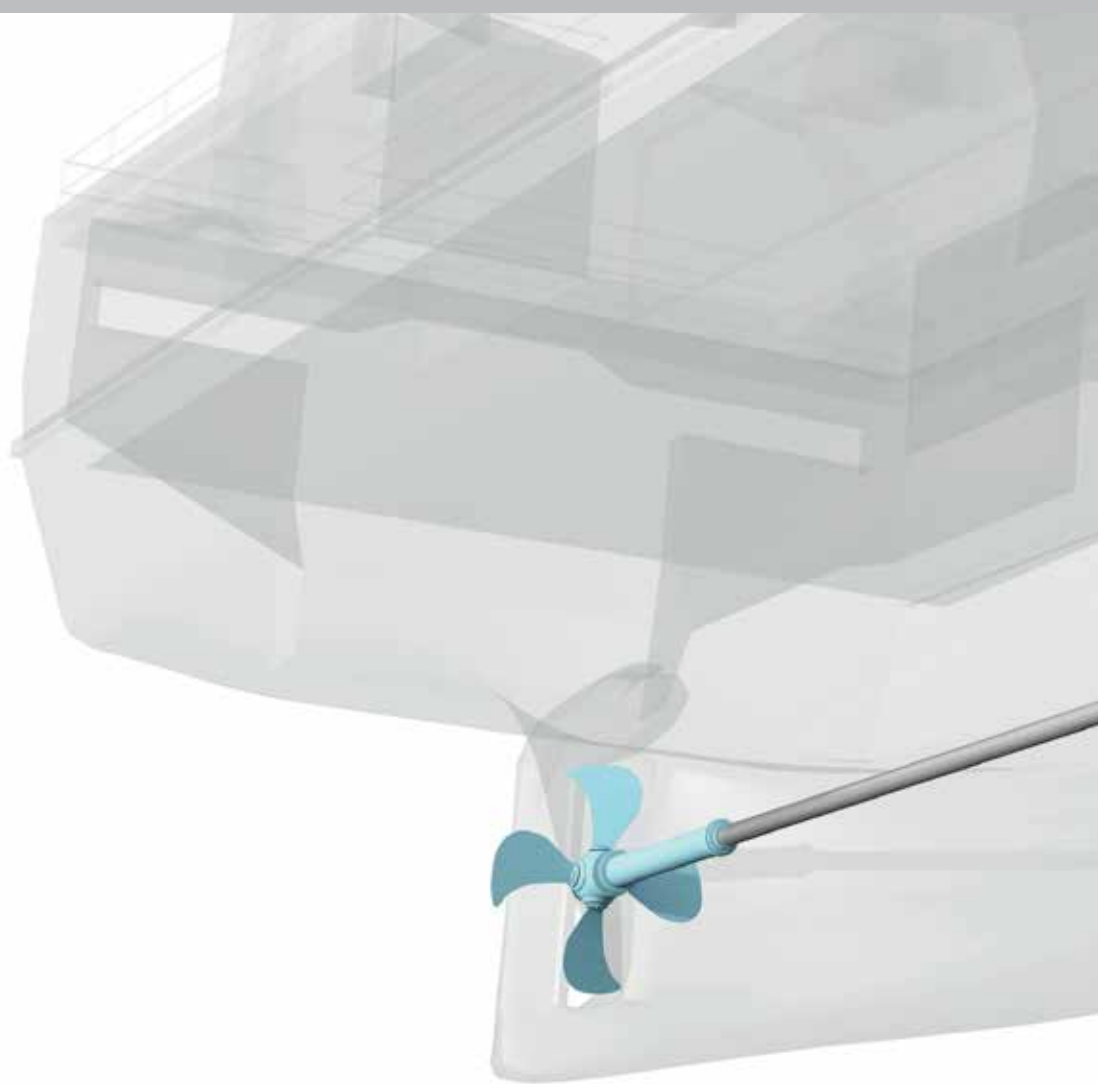
Comprehensive expertise

No matter how complex your needs are, we can customize a solution that delivers the best propulsive efficiency and gives your ship a greener profile. Using RENK gearboxes, MAN Alpha propellers and aft ship systems, and hybrid propulsion systems, we lower fuel consumption and emissions while ensuring reliability, durability and higher output.



Because every ship is different

Propulsion optimization



Quality components for maximum efficiency

RENK is a globally recognized manufacturer of special gear units and propulsion components including “power take-off”, “power boost”, “take-home” and “hybrid” concepts. The MAN Alphatronic 3000 propulsion control system not only optimizes the function of the propeller but also of the engine in terms of maneuverability and overall economy. Efficient MAN Alpha propellers and aft ship systems result in more energy-efficient transport and a reduced impact on the environment. MAN Alpha propeller nozzles can be customized to optimize the propeller thrust and pulling performance to the vessels’ working patterns.

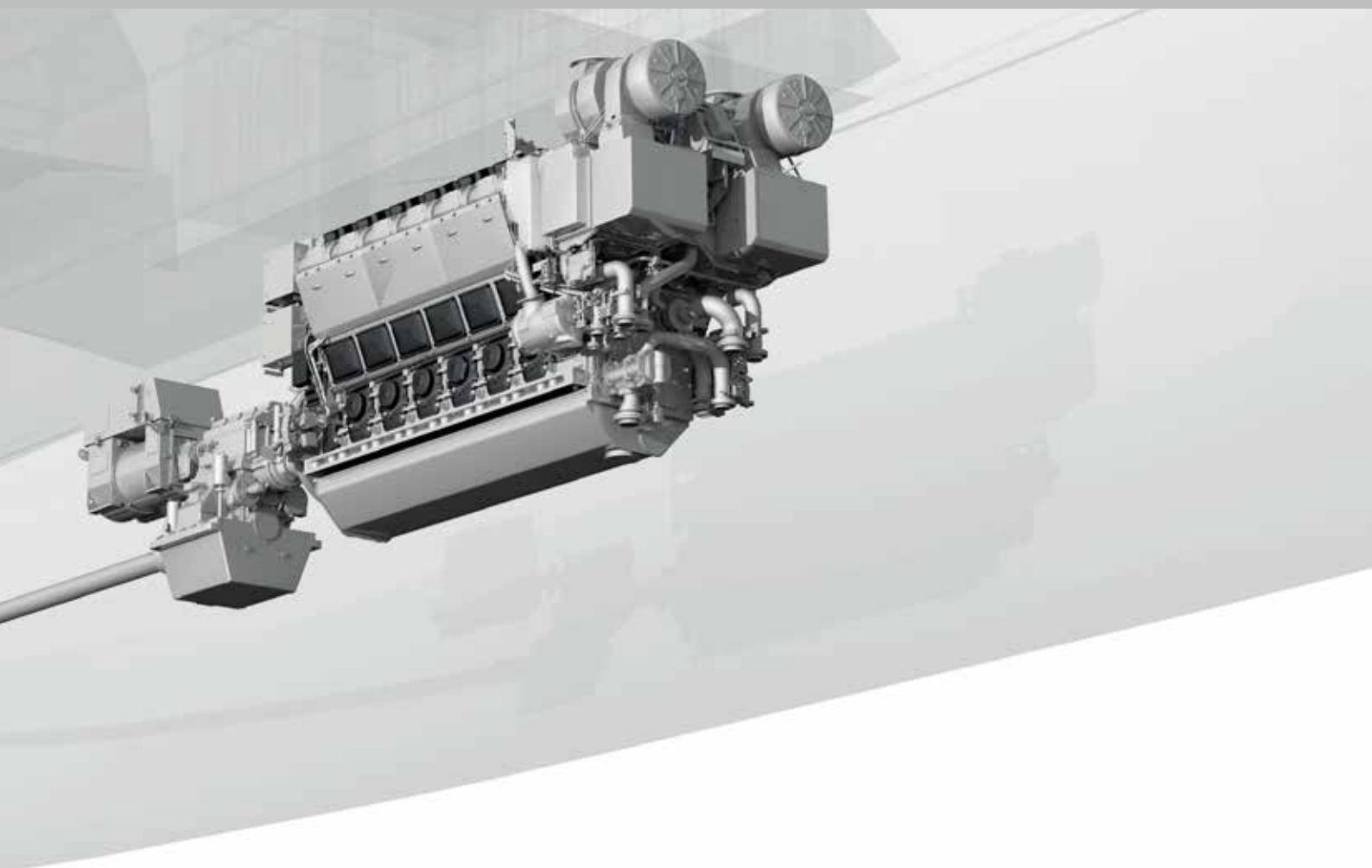
Benefits

All components tailored to your needs

Optimized for your ship’s operational profile

All components from one source

One point of contact, and one contract



Alternative routes to cost-effectiveness

Hybrid propulsion

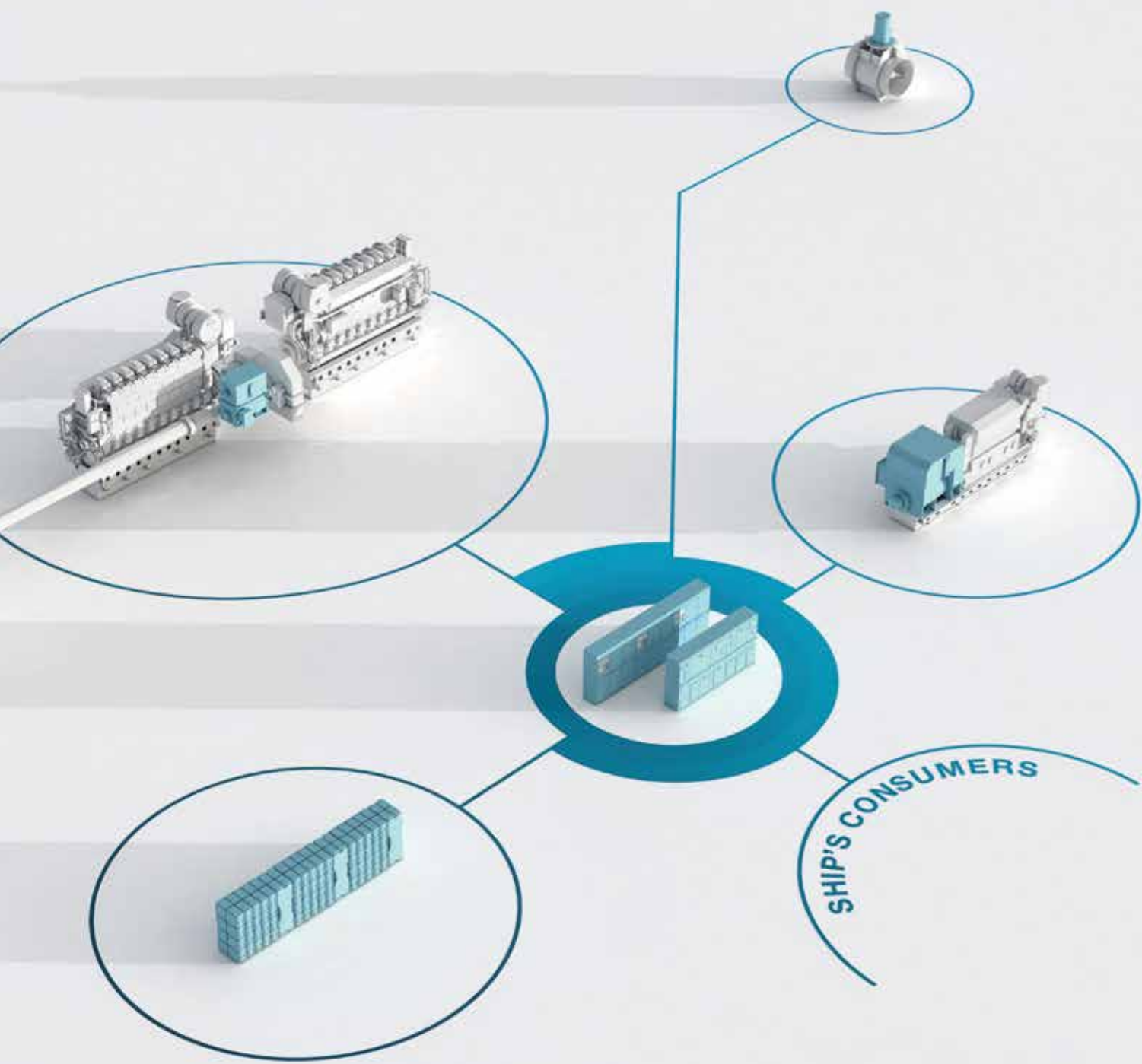
In a hybrid system, mechanical and electric engines work together to provide power for propulsion and hotel loads, optimizing the fuel efficiency of vessels with a flexible power demand.

Flexibility and maximum efficiency optimally combined

The combination of mechanical power from diesel engines and electric power from electric motors provides the vessel with a broad operational capability. We offer fully tailor-made hybrid propulsion and power generation solutions, including all components such as main engines, GenSets, switchboards, converters, electrical motors, gearboxes and propellers.

Battery power

New battery storage solutions further reduce maintenance costs, fuel consumption, greenhouse gas emissions and noise production, while increasing revenue and technical efficiency. To this end, we have acquired a 40% share in Aspin Kemp & Associates (AKA), whose specialized expertise links battery storage systems and marine engines.



Controllable pitch



A versatile and high-efficiency propeller program

The MAN Alpha CP Propeller designs are effectively embracing the power range up to 40,000 kW per shaft line. With no less than 23 different hub sizes, a cost and performance optimal solution is always offered. The standard series of propellers are 4-bladed configurations, with additional 3- and 5-bladed variants available. Further hub designs for the full feathering pitch setting possibility exist. Our standard blade/hub materials are Ni-Al-Bronze, with stainless steel offered as an option – and for special demands our propellers are ice-strengthened, designed and tailored to meet specific class rules up to the highest polar ice classes.

Shaft line systems with tail shafts, intermediate shafts and bearings are customized to a wide range of applications, and e.g., stern tube lube and sealing systems being based on various types of oil, biodegradable oils or water.

Power flexibility and maneuverability

Controllable pitch



Efficient propelling of vessels with varying propulsion demands

MAN Alpha CP Propellers are ideal for ships with varying operational modes and propulsion patterns ranging from dynamic maneuvering and bollard pull conditions to economical part-load service and full speed steaming. Our CPPs are versatile propulsors which meet the challenges of many different applications – and deliver excellent propulsion performance and efficiency at minimal vibration and noise levels.

Benefits

Fuel savings and reduced emission levels

High propulsive efficiency equals low fuel consumption and less exhaust gas emission

Propulsion flexibility and highest overall efficiency

Cutting-edge hydrodynamic blade designs as basis for top propulsion performance and versatility in operating profiles

High comfort for passengers, crew and cargo

Maximized propeller efficiency with due respect to controlled cavitation, pressure pulses and noise

Low wear rates and very long lifetime

Secured by robust and reliable materials and components – designed with ample margins of strength



Applications

Coastal tanker

Ro-ro vessel

Dredger

LNG tanker

Yacht

Ferry

Cruise

Workboat

Naval defense

Ice breaker

Offshore

Fishing

Research/survey

Chemical tanker



Fixed pitch

Customization based on
sturdy and high-efficiency
designs



The MAN Alpha FP Propeller designs effectively cover the full engine portfolio of MAN Energy Solutions. The propeller series are available in 3-, 4-, 5- and 6-bladed monoblock configurations casted in a single piece with hub and blades. Our standard material is specified as Ni-Al-Bronze, but other material alloys are available on request.

For special high ice-class ship and propulsion applications tailored FP Propeller designs with Bolted Replaceable Blades or Bolted Adjustable Blades can be offered. Bolted Blades for possible exchangeability without docking the vessel and Bolted Adjustable Blades for the additional possibility of adjusting

the 'fixed' pitch setting. Further, a new generation FP Propeller with flanged hub/shaft connection is available. Shaft line systems with tail shafts, intermediate shafts, bearings, shaft alternators and couplings are always customized and optimized to the individual powertrain and ship.

Robustness and efficiency

Fixed pitch



Long-haul propulsion at lowest operational costs

MAN Alpha FP Propellers are ideal for ships where highest efficiency and sturdy simplicity is of top priority. The obvious choice for ocean-going vessels with straight forward propulsion plants and operational patterns with long-haul sailing at service speeds at or around the propeller design and layout point, close to or spot on the maximum propulsive efficiency. Straightforward FPPs are, however, also specified for smaller yachts and workboats.

Benefits

Lowest TCO (Total Cost of Ownership)

Operational savings are secured by a highly efficient design with few wearing parts – robustly designed for high reliability and longevity

Minimum fuel consumption and emission levels

Maximized propeller efficiency ensures reduced fuel consumption and a reduction in the exhaust gas emission levels

Efficiency optimized by design

The superior efficiency from the streamlined and smallest hub diam./propeller diam. ratio is exploited with due respect to controlled cavitation, pressure pulses and noise

Applications

Container vessel
Crude oil tanker
Offshore
Bulk carrier
Product tanker
Dry cargo vessel
Yacht
Chemical tanker
Car carrier
OPV ice breaker
Workboat

Kappel design

Unique propeller blade design gains the highest efficiencies

MAN Energy Solutions is offering the fuel-saving Kappel program for FP Propellers and for CP Propellers – meaning that the full range of MAN Alpha propellers is available with propeller blades of Kappel design. For retrofit upgrades numerous monoblock FP Propellers have been exchanged with Kappel, and also other makes of CP Propellers have successfully been fitted with the more efficient Kappel blades.

Geometrically, the Kappel propeller design is characterized by non-planar lifting surfaces and blade geometry,

by which the blade profile can be better aligned to the complex flow patterns in the wake field generated by the ship's hull. The Kappel design originally used design inspiration from birds' wing tip feathers and principles of up-turned aircraft winglets. As a result, the propeller blades which are smoothly curved to the suction side provide a higher lift with reduced energy loss from the tip vortex flow.



A lift to the upper class

Kappel design



Kappel means superior propulsive efficiency

Propellers with the Kappel blade designs are ideal for high-end ship designs where highest efficiency, upper energy classes, lowest consumptions and minimum environmental footprints are prioritized. The increased propulsive efficiency provides power reductions, savings via lower fuel consumption, reduced exhaust gas emissions or can be exploited as higher thrust for increased ship speed at a given engine output.



Benefits

Lowest fuel consumption and emission levels

Maximized propeller efficiency ensures reduced fuel consumption and a reduction in the exhaust gas emission levels

Higher charter values and market attractiveness

Lowest EEDI/EEOI and higher 'energy classes' can be obtained for Kappel propelled vessels. Both newbuildings – and existing vessels being retrofit upgraded, can benefit and be prepared for the future with lower consumptions and a green image

Increased comfort

Lower propeller-induced pressure pulses to the ship's hull will reduce the onboard noise and vibration

Propeller diameter increase

Lower pressure pulses allow smaller clearance to the ship's hull – and offer deployment of an even larger and more efficient propeller

Applications

Chemical tanker
Container vessel
Crude oil tanker
Ferry
Bulk carrier
Product tanker
Naval defense
Ro-Ro vessel
Dry cargo vessel
Car carrier
LNG tanker
Cruise

Clean shipping is the future



Any emission harmful for the environment must be further reduced or completely eliminated in the days ahead. The continued natural development in the direction of more green targets and restrictions will influence the maritime transportation and shipping industry. Future legislation will be driven to even stricter ‘clean shipping criteria’ by governments, non-governmental organizations, IMO, port authorities, ship owners, operators, customers and consumers – demanding actions to minimize the risk of pollution and prevent possible environmental damage.

A number of leakproof and environmentally friendly stern tube systems are available with our propellers. We provide stern tube solutions for water lubrication and systems approved for lubrication with biodegradable non-toxic lubricants. All our propellers can be delivered to comply with the VGP (Vessel General Permit) from US EPA (United States Environmental Protection Agency).



Efficiency improving devices

Improving the flow to and from propellers

MAN Energy Solutions masters a vast number of disciplines in relation to optimization of aft ship parameters and special installation requirements. The perfected layout and hydrodynamic propeller integration are always optimized with the ship's hull and any flow-guiding Efficiency Improving Device (EID) and its position:

Placed before the propeller

Pre-swirl and wake equalizing ducts, pre-swirl fins or vortex generators

Placed at the propeller

A propeller nozzle, a fairing cone, or propeller hub cap fins (EcoCap) can be deployed

Placed after the propeller

The optimization can include high-efficiency rudders and twisted rudders, integrated MAN Alpha (EcoBulb) rudder bulbs, post-swirl fins or similar

More EIDs can be combined in advantageous ways with tailored propeller designs. Tank test results and real-life operations show e.g., that the integration of Kappel designs perform in beneficial synergy as open propellers with a number of EIDs. For ducted operation with propeller nozzles, however, our propeller blade designs are specifically optimized for pulling performance exploiting a more wide-chord layout with extended chord lengths towards the blade tip.



Examples of efficiency gain from individual EIDs

Various solutions on the market today – and how they can be combined

	Before the propeller		At the propeller			After the propeller		
	Pre-swirl fins	Wake equal. duct	Kappel design	EcoCap Hub cap fins	AHT nozzle	EcoBulb Rudder bulb	Post-swirl fins	Efficiency rudder
Pre-swirl fins	3-5%	●	●	●	●	●	●	●
Wake equal. duct	●	3-8%	●	●	●	●	●	●
Kappel design	●	●	3-6%	●	●	●	●	●
EcoCap Hub cap fins	●	●	●	2-5%	●	●	●	●
AHT nozzle	●	●	●	●	5-8%	●	●	●
EcoBulb Rudder bulb	●	●	●	●	●	2-5%	●	●
Post-swirl fins	●	●	●	●	●	●	2-3%	●
Efficiency rudder	●	●	●	●	●	●	●	2-4%

● Can be combined
 ● Can sometimes be partially combined
 ● Should not be combined



In perfect synergy

Efficiency
improving
devices



Propeller and aft ship offerings – tailored with EIDs

Successful combinations have proved their contributions to propulsion power savings and an ever growing experience pool on EID implementation has accumulated during the recent years – both for newbuilding installations and for retrofit upgrades of existing vessels. Ducted and open propellers, propeller designs with low skew, high skew, and the Kappel design have all been optimized to perform efficiently with the individual ships' hull shapes, EIDs and operational patterns of the vessels.

Examples of efficiency benefits of Kappel propellers and EIDs

Kappel propeller alone

Efficiency increased by up to 6 %

Kappel propeller with MAN Alpha EcoBulb Rudder Bulb

Efficiency increased by up to 9 %

Kappel propeller with pre-swirl wake equalizing duct

Efficiency increased by up to 11 %

Kappel propeller with pre-swirl wake equalizing duct and MAN Alpha EcoBulb Rudder Bulb

Efficiency increased by up to 12 %

– and even more for retrofit upgrade solutions.

Propeller nozzle



AHT – Alpha High Thrust nozzles

For optimizing the propeller thrust and pulling performance of specialized vessels, customized AHT nozzle designs are offered for boosting the vessels' working patterns. The AHT nozzle designs offer superior performance compared to the '19A' propeller nozzles, which have been common standard in the marine industry. The increased bollard pull achieved when using the AHT nozzle is not only a result of the CFD-optimized nozzle profile, which is

double-curved on both the inner and outer surface. Other contributing factors are e.g., nozzle length/diameter optimization, nozzle built-in support, aft ship lines adaption, and tilting and azimuthing of the nozzle.

High-thrust and speed customized AHT nozzle installations are popular for vessels requiring increased pulling power and still limited free-sailing resistance.



Push, pull and supply

Propeller nozzle



Superior pulling performance for heavy duty vessels

Our range of ducted propellers and AHT nozzles are the thrust boosters for high performance vessels enabling bollard pull and towing force at very high levels. The propeller blades are specifically designed and tailor-made for optimized operation with the AHT nozzles – customized into the aft ship vessel designs. The blade number optimization and selection is also a result of the hydrodynamic integration and both our Controllable Pitch and Fixed Pitch Propeller concepts are available.

Benefits

More pulling power

Due to the increased propeller thrust – especially at lower ship speeds

Reduced fuel consumption

A specific bollard pull or towing force can be delivered at a reduced power output and engine rating

Individual customization - balanced to application and aft ship design

Provides the perfect match of ahead and astern performance together with reduced free-sailing resistance

Retrofit potential: gain up to 23.5% more bollard pull

Possible when upgrading older nozzles to the AHT design combined with state-of-the-art MAN Alpha propeller blades optimized for nozzle-operation

Applications

Fishing trawler
Anchor handling
tug supply
Dredger
Tug boat
**Seismic research/
survey**
**Ice navigating
vessel**

Alphatronic 3000



**Power and maneuverability –
right at your finger tips**

Reliable and accurate propulsion control all the way – from the navigator’s finger tips to the propeller tips. Any maneuvering order given is translated into electrical speed setting, pitch or clutch signals, governing the hydraulic servo circuits of engine/gearbox and propeller systems. The Alphatronic 3000 Propulsion Control System offers unrivaled “Human to MAN” interface with ergonomically logic and clear layout of panels, levers, buttons, displays and touch screens ensuring safe and efficient maneuver interactions.



Alphasonic 3000 controls both straightforward CP Propeller and FP Propeller installations and can be customized for various propulsion application combinations with MAN low-, medium- and high-speed engines in a wide range of single- and multi-propeller diesel-mechanical, hybrid or diesel-electric propulsion setups.

Propulsion control system

Alphatronic 3000



New levels of design and functionality

The inherent 'electrical shaft system' between control levers ensures synchronization, bumpless and safe transfer of maneuver responsibility from one control station to another. Automatic thrust and engine power synchronization is available for twin propeller plants. The configurable touch screens meet a wide range of customer-specified functions for both controllable pitch and fixed pitch propeller based propulsion plants. The modular Alphasonic 3000 panel concept fits elegantly into bridge and engine control room console layouts, and the installation is made easy for consoles with limited space and free depth. The control panel functionality is pre-tested and made ready for shipyards' plug-and-play installation.

Benefits

Safe and reliable ship maneuvers

Quick system response ensures efficient vessel maneuverability

Saves fuel and minimizes emissions

Economic operation due to optimized engine load and thrust control, and the deployment of an optional Speed Pilot feature with GPS interface for various economy-sailing modes.

Further, our EcoOptimizer concept can be offered for CP propeller propulsion. A fuel-saving overall optimization and mode setting considering ship speeds, pitch settings and engine SFOC mapping

Engine lifetime protection

The engines are protected against overload in general and further thermal protection is provided via controlled running-up and -down programs

Applications

Two-stroke

low-speed

CP Propeller

FP Propeller

PTO

Four-stroke

medium-speed

Twin-in single-out

Power boost

Four-stroke

high-speed

Single- and

multi-propeller

PTH

Diesel-electric

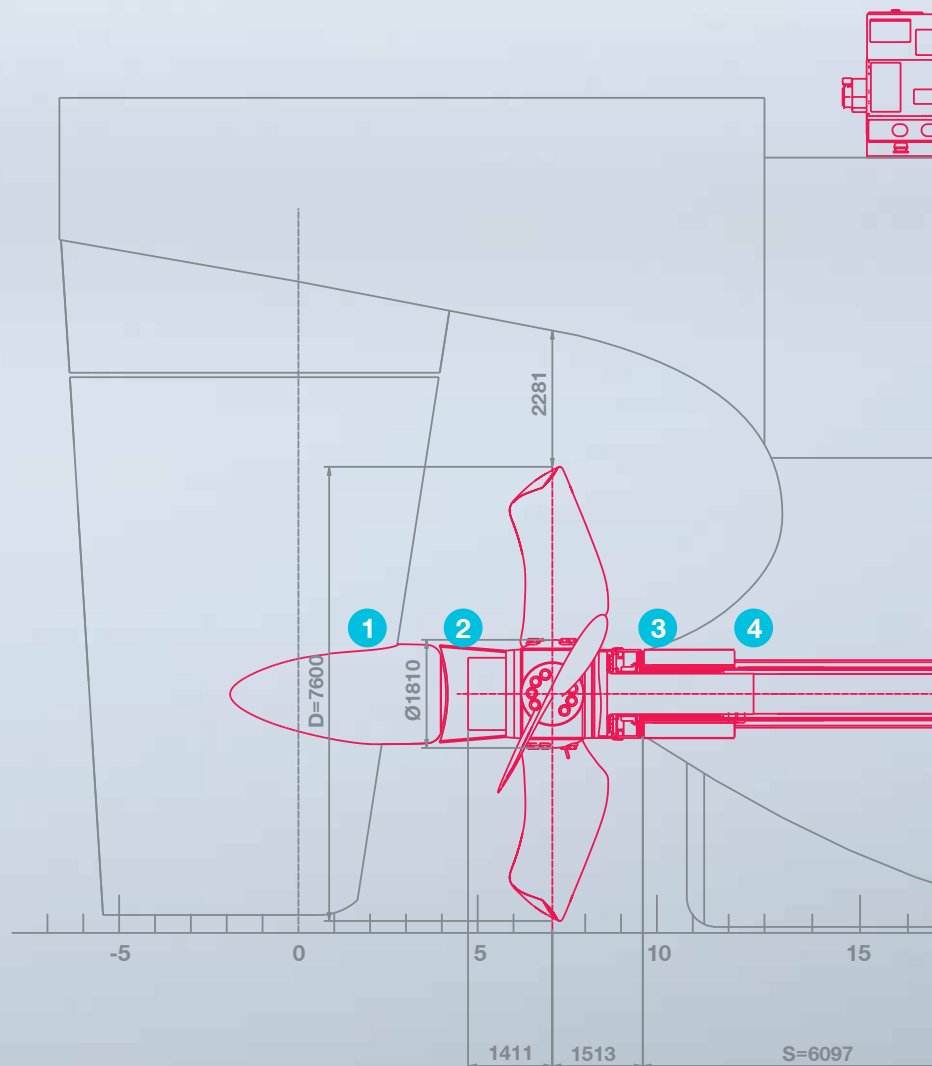
Hybrid plants

System competence

Advanced tanker design loaded with flexibility and efficiency

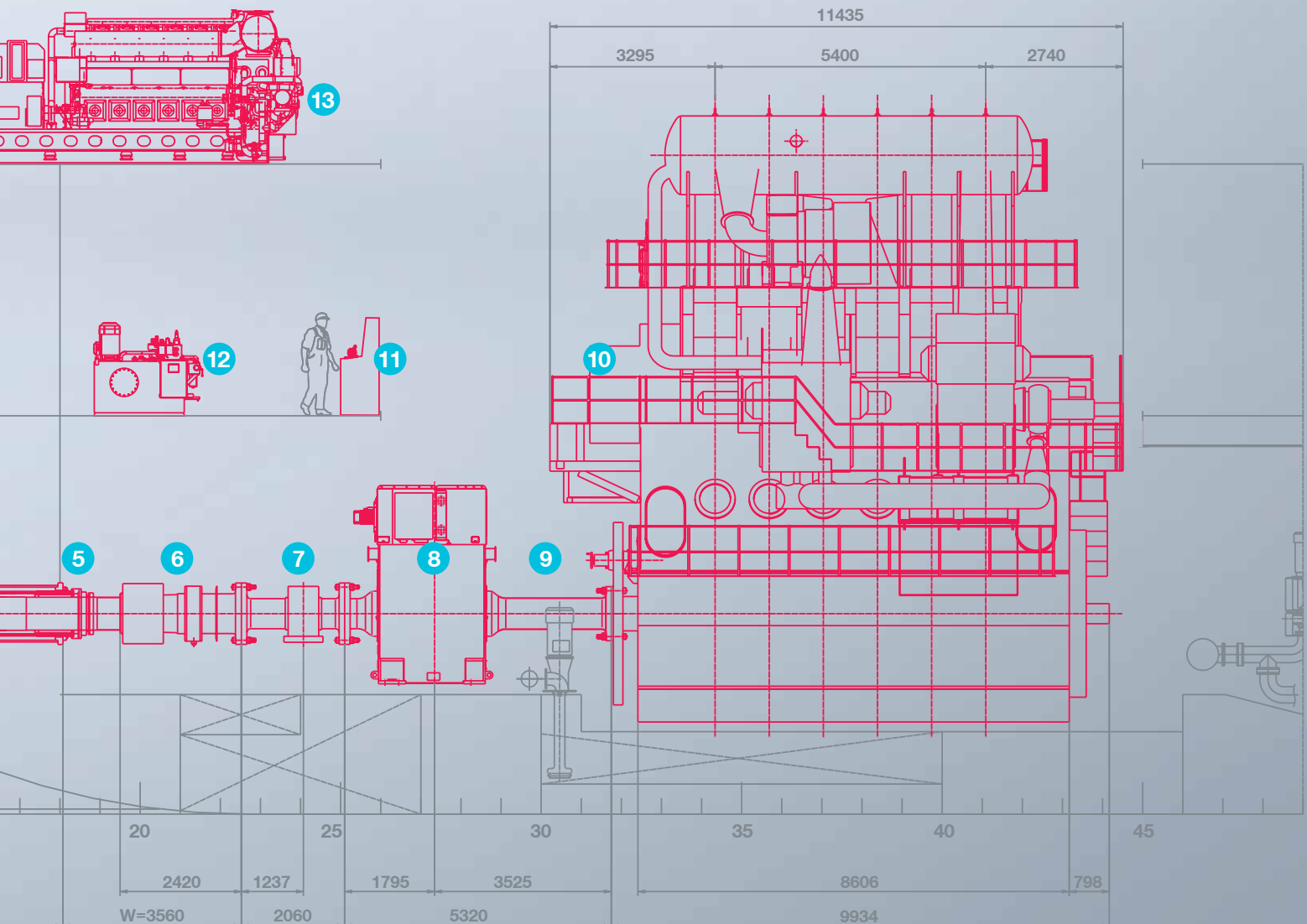
Propulsion plant competence example: Mastering the disciplines of all powertrain and aft ship elements offers the possibility of deploying their synergies to obtain the most efficient and flexible propulsion solution. Our recent delivery for a state-of-the-art VLEC (Very Large Ethane Carrier) represents such an example with a single-propeller single-engine propulsion system. The vessel is designed to the highest propulsive efficiency and prepared for multi-fuel operation on HFO, MDO, MGO, as well as ethane and LNG.

From a propeller and aft ship perspective, the vessel is propulsion-optimized with a twisted leading edge rudder fitted with MAN Alpha EcoBulb Rudder Bulb, a MAN Alpha 7.6 meter Kappel CP Propeller with fairing cone, stern tube and shaft system with shaft alternator – powered by a two-stroke MAN B&W 6G60ME-GI engine.



Propulsion and power package including the complete propeller and aft ship system driving a Very Large Ethane Carrier:

- 1 MAN Alpha designed EcoBulb rudder bulb on ships rudder
- 2 MAN Alpha fairing cone on propeller hub
- 3 MAN Alpha Kappel CP Propeller, type VBS1810
- 4 Oil-lubricated stern tube with liners and aft seal
- 5 Welding ring, adaptor flange, oilbox and forward seal
- 6 MAN Alpha hydraulic coupling flange type ODS650
- 7 Journal bearing
- 8 Shaft alternator, 3,000 kW
- 9 Rotor shaft for alternator
- 10 MAN B&W engine type 6G60ME-C9.5-GI-Tier III with SCR
- 11 Alphasonic 3000 propulsion control system, ECR and bridge
- 12 Hydraulic power unit for propeller system, type 1,500 L
- 13 MAN 6L28/32H Holeby GenSet (4 sets in total)



Mastering high, medium and low speed propulsion

System competence

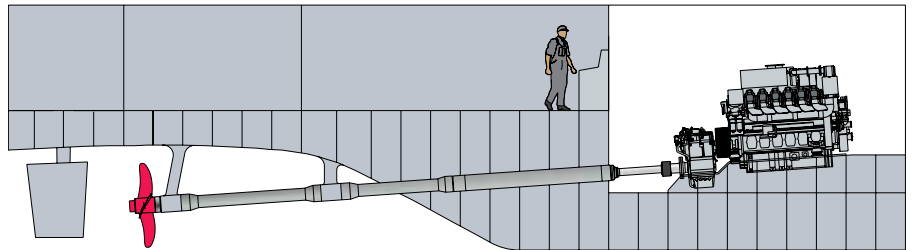


Complete propulsion packages for all engine concepts

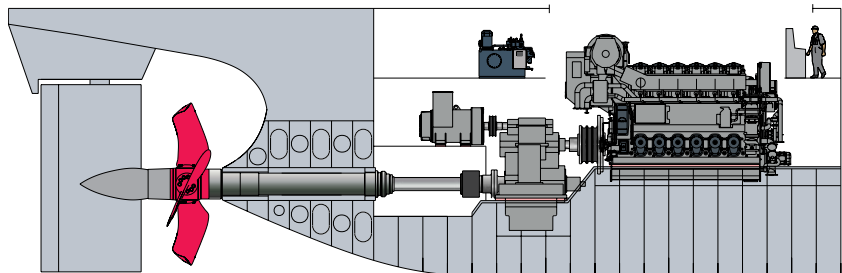
A vast knowledge and development base has accumulated during our many years with focus on the projecting, design, optimization, sales, order processing, supply, commissioning and after sales servicing of complete propulsion systems. Today's core portfolio of propeller and aft ship products and system solutions integrates perfectly with the wide range of MAN Energy Solutions high-speed, medium-speed and low-speed engine designs. No standard concepts fit all.

Tailored solutions are available for individually optimized applications ranging e.g., from a MAN 175D high-speed-powered patrol boat and a MAN 32/44CR medium-speed-powered container vessel to a MAN B&W G45ME low-speed-powered tanker. System competence makes the difference in any case!

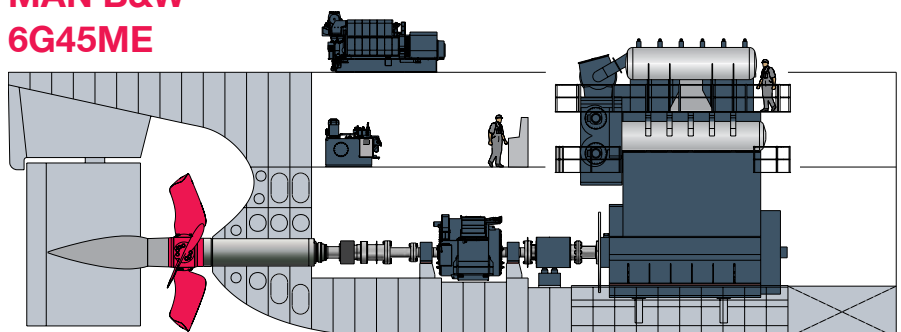
MAN 12V175D



MAN 6L32/44CR



MAN B&W 6G45ME



Customer benefits

System competence



Added value for shipyards, owners and operators

Take direct advantage of

- Reduced installation costs
- Reduced operational costs
- A single point of contact to one responsible organization

Shipyards' projecting benefits

- Pre-project plant conception, power and speed prognosis and estimation of propulsion package parameters with a high degree of system accuracy.
- Layout of auxiliary systems and package engineering based on integrated overall propulsion expertise.
- Propulsion equipment interfaces and integration matters are solved at an early stage.
- Torsional vibration calculations and possible special ice class requirements are dealt with in standard quotations.
- Shaft alignment and calculations for optimal bearing loads and positions are provided.
- One competent contract partner during projecting, planning, purchasing, installation, and commissioning of the equipment.
- Optimal 'package logistics' ensure safe supply of all components – and possible single batch delivery matching the installation schedule.

Shipyards' handling benefits

- Thorough handling of engine, gearbox, propeller and control system leads to minimal shipyard work on a reduced number of connecting points.
- One package of documentation providing information on foundations, piping, electrical wiring, auxiliary systems, and covering on-board interfaces and alignment of the entire power train.
- One team of commissioning engineers responsible for the propulsion package during start-up and sea trials.
- Less shipyard responsibility and administration – minimal engineering, installation work and installation costs.

Owners' operating benefits

- Optimal operating economy is ensured thanks to the optimized layout of engine, reduction gearbox, propeller, propulsion control and safety system.
- Operating reliability, durability and predictable service intervals are assured by a tailored package solution.
- One company supplying, testing and commissioning the package, together with the subsequent lifetime accumulation of performance and operating experience for the propulsion components.

Owners' service benefits

- One package of service documentation, maintenance programs and spare parts catalogues for the propulsion equipment – as the basis for efficient service routines and identification of parts.
- Digital online solutions available – for data monitoring and transmission via MAN PrimeServ Assist.
- One service organization addressing all propulsion plant support requirements via the worldwide network of MAN PrimeServ representatives, authorized workshops and service centers.
- Service contracts are offered in more levels from the basic to the full and very extensive, with all scheduled services performed by MAN PrimeServ.
- Our MAN PrimeServ Academy offering complete propulsion system instruction and training for engineers, operators and service staff.





Retrofit and upgrade

**Make your vessels
fit for the future –
at the next docking**

In many cases economy upgrading and derating have great fuel saving potential, short payback time and can advance existing vessels to higher energy classes. Efficient retrofit solutions may range from relatively simple propeller or blade exchange to more extended concepts where our system competence and holistic view of the complete propulsion plant – including engine, turbocharger, PTO,



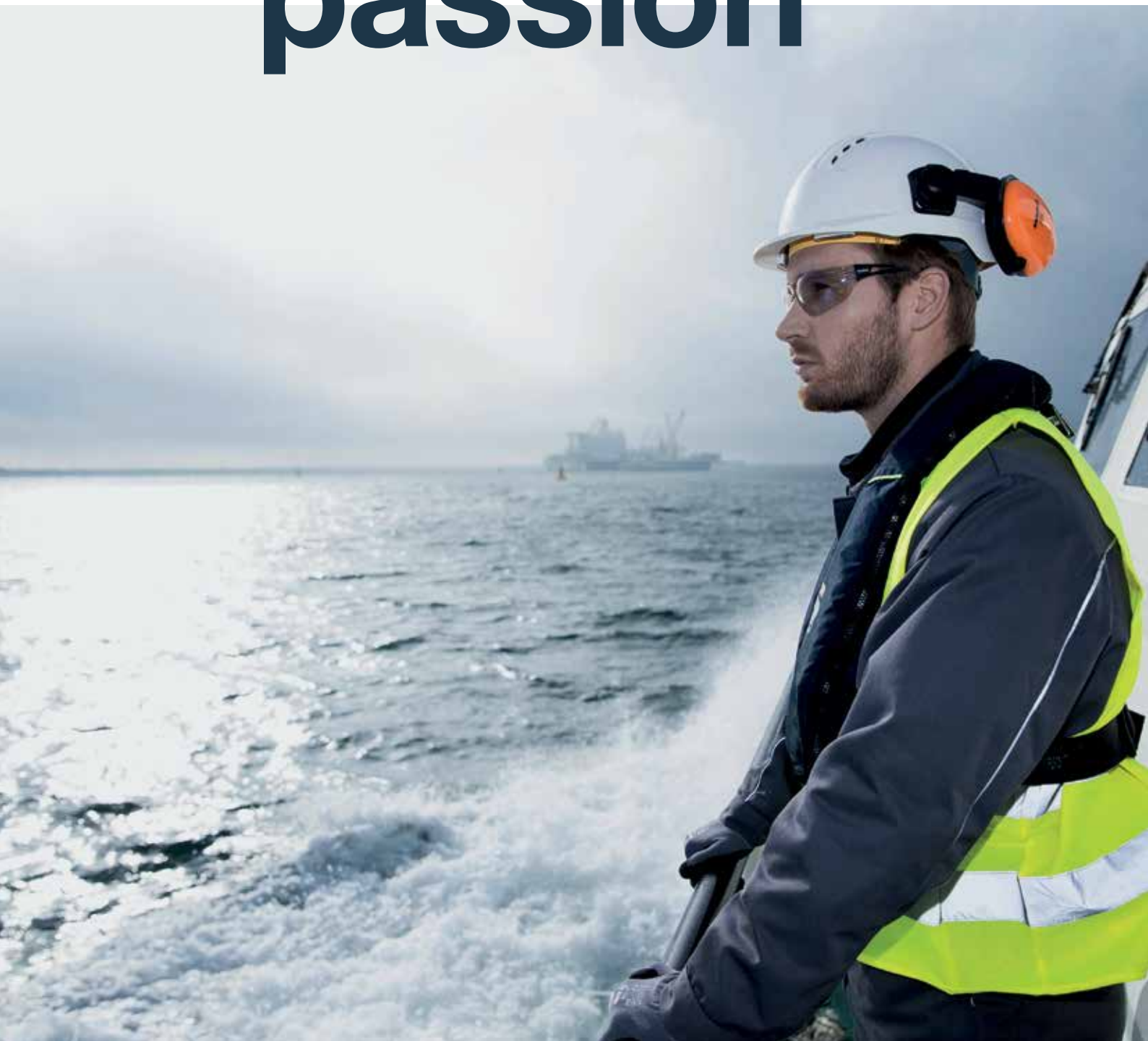
gearing, shafting, propeller and aft ship equipment – really pays off.

As an example six Suezmax tankers gained 17.5% fuel savings with an upgrading and derating solution implemented at their 5-year dockings. A complete package with Kappel propeller, pre-swirl and wake equalizing duct, main engine upgrading with new turbochargers and fuel nozzles,

increased compression ratio and optimized valve timing. With the new Kappel propellers, new intermediate shafts were installed to match and countermeasure the torsional vibration patterns from the 3-bladed propellers, shaft lines and derated engines. After the technical sea trial, NOx measurements were performed on the first ship in order to produce a new (IMO) Technical File.

MAN PrimeServ

Service with passion





hours a day



days a year

MAN PrimeServ is the dedicated MAN Energy Solutions service brand. Via a network of over 100 service centers worldwide, MAN PrimeServ provides 24/7 service across the globe. Our range of services includes technical support, consulting and OEM spares, as well as maintenance, repair and individualized service plans like our PMC, Propeller Maintenance Concept.

The PMC service packages for propeller maintenance are offered in connection with 5 and/or 10 year inspections – in accordance with the docking periods recommended by the classification societies. Similar concepts (GMC and AMC) are available for our gearboxes and Alphatronic controls.

MAN PrimeServ's aim is to provide:

- Prompt delivery of high-demand spare parts within 24 hours
- Fast, reliable and competent customer support
- Individually tailored O&M contracts
- Ongoing training and qualification of operators and maintenance staff
- Global service, 24 hours a day, 365 days a year
- Diagnosis and troubleshooting with our MAN PrimeServ Assist

Worldwide service

As already mentioned, retrofitting and upgrade services are offered to bring propellers, propulsion systems, engines and turbochargers already in service up to the very latest standards of performance and efficiency.

Using the latest digital technology, we enable you to maximize the performance and availability of your MAN equipment by accessing real-time data analysis, remote support and rapid solutions. We also offer an extensive range of training courses at MAN PrimeServ Academies around the world.

For more information please visit
www.man-es.com/primeserv



100

service centers
worldwide



Get in touch and propel ahead



An interactive experience

Download our MAN Brochure Store app from the App Store. Use its exciting interactive features to explore our complete range of products and services. Suitable for iPhone, iPad and Android.



Explore our latest news via an app

DieselFacts brings you the most recent news from the world of engines, propellers and propulsion systems including the latest technical papers, in-depth features and videos.



Propeller & Aft Ship

Download our brochures and leaflets from the web.



Retrofit & Modernization

Visit our website and learn more about upgrading and benefits.



MAN Energy Solutions

Niels Juels Vej 15
9900 Frederikshavn
Denmark
P +45 96 20 41 00
info-frh@man-es.com
www.manalpha.com
www.man-es.com

All data provided in this document is non-binding. This data is for information only and is not guaranteed in any way. Depending on the subsequent specific individual projects, the relevant data may be subject to changes and will be assessed and determined individually for each project. This will depend on the particular characteristics of each individual project, especially specific site and operational conditions.

Copyright © MAN Energy Solutions.
1510-0278-01ppr Printed in Germany