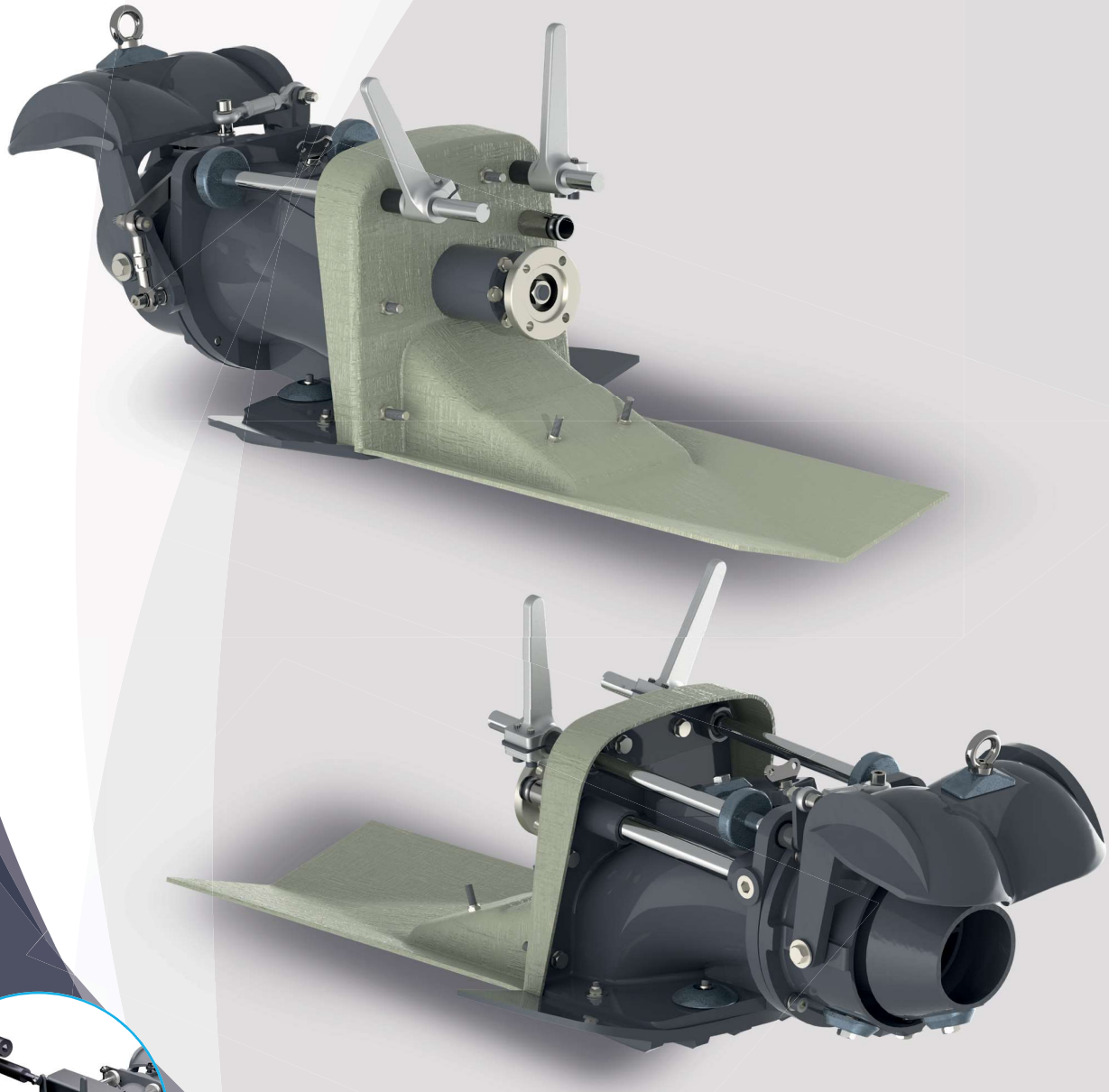
AJ160



REVERSING
DEFLECTOR
CONTROL

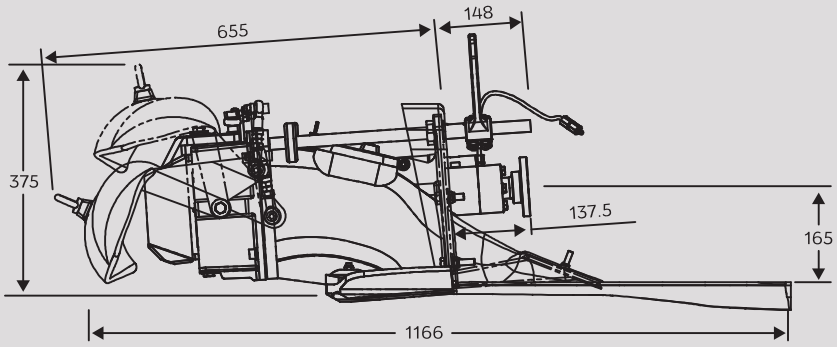
SPECS

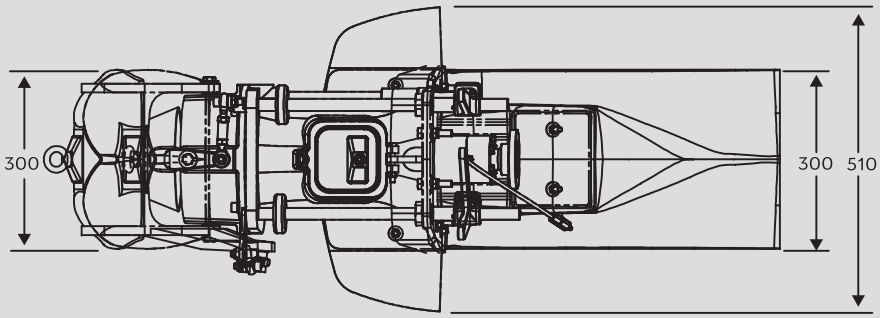
PUMP TYPE
MIXED FLOW,
SINGLE STAGE

IMPELLER SHAFT RPM
MAX. 5000 1/MIN

MAX. VESSEL DISPLACEMENT
1000 KG (2205 LBS)
PER JET UNIT
(PLANING VESSEL)

JET WEIGHT
38 KG
(84 LBS)





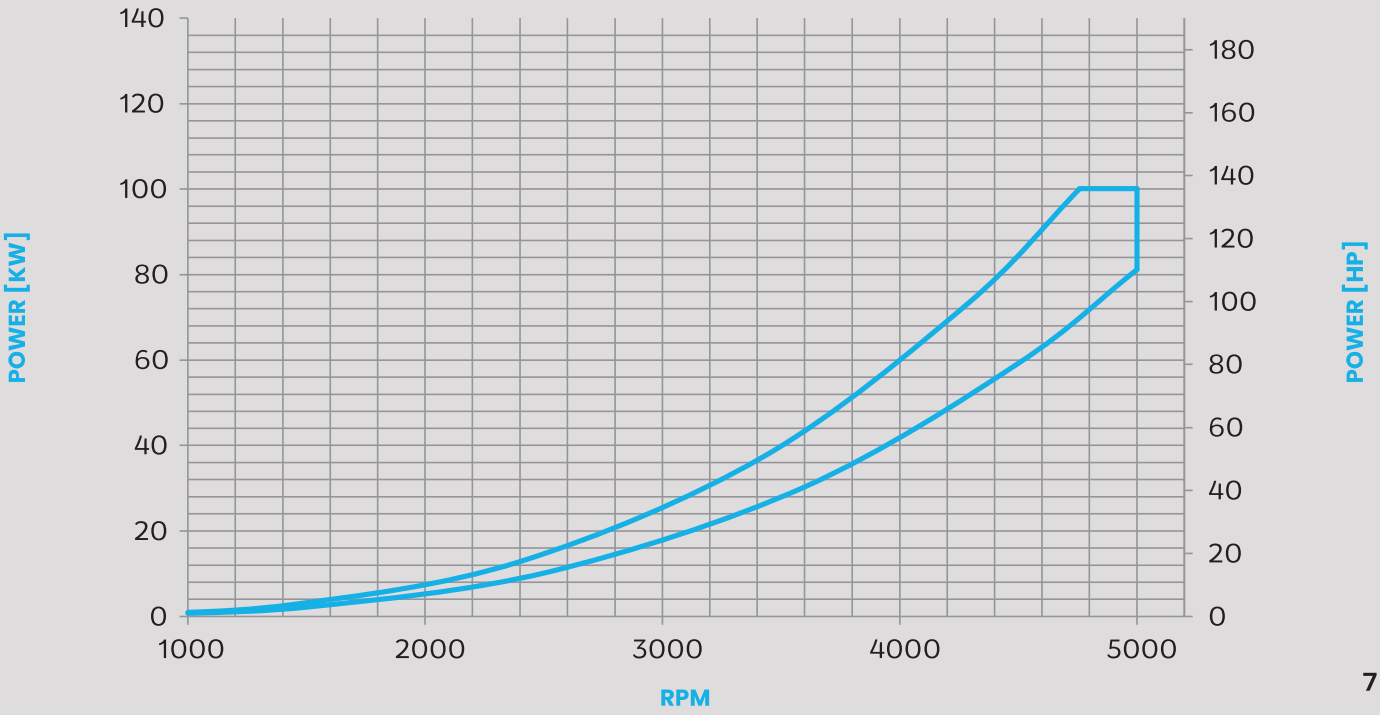
IMPELLER DIAMETER
MAX. 186 MM
(7.3")

MAX INPUT POWER
100 KW
(136 MHP)

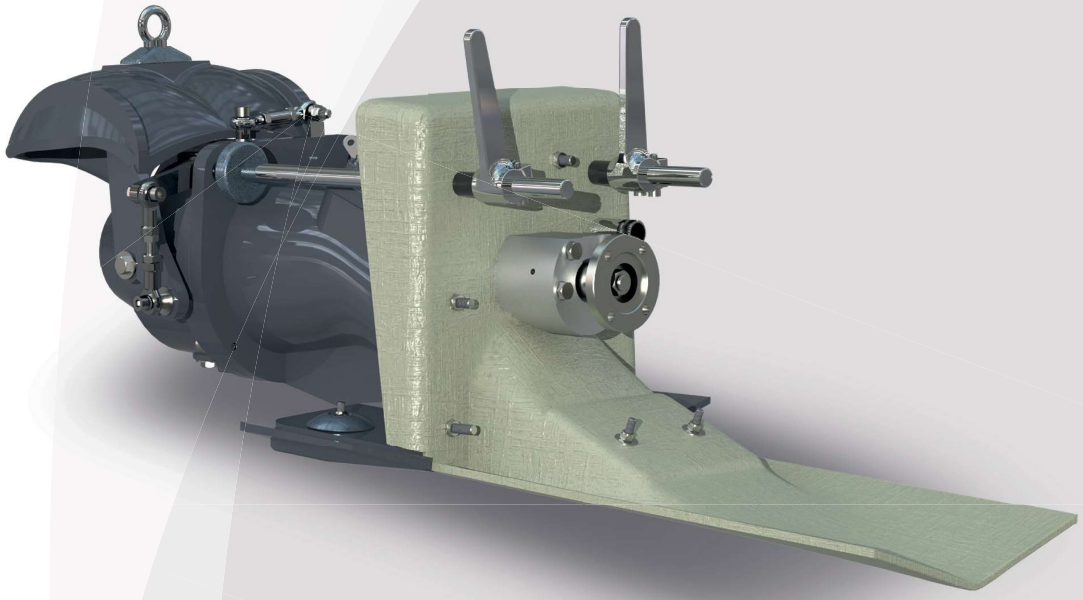
JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

REVERSE DEFLECTOR CONTROL
MECHANICAL OR
ELECTRICAL (ACU)

AJ 160 POWER/RPM COVERAGE



AJ 180/185



REVERSING
DEFLECTOR
CONTROL

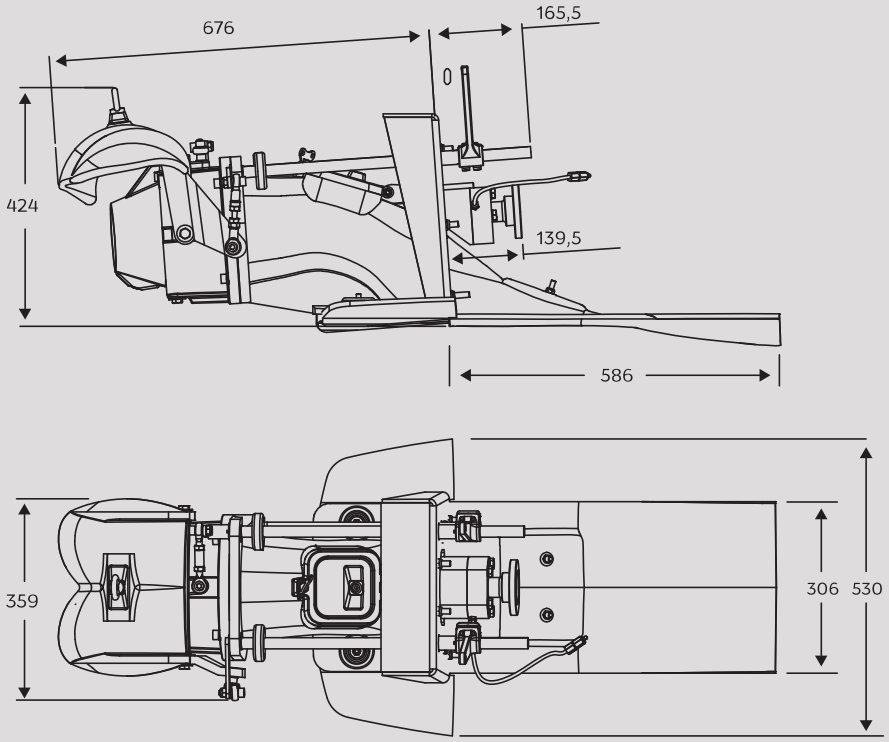
SPECS

PUMP TYPE
MIXED FLOW,
SINGLE STAGE

IMPELLER SHAFT RPM
MAX. 5000 1/MIN

MAX. VESSEL DISPLACEMENT
1700 KG (3700 LBS)
PER JET UNIT
(PLANING VESSEL)

JET WEIGHT
48 / 50 KG
(106 / 110 LBS)



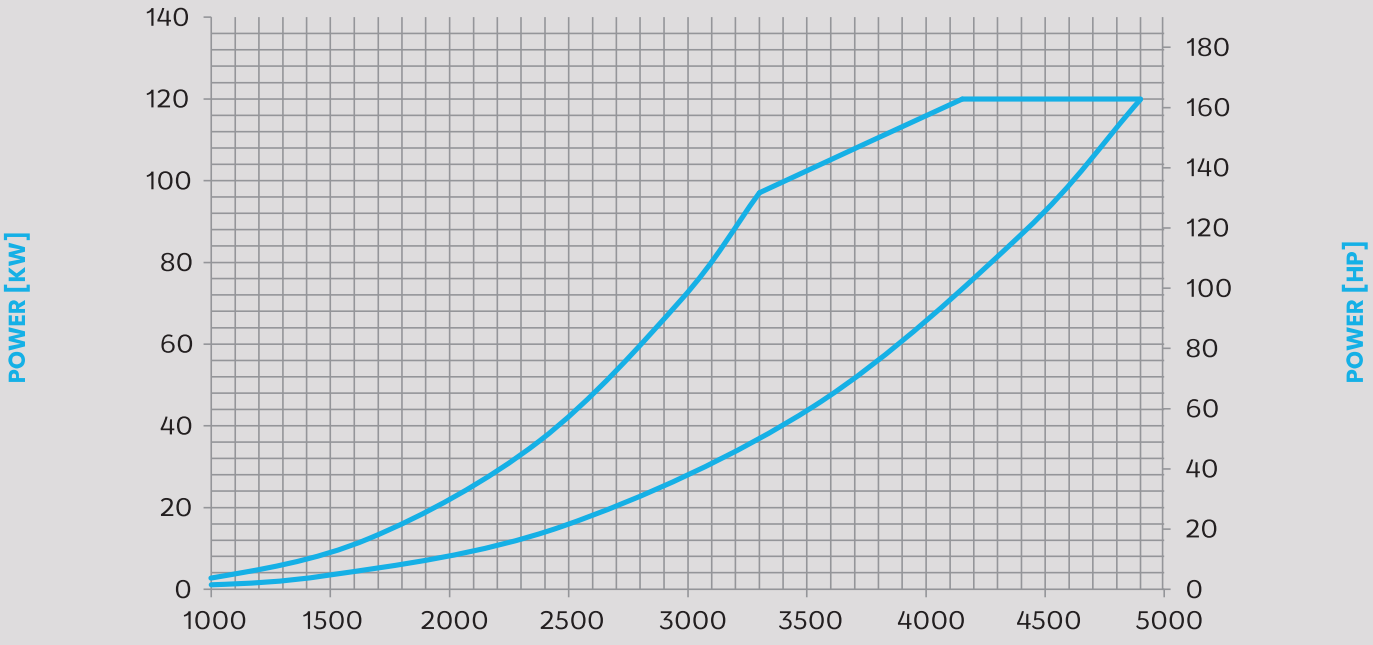
IMPELLER DIAMETER
MAX. 192 / 197 MM
(7.6" / 7.8")

MAX INPUT POWER
120 KW
(163 MHP)

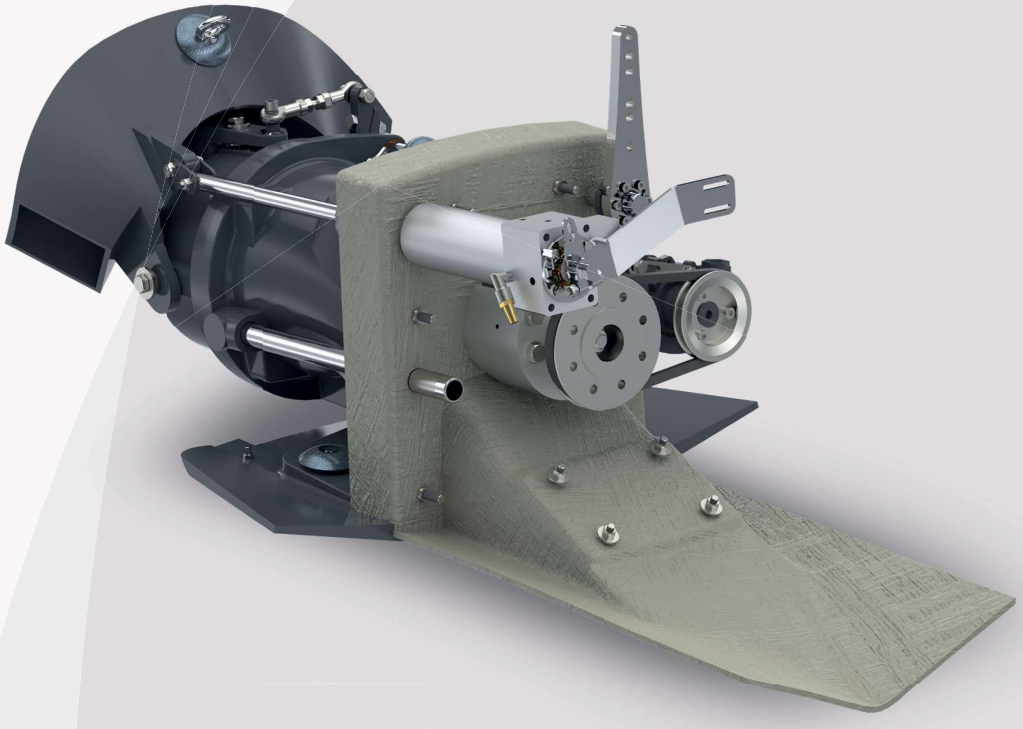
JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

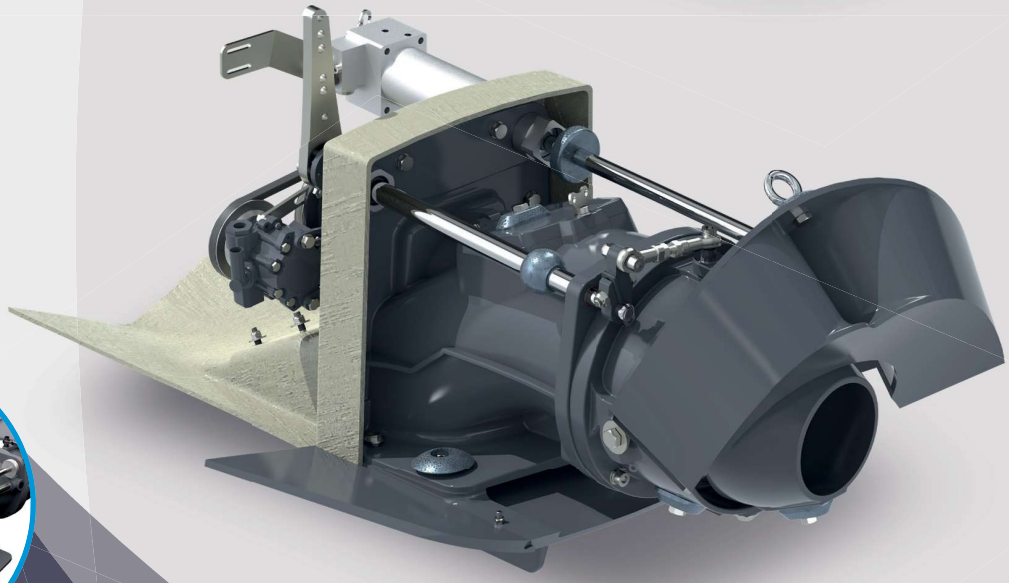
REVERSE DEFLECTOR CONTROL
MECHANICAL OR
ELECTRICAL (ACU)

AJ 180/185 POWER/RPM COVERAGE



AJ 230





REVERSING
DEFLECTOR
CONTROL

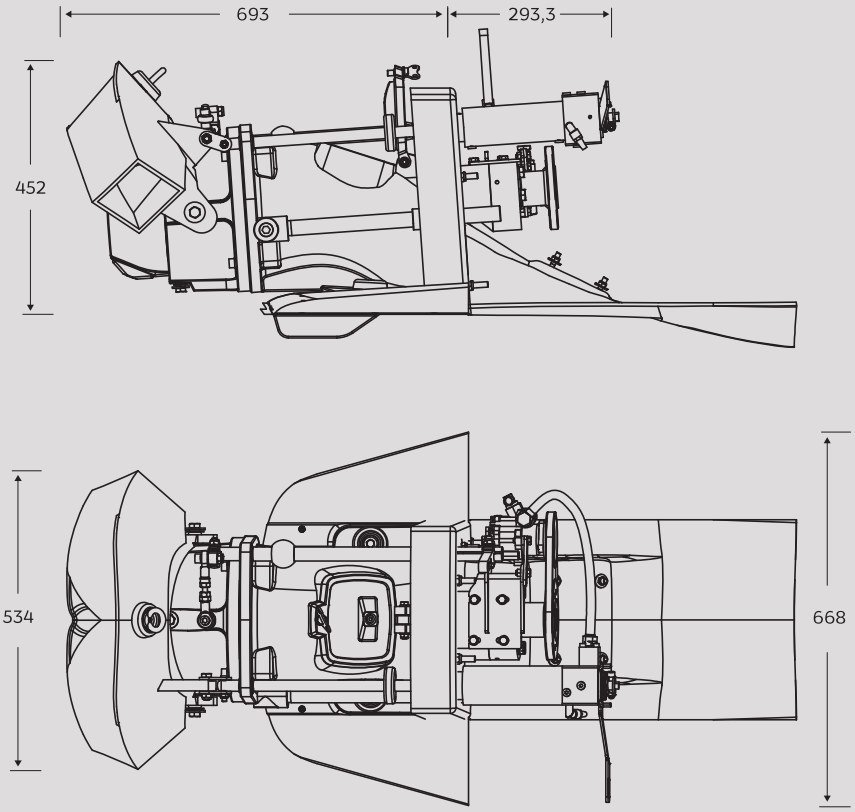
SPECS

PUMP TYPE
MIXED FLOW

IMPELLER SHAFT RPM
MAX. 4600 1/MIN

MAX. VESSEL DISPLACEMENT
3000 KG / 6 600 LBS

JET WEIGHT
81 KG / 179 LBS



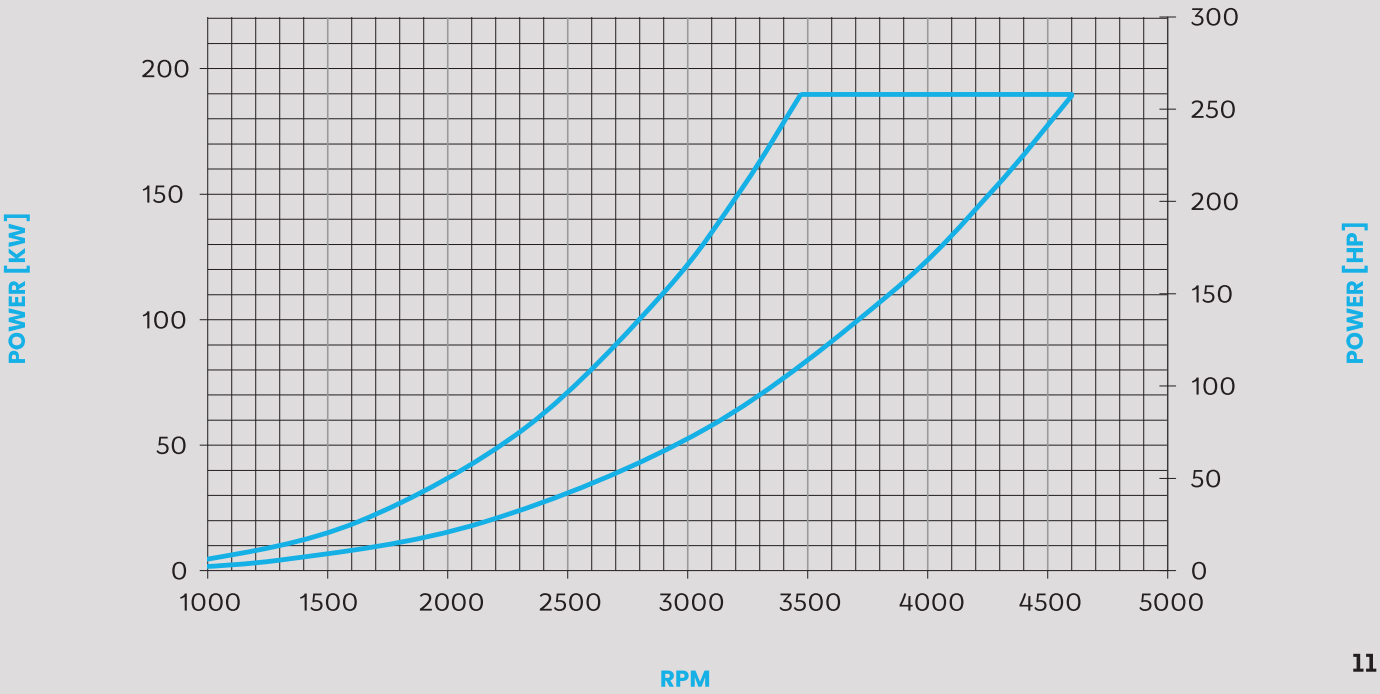
IMPELLER DIAMETER
MAX. 228 MM / 9”

MAX INPUT POWER
190 KW / 260 HP

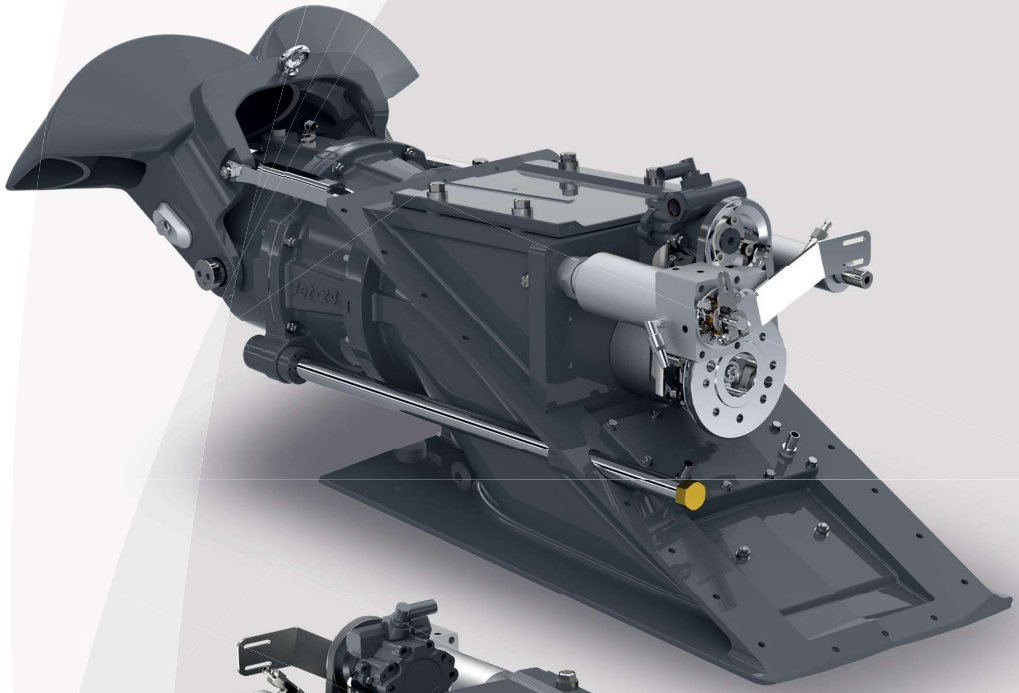
JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

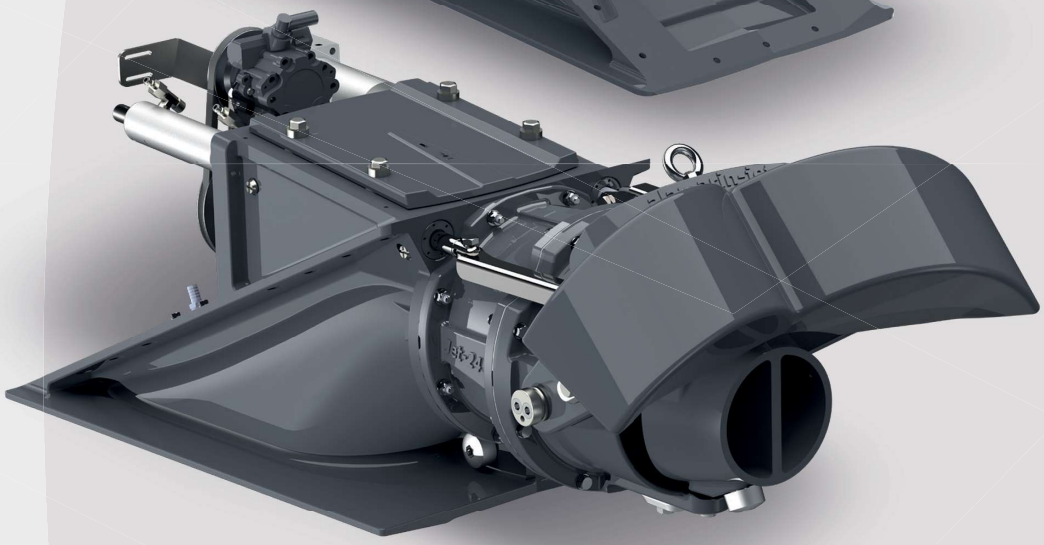
REVERSE DEFLECTOR CONTROL
HYDRAULIC

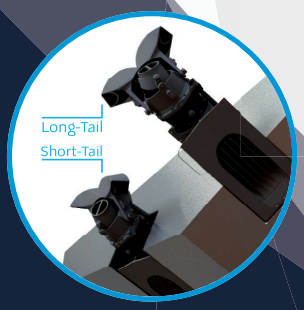
AJ 230 POWER/RPM COVERAGE



AJ 245







TWO INSTALLATION OPTIONS

PATENTED COMBI-FRAME TECHNOLOGY

Integrated oil cooler and steering cylinder

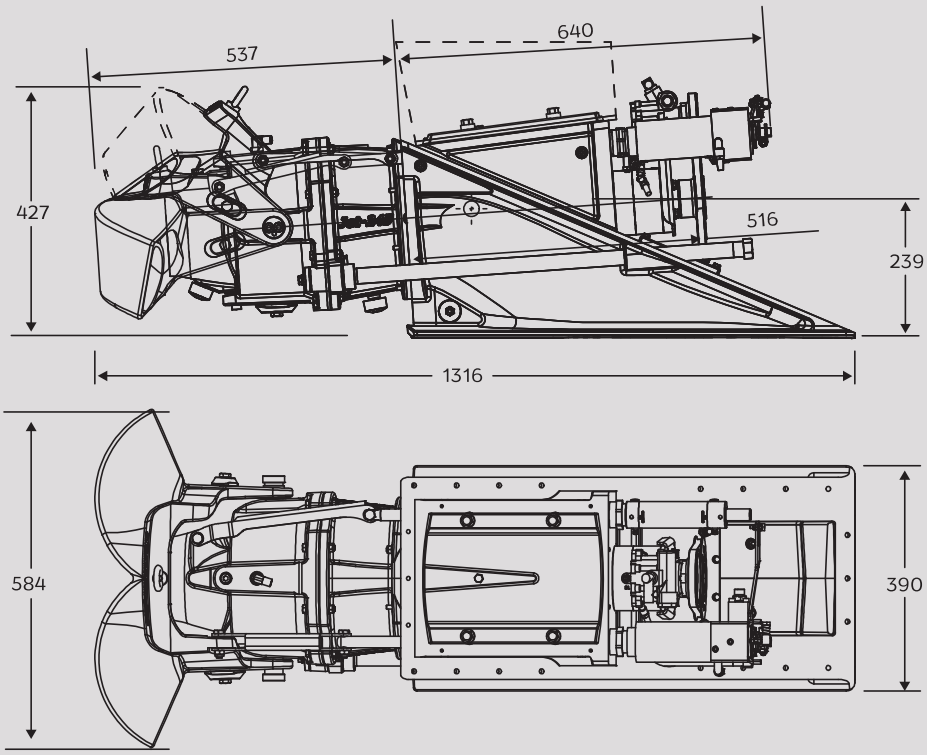
SPECS

PUMP TYPE
MIXED FLOW,
SINGLE STAGE

IMPELLER SHAFT RPM
MAX. 4600 1/MIN

MAX. VESSEL DISPLACEMENT
3500 KG (7700 LBS)
PER JET UNIT
(PLANING VESSEL)

JET WEIGHT
95 KG
(209 LBS)



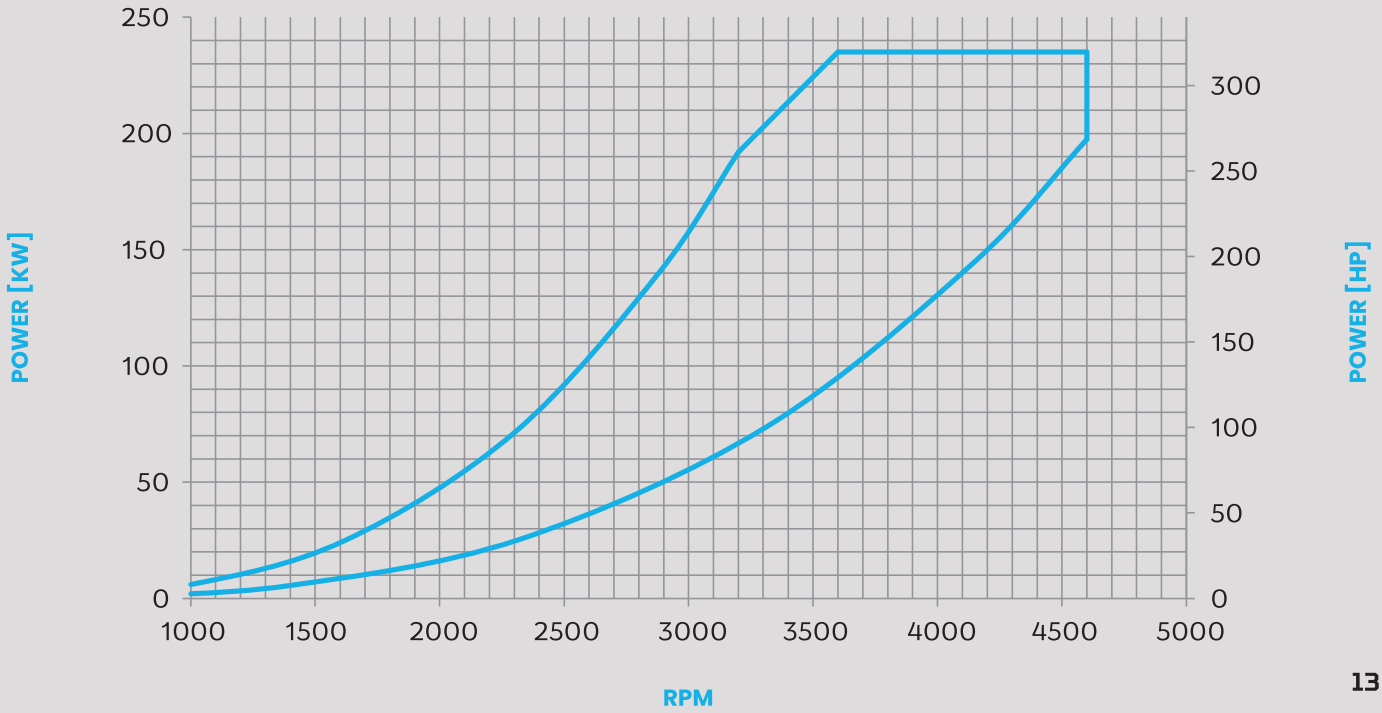
IMPELLER DIAMETER
MAX. 245 MM
(9.6")

MAX INPUT POWER
235 KW
(320 MHP)

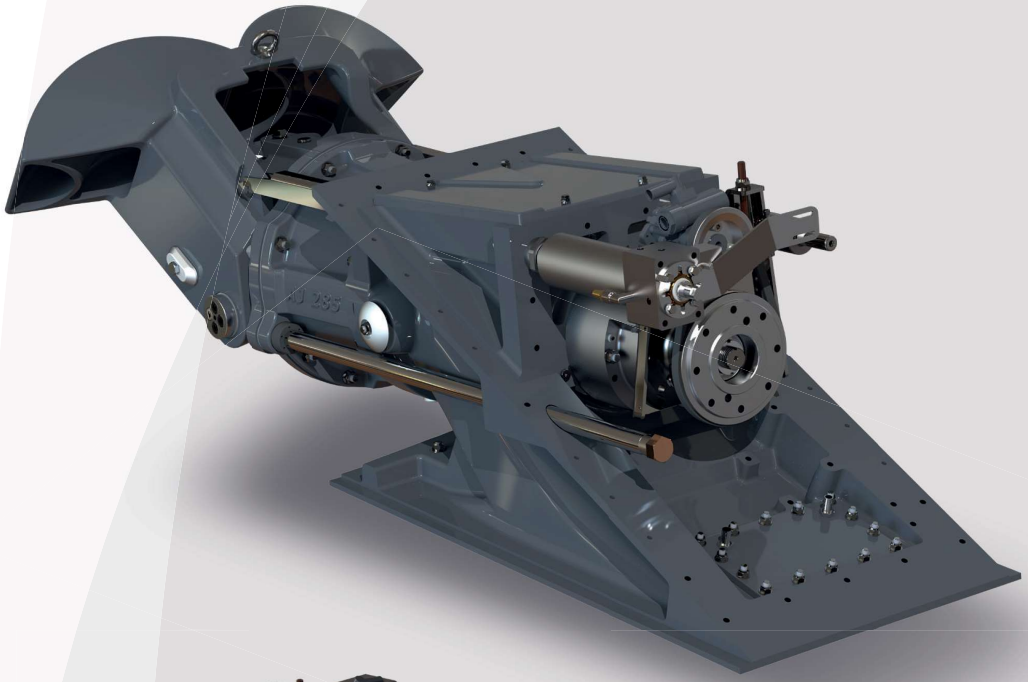
JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

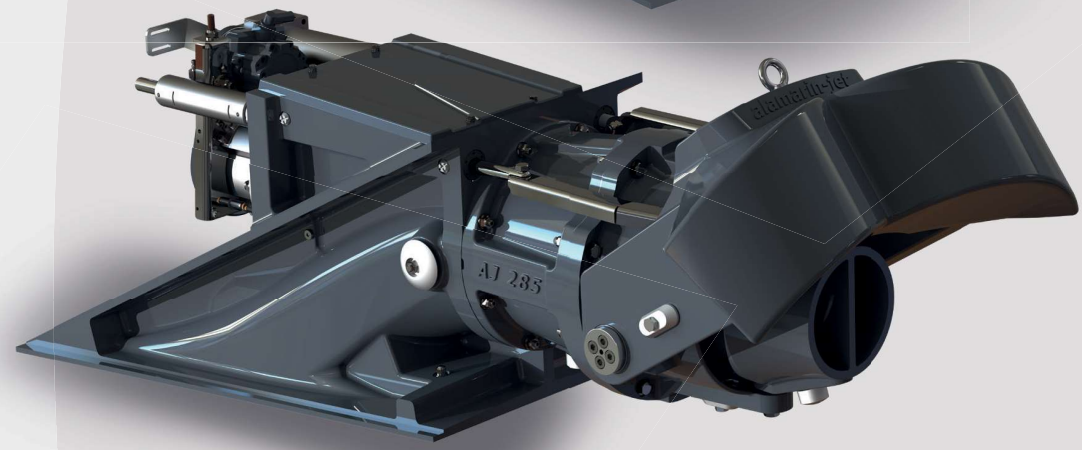
REVERSE DEFLECTOR CONTROL
HYDRAULIC OR
SIGMA CONTROLS

AJ 245 POWER/RPM COVERAGE



AJ 285





TWO INSTALLATION OPTIONS

PATENTED COMBI-FRAME TECHNOLOGY

Integrated oil cooler and steering cylinder

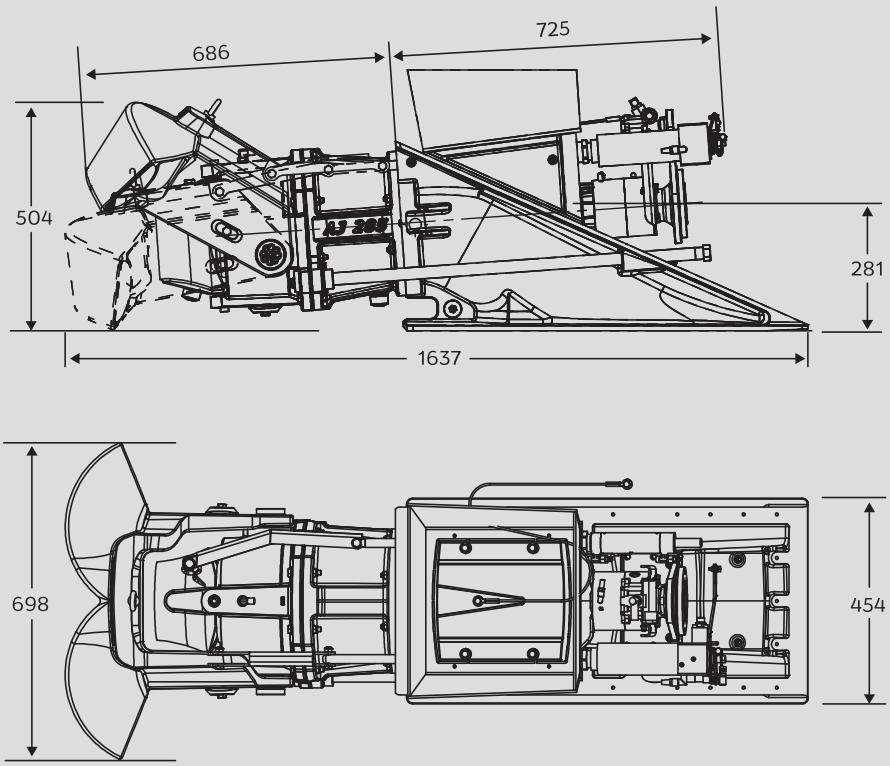
SPECS

PUMP TYPE
MIXED FLOW,
SINGLE STAGE

IMPELLER SHAFT RPM
MAX. 3700 1/MIN

MAX. VESSEL DISPLACEMENT
5000 KG (11 000 LBS)
PER JET UNIT
(PLANING VESSEL)

JET WEIGHT
181 KG
(399 LBS)



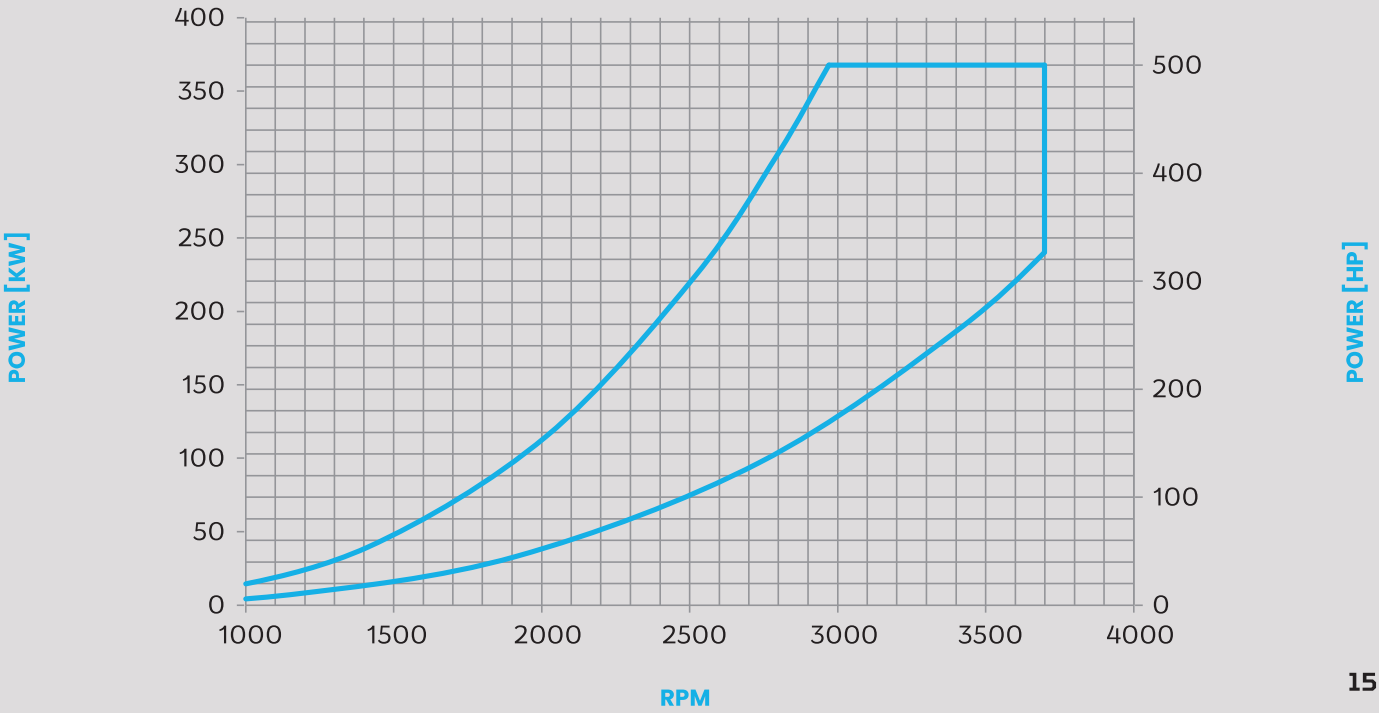
IMPELLER DIAMETER
MAX. 288 MM
(11.3")

MAX INPUT POWER
368 KW
(500 MHP)

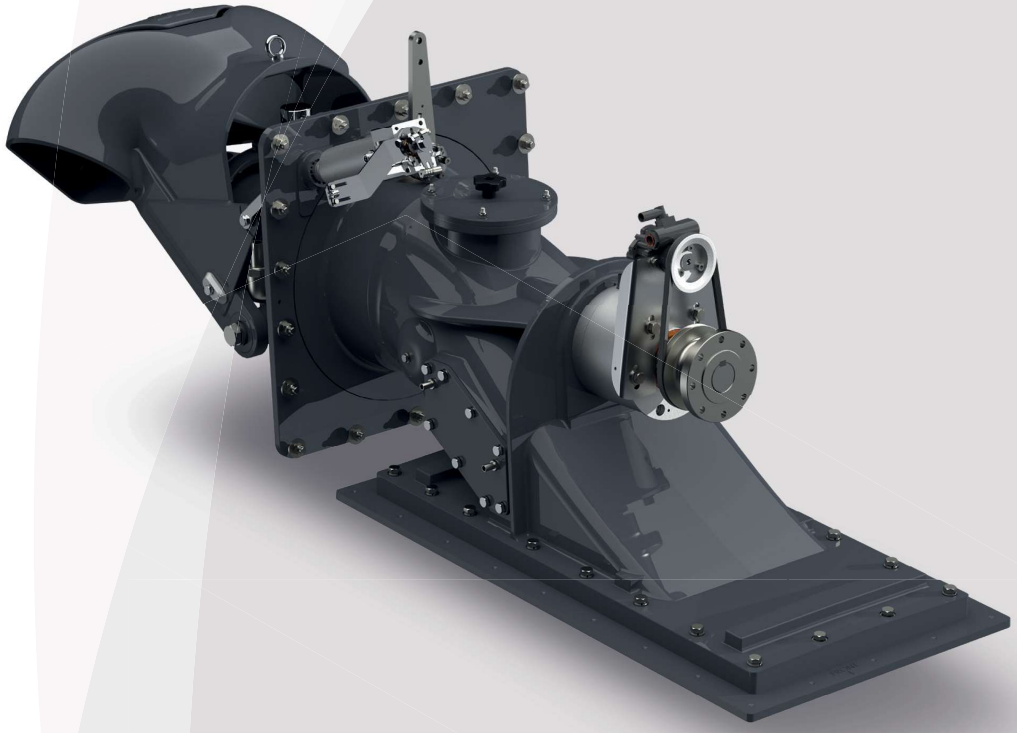
JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

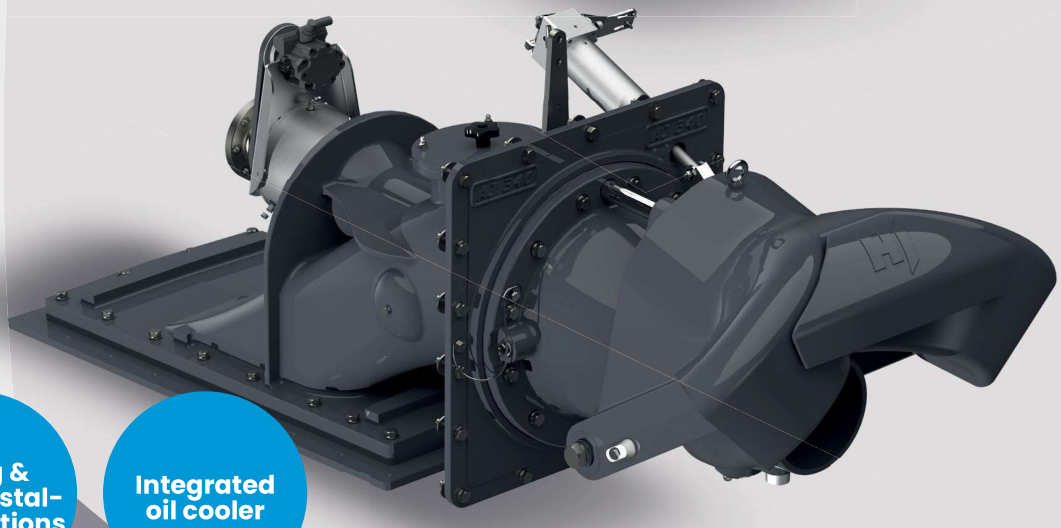
REVERSE DEFLECTOR CONTROL
HYDRAULIC OR
SIGMA CONTROLS

AJ 285 POWER/RPM COVERAGE



AJ 340





0-deg & 5-deg instal-lation options

Integrated oil cooler

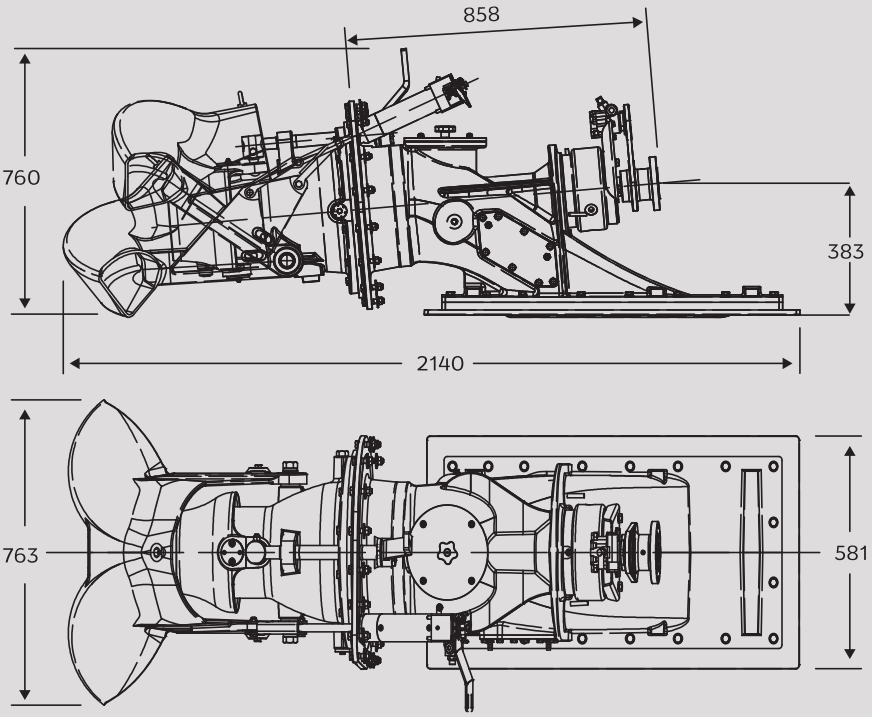
SPECS

PUMP TYPE
MIXED FLOW,
SINGLE STAGE

IMPELLER SHAFT RPM
MAX. 3300 l/MIN

MAX. VESSEL DISPLACEMENT
7500 KG (16 535 LBS)
PER JET UNIT
(PLANING VESSEL)

JET WEIGHT
245 KG
(540 LBS)



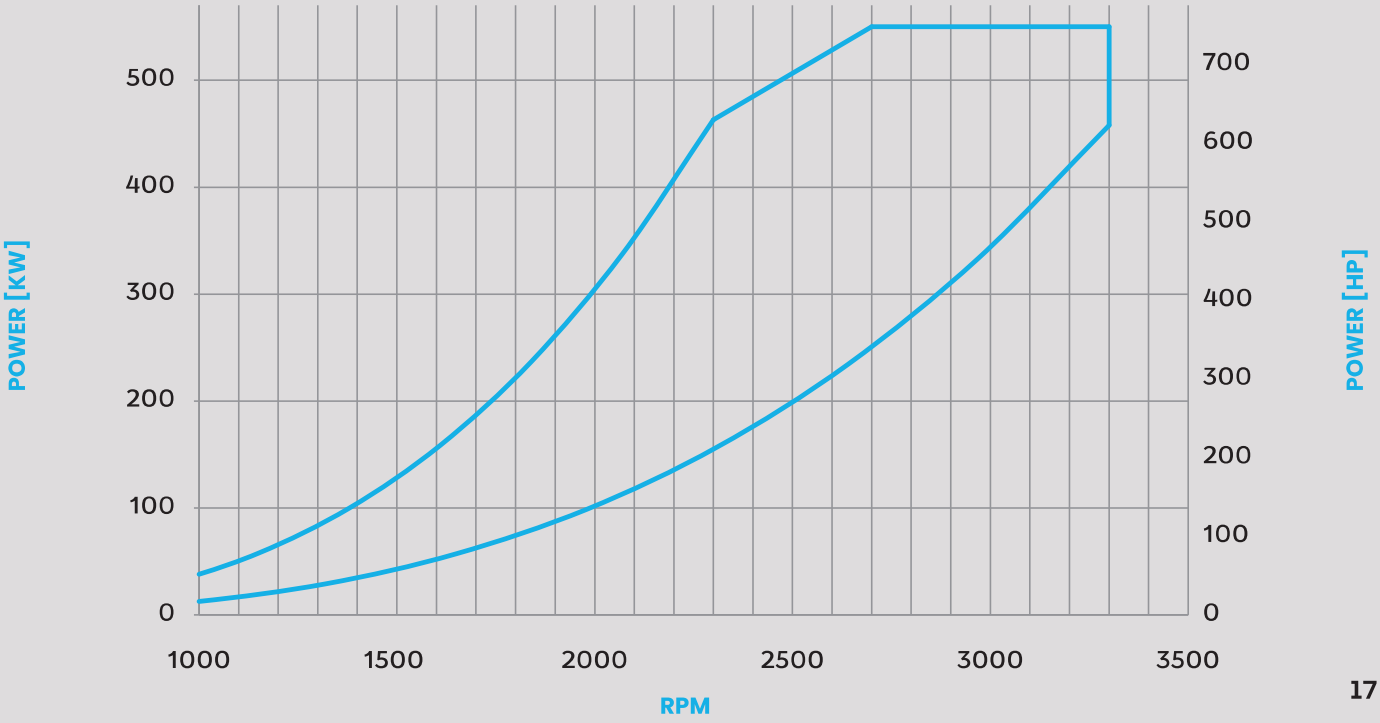
IMPELLER DIAMETER
MAX. 335 MM
(13.2")

MAX INPUT POWER
550 KW
(750 MHP)

JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

REVERSE DEFLECTOR CONTROL
HYDRAULIC OR
SIGMA CONTROLS

AJ 340 POWER/RPM COVERAGE



AJΩ42

DAS:
0-deg & 4-deg shaft options

Integrated SIGMA controls

FIBS:
Frame Integrated Bearing Structure

MIG:
Modular Intake Geometry

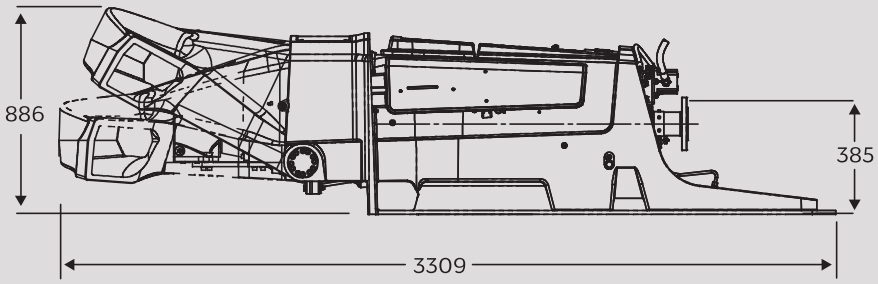
SPECS

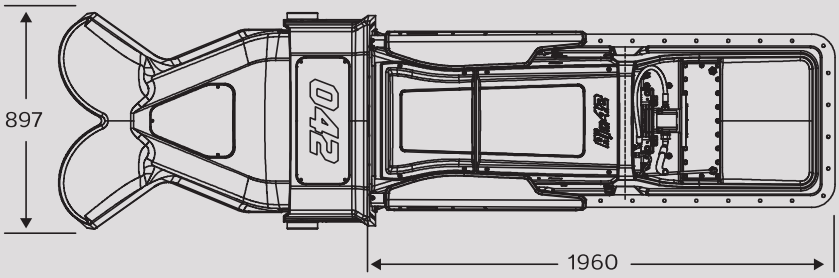
PUMP TYPE
MIXED FLOW,
SINGLE STAGE

IMPELLER SHAFT RPM
MAX. 2300 1/MIN

MAX. VESSEL DISPLACEMENT
24 000 KG (53 000 LBS)
PER JET UNIT
(PLANING VESSEL)

JET WEIGHT
815 KG
(1796 LBS)





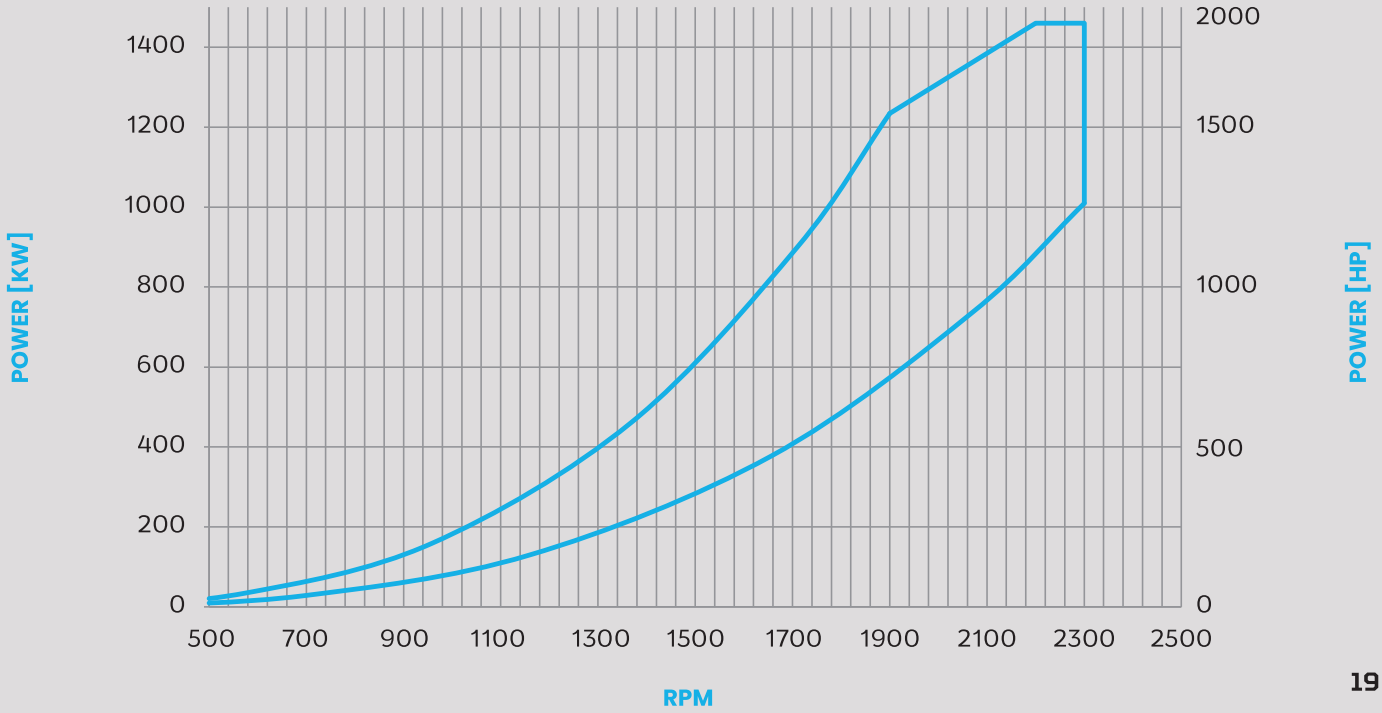
IMPELLER DIAMETER
MAX. 480MM
(18.9")

MAX INPUT POWER
1500 KW
(2040 HP)

JET CONSTRUCTION
ALUMINIUM,
STAINLESS STEEL

REVERSE DEFLECTOR CONTROL
HYDRAULIC OR
SIGMA CONTROLS

AJ OMEGA 42 POWER/RPM COVERAGE



AJ ACU

The Actuator Control Unit System or ACU System is a modular propulsion control system designed to be adaptable for multiple configurations with simple selection of modular components.

The ACU system can be used to control the waterjet deflector(s), as well as engine throttle and gearbox engagement.

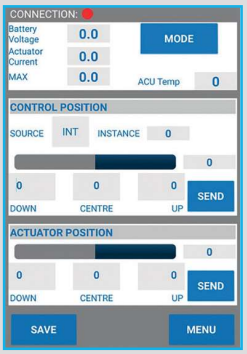
The main unit in the system is the ACU itself.

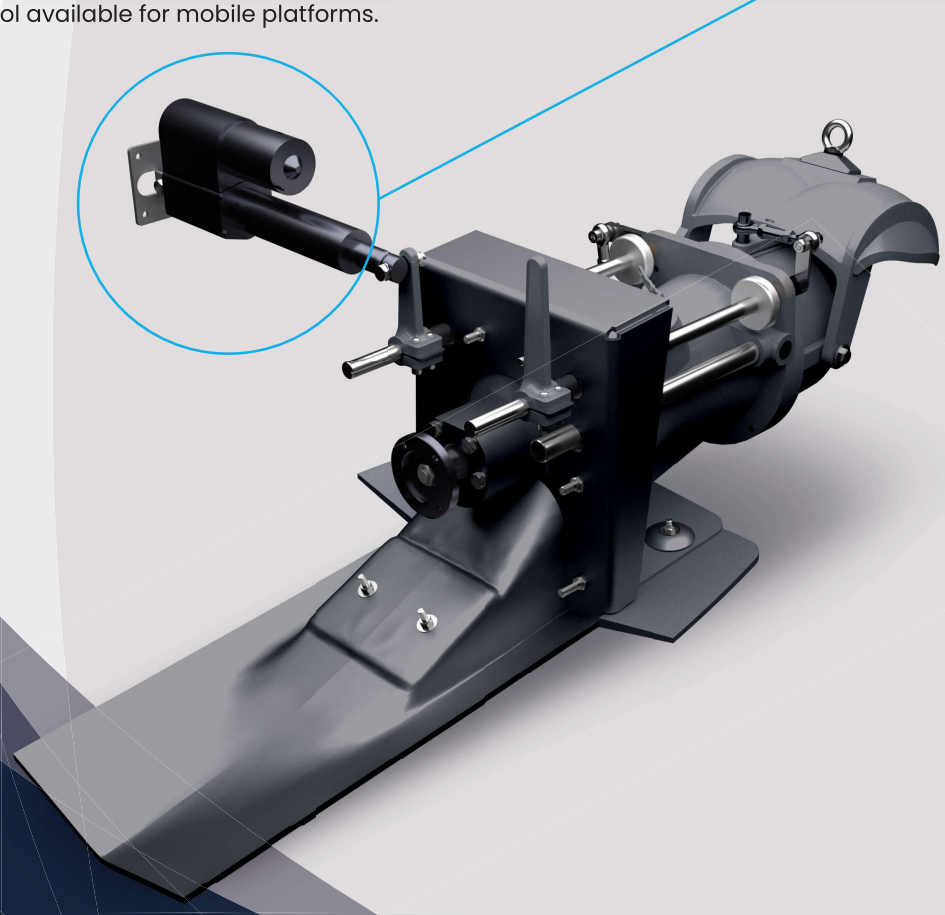
The ACU is a controller box which can be connected to 3 different actuators depending on its role within the overall system.

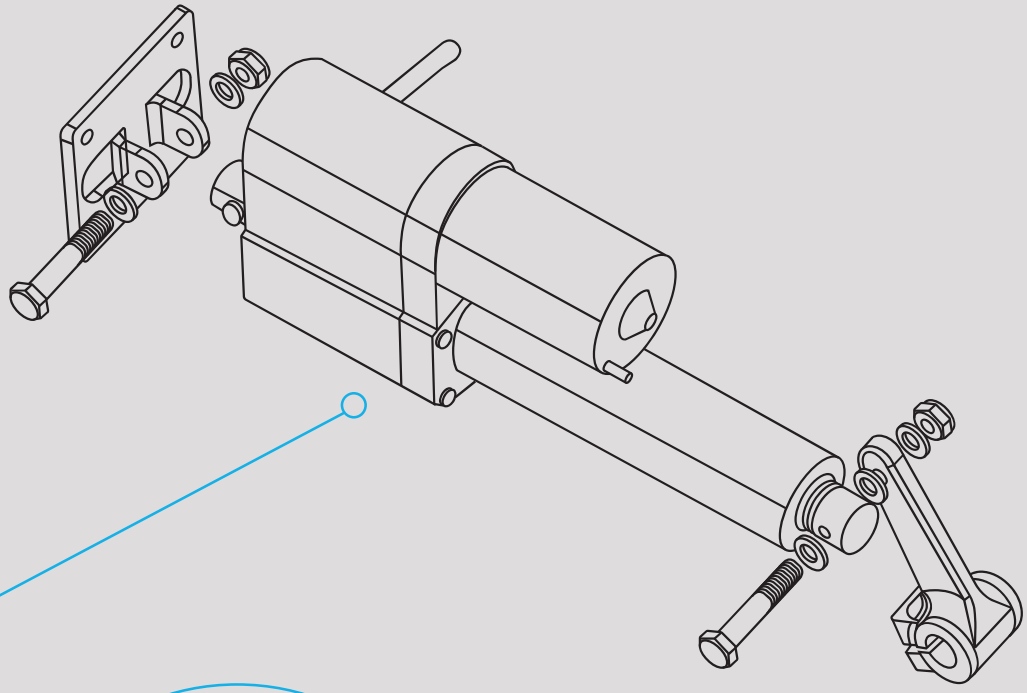
The ACU can accept an analogue voltage signal (typically 0-5v), a CAN signal, or a mechanical input from Morse cable via the built in potentiometer.

The ACU can be configured via the integrated button and 'traffic light' LED's or via ACU Service tool available for mobile platforms.

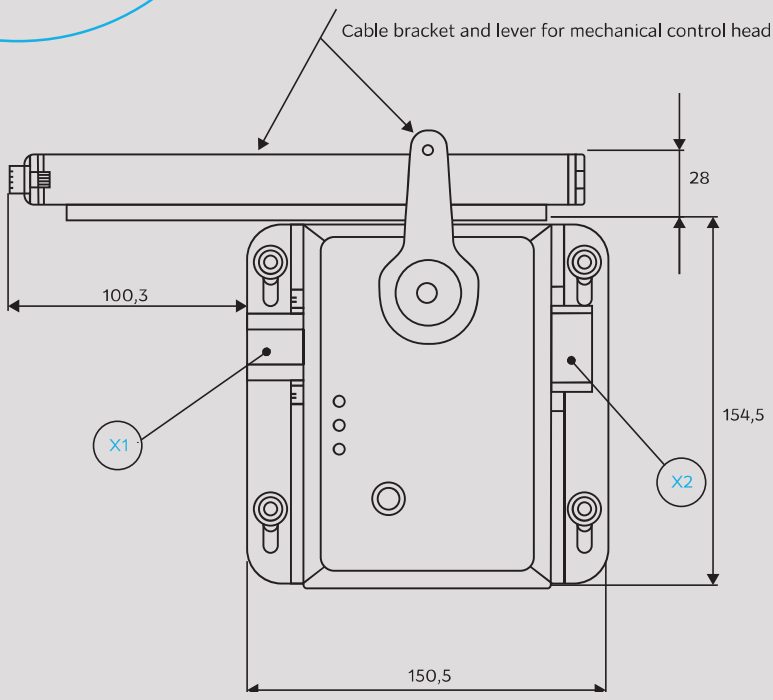
ACU Service Tool (mobile app)

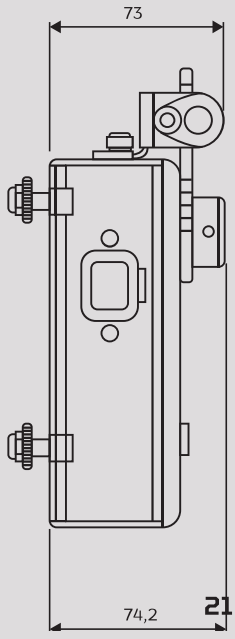






X1	X2
OVDC	Pot. 1 GND
+12VDC	Pot. 1 signal
Actuator neg	Pot. 1 +5VDC
Actuator pos	CAN-L
	CAN-H
	Alarm
	Actuator pot GND
	Actuator pot signal
	Actuator pot +5V
	Pot. 2 GND
	Pot. 2 signal
	Pot. 2 +5VDC





AJ SIGMA CONTROLS

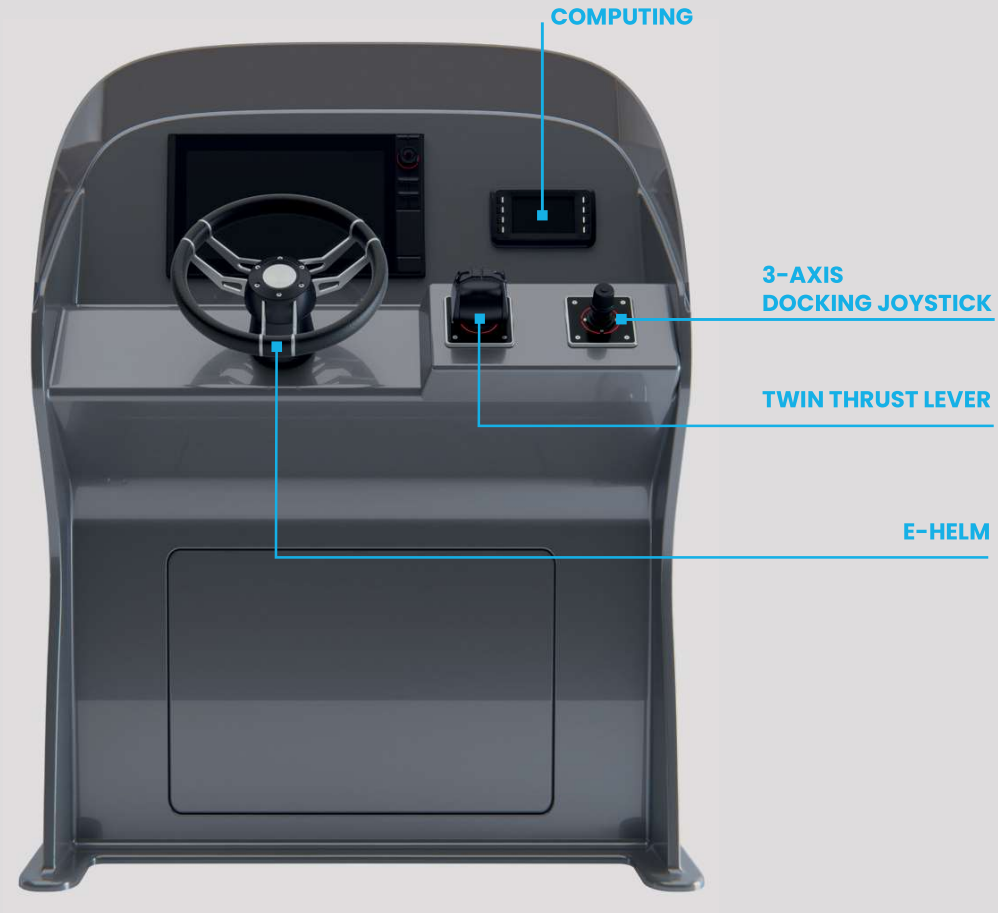
AND INTELLIGENT DYNAMICS

Alamarin-Jet SIGMA Control is an electro-hydraulic integrated drive-by-wire control system. It supports installations from single to quadruple waterjets.
The system is based on modular architecture and the level of features depends on the modules integrated based on the user requirements.

In addition to the standard configuration of Sigma Controls, AJ Intelligent Dynamics is also available as an add-on feature. AJ Intelligent Dynamics has been developed with future markets and industries at its core, such as effortless and straightforward integration with 3rd party autonomous and unmanned systems. Intelligent Dynamics also features highly sophisticated position and heading keeping functions which give significant operational benefits to a wide

INTELLIGENT DYNAMICS IS THE GROUP OF FEATURES INCLUDING:

- **Intelligent Position Hold (DPS)**
- **Intelligent Vessel Anchor (ANC)**
- **Intelligent Heading Keeping (HDG)**



TECHNICAL:

The SIGMA Control system is built on a CAN network, the core of the system being the Jet Controller Units (JCU) and Helm Control Units (HCU) being connected via a standardised cable system. Each Jet has its own independent JCU and individual control hydraulics for increased redundancy. Each JCU works also as an individual control network node (CAN Bus). The primary BUS system is capable to carry both, electric power for each JCU node and network communications.

In the case of twin installation and upwards, two electrically separated primary BUS lines are used to increase the redundancy level. All primary control heads are capable to deliver isolated dual output. Each Control Head axis of movement has two electronically separated circuits, making each propulsion line truly separated and independent. Any single point of failure does not affect to another Primary BUS propulsion line.

Modular and scalable architecture – From single installation up to quad installation

Multiple control stations

Multiple control head arrangement options

Flexible BUS architecture – each jet unit acts as an individual BUS

Factory made modular cabling system, no custom cables required

Easy to approach design

Installation is based on plug'n'play modules

Intuitive walk through commissioning procedure

Simple to use, new High Resolution display with modern UI/UX usability

Digital engine interface – Direct digital CAN-CAN Throttle control

Sophisticated diagnostics – Multiple data logging and diagnostics

Intelligent self-monitoring system. Temperature, Pressure and Fluid

USV Ready – Comprehensive low-level (CAN) and high-level (IP) interfaces

The Waterjet Advantage

EFFICIENCY

As vessel speed increases waterjets become more efficient compared to conventional propeller systems. Efficiency benefits are due to...

- No appendage drag – the waterjet intake sits flush with the hull bottom without struts, propeller shafts, rudders or any elements protruding beneath the hull to increase hull resistance, particularly as speed increases.
- Thrust generated by a waterjet is parallel to the direction of travel. For many propeller systems the shaft is angled down and thrust is generated in the direction of the shaft, so only a component of the total thrust is in the direction of travel.
- Energy lost from flow rotation is recovered by the stator section of the waterjet. This is energy that is lost in a propeller installation.

MANOEUVRABILITY

Waterjet propulsion provides far superior manoeuvrability at both high and low speeds compared to a propeller boat...

- Waterjet thrust is independent of boat speed – thrust is determined by input power and astern deflector position and is available at all times, even at zero speed. Result – boat can be turned without moving ahead or astern, and the ability to move the reverse deflector slightly either side of the zero speed position also provides very fine ahead or astern control, all while maintaining full steering control.
- No need to change engine rotation to generate reverse thrust. A change from full forward thrust to full reverse thrust only requires the reverse duct to move from fully up to fully down position.
- Sideways thrust capability with two or more jets (with split duct reverse deflectors) without the need for a bow thruster.

SAFETY

Waterjets have no exposed high-speed moving components external to a vessel's hull, providing greater safety to people in the water and marine life, and allowing the propulsor to keep running when operating in such conditions. There is also less risk to equipment in the water.

DURABILITY

A waterjet is inherently more durable than conventional propeller propulsion...

- No exposed appendages beneath the hull – allows the vessel to access shallow waterways, cross sandbars and reefs, and complete beach landings and launches.
- The impeller is protected inside the body of the jet – propulsion gear is not exposed to damage from floating debris or in the event of grounding.
- Maintenance can be predicted and planned in advance – with propeller systems there is always uncertainty as exposed propulsion gear could be damaged at any time. Waterjets reduce downtime for vessel maintenance and can mean fewer vessels are required in a fleet.

FLEXIBILITY

Waterjets offer significant advantages for vessels subject to variable loads...

- Boat speed is determined by hull weight – when the vessel is running light it will travel faster or maintain service speed with reduced power input, resulting in fuel and time savings.
- Engines can not be overloaded when vessel is heavily laden – unlike propeller systems which can transfer load to the engine, a waterjet will always match available engine power. This results in less engine wear and consequently less maintenance and longer engine life.
- Secondary propulsion option – waterjets can be used as boost or loiter propulsion alongside other waterjets or propellers.

Right: The twin jetstreams of this patrol vessel in Spain are delivered from a pair of HamiltonJet HJ403 waterjets.

The HamiltonJet Difference

PERFORMANCE

High speed performance and efficiency – advanced impeller and intake designs provide peak efficiency and performance over a wide speed range.

Low speed performance – high thrust at low speeds ensures excellent station-keeping, bollard pull, load carrying and manoeuvring.

Acceleration – ability to apply full power at lower speeds ensures fast acceleration for patrol boats, rescue craft, pilot boats and recreational vessels.

CONTROL

Steering control – HamiltonJet's JT steering system out-performs all others, reducing thrust losses when steering to give tighter turns and maintain vessel speed during the turn.

Ahead / Astern control – HamiltonJet's split duct reverse deflector provides up to 60% of forward thrust, resulting in highly responsive control at slow boat speeds where engine is set to higher than idle RPM and the reverse duct is used to regulate forward and aft thrust.

Speed of the controls response – HamiltonJet controls respond quickly to skipper input to improve manoeuvring control and safety. The company develops hydraulic and electronic control systems to maximise control benefits of its waterjets.

LIFECYCLE

Material specifications – all HamiltonJet waterjets are manufactured using high quality materials to ensure the best mix of durability, weight, corrosion resistance and cost.

Impeller rating accuracy – impellers are cast as a single piece to ensure more accurate ratings for all impellers and a better match to peak engine rating.

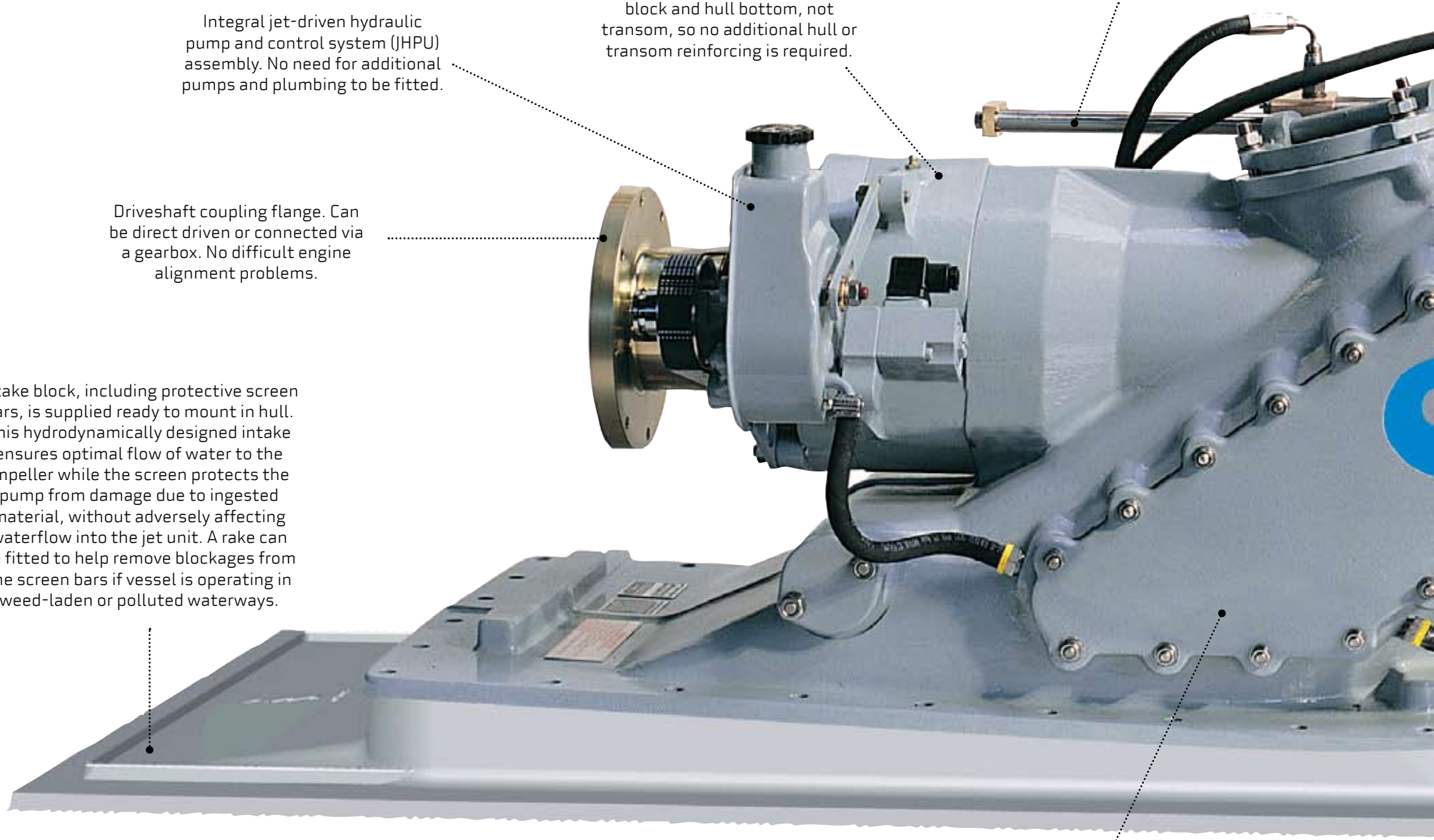
Application engineering – HamiltonJet provides the highest level of technical expertise and advice to builders, designers and end users throughout the entire vessel design, build and commissioning phases, and for the operational life of a vessel.

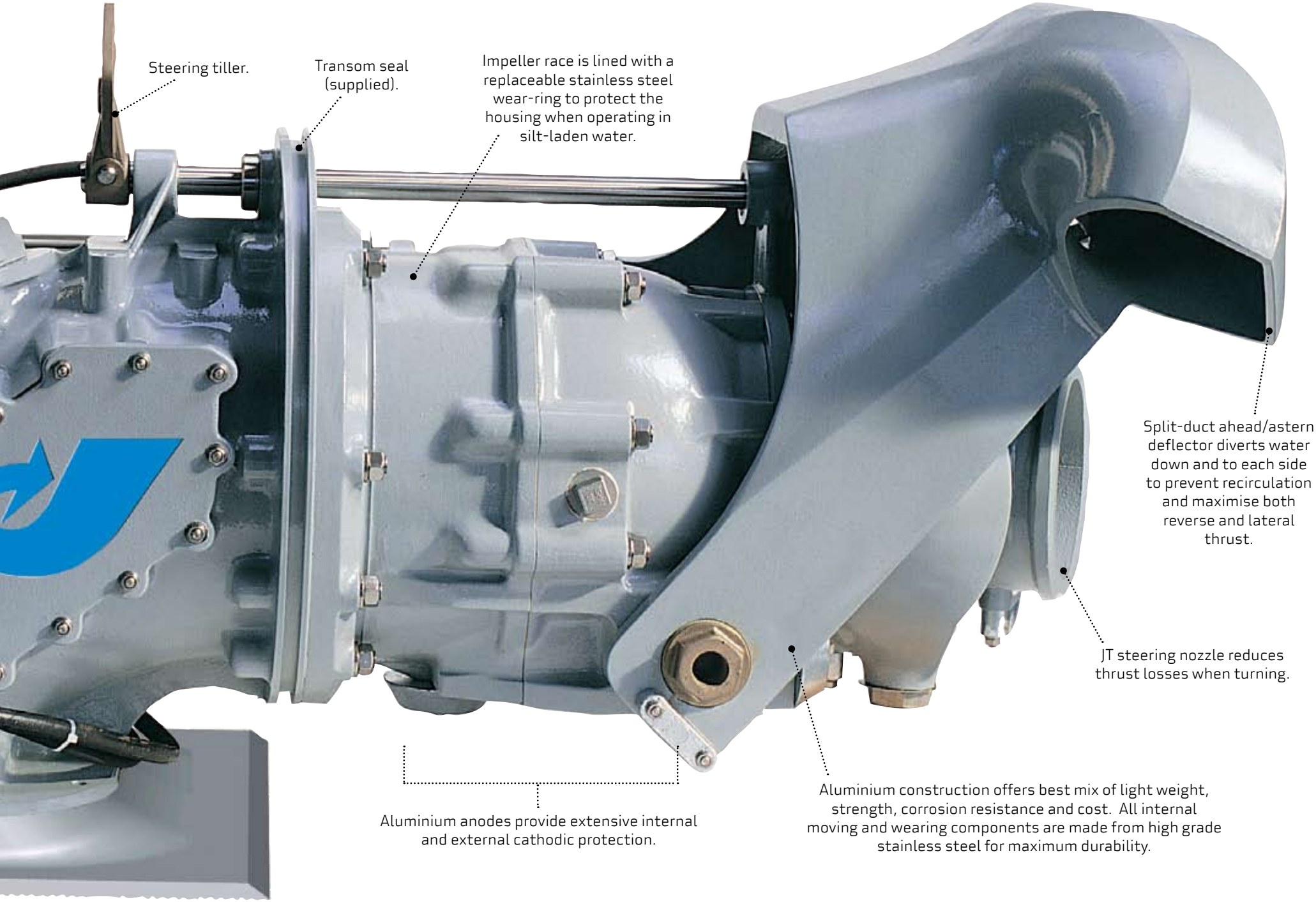
Integrated Engineering – Each HamiltonJet waterjet is a complete packaged, factory tested, propulsion module, with reverse and steering control systems fully integrated with the jet to simplify installation and maintenance.

SUPPORT

International Support – HamiltonJet's service and support network extends around the globe to provide immediate assistance and spare parts supply.

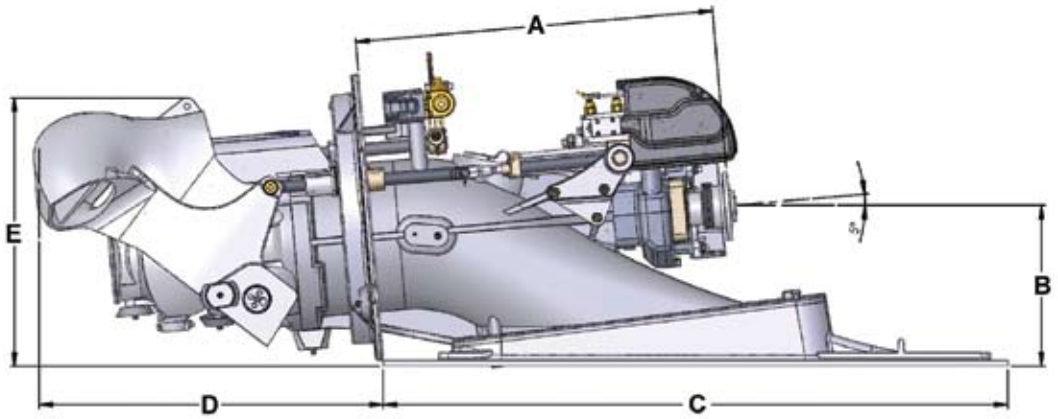
HamiltonJet Features

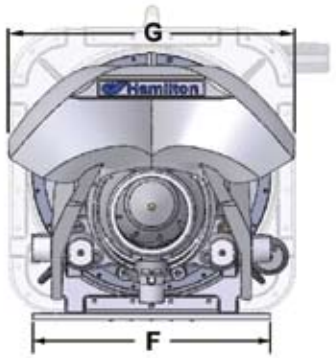



Steering tiller.
Transom seal (supplied).
Impeller race is lined with a replaceable stainless steel wear-ring to protect the housing when operating in silt-laden water.
Split-duct ahead/astern deflector diverts water down and to each side to prevent recirculation and maximise both reverse and lateral thrust.
JT steering nozzle reduces thrust losses when turning.
Aluminium anodes provide extensive internal and external cathodic protection.
Aluminium construction offers best mix of light weight, strength, corrosion resistance and cost. All internal moving and wearing components are made from high grade stainless steel for maximum durability.

HamiltonJet HJ Series Dimensions

The HJ Series comprises a range of highly efficient waterjet units suitable for propelling craft at speeds ranging from zero to up to 50 knots and typically of length up to 20 metres.





Jet Model	A (mm)	B (mm)	C (mm)	D (mm)	E (mm)	F (mm)	G (mm)	Intake Block (kg / lbs)	Dry Weight (kg / lbs)	Entrained Water (kg / lbs)
HJ212	450.3[a]	221.2	762	609	440	386	450	7 / 15.4	75 / 165	17 / 37
HJ213	413	249	762	609	420	386	450	7 / 15.4	84 / 185	17 / 37
HJ241	424	284	829	705	491	431	502	10 / 22	104 / 229	26 / 57
HJ274	570	302	1100	710	548	470	608	22 / 48.5	152 / 335	35 / 77
HJ292	681	330	1180	750	550	495	608	26.4 / 58	187 / 412	45 / 99
HJ322	866	371	1380	835	637	550	680	37 / 82	260 / 573	62 / 137
HJ364	937	420	1634	901	701	621	747	62 / 137	408 / 899	79 / 174
HJ403	1053	474	1723	1080	752	690	803	72 / 159	641 / 1407	110 / 243

NOTES: Input RPM are subject to suitable cavitation limits – lower RPM figure is always preferred. Higher power inputs will restrict input RPM range.

[a] – HJ212 "A" dimension is to the end of a splined shaft. May be close coupled.

Weight based on standard 5° Intake Block option. Contact HamiltonJet for weights of optional 0° intake.

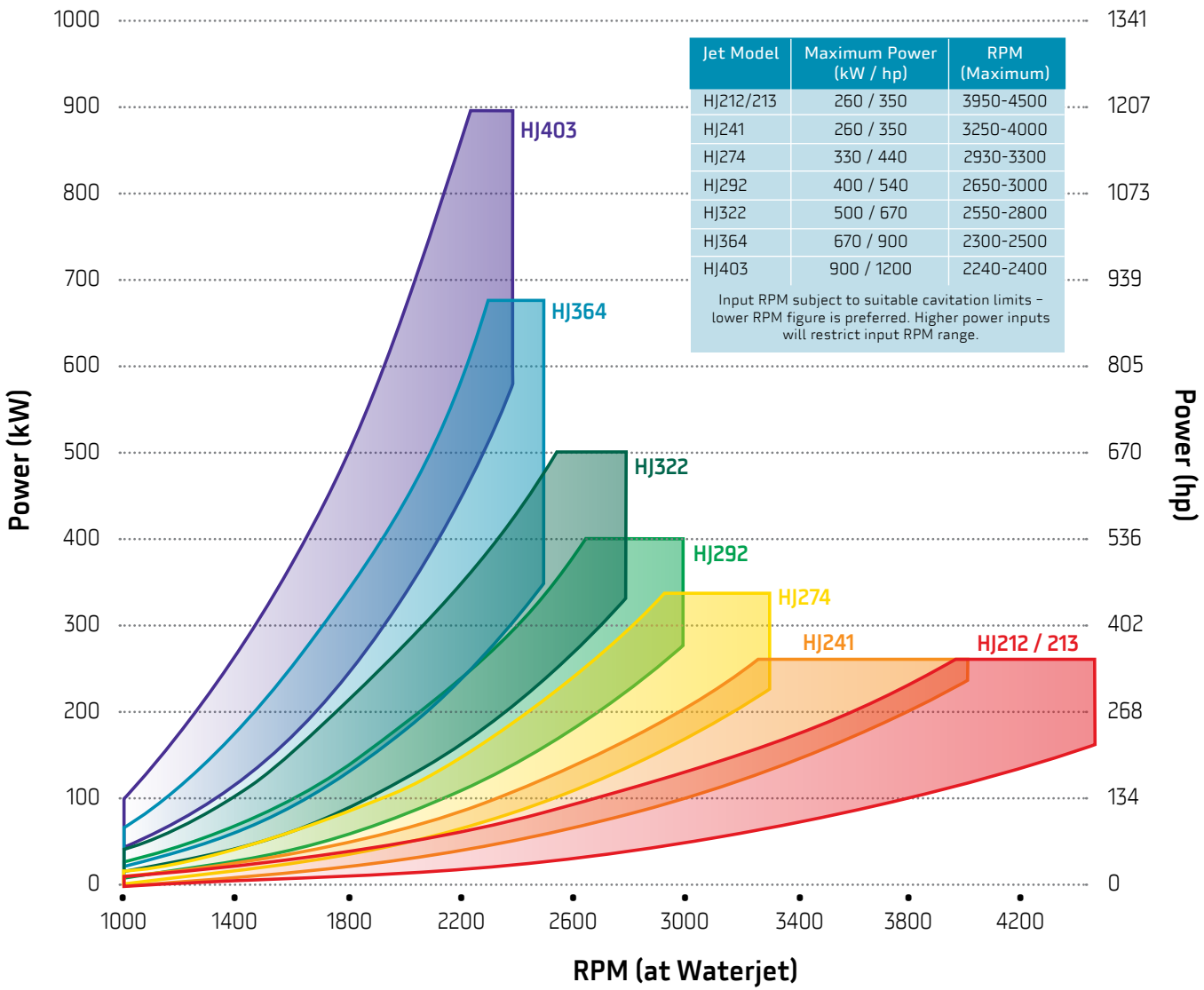
Layout and dimensions shown are indicative only for initial design purposes, based on jets with standard 5° intake block which facilitates close direct drive coupling of the engine. An optional 0° intake block, which positions the jet parallel to the hull bottom, is available for certain models. Consult HamiltonJet for more detailed information.

Right: Kvichak-built US Navy Maritime Prepositioning Force (MPF) high speed landing barge. Twin HamiltonJet HJ364 waterjets.

HamiltonJet HJ Series Power / RPM Curves

Jet Model	Maximum Power (kW / hp)	RPM (Maximum)
HJ212/213	260 / 350	3950-4500
HJ241	260 / 350	3250-4000
HJ274	330 / 440	2930-3300
HJ292	400 / 540	2650-3000
HJ322	500 / 670	2550-2800
HJ364	670 / 900	2300-2500
HJ403	900 / 1200	2240-2400

Input RPM subject to suitable cavitation limits – lower RPM figure is preferred. Higher power inputs will restrict input RPM range.



Note: Waterjet selection is determined by a range of hull and operational factors, most importantly vessel size and displacement (weight), and not necessarily by matching the above specifications to the desired engine power/RPM curve. In all cases you should consult HamiltonJet for assistance with waterjet selection.

HamiltonJet Operation

JT Steering

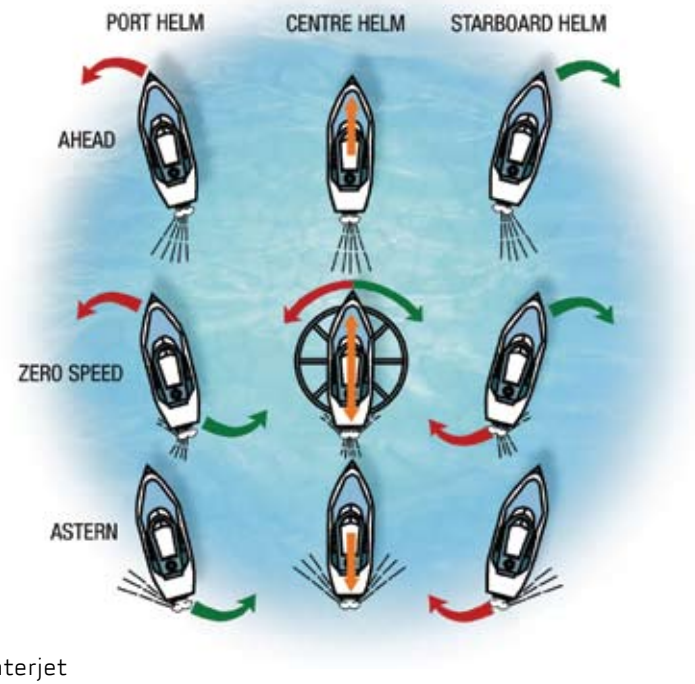
All HJ Series waterjets incorporate HamiltonJet's JT steering nozzle to optimise both steering efficiency and delivery of propulsive thrust. Compared with other waterjet steering systems, the JT nozzle provides outstanding steering response at all boat speeds. This is particularly noticeable at low speeds due to the absence of a central "deadband". The design reduces nozzle flow disturbance, resulting in lower energy losses and minimal loss of forward thrust when steering. These factors mean higher overall efficiency through improved course-keeping and, coupled with low steering loads and noise level, make the JT system highly effective and reliable under all conditions.

Ahead / Astern

The ahead/astern function is an integral part of HJ Series waterjets, utilising a split-duct deflector to provide maximum astern thrust under all conditions of boat speed, water depth and throttle opening. The splitter incorporated in the deflector divides the flow to two outlet ducts angled down to clear the transom and to the sides to retain the steering thrust component. Vectoring the astern thrust away from the jet intake avoids recirculation and the resulting astern thrust is equivalent to up to 60% of ahead thrust – maintainable up to high throttle settings.

The shift from full ahead to full astern is a smooth transition as the deflector is lowered through the jetstream, eliminating any delay or shock loading normally associated with propeller/gearbox drives. Designed to withstand the loads imposed when the deflector is lowered at full speed ahead, the arrangement provides a powerful braking function for emergencies.

The separation of the steering and ahead/astern functions offer the opportunity for unlimited combinations of translational and rotational movements for outstanding vessel control.



Control Functions

Since steering and ahead/astern functions are separate and have independent effects, they may be used together to enable complex vessel manoeuvres without complex combinations of control inputs by the operator.

With the astern deflector fully raised, full forward thrust is available. With the deflector in the lower position, full astern thrust is generated. In both positions full independent steering is available for rotating the craft. By setting the deflector in the intermediate "zero-speed" position, ahead and astern thrusts are equalised for holding the craft on station, but with independent steering effect still available for rotational control. Infinitely variable adjustment either side of "zero-speed" enables the craft to be crept ahead or astern, and in multiple jet installations appropriate thrust vectoring alone can be used to induce true sideways movement.

Control Systems

All HamiltonJet waterjets incorporate a hydraulic or electronic control system specifically designed to best match the characteristics of the particular vessel and waterjet configuration. Hydraulic components are built into the waterjet and can be actuated from the helm by either manual cables (smaller HJ models only), a hynautic hydraulic control system or HamiltonJet's blue ARROW and MECS electronic control systems (for HJ292 – HJ403 only).

Electronic control systems offer a greater level of customization to suit a wide range of operational parameters, including combined or seperate throttle & reverse control, multiple control stations, interface with other electronic helm components such as autopilots and DPS, and improved operator interface to ensure skippers of all levels of experience have full access to the manoeuvring capabilities and advantages of HamiltonJet waterjets.

Left: NorSafe Magnum 750 and Magnum 850 Rescue Craft, Norway. Single and Twin HamiltonJet HJ241 waterjets.

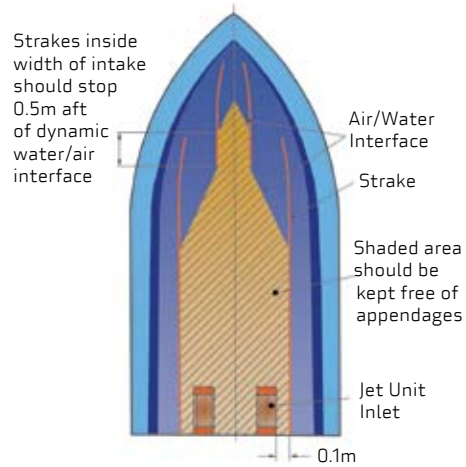
HamiltonJet Suitable Hull Form Guidelines

This page provides basic information to assist when determining the suitability of waterjet propulsion for different hull forms, vessel applications and performance expectations.

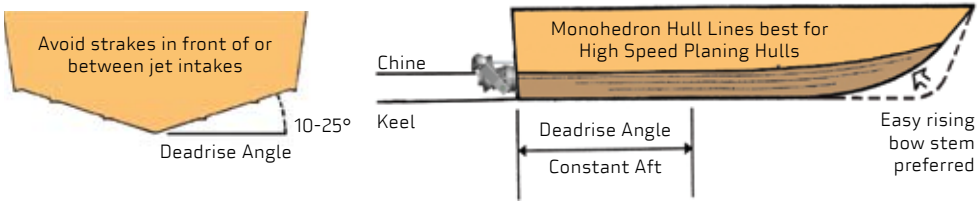
General Guidelines

The hull shape, monohull or multihull, should be that which best suits the size, displacement and cruising speed of the craft, but with the following prerequisites:

- Hull shape and appendages must avoid entraining air into the waterjet inlet.
- If no keeling is proposed, hull shape must be directionally stable without such appendages.
- Avoid appendages such as keels, rudders, planing strakes, etc for at least 2 metres in front of the waterjet intake. Appendages can generally be placed to the outside of the projected area foward of the waterjet inlet(s) without affecting their performance.
- Water level must be at least up to the waterjet mainshaft when the craft is at rest.
- HamiltonJet should be consulted in all cases before construction starts.



High ("Planing") Speed Craft (over 30 knots)



For best directional stability and speed, a hull with monohedron lines (constant deadrise over planing area) is recommended.

Avoid deep and fine bow stems as, without additional keeling, these can cause directional instability at speeds over 25 knots. Also for directional stability and to avoid air being entrained into the waterjet from bow waves, deadrise angles of between 10° and 25° are generally recommended.

Multihulls and Medium Speed Craft (10 to 30 knots but increasing with length)

- Long narrow multihulls, which maintain low trim angles throughout the speed range, are well suited to waterjet propulsion. To minimise hull resistance of catamarans, designers should compensate for lost buoyancy aft caused by waterjet installation, generally by keeping the Longitudinal Centre of Gravity (LCG) well forward.
- Surface Effect Ship concept hulls and foils can provide additional 'lift' to the hull and give significant reduction in resistance, but care must then be taken to avoid aerated water from the bows and foils entering the waterjet(s).
- For medium speed craft (eg: semi-displacement and warped hulls) ensure sufficient immersion for waterjet(s) to prime when craft is at rest and LCG is positioned for best speed.

Note: Due to moderate dead rise and immersion aft and deeper vee forward sections, some keeling aft may be required to maintain directional stability.

Slow Speed Craft (0 to 10 knots but increasing with length)

- Craft speed is limited by the water line length (WLL or LWL) and efficient hull shape rather than shaft power.
- At speeds up to the natural displacement speed (NDS), very modest shaft power is required and acceptable propulsive efficiencies can thus be obtained with relatively small waterjets.

In all situations we recommend you submit the Application Questionnaire form on the reverse and then discuss your propulsion options with a HamiltonJet authorised Distributor to ensure waterjets are successful in your vessel.

MERCURY

Sterndrive & Inboard Engines

GASOLINE • DIESEL

MERCRUISER STERNDRIVES

The heart of better boating

Mercury MerCruiser® is world-renowned for creating innovations that provide boaters the best experiences on the water. From our pioneering sterndrive propulsion introduced at the Chicago Boat Show more than a half-century ago to today's joystick controls that give boaters the confidence and ability to pilot the boat of their dreams even under extreme conditions, MerCruiser® is the undisputed leader in marine power and technology.

The complete package

No matter what type of boating interests you most, MerCruiser can power it better than anyone else. Our extensive range of gas and diesel engines is the most comprehensive lineup in the industry, and our superior engines and drives are engineered to provide the best possible boating experience. So whether you're interested in TowSports or fishing, cruising inland lakes or big water offshore, the answer to your propulsion needs is MerCruiser.

Technology leader

From Emissions Control Technology that provides clean, environmentally friendly boating to the latest in electronic controls and engine-monitoring systems, MerCruiser leads the industry in providing game-changing innovations that continue to make boating better and better. Before we introduce a new engine or drive, it undergoes grueling lab, endurance and open-water testing to bring you the best product possible. You can count on MerCruiser to provide proven technology and unmatched performance.

Reliably dependable

Our engines and drive systems are designed from the ground up to make your boating experience as stress-free as possible. With patented metallurgy technology, state-of-the-art electronics and robust manufacturing, every MerCruiser package is built to deliver best-in-class reliability, dependability, performance and longevity. Our experience, expertise, innovation, commitment to quality and our extensive dealer network produce a boating experience that delivers everything you desire, including easy maintenance, low cost of ownership and the greatest benefit of all – peace of mind.

MERCURY®

Axius® Joystick Piloting

Total boat control at your fingertips

Axius® drive system has elevated boat control to a new level of ease and simplicity. Perhaps no boating environment is more challenging and nerve-wracking than piloting and docking a large boat in a crowded marina. Throw in crosswinds, currents and other distractions and the feeling of chaos can loom. Relax – Axius joystick piloting eliminates docking anxiety forever.

At the heart of Mercury® Axius is the ergonomically designed joystick that provides single-handed, intuitive, easy and natural control of your boat.

- Push the joystick to the right and your boat moves sideways to the right.
- Push the joystick left and your boat moves to the left.
- Twist the joystick to the left or right and your boat will rotate in that direction.
- Push toward the bow to move forward, toward the stern to move backward.
- You control the speed by the amount of pressure you apply.

This unprecedented level of control and ease is made possible by a joystick system that directs two independently steered sterndrives to turn driver input into easy and accurate complex maneuvers.

Axius® compatible engines

5.0L / 350 MAG / 377 MAG / 8.2L

Axius® Premier changes everything on open water

While Axius delivers incredible joystick docking, Axius Premier provides benefits in open water that elevate boating to a new level of enjoyment and satisfaction.

Skyhook® Digital Anchor

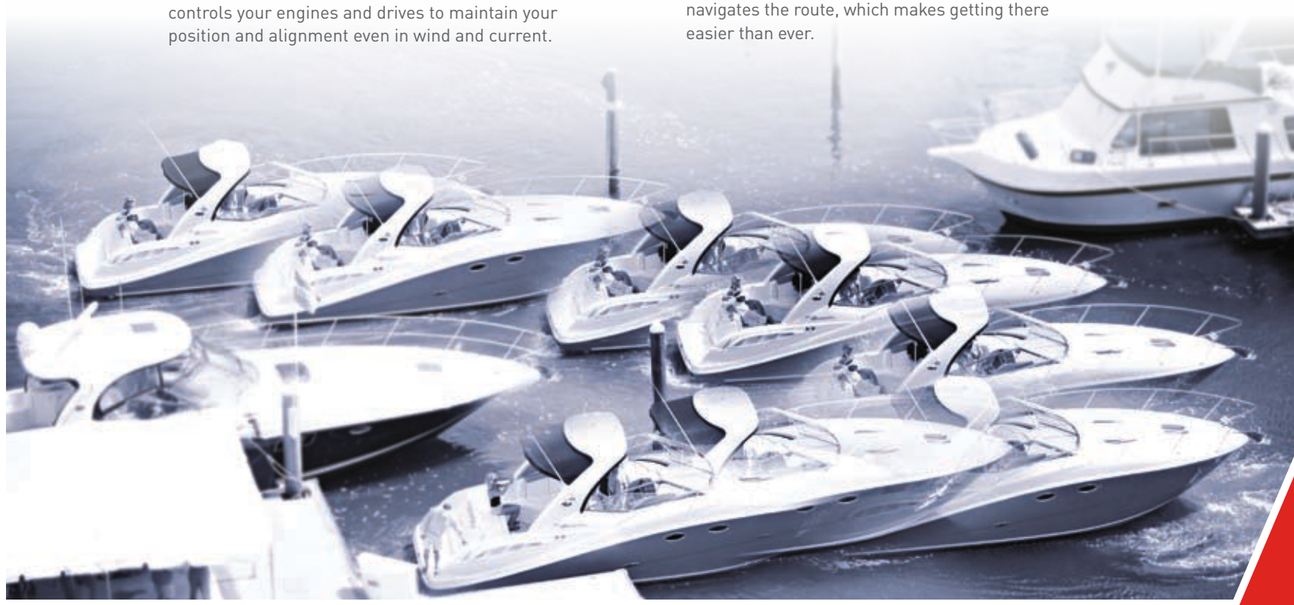
Now you can maintain your place in line at the fuel dock, stay locked onto your favorite fishing spot or hold a fixed position while waiting for a bridge or lock to open without constantly adjusting your controls. With the touch of a button, Skyhook technology uses GPS satellites to pinpoint your boat's position, then controls your engines and drives to maintain your position and alignment even in wind and current.

Auto Heading

Auto Heading uses a built-in digital compass to maintain course and make precise corrections with the touch of your finger. When Auto Heading is engaged, you can correct course by one degree with a single tap on the joystick control, or adjust by 10 degrees with a single tap on the control pad.

Waypoint Sequencing

We've taken chart plotting to a new level of ease and accuracy with Waypoint Sequencing. Using your VesselView® screen, you can plot your course along multiple points on the way to your final destination. Waypoint Sequencing follows your inputs and precisely navigates the route, which makes getting there easier than ever.



SmartCraft DTS

Amazingly smooth and responsive, DTS replaces the lag and hesitation of traditional throttle and shift cables with digital precision, resulting in smooth shifting and instant throttle response. DTS also includes auto synchronization, allowing you to control multiple engines with a single control lever.

MerCruiser SEACORE system

MerCruiser's SeaCore technology is a comprehensive corrosion protection system developed to ensure your MerCruiser engine handles the rigors of the marine environment over the long haul. Built-in corrosion-fighting features, including hardcoat anodized components, a closed-cooling system (which seals out saltwater from the block) and widespread use of stainless steel parts impervious to saltwater corrosion contribute to a system that's the toughest and most complete corrosion-resistant technology on the water.

EMISSIONS control TECHNOLOGY

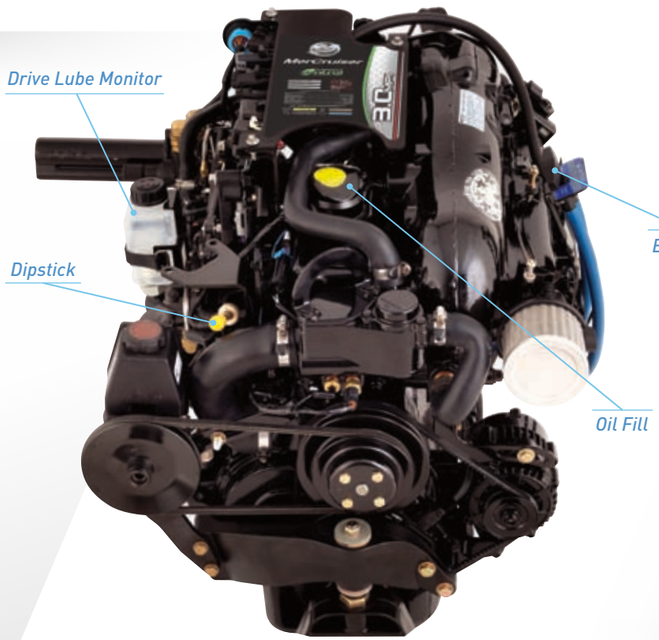
MerCruiser is committed to Emissions Control Technology (ECT), offering a full line of sterndrive and inboard engines in the 135 - 430hp range. To meet California Air Resource Board (CARB) and the Environmental Protection agency (EPA) emissions standards, Mercury Marine utilizes a reliable catalyst system that produces cleaner exhaust without limiting classic MerCruiser performance.

Axius®

The MerCruiser Axius system simplifies docking and low-speed maneuvering by using a joystick to control steering, throttle and shift. The intuitive and natural user interface provides total boat control with one hand, meaning virtually anyone can dock safely with total confidence. Axius Premier provides advanced open-water benefits.

The people's choice

No marine engine provides more fun than the Mercury MerCruiser® 3.0L MPI ECT sterndrive package.
Instant throttle response pulls skiers out of the water with ease, while unmatched durability gives you confidence to go wherever you want. In addition to many fun-enhancing features, easy-access maintenance turns routine service into a snap. No wonder more than a half-million runabouts, pontoons and houseboats have been powered by MerCruiser 3.0L sterndrive units. It's the engine designed with fun in mind!



Designed to deliver

How do you improve on pure enjoyment? Make it totally unbeatable.
The MerCruiser 3.0L sterndrive's cutting-edge sequential Multiport Fuel Injection (MPI) continuously delivers the exact amount of fuel appropriate for all driving conditions. The result is easy starting regardless of weather, smooth and stable idling, awesome throttle response, increased fuel efficiency and reduced cost of operation. Thanks to Mercury Emissions Control Technology (ECT), emissions are low and all you leave behind is a wake.

Easy to maintain, a joy to drive

Simplicity is often the key to success in boating, and no boat engine is easier to maintain than the 3.0L MPI ECT. Mercury Marine takes great care to design and develop MerCruiser engine technologies and innovations that provide years of easy, stress-free boating – starting with the care of your engine. This contemporary engine is equipped with color-coded maintenance points that simplify checking and filling fluid reservoirs, while the Mercury-exclusive Engine Guardian System senses potential problems and helps prevent engine or drive damage from low oil pressure, low drive lubricant or overheating. This remarkable engine is also armed with the Mercury SmartCraft® system and delivers information regarding critical engine functions, such as fuel usage and rpm, in an easy-to-read display at the helm.

GASOLINE	3.0L MPI
Horsepower	135
Full Throttle RPM	4400-4800
Cylinders	4 (I-4)
Drives	Alpha®

Smooth operator

Have a Mercury MerCruiser® day: *Get up early, drive to the marina, climb aboard, leave fast and come home late after skiing, fishing, sunning, swimming, tubing, smiling, relaxing and once in while just driving full throttle over smooth water on a boat powered by a MerCruiser 4.3L MPI ECT. This engine has the power to get you on plane immediately and run strong and smooth all day. The 4.3L MPI ECT is an excellent choice for single-engine runabouts and pontoons, as well as multi-engine cruisers and houseboats. Additionally, this sterndrive package offers unmatched power-to-weight ratio for superior acceleration and fuel efficiency.*

Making waves

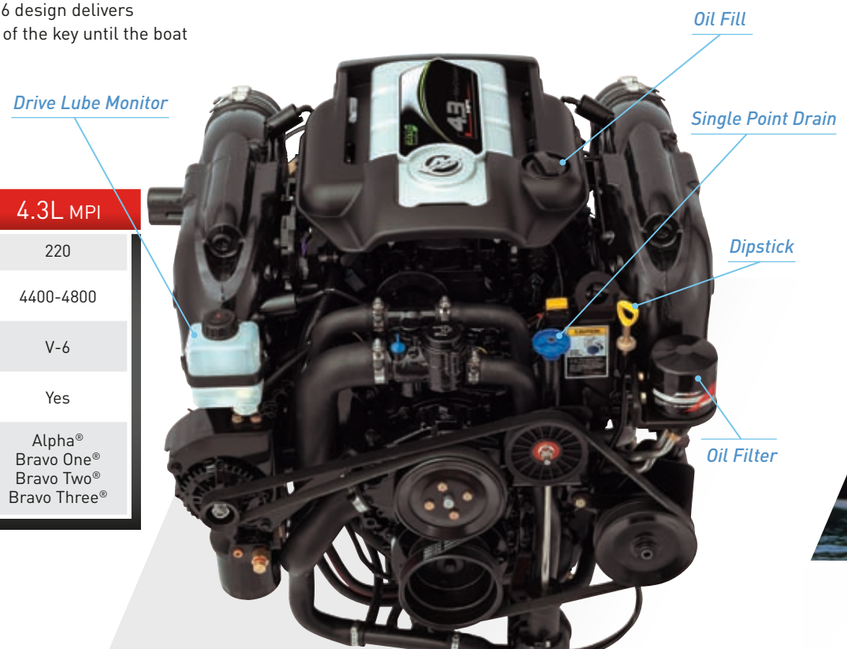
Mercury Marine® technologies and products are proven long before you experience them because they're subjected to demanding tests throughout every stage of design, development and manufacturing. Whether your passion is skiing over a glassy lake or enjoying the view from an evening pontoon cruise, whether you crave an iconic Mercury hole shot or long-lasting, unwavering power, this tough but refined V-6 design delivers impressively from the first turn of the key until the boat is docked for the night.

Technology beats corrosion

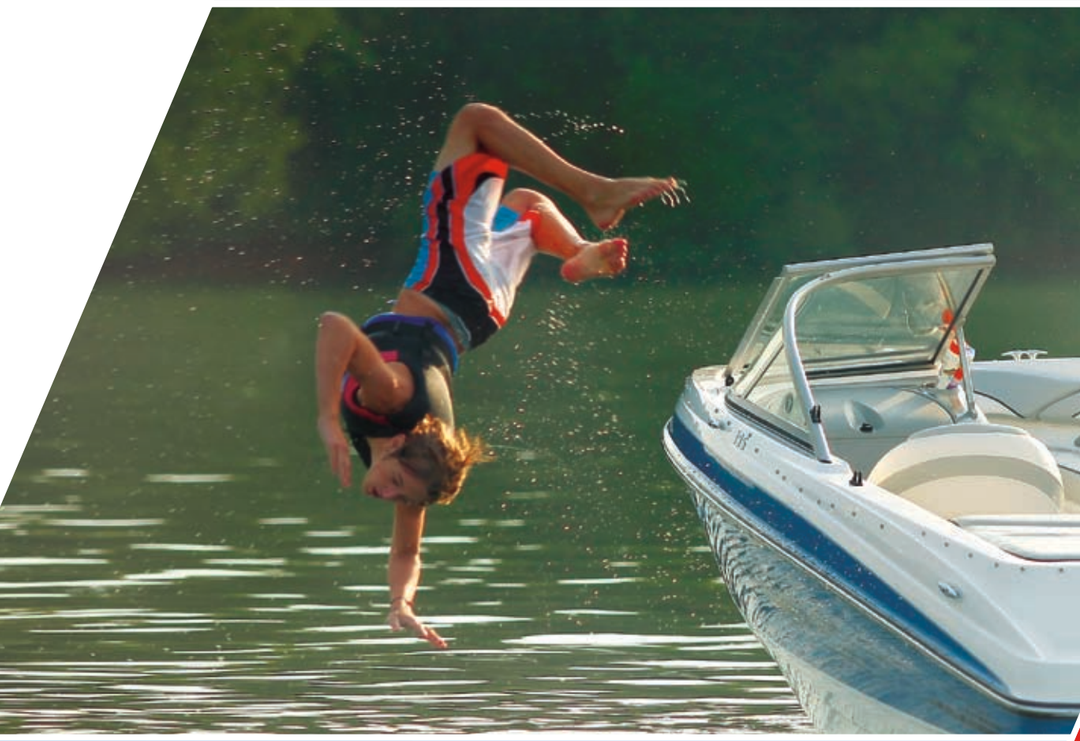
The MerCruiser freshwater-cooled with optional SeaCore® technology 4.3L sterndrive delivers unequaled saltwater protection through generous use of stainless steel components. SeaCore components also implement hard-coat anodizing and the MerCathode® active corrosion protection system that creates a protective field around underwater hardware and drive units to significantly reduce the opportunity for corrosion.

Built to perform
Built to last

A MerCruiser 4.3L engine can be paired with any of several popular Mercury drives – including Alpha® and Bravo® – for robust, long-term performance and durability. MerCathode® corrosion protection, an active cathodic corrosion-protection system, is standard on Bravo drive models and available on Alpha One® drives. Meanwhile, the Mercury-exclusive Engine Guardian System senses potential problems and helps prevent engine or drive damage from low oil pressure, low drive lubricant or overheating. And if you ever need service or parts, the Mercury global network of dealers ensures that help is always nearby.



GASOLINE	4.3L TKS	4.3L MPI
Horsepower	190	220
Full Throttle RPM	4400-4800	4400-4800
Cylinders	V-6	V-6
SeaCore®	Yes	Yes
Drives	Alpha® Bravo One® Bravo Two® Bravo Three®	Alpha® Bravo One® Bravo Two® Bravo Three®



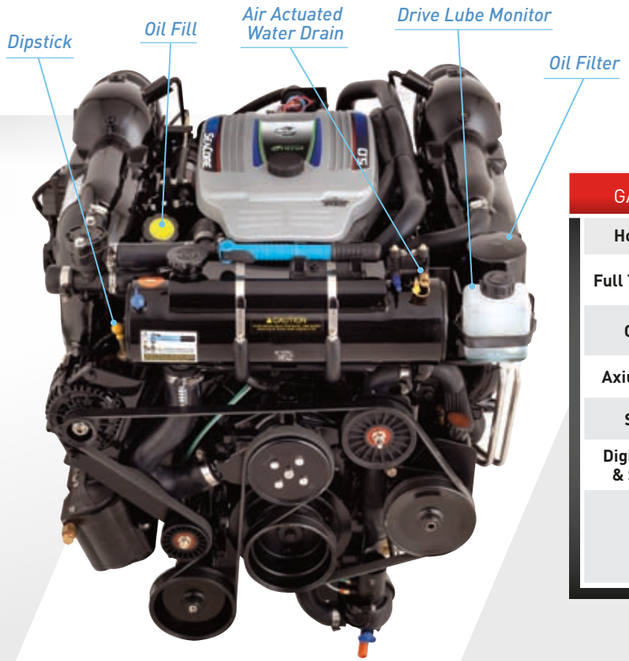
5.0L, 350 MAG, 377 MAG
SMALL BLOCK V-8 GASOLINE

Command performance

***Boating is a major part of your life**. No matter what you do on the water, you need an engine that delivers performance and amenities to accommodate all your activities – whether pulling wake boarders on a sunny afternoon, hosting friends on a pleasant evening, or sleeping down below on a hidden moonlit cove. Small-block V-8 sterndrive engines by Mercury MerCruiser® will take you where you want to go, will satisfy all your demands and will get you home refreshed and craving your next trip on the water.*

What you need

The MerCruiser® small-block V-8 sterndrive engines – the 5.0L MPI ECT, the 350 MAG ECT and the 377 MAG ECT – are the premium choices for runabouts and cruisers because they deliver the power and durability active boaters demand. Only MerCruiser offers the versatility of choosing the combination of power, performance and efficiency that best fits your boating needs and preferences.



What you want

MerCruiser engines are remarkably reliable, thanks in part to extensive and unequaled testing and development. But they also deliver superior benefits that optimize your time on the water with options such as joystick piloting by Axius®, which provides remarkable user-friendly joystick control and maneuverability; and SmartCraft® Digital Throttle and Shift for smooth shifting, immediate throttle response, industry-leading digital controls and cutting-edge information displays. Emissions Control Technology (ECT) keeps emissions low, while reliable SeaCore® technology with freshwater cooling creates a protective shield around underwater hardware, engine and drive units to significantly reduce the opportunity for corrosion. Meanwhile, the Engine Guardian System by Mercury Marine senses potential problems and helps prevent engine or drive damage from low oil pressure, low drive lubricant or overheating. Should you ever need service or parts, our global dealer network ensures that help is always nearby.

Select your drive

You can perfect and refine your driving experience by matching your needs with an Alpha® drive or any of our three Bravo® drive systems. If you're seeking great value, look to the Alpha®. If speed matters most, the Bravo One® sterndrive is your best choice. If maximum thrust for a heavier boat is your top priority, try a Bravo Two®. If you want the ultimate in efficiency and agile handling, go with the Bravo Three®. With so many options, MerCruiser leads the industry in customizing your propulsion to your boat.

GASOLINE	5.0L MPI	350 MAG	377 MAG
Horsepower	260	300	320
Full Throttle RPM	4600-5000	4800-5200	4800-5200
Cylinders	V-8	V-8	V-8
Axius® Premier	Yes	Yes	Yes
SeaCore®	Yes	Yes	Yes
Digital Throttle & Shift (DTS)	Yes	Yes	Yes
Drives	Alpha® Bravo One® Bravo Two® Bravo Three®	Alpha® Bravo One® Bravo Two® Bravo Three®	Bravo One® Bravo Two® Bravo Three®

Welcome to luxury

The Mercury MerCruiser® 8.2L V-8 sterndrive engine is a masterpiece of powerful simplicity. It's simple to drive. Simple to maintain. And simple to own. Yet, it delivers the benefits sought by boaters who settle for nothing but the best, including high torque and long-term durability and value through high displacement.

The 8.2L, with roots deep in the legendary history of Mercury Racing® engines, offers sensational acceleration, immediate planing and superior throttle response at every range. But there's much more than unequaled power to this engine: Throttle and shift are space-age smooth, anti-corrosion protection is the best in the industry, emissions are low, fuel efficiency is high, engine noise has been decreased and vibration is virtually non existent. And, on multi-engine applications, our available Axius® joystick piloting simplifies maneuvering in tight spaces, making boating more enjoyable for everyone.

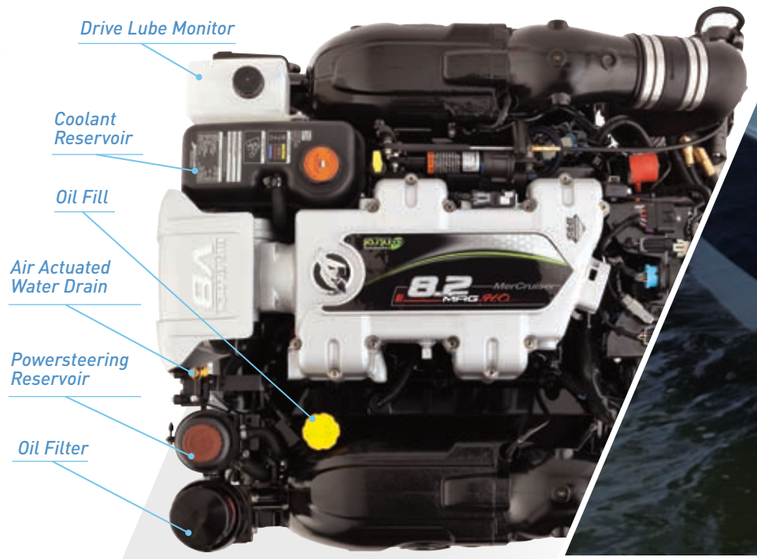
Power-packed

MerCruiser engineers collaborated with the performance masters at Mercury Racing to create the 8.2L, and the result is an engine that delivers on all levels. The 8.2L features high-performance aluminum cylinder heads that improve mid-range acceleration and increase power, and the 8.2L's Multiport Fuel Injection (MPI) system constantly delivers the optimum fuel/air mixture. Its high-output alternator produces 65% more power than previous versions. The engine runs on 87 octane fuel, yet delivers the power that explains why so many boaters say "There's no replacement for displacement."

Easy and effective

The MerCruiser 8.2L is simple to maintain and service. This engine has a straightforward drive-lube monitoring system, water drain system, fluid servicing and standard freshwater cooling to take the mystery and frustration out of maintenance. Access to service points and connections has been significantly improved to simplify installation and maintenance. The big block is also equipped with the tried-and-true Mercury MerCathode® corrosion-prevention system, as well as Mercury Engine Guardian monitoring for unmatched reliability and longevity.

GASOLINE	8.2L MAG	8.2L MAG H.O.
Horsepower	380	430
Full Throttle RPM	4400-4800	4600-5000
Cylinders	V-8	V-8
Axius® Premier	Yes	Yes
SeaCore®	Yes	Yes
Digital Throttle & Shift (DTS)	Yes	Yes
Drives	Bravo One® X, XR Bravo Two® X Bravo Three® X, XR	Bravo One® X, XR Bravo Two® X Bravo Three® X, XR



The inside story

Whether your prime boating activities consist of adrenaline-pumping tow sports or relaxing cruises over big water, you want and need performance with no headaches. Mercury Marine® stands alone in developing innovative and sound technologies that produce the most enjoyable boating experience. If your activities call for inboard power, nobody offers more options than Mercury MerCruiser®. We know that one size doesn't fit all, so we offer choices of the best technologies to propel your style of boating. From our smooth-running Horizon® inboard series to our high-performance Scorpion® TowSport unit, all our inboards feature proven technology, rock-solid reliability and an unbeatable combination of performance and fuel efficiency.

Innovation advantage

When you power up with a MerCruiser inboard, you'll be wildly pleased by the cutting-edge features that are standard on our engines. MerCruiser inboards have electronic Multiport Fuel Injection (MPI) that provides instant starts, effortless cruising and legendary MerCruiser reliability. Closed-cooling technology dramatically reduces potential for corrosion, extending the life of your engine and your boating season. Stainless steel exhaust, durable designs and easy maintenance combine to produce engines that are remarkably simple to own and use, allowing you more time to enjoy your boat.

Keep it real!

If tow sports are your passion, team up with the engine known worldwide for its superior tow-sport prowess. Mercury MerCruiser offers two spectacular TowSport engines – a 5.7L MPI ECT and a Scorpion 350 DTS ECT. When you're about to land your first 360, engine reputation – and the reliability that created that reputation – will provide the power for success the first time and every time.

Perfect torque

Tow sport excitement demands power that's available exactly when you need it. Our high-displacement engine platforms deliver maximum horsepower at the rpm range appropriate for tow sports.

Born to tow

Pair up our TowSport engines with Smart Tow® and Smart Tow Pro technology to ensure a perfect launch every time. Just press the buttons, open the throttle and let Smart Tow do the work. Smart Tow features include launch control, cruise control, five pre-set launches, a unique monitor and SmartCraft® engine monitor.*

**available only on engines equipped with Digital Throttle & Shift.*

	INBOARD			
GASOLINE	5.7L HORIZON	6.2L HORIZON	8.2L HORIZON	8.2L H.O.
Horsepower	300	320	375	425
Full Throttle RPM	4600-5000	4600-5000	4200-4600	4400-4800
Cylinders	V-8	V-8	V-8	V-8
Digital Throttle & Shift (DTS)	Yes	Yes	Yes	Yes

	TOWSPORT	
GASOLINE	5.7L MPI	350 SCORPION
Horsepower	315	330
Full Throttle RPM	4600-5000	4600-5000
Cylinders	V-8	V-8
Digital Throttle & Shift (DTS)	Yes	Yes

The diesel advantage

Mercury Diesel TDI engines usher in a new era of technology that delivers a diesel driving experience superior to any other. Mercury Diesel TDI engines are quiet and smooth with virtually no smoke or odor. Add to that the exceptional reliability and worldwide dealer support network of Mercury Marine, and you have inboard and sterndrive power that's simply unbeatable. Whether you're pulling skiers, long-distance cruising, or simply zipping across the water, Mercury Diesel TDI engines offer an enviable advantage.

A technological knockout

The new Mercury Diesel TDI engines feature advanced turbocharger technology and a fuel-injection system that virtually eliminates the noise and harshness of traditional diesel engines. The advanced intake system delivers exceptional torque, impressive power and an increase of up to 50% in fuel efficiency over gas engines of similar horsepower.

Weight no more!

Mercury TDI engines deliver heavy-duty power in a light package. While enhancing acceleration and top speed, the engines' industry-leading power-to-weight ratio contributes to improved boat maneuverability and enhanced fuel efficiency. The combination of low weight and exceptional torque at low engine speeds reduces time to plane.

The durable diesel

In addition to legendary durability and reliability inherent to diesel power, Mercury's advanced cooling and control systems ensure long life for our TDI engines. The thermostatically controlled, closed-cooled system provides ultimate engine-corrosion resistance. Variable Geometry Turbochargers (VGT) virtually eliminate turbo-lag, resulting in powerful torque at low rpms for rapid acceleration. The engines also feature water-cooled engine oil, gear oil and steering fluid, decreasing engine-compartment temperatures and extending engine life.

New SmartCraft®-capable and EPA Tier 3-compliant 3.0L and 4.2L TDI engines will be available in late 2013!

ENGINE	V-6	V-8
Displacement	3.0L	4.2L
Horsepower	225/265	350
Sterndrives	Bravo One® X, XR Bravo Two® X, XR Bravo Three® X, XR	Bravo One® XR Bravo Three® XR

2.0L, 2.8L, 4.2L
I-4, V-6, I-6 DIESEL QSD

Solid. Quiet. Dependable.

The lightweight, high-output turbocharged Mercury Diesel QSD engines deliver gas-like performance in a package that's quieter than competitive diesel engines and provides remarkable fuel efficiency. That's the Mercury Diesel QSD difference!

High pressure performance

The secret to Mercury Diesel QSD's smooth performance lies in its High Pressure Common Rail Injection system. This state-of-the-art fuel-delivery system makes Mercury Diesel QSD engines significantly quieter at idle than our competitors' engines, and an internal counterbalancing system ensures the engine runs significantly smoother. Pair that with the QSD's performance-boosting turbocharger and you get the best of both worlds – diesel efficiency with the power and smooth driving experience of a gas sterndrive or inboard.

The "Smart" choice

All Mercury Diesel QSD engines feature SmartCraft® controls and electronics. From the silky-smooth operation of our Digital Throttle & Shift (DTS) system and the effortless operation of power steering to the pinpoint accuracy of digital gauges, SmartCraft makes boating more enjoyable and less stressful. And because you can pair our diesel engines with superior MerCruiser® drives, you can customize the gear ratios and drives for optimal boat performance.

Tested tough

Like every Mercury engine, our QSD diesel engines undergo rigorous trials in the lab and in open-water testing. The result is an engine designed to shrug aside the worst Mother Nature can throw at it. From the advanced materials and cutting-edge technology of our optional SeaCore® drive system to a closed cooling system that protects internal components from the damaging effects of saltwater, Mercury Diesel QSD engines are designed to provide years of trouble-free operation.

ENGINE	I-4	I-4	I-6
Displacement	2.0L	2.8L	4.2L
Horsepower	115/130/150/170	220	270/320/350
Axius® Premier	No	Yes	Yes
Digital Throttle & Shift (DTS)	Yes	Yes	Yes
Sterndrives	Alpha® Bravo One® X Bravo Two® X Bravo Three® X	Bravo One® X Bravo Two® X Bravo Three® X	Bravo One® X, XR Bravo Three® X, XR

We are driven!

Mercury MerCruiser® offers a comprehensive selection of drive systems for single- and multi-engine applications on a wide variety of boats – from Alpha One®, the world's most popular sterndrive, to our strong Bravo® drives, ideal for larger boats and performance applications. Whether you want to cruise your favorite lake, pull skiers and boarders or skim along the surface at 100 mph, MerCruiser has the perfect drive option to deliver the performance and durability you need.

Alpha One Drive

So strong. So versatile. So reliable.

- Time-tested and straight-out reliable, the Alpha One is the most popular sterndrive in the world.
- Available for single and twin engine applications.
- The Alpha One's efficient hydrodynamic profile produces very little drag, which means better boat performance and fuel economy.
- Features like an integrated water pump and permanently lubricated pivot points let you spend less time on maintenance and more time boating.
- Designed for boats capable of up to 65 mph and gas engines delivering up to 300hp.

Available with MerCruiser SEACORE system

Bravo One
Bravo One X / Bravo One XR

When it comes to high-performance sterndrives, one drive stands out: Bravo One®.

- The Bravo One's extended-length torpedo reduces drag and, along with a deeper skeg, provides a large rudder area for excellent high- and low-speed steering response.
- Created for boats capable of speeds up to 80 mph, the Bravo One is also refined and well-mannered with best-in-class shifting.
- Intended for single, twin and triple applications with engines that deliver up to 400hp with Bravo One, up to 450hp with Bravo One X or up to 600hp with Bravo One XR.

Available with MerCruiser SEACORE system

Bravo Two / Bravo Two X

Big cruisers and houseboats need big thrust and lift.

- A longer-length design and a large-diameter shaft capable of accommodating a 20-inch propeller deliver high thrust at low speeds, quick planing and improved fuel economy.
- Heavy-duty forged gears offer great durability for pushing big boats with high-torque engines.
- Permanently lubricated pivot points minimize maintenance time on your engine and drive.
- Bravo Two® is designed specifically for single and twin applications that run up to 55 mph

Available with MerCruiser SEACORE system

Bravo Three
Bravo Three X / Bravo Three XR

Behold the power of three!

- Bravo Three® drives feature dual counter-rotating propellers for exceptional acceleration, maneuverability and efficiency.
- With Bravo Three drives on your boat, you'll enjoy excellent maneuverability in the marina and incredible performance on open water.
- The extra blade area of the dual propellers means that your boat will plane-off at a lower speed for optimal fuel efficiency.
- The Bravo Three's efficient design also means minimal bow rise on acceleration for increased forward visibility.

SmartCraft provides power and confidence

No matter where your boating passion lies, being able to immediately access and utilize important information can make a world of difference. Mercury SmartCraft® technology keeps you up to speed on all critical engine functions and environmental conditions. Speak with your Mercury Marine® dealer to ensure you have the system that's best suited to your boating needs.

Mission control

Driving Mercury Digital Throttle & Shift (DTS) for the first time is like getting up on skis the first time or catching your first fish – there's just no turning back. DTS for single and multi-engine applications adds precise control and smooth operation to the MerCruiser® experience. Unlike traditional mechanical systems, with DTS there's no throttle lag – just instant and progressive acceleration, providing more control throughout the engine's powerband.

Mercury Propellers

Perfecting performance

Your propeller contributes as much to your boat's performance as your drive and engine. The right propeller can improve thrust, raise top speed, enhance efficiency and increase control. No matter which type of prop is best for your boat and your style of boating, you can be certain that every Mercury® propeller is up to the task. All Mercury propellers are subjected to rigorous testing in the lab and on the water before they're matched with a boat, engine, drive and purpose. Created by Mercury engineers with more than 160 years of combined prop-design experience, our propellers are the best-performing and most trusted in the industry.

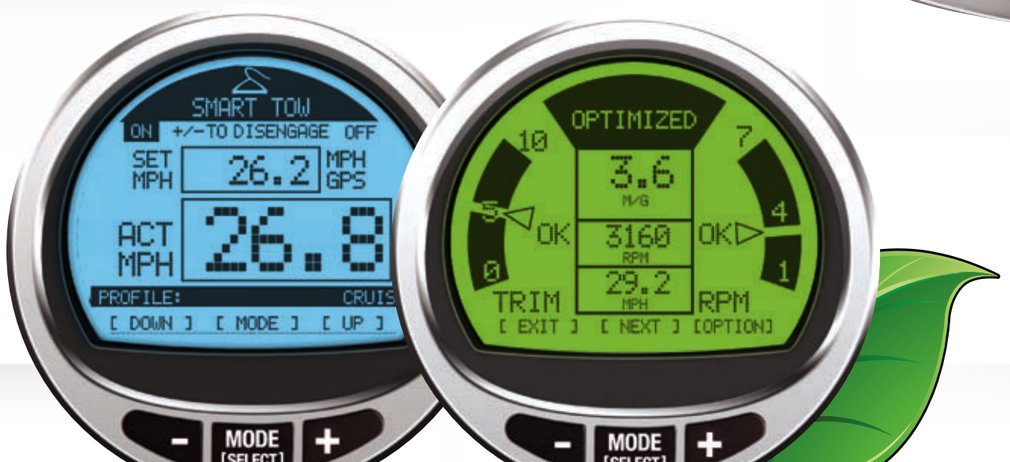
A material advantage

Mercury propellers are made with the best materials available, and our flagship performance propellers feature the Mercury X7® alloy, a patented material that creates high-performance designs that would not be possible with conventional stainless steel. Our aluminum props feature Mercalloy®, a patented aluminum alloy that allows for a thinner propeller blade, resulting in less drag. For extra prop confidence and dependability, many Mercury propellers feature the Flo-Torq® hub system that keeps your gearcase protected in the event of an encounter with an underwater obstruction, getting you back to shore safely.

X7 ALLOY

Smooth operator

Boaters seeking the most bang from a tank of gas turn to SmartCraft and MercMonitor™, which feature fuel-saving ECO-Screen technology. The multi-colored LED backlit screen continuously monitors engine trim, rpm, speed and fuel consumption while simultaneously providing fuel-optimization suggestions to the driver. Smart Tow® technology in MercMonitor also helps the driver select the ideal launch profile for a skier or wakeboarder. There's even a cruise control function that allows the driver to provide the best towing experience by setting a specific speed.



Find the propeller for you!

Choose the perfect propeller for your boat in five easy steps. Visit the industry-leading Mercury prop selector at mercurymarine.com/propellers

There is a difference

Boat and automotive engines have many similarities, but they also have many differences. For starters, it's estimated that a boat cruising on a lake or ocean must work as hard as an automobile pulling a loaded trailer uphill at 60 mph. Each of these engines requires specific care and maintenance. Conventional products made for your car – such as engine oil, gear oil, fuel additives and fuel filters – are not designed to handle the stressful environment experienced by your boat engine. Your MerCruiser® engine needs and deserves original-manufacturer parts and accessories from Mercury Marine®.

Maintenance and engine care videos available at ***MercuryMarine.com*** *and* ***YouTube.com/MercuryMarineTV***

We won't let you down

There's nothing more exciting than that first boat ride of the season – unless you find yourself with an engine that won't start. To avoid those frustrating situations, maintain all engine components properly. Mercury markets several products to keep engines performing at their best. Our products include fuel additives, anodes, lubricants and water-separating fuel filters, all of which are specially designed by experienced and knowledgeable Mercury engineers. Engine-care products from Mercury provide better care than imitation brands.

Rely on Mercury parts

To benefit from Mercury precision engineering and state-of-the-art manufacturing, always use Mercury parts with each maintenance and accessory application. Mercury parts and accessories are designed and tested by the same people who design our engines. Using original-manufacturer parts and accessories, rather than aftermarket products, ensures ongoing reliability.

MERCURY WARRANTY

Protection for the long haul

At Mercury Marine®, we know we build reliable drives and engines. We know we make them to be durable, intuitive and easy to use. We also know that few worlds are more unpredictable than the marine environment, and that's why we offer the most comprehensive warranty in the industry. It's our commitment to your satisfaction and our promise to you for putting your faith in Mercury MerCruiser®, our products and our people.

Backed for the future

Every MerCruiser® engine and drive (for recreational use) comes with a standard limited factory-backed, non-declining warranty of 1-3 years.

Built to last

The same is true with our exclusive corrosion protection for recreational boaters. Mercury® provides limited corrosion protection for three full years on most systems and four years on our SeaCore® models. So no matter whether you run in freshwater or saltwater, you're covered in even the harshest marine environments.

Setting standards

Boat brands whose manufacturers have met requirements for the Mercury Installation Quality Certification℠ Program carry an additional year of warranty on MerCruiser engines. The program is the first of its kind in the boating industry and the only comprehensive manufacturer-installation certification system. This rigorous system identifies areas of improvement, and implements resolution before the product leaves the factory. With the addition of the Installation Quality Certification Program, Mercury Marine not only leads the marine industry to new standards, but also ensures that you're offered the highest-quality products possible. That means your boating experience will be the best it can possibly be.

MERCURY PRODUCT PROTECTION

Confidence is priceless

For additional peace of mind, consider Mercury Product Protection® (MPP) to extend coverage of your engine past the term of your standard factory warranty. Mercury Product Protection is available at two levels: MPP Gold covers failures in mechanical parts and systems caused by defects in materials or workmanship, while MPP Platinum additionally covers electrical and mechanical failures caused by defects in materials or workmanship.

As with our standard warranty, Mercury Product Protection is 100% factory-backed and administered. There's no third party to work with, which is not true with other extended-warranty programs. The coverage takes effect when your factory warranty expires, so there's no duplication or lapse in coverage. Mercury Product Protection ensures your repairs will be performed by factory-trained technicians at your Mercury Marine® authorized dealer. All claims are paid to the dealership, so you don't have to pay for the repair and wait for reimbursement.

MERCURY Product Protection

More details on the best protection plans in the business are available at MercuryMarine.com/MPP

SPECIFICATIONS

STERNDRIVES / GASOLINE

Engine	3.0L MPI	4.3L TKS	4.3L MPI	5.0L MPI	350 MAG	377 MAG	8.2L MAG	8.2L MAG H.O.
HP/kW	135/99.3	190/140	220/162	260/191	300/221	320/235	380/283	430/321
Full Throttle RPM	4400-4800	4400-4800	4400-4800	4600-5000	4800-5200	4800-5200	4400-4800	4600-5000
Cylinders	I-4	V-6	V-6	V-8	V-8	V-8	V-8	V-8
Displacement (CID/L)	181/3.0	262/4.3	262/4.3	305/5.0	350/5.7	377/6.2	502/8.2	502/8.2
Fuel Injection System	Multi-point Electronic Fuel Injection (MPI)	2V carb with turn-key start and electric fuel pump	Multi-point Electronic Fuel Injection (MPI)	Multi-point Electronic Fuel Injection (MPI)	Multi-point Electronic Fuel Injection (MPI)	Multi-point Electronic Fuel Injection (MPI)	Multi-point Electronic Fuel Injection (MPI)	Multi-point Electronic Fuel Injection (MPI)
Fuel/Ethanol Tolerance	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol	87 Octane/up to 10% ethanol
Engine Guardian System	Low oil pressure, high coolant temperature, low voltage, over-rev control, high exhaust manifold temperature	High coolant temperature Low drive lubricant Low oil pressure	Low oil pressure, high coolant temperature, low sea water pressure, low voltage, over-rev control, high exhaust manifold temperature	Low oil pressure, high coolant temperature, low sea water pressure, low voltage, over-rev control, high exhaust manifold temperature	Low oil pressure, high coolant temperature, low sea water pressure, low voltage, over-rev control, high exhaust manifold temperature	Low oil pressure, high coolant temperature, low sea water pressure, low voltage, over-rev control, high exhaust manifold temperature	Low oil pressure, high coolant temperature, low sea water pressure, low voltage, over-rev control, high exhaust manifold temperature	Low oil pressure, high coolant temperature, low sea water pressure, low voltage, over-rev control, high exhaust manifold temperature
Cooling System	Optional freshwater cooling	Raw water Thermostatically controlled	Optional freshwater cooling on Alpha drive; Standard on Bravo SeaCore drive	Optional freshwater cooling on Alpha drive; Standard on Bravo SeaCore drive	Optional freshwater cooling on Alpha drive; Standard on Bravo SeaCore drive	Optional freshwater cooling on Bravo SeaCore drive	Standard freshwater cooling	Standard freshwater cooling
Digital Throttle & Shift	N/A	N/A	N/A	Optional	Optional	Optional	Optional	N/A
Drives	Alpha®	Alpha® Bravo One® Bravo Two® Bravo Three®	Alpha® Bravo One® Bravo Two® Bravo Three®	Alpha® Bravo One® Bravo Two® Bravo Three®	Alpha® Bravo One® Bravo Two® Bravo Three®	Bravo One® Bravo Two® Bravo Three®	Bravo One® X, XR Bravo Two® X Bravo Three® X, XR	Bravo One® X, XR Bravo Two® X Bravo Three® X, XR

STERNDRIVES & INBOARDS / DIESEL

Engine	2.0L QSD	2.8L QSD	3.0L TDI	4.2L QSD	4.2L TDI
HP	115/130/150/170	220	225/265	270/320/350	350
Rated RPM	4000	3800	4200	3800	4200
Cylinders	I-4	I-4	V-6	I-6	V-8
Engine Dry Weight (lbs/kg)	551/250	794/360	726/329	1014/460	810/367
Aspiration	Turbocharged	Turbocharged	Turbocharged (VGT)	Turbocharged	Twin Turbocharged (VGT)
Fuel Injection System	High Pressure Common Rail (HPCR)	High Pressure Common Rail (HPCR)	High Pressure Common Rail (HPCR)	High Pressure Common Rail (HPCR)	High Pressure Common Rail (HPCR)
Cooling System	Freshwater cooling	Freshwater cooling	Freshwater cooling	Freshwater cooling	Freshwater cooling
Digital Throttle & Shift	Yes	Yes	No*	Yes	No*
Sterndrives	Alpha® Bravo One® X Bravo Two® X Bravo Three® X	Bravo One® X Bravo Two® X Bravo Three® X	Bravo One® X, XR Bravo Two® X Bravo Three® X, XR	Bravo One® X/XR Bravo Two® X Bravo Three® X/XR	Bravo One® XR Bravo Three® XR
Inboard Transmissions	Turn Disc 345A Down Angle	Turn Disc 485A Down Angle ZF 631V V-Drive	ZF 45A Down Angle ZF 63A Down Angle ZF 63IV V-Drive	ZF 63A Down Angle ZF 63IV V-Drive	ZF 63 ZF 63A Down Angle ZF 63IV V-Drive

*Coming with introduction of Tier 3 U.S. EPA compliant engine in 2013.

MERCURY

INBOARD / GASOLINE — TOWSPORT / GASOLINE

Engine	5.7L HORIZON	6.2L HORIZON	8.2L HORIZON	8.2L H.O.	5.7L MPI	350 SCORPION
HP/kW	300/221	320/235	375/280	425/317	315/235	330/254
Full Throttle RPM	4600 - 5000	4600 - 5000	4200 - 4600	4400 - 4800	4600 - 5000	4800 - 5200
Cylinders	V-8	V-8	V-8	V-8	V-8	V-8
Displacement (CID/L)	350/5.7	377/6.2	502/8.2	502/8.2	350/5.7	350/5.7
Fuel Injection System	Multi-point electronic fuel injection (MPI)	Multi-point electronic fuel injection (MPI)	Multi-point electronic fuel injection (MPI) (Sequential Fuel Injection w/DTS)	Multi-point electronic fuel injection (MPI) (Sequential Fuel Injection w/DTS)	Multi-point electronic fuel injection (MPI)	Multi-point electronic fuel injection (MPI)
Fuel/Ethanol Tolerance	87 Octane / up to 10% ethanol	87 Octane / up to 10% ethanol	87 Octane / up to 10% ethanol	87 Octane / up to 10% ethanol	87 Octane / up to 10% ethanol	87 Octane / up to 10% ethanol
Engine Guardian System	Low oil pressure, high coolant temperature, low seawater pressure, low voltage, over-rev control, transmission temperature and pressure	Low oil pressure, high coolant temperature, low seawater pressure, low voltage, over-rev control, transmission temperature and pressure	Low oil pressure, high coolant temperature, low seawater pressure, low voltage, over-rev control, high exhaust manifold temperature, transmission temperature and pressure	Low oil pressure, high coolant temperature, low seawater pressure, low voltage, over-rev control, high exhaust manifold temperature, transmission temperature and pressure	Low oil pressure, high coolant temperature, low seawater pressure, low voltage, over-rev control, transmission temperature and pressure	Low oil pressure, high coolant temperature, low seawater pressure, low voltage, over-rev control, transmission temperature and pressure
Cooling System	Closed cooling long life 5-year antifreeze brass seawater pump	Closed cooling long life 5-year antifreeze brass seawater pump	Closed cooling long life 5-year antifreeze brass seawater pump	Closed cooling long life 5-year antifreeze brass seawater pump	Thermostatically controlled raw water brass sea water pump	Thermostatically controlled raw water brass sea water pump
Digital Throttle & Shift	Standard	Standard	Standard	Standard	Optional	Standard

Note: Due to our constant efforts to offer the finest products available, we reserve the right to change specifications without notice. See your Mercury Authorized Dealer for more information on the propeller that is right for you.

Konrad 520 Stern Drives Are Built To Last

The Konrad 520 Stern Drive is designed and engineered for people that play hard and work hard. Whether you want to relax and cruise all day or if your living depends on your stern drive, the 520 is for people who need Durability, Dependability and Performance.

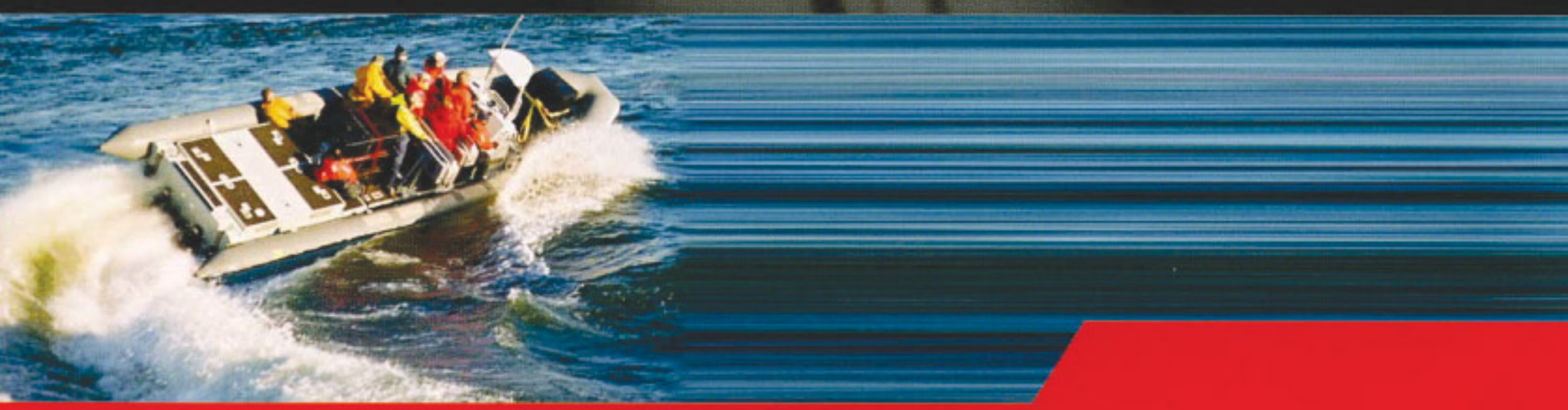
The Konrad 520 has been engineered with hard work in mind and has a number of benefits that set it apart from the other stern drives on the market:

- Oversized bearings
- Thicker walled casings
- One piece propeller shaft
- Continuous oil circulation for cool operation
- No corrosive exhaust through drive
- Precision machined super alloy gears
- "Special K" gears available for demanding high performance
- No failure-prone cone clutch
- Minimal maintenance required

520 Stern Drive

All materials and workmanship are guaranteed. We stand behind our products. For over 35 years, the Konrad Companies have excelled in precision machining.

There is no other stern drive with this torque rating. It has the power and endurance necessary for fishing vessels, crew boats, water taxis, charters, parasail boats, as well as military applications.



The Konrad 520 is specifically designed to be tough and durable. Its versatility and endurance surpass any stern drive on the market. It is not a "pleasure" drive. It's a working drive that can take you fishing all day or patrol harbors 24/7 to protect our country.

This is the only stern drive available for a 134 kw - 328 kw (180 hp - 440 hp) diesel engine application. The 520 can handle up to a 20 inch propeller, depending on the craft and its use.

What does this mean to you? You have the best. Less maintenance. More time out-performing the rest.

It's time you consider the best in performance.

The Konrad 520 Stern Drive
Dependability, Durability and Performance

D²P
DURABILITY • DEPENDABILITY • PERFORMANCE

520 Duty Classifications

Recreational Performance

Maximum recommendation: 1000 Nm (738 lb. ft.) of torque for diesel or gas applications. Maximum operation: 250 hours per year for planing type hulls of highly intermittent operation. Gross weight to horsepower less than 15.2 kg/kw (25 lbs./hp). This classification includes private, non-commercial, non-charter, sport/leisure activity craft. Long range pleasure cruisers, sport fishing charters and commercial service craft are NOT included in this classification. Standard warranty.

Commercial/Military Performance

Maximum recommendation: 755 Nm (557 lb. ft.) of torque for semi displacement and planing mono hulls of intermittent operation. Maximum operation: 1000 hours per year and gross weight to horsepower less than 21.3 kg/kw (35 lbs./hp). This classification includes light commercial charter/sport activity craft, patrol and crew boats. Standard warranty.

Medium Duty Performance

Maximum recommendation: 678 Nm (500 lb. ft.) of torque for semi displacement and displacement mono hulls of intermittent operation with some variations in engine rpm and power. This classification includes charter and commercial craft. Note: These applications must be approved by the factory. Standard warranty.

Material and Manufacturing Specifications

Bearings	Taper roller bearings, spaced for optimum load carrying capabilities, support the shafts
Castings	Manufactured from high strength, heat treated aluminum
Gears	High strength heat treated alloy steel utilizing high performance marine technology
Shafts	Manufactured from high alloy, heat treated steel
U-Joint	Industry leading size for increased load carrying capacity and extended life

Installation and Operational Specifications

Application	Recreational or Commercial
Corrosion Protection	Multiple anodes, all castings chromatized and layered with powder coatings
Engine Drive Shaft	Mounting flange available for several types of transmissions
Exhaust	None through the stern drive
Gear Ratios	1.43:1, 1.57:1, 1.79:1, and the 2.0:1 is available by special order
Lubrication	Full immersion, seven quarts with external reservoir
Propeller	Up to 508 mm (20 in) diameter
Rotation	Operates in either right or left hand rotation
Steering Angle	40° range
Torque Rating	Up to 1000 Nm (738 lb. ft.) input for recreational, lower for commercial applications
Torsional Coupling	Compact torsional coupling design reduces vibrations for quieter performance
Transmission	Reversing transmission required
Transom Mounting	Template available
Transom Requirements	14° angle nominal, 6.4 mm - 57.2 mm (1/4 in - 2-1/4 in) thick
Trim/Lift System	Approximate –6° to +10° trim, twin cylinders with electrohydraulic pump. Approximate 40° of total lift range
Warranty	Standard Warranty
Water Pickup	None through the stern drive

Konrad

The Ultimate Force in the Water

www.konradmarine.com 1-715-386-4203
1421 Hanley Road • Hudson, WI 54016-9376 USA

540

540 HP

540 Standard

Includes:

- 500 Series Upper Housing
- LH or RH Lower Housing Assembly
- Gimbal Assembly
- Carrier Bearing or Tailpiece
- Trim Pump Assembly

Options:

- Propeller
- Steering System
- HD Upper Assembly
- HP Nose Cone Lower Assembly
- X-Factor™ Lower Assembly
- Trim Control System
- Cavitation Plate Extension

Cougartek 1500 Pursuit

Vessel LOA:	47.8'
Vessel Weight:	17,172 lbs.
Engine:	3X Innovation Gasoline
Hp:	3X 550 hp
Transmission:	3X Huber HM 1200 Ratio 1:1
Stern Drive:	3X Konrad 540 Propulsion System Ratio 1.51:1
Performance:	69 m.p.h.

Salt Shaker

Vessel LOA:	33'
Vessel Weight:	12,000 lbs.
Engine:	2X Steyr Diesel
Hp:	2X 250 hp
Transmission:	2X Konrad VD Ratio 1:1
Stern Drive:	2X Konrad 540 Propulsion System Ratio 1.69:1
Performance:	42 m.p.h.

Cigarette Top Gun

Vessel LOA:	38'
Vessel Weight:	11,500 lbs.
Engine:	2X Chief Gasoline
Hp:	2X 800 hp
Transmission:	2X BAM 1350 Ratio 1:1
Stern Drive:	2X Konrad 540 Propulsion System Ratio 1.51:1
Performance:	86 m.p.h.

IT'S TIME YOU CONSIDER THE BEST IN PERFORMANCE.

The 540 has several assembly upgrades including the high performance (HP) lower assemblies and the heavy duty (HD) upper housing assembly.

The 540 HD has an upgraded input shaft design that provides extra durability for extreme boating conditions.

With the optional HP or X-Factor™ Lower assembly, the Konrad 540 has proven to increase top speeds.

The Konrad 540 stern drive provides excellent propulsion in hard working, high speed applications. Vessels fitted with the 540 include police rescue and intercept, military operations and high performance racing.

The common denominator required for these applications is durability, dependability and performance. Konrad stern drives provide these without question.

- One piece propeller shaft
- Oversized bearings
- Thicker walled castings
- Continuous oil circulation
- No corrosive exhaust through drive
- Precision machined super alloy gears
- "Special K" gears available
- Minimal maintenance required

Material and Manufacturing Specifications

Bearings	Tapered roller bearings, spaced for optimum load carrying capabilities, support the shafts
Castings	Manufactured from high strength, heat treated aluminum
Gears	High Strength heat treated alloy steel utilizing high performance marine technology
Shafts	Manufactured from high alloy, heat treated steel
U-Joints	Industry leading size for increased load carrying capacity and extended life

Installation and Operational Specifications

Application	Commercial or recreational
Corrosion protection	Multiple anodes, all castings chromatized and layered with powder coatings
Engine type	Gasoline or diesel
Gear ratios	1.21:1, 1.33:1, 1.51:1, 1.67:1
Propeller diameters	Up to 16.75" (425.45 mm)
Steering range	56°
Trim/lift system	-6° to 10° (Trim) 10° to 46° (Lift)
Shifting	Reversing transmission required
Water pick up	None
Exhaust discharge	None

Konrad®
HIGH OUTPUT PROPULSION SYSTEMS

www.konradmarine.com
sales@konradmarine.com
715-386-4203 • 800-927-3545

560 TWIN PROP

- Increased efficiency
- Counter rotating propellers
- Higher input capability
- Superior handling & control

Material and Manufacturing Specifications

Bearings	Tapered roller bearings, spaced for optimum load carrying capabilities, support the shafts
Castings	Manufactured from high strength, heat treated aluminum
Gears	High Strength heat treated alloy steel utilizing high performance marine technology
Shafts	Manufactured from high alloy, heat treated steel
U-Joints	Industry leading size for increased load carrying capacity and extended life

Installation and Operational Specifications

Application	Commercial or recreational
Corrosion protection	Multiple anodes, all castings chromatized and layered with powder coatings
Engine type	Gasoline or diesel
Gear ratios	1.21:1, 1.33:1, 1.51:1, 1.67:1
Propeller diameters	15 3/4" (forward) and 15 1/4" (rear)
Steering range	56°
Trim/lift system	Trim -6° to 10° Lift 10° to 46°
Shifting	Reversing transmission required
Water pick up	None
Exhaust discharge	None

Includes:

- Counter Rotating Lower Housing
- Gimbal Assembly
- 500 Series Upper Housing
- Carrier Bearing
- Trim Pump Assembly

Options:

- Propellers
- Steering System
- HD Upper Housing Assembly
- Lifting Bracket
- Trim Control System
- Cavitation Plate Extension

IT'S TIME YOU CONSIDER THE BEST IN PERFORMANCE.

For more than 40 years, the Konrad name has been synonymous with quality and durability. All Konrad products are designed, manufactured and assembled with precision accuracy and consistency; print, program and process.

The Konrad 560 Twin Prop System was engineered to reduce stress on the gears using dual propeller technology, offering a durable drive you can depend on for years to come.

The 560 Twin Prop drive features two, one piece stainless steel propeller shafts, fitted with line protection seals. The specially designed stainless steel propellers vary in pitch up to a 16" maximum diameter.

To ensure customer satisfaction, Konrad tests all their stern drives for heat, noise and vibration prior to leaving their plant. The 560 and all other Konrad stern drives are manufactured and assembled in the U.S.A.

- (2) One piece propeller shaft
- Oversized bearings
- Thicker walled castings
- Continuous oil circulation
- No corrosive exhaust through drive
- Precision machined super alloy gears
- No failure-prone cone clutch
- Minimal maintenance required

Vessel Type and LOA	SeaArk Dauntless 34 10.4 m (34 ft)
Engine	2X Yanmar 6LY (diesel)
Power	2X 370 hp @ 3,300 RPM
Transmission	2X ZF280 Ratio 1:1
Ideal Stern Drive	2X Konrad 620 Ratio 1.74:1
Performance	36 kts (41 mph)
Weight	9 metric tons (20,000 lbs)

Vessel Type and LOA	Motomarine 12.5 m (41 ft)
Engine	2X Volvo 435 D6 (diesel)
Power	2X 435 hp @ 3,500 RPM
Transmission	2X BAM 1350 Ratio 1:1
Ideal Stern Drive	2X Konrad 660 Ratio 1.23:1
Performance	53 kts (61 mph)
Weight	6.8 metric tons (15,000 lbs)

Vessel Type and LOA	Scully 11.6 m (38 ft)
Engine	2X Iveco FPT Power Train (diesel)
Power	2X 330 hp @ 3,000 RPM
Transmission	2X BAM 1350 Ratio 1:1
Ideal Stern Drive	2X Konrad 680 Ratio 1.74:1
Performance	28 kts (32 mph)
Weight	14.5 metric tons (32,000 lbs)

D²P DURABILITY-DEPENDABILITY-PERFORMANCE

Celebrating 20 Years of Excellence 1991 - 2011

1421 HANLEY ROAD, HUDSON, WISCONSIN 54016 U.S.A.
715-386-4203 PH • 715-386-4219 FAX

Konrad®
HIGH OUTPUT PROPULSION SYSTEMS

"When Strength, Performance, and Reliability are what you need..."

600

SERIES PRODUCT LINE

COMMERCIAL-GRADE PROPULSION SYSTEMS

600 SERIES

Konrad Marine's 600 Series product line is taking stern drive technology to a whole new level. The sleek design is engineered for minimal drag, increased efficiency and load carrying capability. The multi-piece housing assembly is designed to make service, overhauls and maintenance quick and efficient by providing easy access to all major internal components.

Larger gears, up to 2 times stronger, provide exceptional durability that can handle higher torque inputs than other stern drives. The 600 Series product line is rated up to 1,200 Nm (885 lb. ft.) of torque and can handle single and dual propeller configurations as large as 20 inches (51 cm) in diameter.

The Konrad 600 Series has three models with several options available, allowing you to customize a stern drive to meet your needs. The 620 package is designed for lighter, single prop applications. For higher speed diesel applications, the 660s will provide outstanding performance and dependability with their twin 16 inch (41 cm) propellers. The 680 can handle heavier applications, designed to carry the loads of large cruisers and work boats.

Konrad's 600 Series stern drives are engineered with Harmonically Tuned Gear Train *(HTGT)* technology which optimizes the balance of your drives, providing significantly longer life to all components and a smoother running system. It enhances the performance, durability and reliability of your drives by minimizing drive vibrations and improving overall synchronization of internal components. This unique design feature is exclusive to the Konrad 600 Series and so advanced that no other drive in its class offers anything comparable.

PACKAGES & OPTIONS

INCLUDES

- 600 Series Assembly
- Exclusive *HTGT* Technology
- Gimbal Assembly and Carrier Bearing
- Deflection Plate
- Trim Pump Assembly
- Cavitation Plate
- Inner Transom Plate

OPTIONS

- Propellers
- Trim Control Systems
- Steering Systems (Internal & External)
- Transmissions
- Drive Shafts
- Lifting Brackets
- Spacer Kits

620

DURABLE

Considered the workhorse of the fleet, the 620 is a dependable, robust drive. By combining Konrad's proven, single 20 inch (51 cm) propeller technology with stronger shafts and gears, the 620 has set a new standard for stern drive durability.

660

FAST

For performance driven applications, such as extreme government patrol or sports leisure boating, the 660 is built to meet your demand for speed. With dual, counter rotating 16 inch (41 cm) propellers, this drive is designed for 7 - 15 meter (21 - 50 foot) vessels with speeds up to 60 knots (70 mph).

680

STRONG

Engineered with the largest, strongest gears in the industry, the 680 gives you efficient carrying capacities up to 7.7 metric tons (17,000 lbs.) per drive. This model operates with extreme efficiency in the 40 knot (46 mph) range and sports dual 20 inch (51 cm) counter rotating propellers.

VISIT US ONLINE AT
www.konradmarine.com

"...Konrad stern drives are what you want."

DUTY CLASSIFICATIONS

Recreational Performance

This classification includes private, non-commercial, non-charter, sport/leisure activity craft. Standard Warranty.

MAXIMUM OPERATION

Stern Drive	Torque Nm/lb. ft.	Hours/ Year	Gross Weight/ Horsepower
620	1100 Nm 812 lb. ft.	300	29 kw/kg (40 lbs/hp)
660	1100 Nm 812 lb. ft.	300	22 kw/kg (30 lbs/hp)
680	1200 Nm 885 lb. ft.	300	37 kw/kg (50 lbs/hp)

Military and Government Service

This classification includes light commercial charter/sport activity craft, patrol and crew boats. Standard Warranty.

MAXIMUM OPERATION

Stern Drive	Torque Nm/lb. ft.	Hours/ Year	Gross Weight/ Horsepower
620	830 Nm 612 lb. ft.	800	29 kw/kg (40 lbs/hp)
660	830 Nm 612 lb. ft.	500	22 kw/kg (30 lbs/hp)
680	904 Nm 667 lb. ft.	1000	37 kw/kg (50 lbs/hp)

Medium Duty Commercial Performance

This classification includes charter and commercial craft. These applications must be approved by the factory.

MAXIMUM OPERATION

Stern Drive	Torque Nm/lb. ft.	Hours/ Year	Gross Weight/ Horsepower
620	745 Nm 550 lb. ft.	2000	29 kw/kg (40 lbs/hp)
660	745 Nm 550 lb. ft.	1000	22 kw/kg (30 lbs/hp)
680	813 Nm 600 lb. ft.	2000	37 kw/kg (50 lbs/hp)

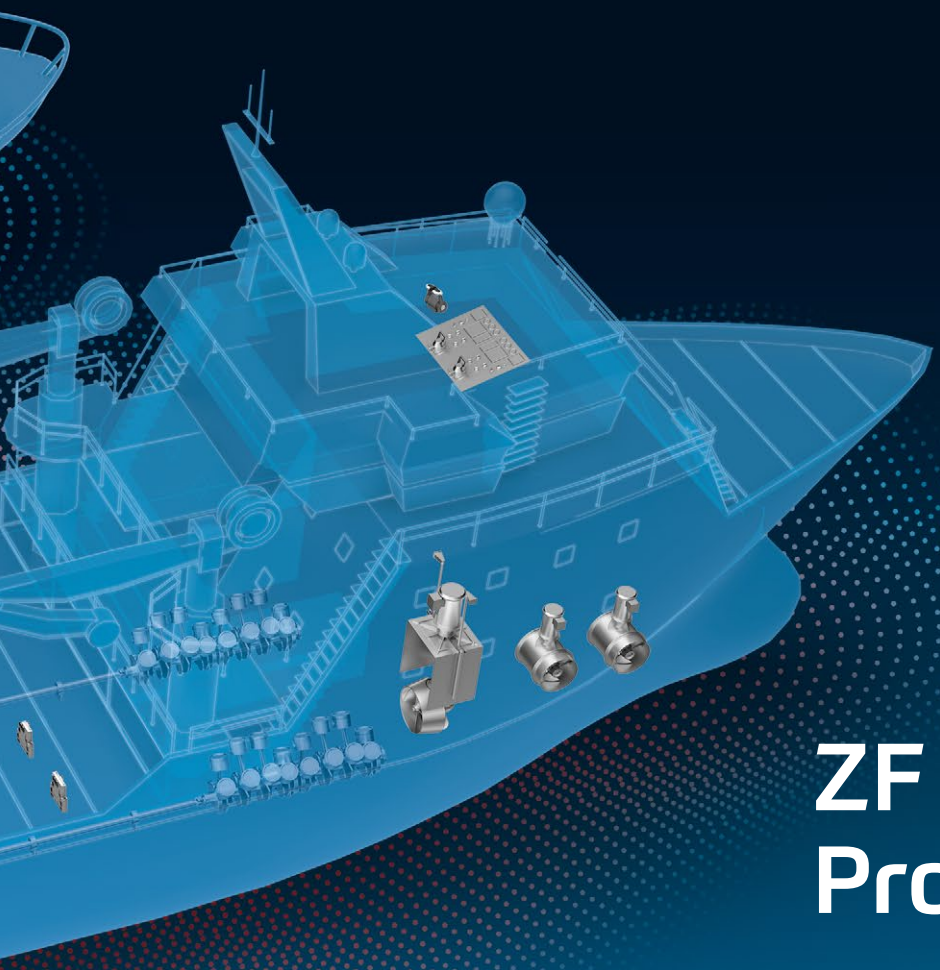
MATERIAL AND MANUFACTURING SPECIFICATIONS

Bearings	Tapered roller bearings, spaced for optimum load carrying capabilities support the shafts
Castings	Manufactured from high strength, heat treated aluminum
Gears	Six inch, high strength, heat treated alloy steel utilizing high performance marine technology
Shafts	Manufactured from high alloy, heat treated steel
U-Joints	Industry leading size for increased load carrying capacity and extended life

INSTALLATION AND OPERATIONAL SPECIFICATIONS

Application	Commercial, Military, and Recreational
Corrosion protection	Multiple anodes, all castings chromatized and layered with powder coatings
Engine Type	Diesel or Petrol/Gasoline
Gear Ratios	620: 1.23:1, 1.45:1, 1.55:1, 1.78:1 660: 1.07:1, 1.23:1, 1.31:1, 1.43:1, 1.50:1, 1.74:1 680: 1.24:1, 1.43:1, 1.52:1, 1.74:1
Propeller diameters	16 inch (41 cm) - or - 20 inch (51 cm) depending on drive model
Steering range	56°
Trim/lift system	-6° to 10° (trim) 10° to 46° (lift)
Shifting	Reversing transmission required
Water pick up	None

TECHNICAL INFORMATION



ZF is Propulsion.

ZF is a global leader in driveline and chassis technology as well as active and passive safety technology. The company has a global workforce of 146,000 with approximately 230 locations in some 40 countries.

ZF Marine is recognized as an outstanding and reliable partner for propulsion systems, supplying complete driveline systems as well as components for all types of vessels such as motor yachts, watersports boats, sailboats, government craft, high-speed ferries, workboats and commercial vessels, covering a power range from 10 to 12,000 kilowatts.

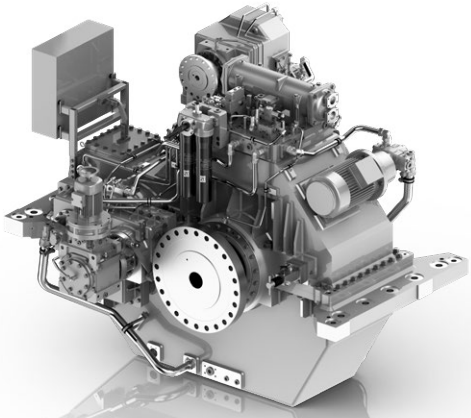
The product portfolio includes a comprehensive range of transmissions (reversing, non-reversing and hybrid), propellers, steering systems, electronic control systems, azimuth thrusters, tunnel thrusters and sail drives.

ZF annually invests about 6% of its sales in research and development. Marine products benefit from ZF Group R&D investments e.g. through design of light gearboxes with high torque transfer rate, worldwide unique acoustics test benches and continuous development of single parts.

Excellent products are backed-up by dedicated 24/7 service through the extensive worldwide network of ZF Marine.

Transmissions for commercial & fast craft applications

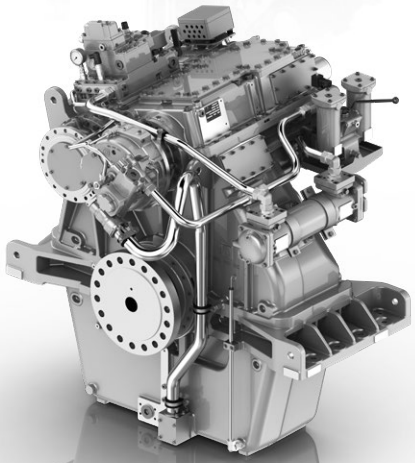
ZF provides a complete line of compact, high performance transmissions, specially configured to meet designer's requirements. Numerous ratios are available that perfectly match today's medium- and high-speed diesel engines. Highest quality standards, intelligent design concepts and ease of maintenance ensure compliance with specified operating profiles at minimum down-time and life cycle cost.



ZF 83000

Fast craft applications

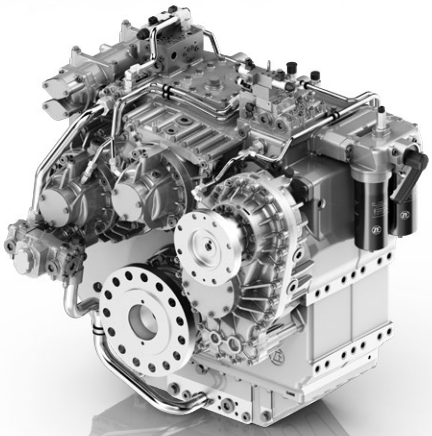
Large motor yachts, superyachts, offshore supply vessels, government vessels and fast ferries are typical applications for this series of marine transmissions. It is characterized by an optimum power-to-weight ratio, capable of withstanding high loads under extreme operating conditions.



TOUGH GEAR®

Commercial applications

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



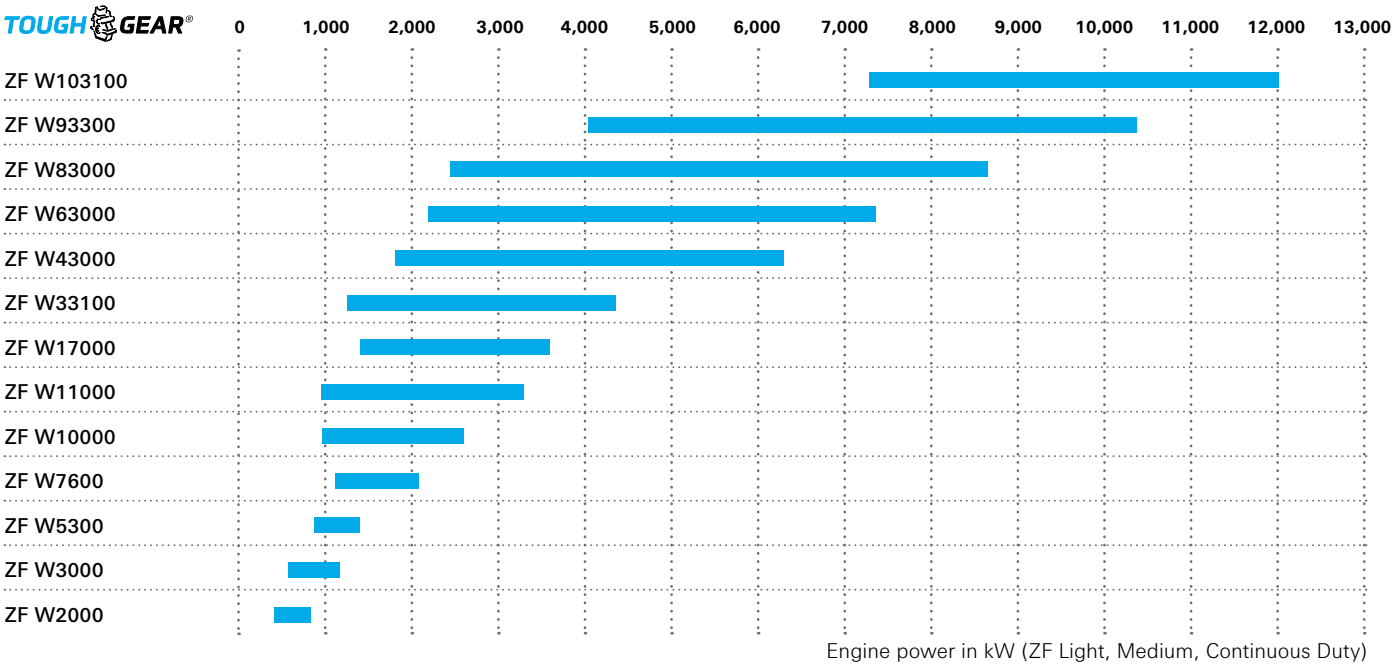
ZF 8300 PTI

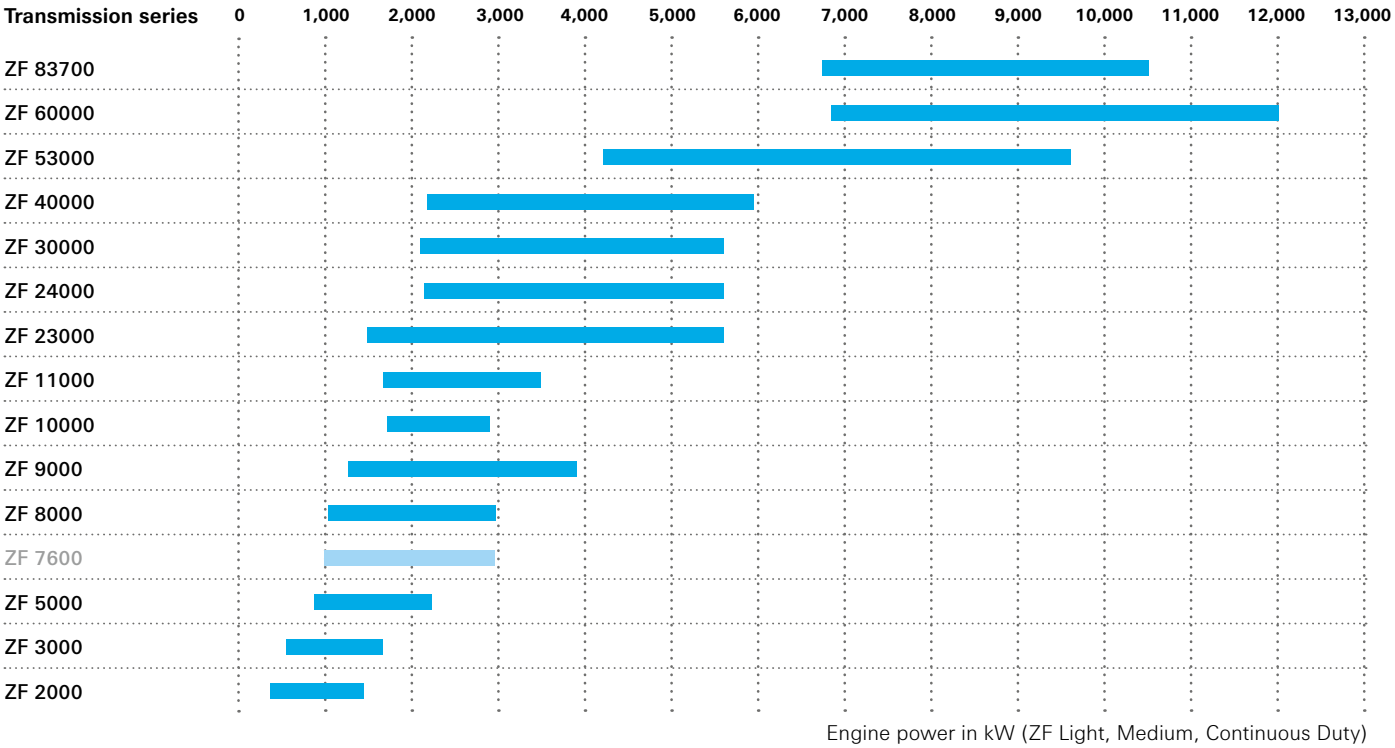
Hybrid-ready transmissions

For installation in medium and large vessels ZF Marine 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.

Transmissions for commercial & fast craft applications

Power range of ZF transmissions





Transmission configurations

ToughGear transmission series	PTI option	PTO option	PTH option	Shallow case	Semi deep case	Deep case	NR	NC	Shaft brake	AUTO-TROLL
ZF W103100		●	●		●			CEW		
ZF W93300		●	●		●			CEW		
ZF W83000		●	●	●	●		CEW	CEW		
ZF W63000		●		●			CEW			
ZF W43000	●	●	●	●	●		CEW	CEW		
ZF W33100		●			●		CEW	CEW		
ZF W17000		●		●	●	●	CEW/EW	CEW/EW	●	
ZF W11000	●	●		●	●	●	CEW/EW	CEW/EW	●	●
ZF W10000	●	●		●	●	●	CEW/EW	CEW/EW	●	●
ZF W7600		●			●	●	CEW/EW	CEW/EW		●
ZF W5300	●	●			●		CEW/EW	CEW/EW	●	●
ZF W3000	●	●			●	●	CEW/EW	CEW/EW	●	●
ZF W2000		●			●	●	CEW/EW	CEW/EW		●

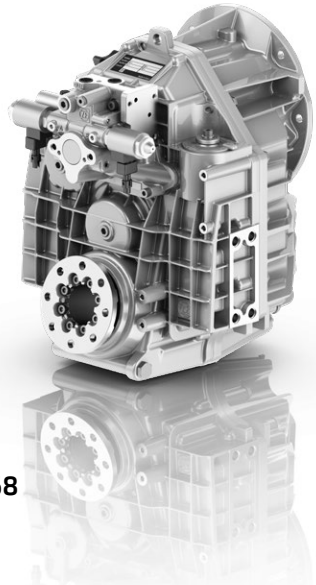
Transmission series	PTI option	PTO option	Shallow case	Semi deep case	Deep case	A and V	C	D	NR2H L/R	NR2	NR2B
ZF 83700	●	●		●					●[1]		
ZF 60000		●	●						●[1]		
ZF 53000		●	●						●[1]		●[1]
ZF 40000	●	●	●	●				●	●[1]	●[1]	●[1]
ZF 30000	●	●	●	●				●	●[1]	●[1]	●[1]
ZF 24000	●	●	●	●			●	●	●[1]	●[1]	●[1]
ZF 23000		●	●				●	●			
ZF 11000	●	●			●						
ZF 10000	●	●			●						
ZF 9000	●	●	●	●		●			●[1]	●[1]	●[1]
ZF 8000	●	●	●	●		●		●	●[1]	●[1]	●[1]
ZF 7600		●	●	●	●	●			●[1]	●[1]	●[1]
ZF 5000	●	●	●	●		●		●	●[1]		
ZF 3000	●	●	●	●	●	●		●			
ZF 2000			●	●	●	●					

[1] Waterjet only / Abbreviations: PTI: power take-in, PTO: power take-out, PTH: power take home, A: down-angle, V: remote V-drive, C: coaxial, D: diagonal, NC: no clutch, NR: non-reversing, NR2: non-reversing/ two shafts (input above output), NR2B: non-reversing/two shafts (input below output), NR2H: non-reversing/two shafts (input horizontal output), EW: engine-wise, CEW: counter engine-wise

Transmissions for pleasure craft applications

ZF offers a wide range of lightweight and robust transmissions suitable for all types of engines and propulsion systems, covering every application, such as motor yachts, cruisers, sport fishing vessels, watersports boats and sail boats, but also patrol boats, fishing and small commercial vessels.

ZF 30 M



ZF 68

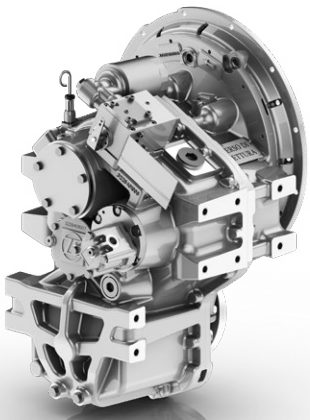
While the mechanically operated “M”-series transmissions are typically installed in lower horsepower applications such as sailboats and river craft, they are also utilized in life saving applications such as lifeboats.

ZF transmissions for pleasure craft applications are designed for both forward and reverse reduction operation. The mid-range transmissions are primarily employed in various types of pleasure craft including watersports boats, sport fishing vessels, cruisers and luxury motor yachts. Transmissions with higher power ratings are equipped with ZF Marine’s innovative SuperShift2 clutch control.

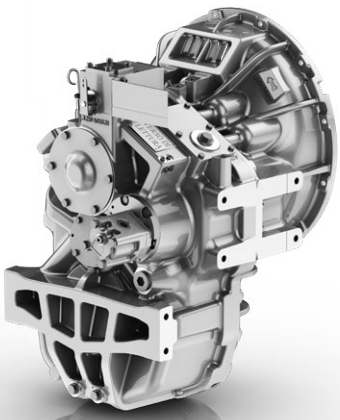
The transmissions are made of a robust yet lightweight sea-water resistant aluminum alloy housing. The output shaft thrust bearings of these transmissions are designed to take maximum propeller thrust astern and ahead. All the gears are calculated and optimized for minimum noise and maximum strength, case hardened with precisely ground gear teeth for long life and smooth running.

The transmissions are compatible with all types of engines and propulsion systems, including waterjets and surface-piercing propellers. They are built to stand up to not only pleasure craft but commercial vessel duty cycles. All of ZF Marine’s transmission design, manufacture and quality control standards meet ISO 9001.

The 2-speed (TS) series transmissions have been developed for applications, where optimum acceleration, safety and maneuverability are determining factors. These 2-speed, power-shift, reverse reduction marine transmissions are equipped with a planetary step-up gear on the power input side and electric shift from first to second speed.



ZF 335

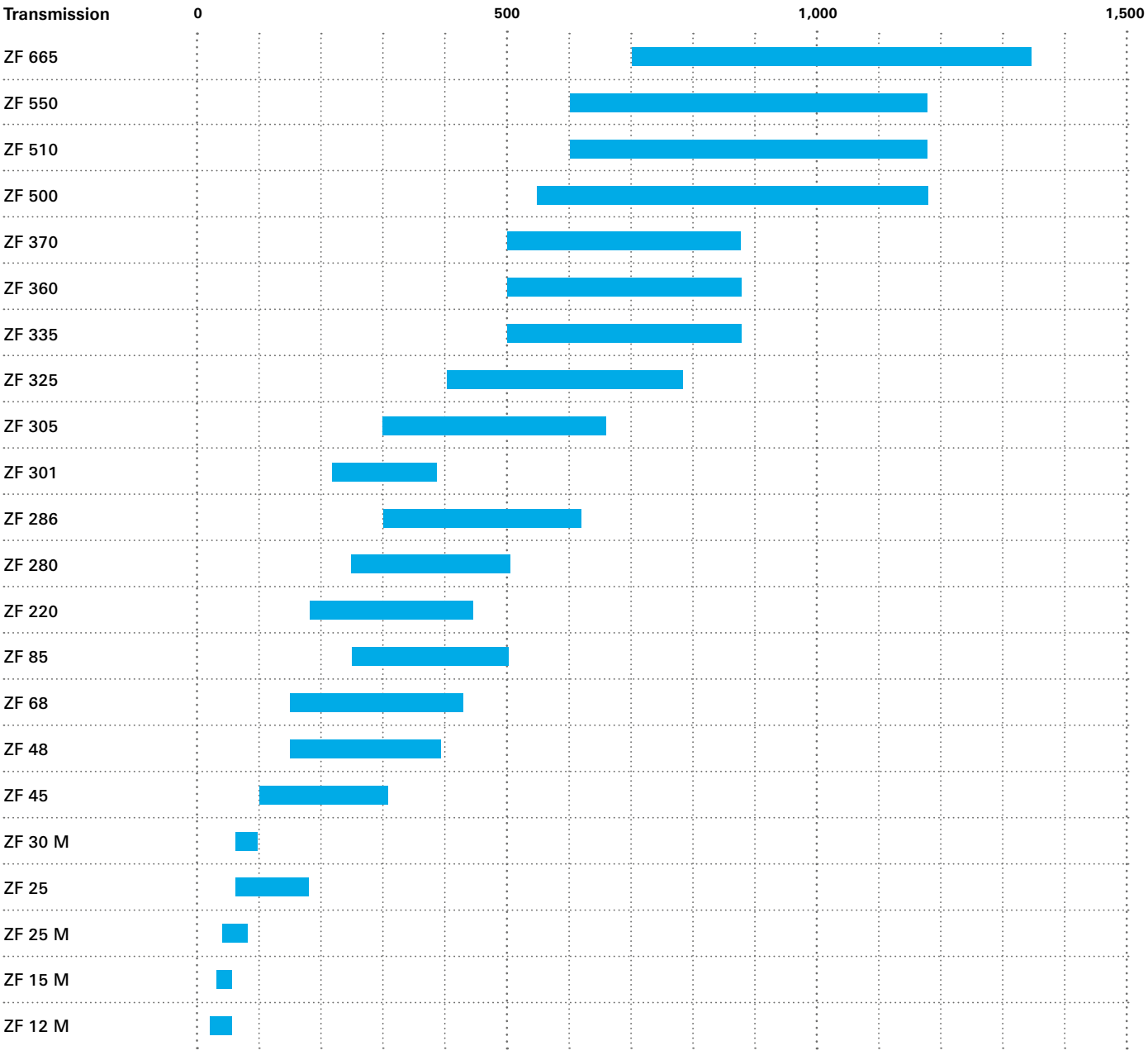


ZF 500

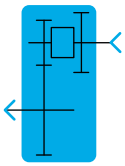
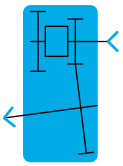
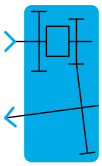
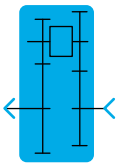
ZF 665

Transmissions for pleasure craft applications

Power range of ZF transmissions



Transmission configurations

Transmission	Parallel offset	Down angle	V-drive	Coaxial
ZF 665	●	●	●	
ZF 550	●	●	●	
ZF 510		●	●	
ZF 500	●	●	●	
ZF 370			●	
ZF 360	●	●	●	
ZF 335		●	●	
ZF 325	●	●	●	
ZF 305	●	●		
ZF 301		●		●
ZF 286	●	●	●	
ZF 280	●	●	●	
ZF 220	●	●		
ZF 85		●	●	
ZF 68	●	●	●	
ZF 48			●	
ZF 45	●	●		●
ZF 30 M	●			
ZF 25	●	●		
ZF 25 M	●	●		
ZF 15 M	●	●	●	
ZF 12 M	●			

Transmission functionalities

In addition to their large variety and versatility ZF Marine transmissions deliver another strong asset in terms of their outstanding functionalities.

Dynamic positioning capabilities

Transmissions from ZF Marine are designed to work in the most demanding applications. Our systems are designed for the tough duty cycles that workboats face.
The SuperShift2 and AutoTroll features, combined with ZF 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.
For as long as the vessel needs to be on station, repeated gear engagements, reversals, and exact propeller speed are all available with no risk of damage to the propulsion system.

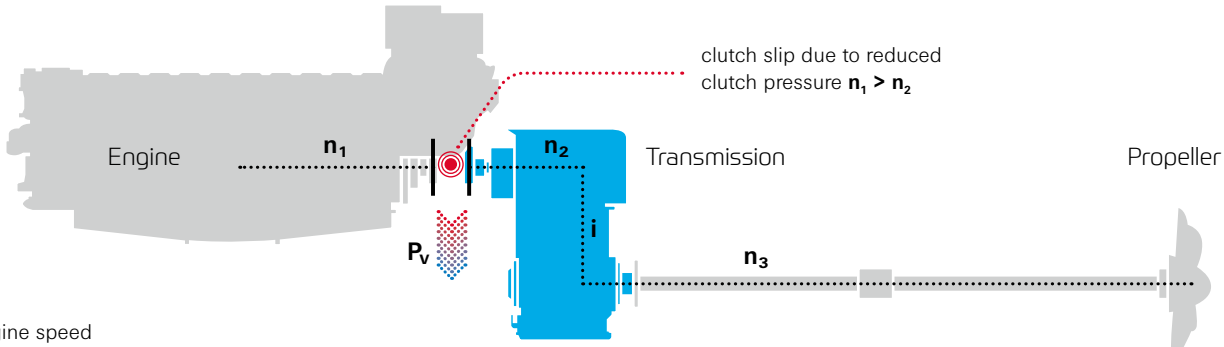
SUPERSHIFT2

ZF Marine SuperShift2 is a mechanical / hydraulic clutch control system operated by solenoid valves. The system incorporates standard components only and does not require electronic controls. This insures the maximum possible durability and dependability. SuperShift2 is fitted to transmissions of ZF Marine propulsion systems as standard equipment at no extra cost.

SuperShift2 delivers

- Quick, smooth and practically undetectable shift engagement
- Precise and predictable control of transmission output, thus providing excellent low-speed vessel maneuverability
- Seamless interaction with ZF's Joystick Maneuvering System (JMS)
- Utilizes ZF Marine's proven reliable transmission technology
- Clutch pressure, modulated in two steps, allowing fast shifts without engine stall
- Shift quality is not effected in any emergency situations
- "Get home" capability incorporated in all models
- Satisfies all requirements of any classification standard
- Compatible with other control features such as Electric Trolling, AutoTroll and Dynamic Positioning

AUTOTROLL®



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

The ZF AutoTroll system provides infinitely variable propeller speed control when there is a need to run slower than the engine idle speed. AutoTroll allows operators to increase or reduce transmission slip to match the exact amount of thrust required during low speed operation for extended periods without risking damage to the transmission.

Typical applications are:

- Slow speed cruising
- Maneuvering in harbors and moorings
- Towing small boats
- Sport fishing at optimum trolling speed

iDrift®

Using ZF iAnchor as the base platform, ZF iDrift technology offers the ability to control drift speed and direction when the vessel is in windy conditions and/or active current – all while maintaining the bow's heading. Depending on the direction and strength of the wind and/or current, the bow can be oriented to the desired heading, then ZF iDrift can be activated.
ZF iDrift is the perfect solution to control the vessel's drift speed and heading when kite fishing, bottom fishing, or wreck fishing.

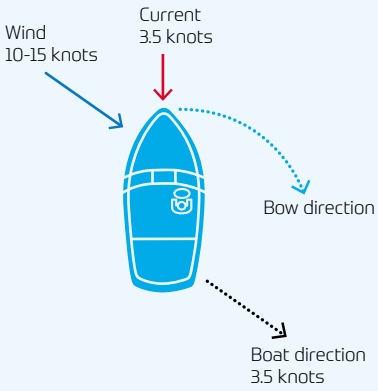
❶ Without iDrift®

Boat is bow first into the current, which is running at 3.5 knots, and wind is on the port bow at 10-15 knots. The wind will push the bow to the starboard (right) and the boat will drift with the current at 3.5 knots, but it will be pushed to the starboard because of the effect of the wind.

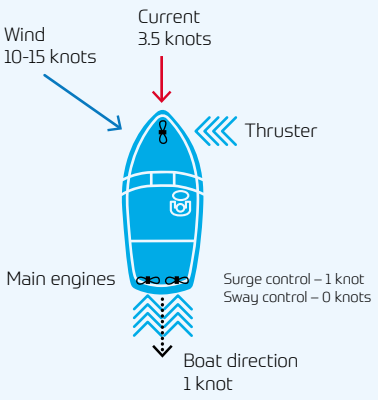
❷ iDrift® – Controlled Drift Mode (Surge & Sway)

The Surge Control allows the boat to drift at 1 knot, and now the Sway Control holds the boat – to not let it move to starboard due to the wind. The bow still holds its direction on the compass heading, the main engines are engaged, and the starboard (right) engine works to keep the boat from drifting to starboard – the boat actually drifts straight backwards at 1 knot.
All the functionality of ZF iDrift is fully engaged.

❶

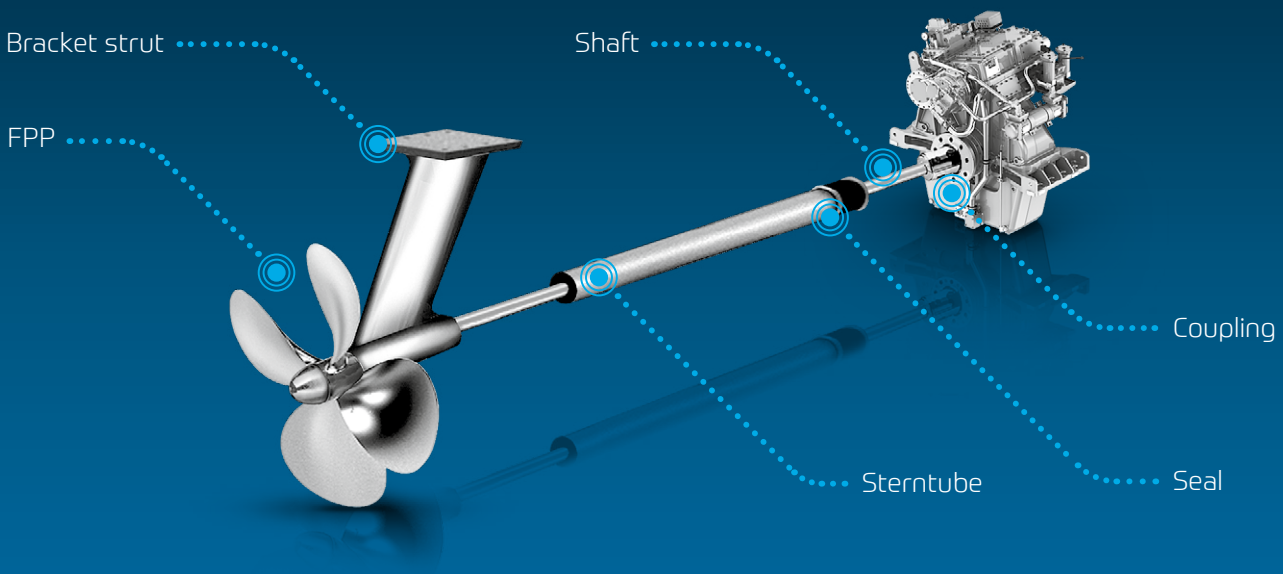


❷



Propulsors

Watersports boats, sport fishing vessels, cruisers, motor yachts, sailing yachts or commercial and fast craft vessels – different boat types require different types of propulsors. The ZF product range includes surface drives, sail boat propulsion and fixed pitch propellers, and thus, offers the right propulsion for every application.

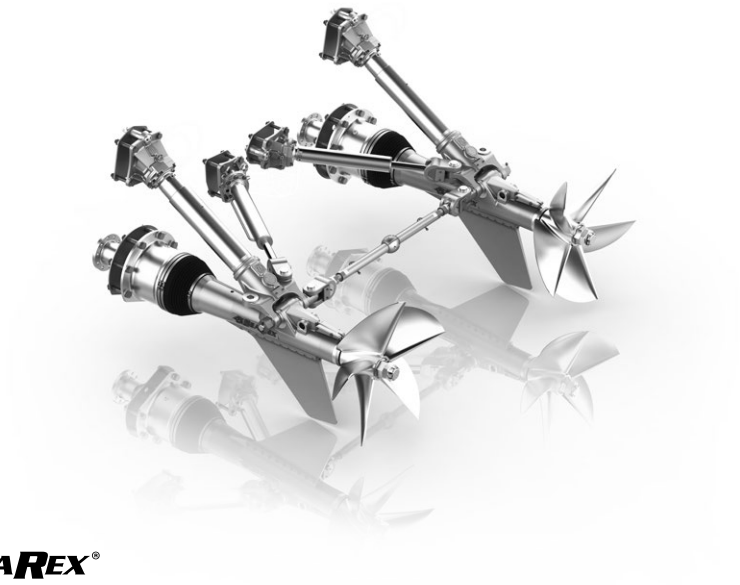


Propulsion shafting design

In order to extract the full power of the engines, ZF is able to offer a large variety of essential parts starting from the transmission 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 Propellers factory in Kaohsiung (Taiwan) 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.

Note: Shafting package currently available for the Asia region only



SEAREX®

Surface drives

ZF SeaRex represents the most advanced and efficient technology in surface drives and is the perfect propulsion solution for high speed boats. It also offers special patented options, such as automatically controlled trim and steering.

ZF SD SPP

Sail boat propulsion

Exceptional hydrodynamic efficiency and highest design flexibility – with unmatched maneuverability provided by the integrated joystick in the SPP version – is what characterizes the ZF Sail Drive system. Ease of installation as well as its compatibility with a large variety of fixed and foldable propellers are additional benefits.

ZF Propellers

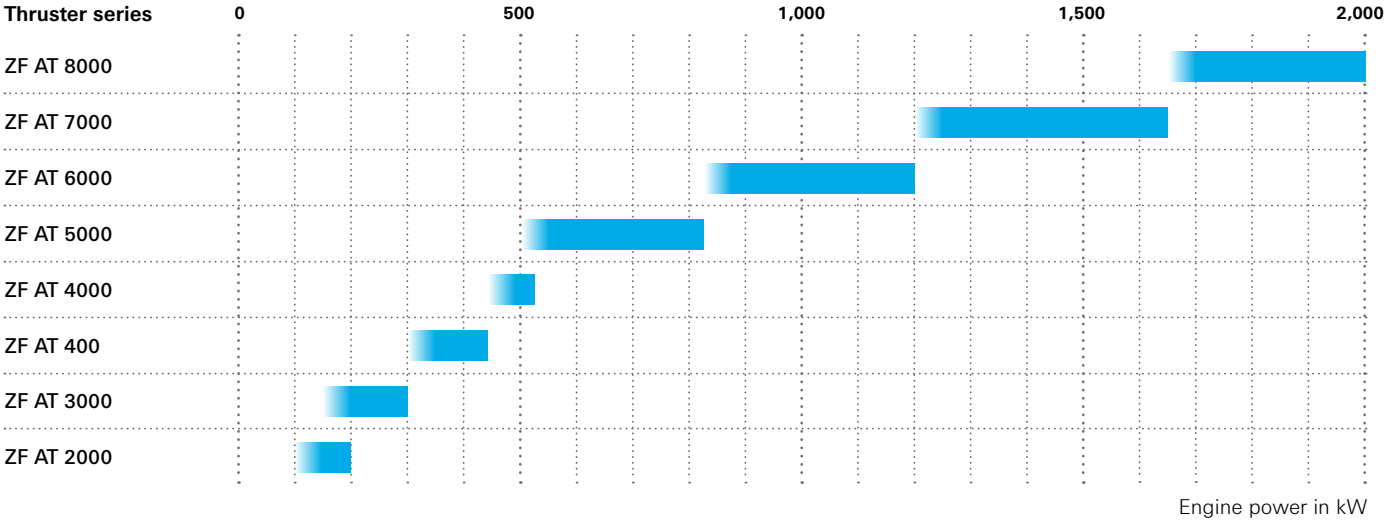
Fixed pitch propellers

Custom-designed and standard fixed pitch propellers are specialties of ZF Marine. Propellers of various designs for all kinds of craft are available, employing sophisticated CAD-CAM design and manufacturing tools and meeting the highest standards in quality and efficiency.

Thruster systems

ZF Marine develops, designs and produces tailor-made thruster systems for all types of vessels. The product line comprises azimuth thrusters which are 360° steerable as well as transverse thrusters. The scope of supply is complete with the ZF ThrusterCommand control system.

Power range of ZF thrusters*



Fixed Pitch Tunnel Thruster

Series
ZF TT 1000 – 8000 FP

100 kW – 2,000 kW input power.

Versions
L-Drive
Z-Drive

Controllable Pitch Tunnel Thruster

Series
ZF TT 4000 – 5000 CP

500 kW – 850 kW input power.

Versions
L-Drive
Z-Drive

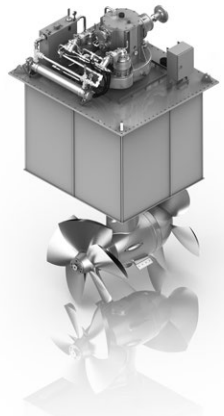
*Rating, subject to classification and application. Mentioned data for indication purposes only. Consult ZF Marine technical staff to determine applicable power for each specific use.

Well Mounted Azimuth Thruster

Series
ZF AT 2000 – 8000 WM-FP

Well mounted (placed below deck) azimuth thrusters, fixed pitch propeller, diesel, electric or hydraulic drive, 200 kW – 2,000 kW input power.

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



Contra Rotation Azimuth Thruster

Series
ZF AT 2000 – 5000 WM-CR

360° steerable azimuth thruster with contra rotating propellers for higher efficiency and comfort on board, 150 kW – 770 kW.

Versions
L-Drive
Z-Drive

Retractable Azimuth Thruster

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, 200 kW – 2,000 kW.

Versions
L-Drive
Z-Drive

Deck Mounted Azimuth Thruster

Series
ZF AT 2000 – 6000 DM-FP

Deck mounted azimuth thruster placed on deck, containerized prime mover, 180 kW – 1,200 kW.

Version
Z-Drive

Stern Mounted Azimuth Thruster

Series
ZF AT 2000 – 6000 SM-FP

180 kW – 1,200 kW.

Versions
L-Drive
Z-Drive

Shallow Draught Thruster

Series
ZF SDT 2000 – 6000 FP

Shallow draught thrusters for use in shallow waters. 100 kW – 825 kW input power.

Versions
L-Drive
Z-Drive

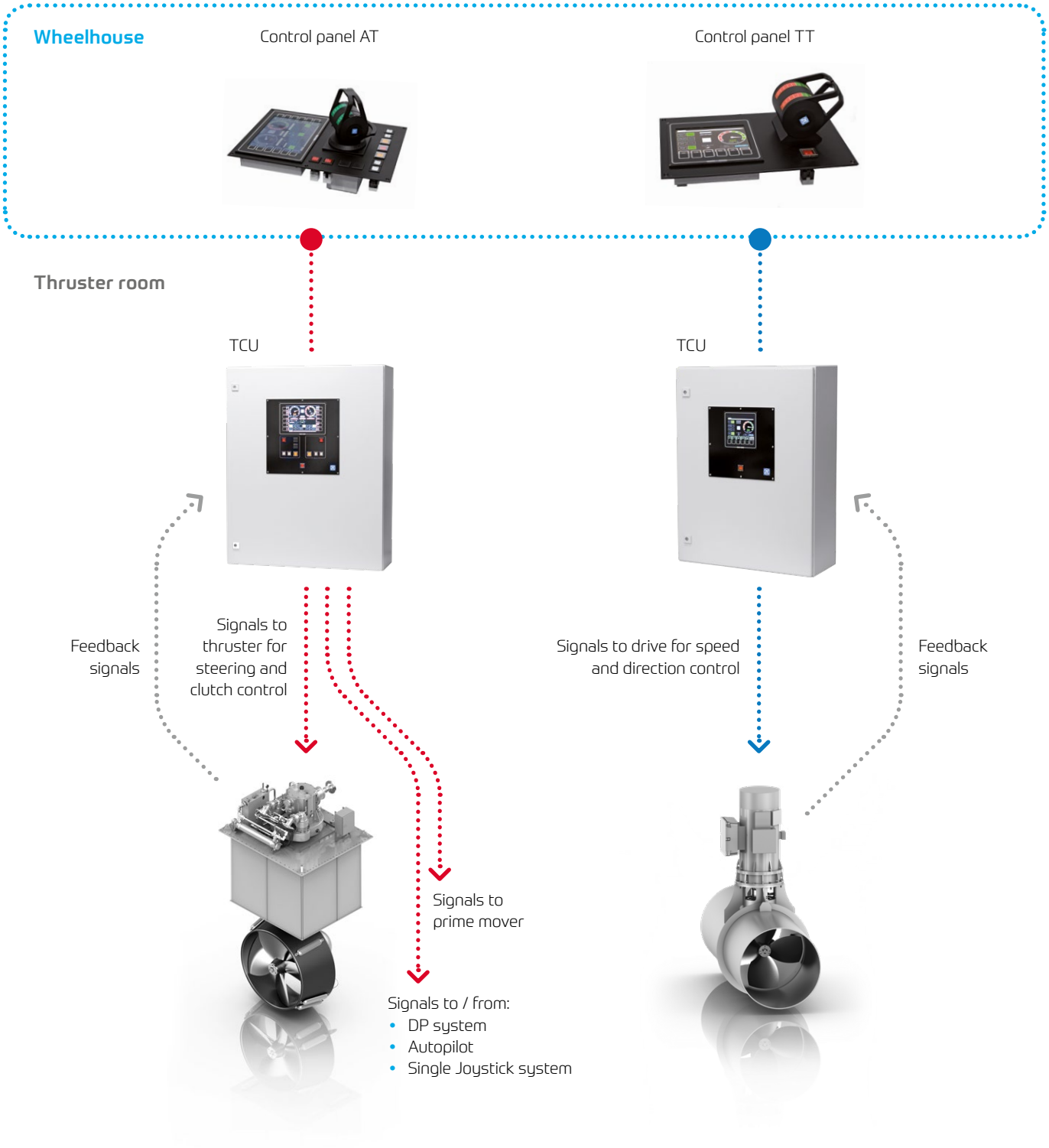
Control systems

Reliable, responsive control systems for both mechanical and electronic applications are an essential element of ZF Marine propulsion systems.

ZF control systems are designed to smoothly interface with most engine options and our complete transmissions range, either for leisure, professional or very heavy commercial applications. They comply with highest classification standards, make installation easy for boat builders and operation comfortable for boat owners.
Whatever the application – from the most basic marine applications to large offshore supply vessels with highly sophisticated dynamic positioning equipment or luxury yachts – we provide the suitable propulsion control systems for mechanical or electronic engine and transmission operation.

THRUSTER COMMAND

The ZF ThrusterCommand 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.



Control systems

All of ZF Marine's control systems carry our product "DNA", features that you will find across all of our control systems families.

Standard features of ZF Marine control systems include

- "Plug and Play" installation for a simplified install
- Push button set up for easy parameter configuration
- Neutral start interlock to prevent unintended in gear engine start
- Emergency reversal protection allows safe shifting from full ahead to full reverse in one motion

These features are evidence of ZF Marine's understanding of what safe and unobstructed boat handling is all about.

MicroCommander® / ClearCommand®

MicroCommander and ClearCommand are robust controls that have been long established as industry standards in electronic controls technology. Both systems are suited to applications utilizing mechanically actuated engines and transmissions or any combination of electronic throttle or shift.
Premium ClearCommand was developed specifically for unique applications in multi-engine commercial, and very large pleasure craft vessel applications. It is designed to interface with many commercially available DP systems and meets the stringent standards of most classification societies.

CruiseCommand®

CruiseCommand is the next step based on the proven MicroCommander and ClearCommand product families. It is designed specifically for larger vessels with multiple control stations and electronic engines and electrically shifted transmissions. CruiseCommand incorporates all the standard features of ZF Marine control systems including warm up mode, station transfer, single lever operation, and engine synchronization.
Electric trolling valve control is a standard feature with CruiseCommand and can be activated as part of the initial system set up. This allows for a range of low speed control at engine idle.

MiniCommand

MiniCommand is the evolution of standard electronic controls. MiniCommand provides affordable single or twin lever control of electronically actuated diesel engines and marine transmissions. Designed specifically for pleasure craft and light duty commercial applications up to 60 feet in length, with a maximum of two control stations, the MiniCommand control processor incorporates the logic circuits for two engines and transmissions in one compact package.

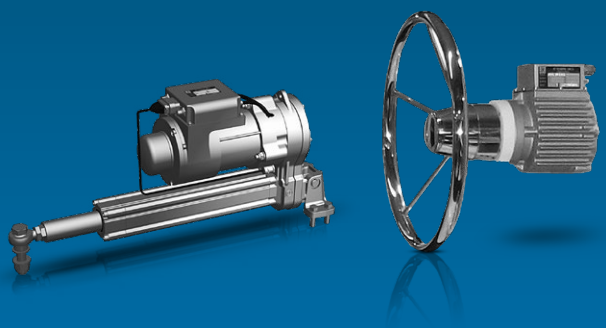
SmartCommand®

SmartCommand, a powerful control system for electronically controlled engines and ZF transmissions, integrates the latest in CANbus technology with a user-friendly multifunction control head for up to six vessel control stations.
SmartCommand provides complete control with dedicated control modes for all standard ZF Marine control system functions with the addition of Easidock, and AutoTroll.

JMS® featuring iDrift® and iAnchor®

ZF Marine's Joystick Maneuvering System (JMS) operates off of the SmartCommand control system, offering simple and intuitive vessel control at your fingertips.
JMS manages the vessel's main engines, ZF transmissions and bow thruster all through the joystick, giving the operator precise speed, smooth maneuvering and easy docking. JMS offers vessel operators the ability to move the vessel sideways or rotate 360 degrees on the vessel's axis. The control functions iAnchor (automatic positioning) and iDrift (drift speed and direction control) are unique JMS features.

SteerCommand



Based on the SmartCommand platform, SteerCommand brings to marine the most advanced steer-by-wire technology for unparalleled performance and greatest ease of installation.
Traditional bulky hydraulic steering systems with their plumbing and many liters of fluid are now replaced with simple electronic harnesses. The vessel control experience is also significantly improved. Steering feel at the helm is more precise, and ZF Marine's patented force feedback system offers rudder feel at the helm. Individual rudder controls offer increased maneuverability by allowing each rudder to move independently.