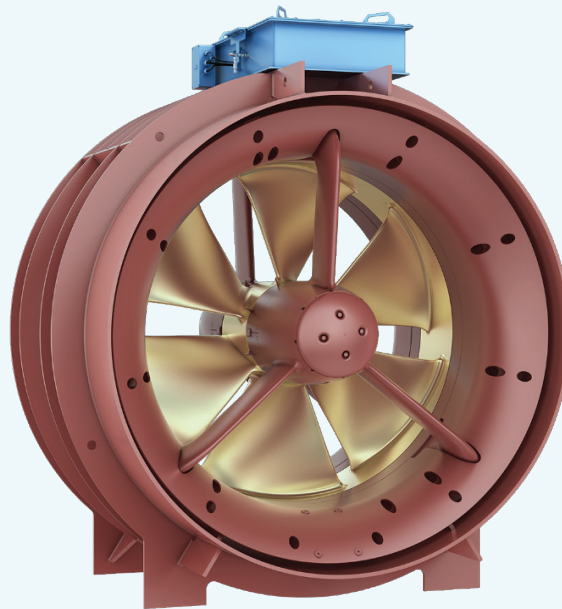


TUNNEL THRUSTER TT-PM 2000



KONGSBERG



KONGSBERG TUNNEL THRUSTERS

TT-PM 2000

The Permanent Magnet tunnel thruster is a new addition to the Kongsberg Maritime family of thrusters, building on a completely new approach to thruster design and motor integration. The (TT-PM) has been engineered with reliability and through life costs as the focus. Using permanent magnet motor technology increases efficiency and makes the installation more compact, only the variable frequency drive unit is housed in the thruster room, freeing up space on board.

The TT-PM will meet the strictest requirements for performance, noise and vibration, and will be an excellent choice for operations where low noise and high performance is required.

The TT-PM is built around permanent magnet motor technology and a propeller running on roller bearings, supported by a central shaft. The central shaft is supported by stays. These stays recover some of the swirl energy created by the propeller, providing additional thrust.

The Kongsberg Maritime thruster has been developed following strict requirements to quality.

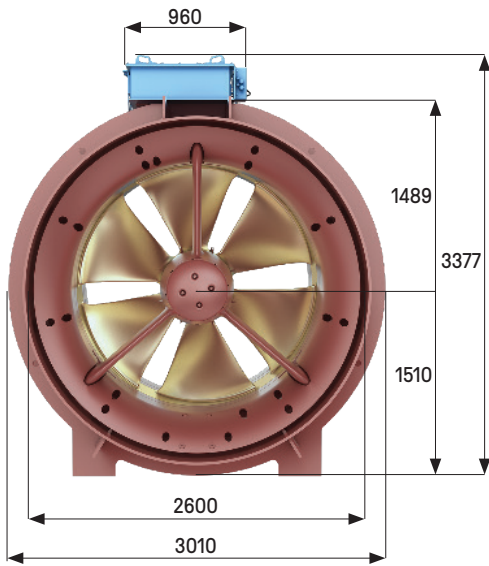
The thruster contains only one moving part compared to mechanical tunnel thrusters, and thus has fewer components subject to wear and tear. A new mounting system allows more relaxed tolerances and permits installation of the thruster at a convenient stage in the construction of the vessel. The mounting system also allows for easy exchange of a complete thruster. The thruster is approved for EAL (Environmentally Approved Lubricant).

The TT-PM consist of:

- Permanent magnet motor
- Monoblock fixed pitch propeller
- Lubrication system
- Hydrodynamic fairings on thruster
- Easy installation system

TYPICAL APPLICATIONS

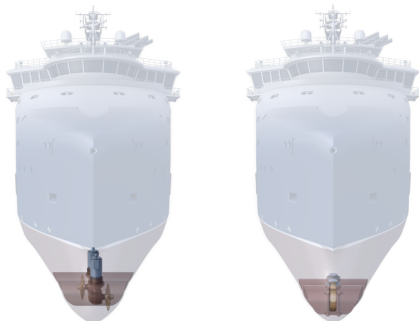
Suitable for and installed in all types of vessels



TT-PM installed in tunnel



Standard tunnel seen from side



Equal thrust in both directions

TT-PM tunnel thruster benefits:

- Highly efficient electric Tunnel Thruster with integrated Permanent Magnet Synchronous Motor (PMSM).
- Efficient and space saving PM technology with high torque density.
- Designed for integration to a variety of drive make/supplier.
- Optimised Propulsion and system efficiency utilising the excellent hydrodynamic performance in combination with a high torque density PM-motor with fast response time.
- Fast response times to full power give improved manoeuvrability and operability and anti-roll function capability (<1,5 sec, zero to full thrust port or starboard).
- Excellent noise and vibration level, structural and underwater radiated noise (URN).
- Symmetrical design ensures easy and optimal integration and give equal thrust in both directions
- Environmentally friendly – Green propulsion with limited oil volume (EAL-oil approved).
- Robust and reliable design with few rotation parts and reduced failure modes. Robust center shaft carries all propeller loads.
- Simplified system design with limited axillary equipment and reduced installation time of unit.
- Reduced footprint, no additional cooling required, Thruster unit cooled by surrounding seawater.
- Reduced maintenance and lifecycle cost.
- Long service intervals (15 year)
- Prepared for easy adaption of EHM-system.
- Strong operational support and Thrusters available in Thruster Support Pool (TSP)

TECHNICAL DATA TT-PM 2000

Propeller diameter (mm)	2000
Tunnel diameter (mm)	2600
Max. power (continuous rating) (kW)	1000-1600
Nominal speed (rpm)	0-280
Max. output thrust (kN)	243*
Oil volume (dm ³)	320
Weight thruster (kg)	14 500
Weight tunnel (kg)	5 066
Total weight (kg)	19 566
Propeller type	Propeller, Fixed Pitch
Direction of rotation	CW/CCW
Drive	AFE or 12-pulse drive*

* Approximate values provided for information only. Actual thrust may vary for given applications. All data is subject to change without prior notice.

