

# AZIPULL PM L

## OPERATIONAL BENEFITS

- AZP on the market more than 15 years
- Superior hydrodynamic efficiency due to streamlined housing and further improved housing geometry using latest CFD tooling and in-house hydrodynamic expertise
- Superior maneuverability and course stability (up to 20% power saving compared to pushing thrusters without nozzle)
- Superior flexibility due to controllable pitch and full feathering propeller, especially in Safe Return to Port [SRtP] conditions
- Increased mechanical and electrical efficiency resulting in lower fuel consumption and potentially lower total installed power requirement for the customer (lower OPEX & CAPEX)
- Low propeller rpm and high torque capacity of the driveline increases propulsion efficiency
- Increased efficiency on lower power operation due to permanent magnet motor technology
- Lower system inertia allows increased propeller diameter for ICE class thrusters = increased propulsion efficiency
- Low noise and vibration level
- Optimised for battery solutions



KONGSBERG

## KONGSBERG MARITIME AZIMUTH THRUSTERS

### Azipull PM L

The azimuthing pulling thruster – AZP is now available in compact L-drive solution.

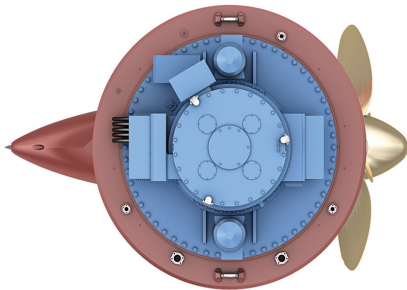
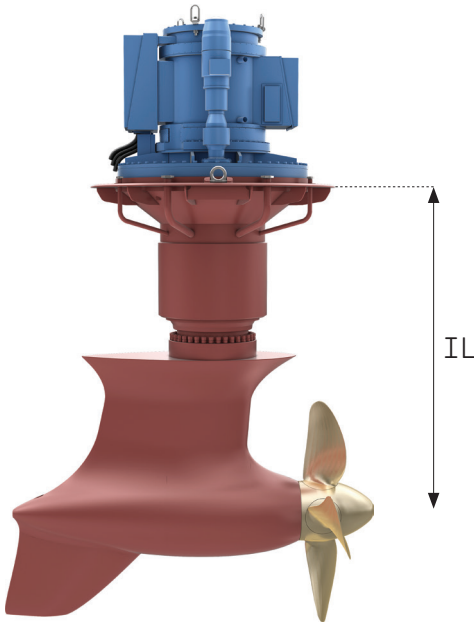
A permanent magnet motor is directly integrated into the thruster system to improve efficiency, reduce the footprint and increase customer benefits by reduced operating and investment cost.

The Azipull is a well known and established product in the market since it's introduction in 2002. More than 550 units has been sold so far, number increasing rapidly. However Innovation never stops even after so many years in successful operation.

In 2017 a new Azipull PM joined the existing line-up. It has an L-drive configuration using essentially the same underwater unit, but with a vertical shaft permanent magnet (PM) motor integrated into a new upper unit.

The PM motor maintains a very high efficiency over a wide speed range. Combined with the proven high propulsive and hydrodynamic efficiency of the Azipull this is a winning combination, especially as there is a further small gain in mechanical efficiency by eliminating the upper gearbox.

Space requirements in the thruster room are reduced by up to 30% because the new thruster is compact, the PM motor lying within the diameter of the mounting flange giving a small footprint and avoiding the complication of a coupling and foundations for the separate motor of a conventional Z or C drive electric configuration.



The thruster system is optimised for battery solution and capable of handling degrading of batteries during their lifetime.

Installation procedure and time for the shipyard is significantly simplified and reduced with the new developed weld-in tube hullfitting. This is a cylindrical steel element with a conical section to the mounting flange which is easy to weld into the vessel's hull structure, especially for a thruster inclined in all directions.

Three propeller types are available, and the choice will depend on the particular vessel and operation. All are in use on existing Azipull models. If a fixed pitch propeller is selected for the AZP PM L unit speed is controlled by varying the frequency of the current supplied to the motor. For a CP installation both rotational speed and propeller pitch can be varied with the Kongsberg Maritime combinator control system.

The fully feathering version has the same merits as the CP propeller, but the ability to align the blades with the water flow to minimise drag when the thruster is not powered is of great benefit for installations in multifunctional vessels and others such as double ended ferries where it is usually optimal to feed power only to the aft unit for the selected direction of travel, with the forward thruster inactive during transit.

### Installation and maintenance benefits

- Up to 30% footprint reduction in machine room compared to z-drive thruster configuration
- No realignment of thruster and drive motor incl. flexible coupling after thruster or motor exchange
- Simplified maintainability due to direct motor access through the machine room (minimum service space requirement)
- Simplified hull installation though new developed weld-in tube hull fitting
- Units are part of the thruster support pool (TSP)

### Safety & other benefits and system options

- Permanent magnet motor is equipped with static holding brake for safe maintenance operation and in case system failure
- EAL approved sealing solutions
- Kongsberg Maritime offers support during design stage to optimize propulsion system and integrated solution as for example hull, headbox and propeller design
- Underwater blade exchange (optional)
- Condition monitoring system (optional)

SIZE	AZP 85 PM L	AZP 100 PM L	AZP 120 PM L	AZP 150 PM L
Power range [kW]*	600-1700	1800-2500	2500-3500	3500-5000
Propeller diameter [mm]*	1900-2300	2300-2800	2800-3300	3300-4200
Propeller type	CP/FP/CP-F	CP/FP/CP-F	CP/FP/CP-F**	CP/FP/CP-F**
Installation length - IL [mm]	2720	3080	4055	4200 (approx.)
ICE class capability [Baltic, Polar]***	ICE 1C	ICE 1B	ICE 1AS, PC6	ICE 1AS, PC6
Approx. dryweight [tonnes]	17	31	58	TBD
Availability	2018	2019	2017	2019/20

\* Standard range at 690V - variation possible. \*\* Under development, available in 2019. \*\*\* Derating in ICE mode required

