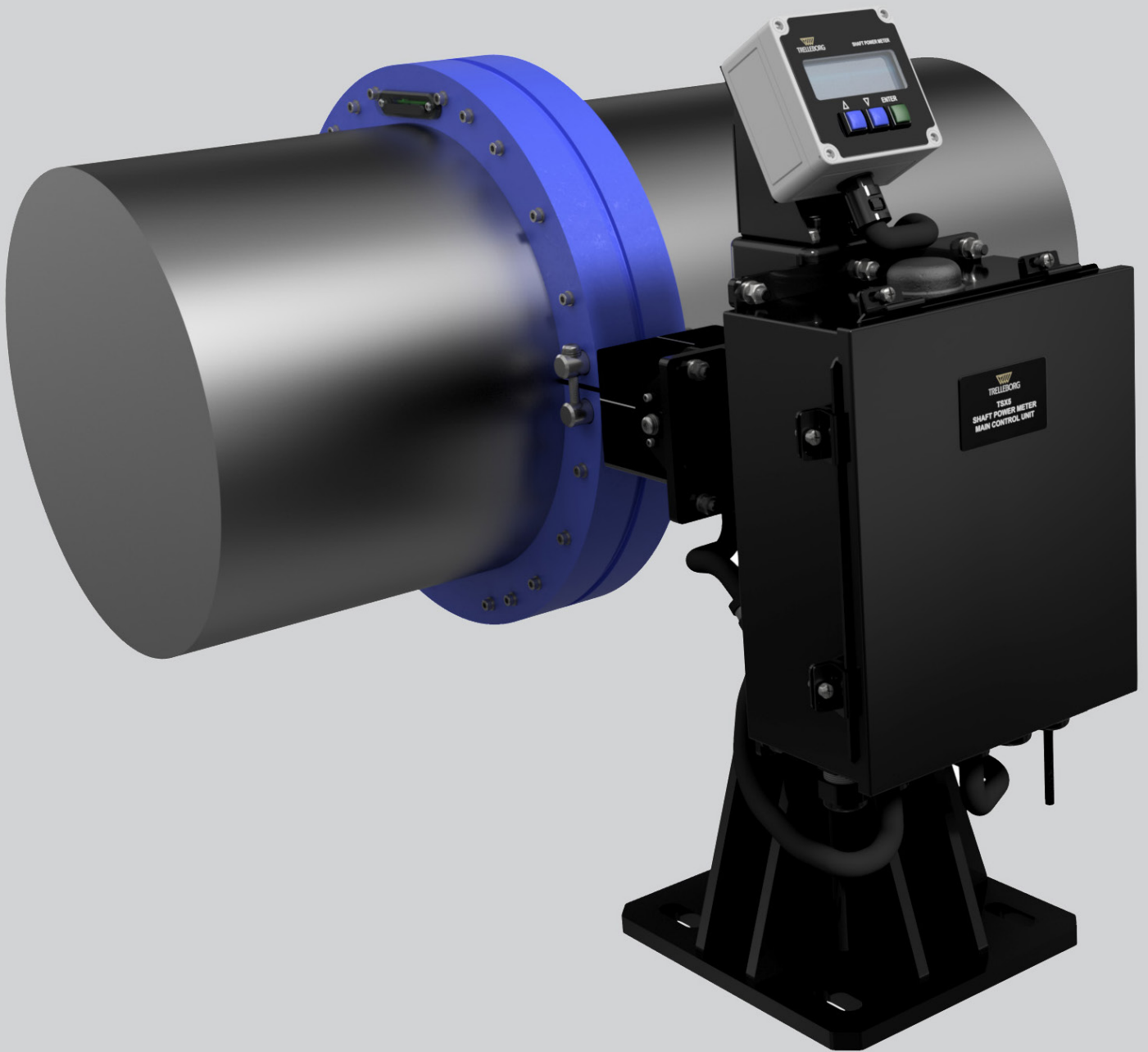


TSX5 Shaft Power Meter



Product Brochure

The Smarter Approach to Shaft Power Measurement

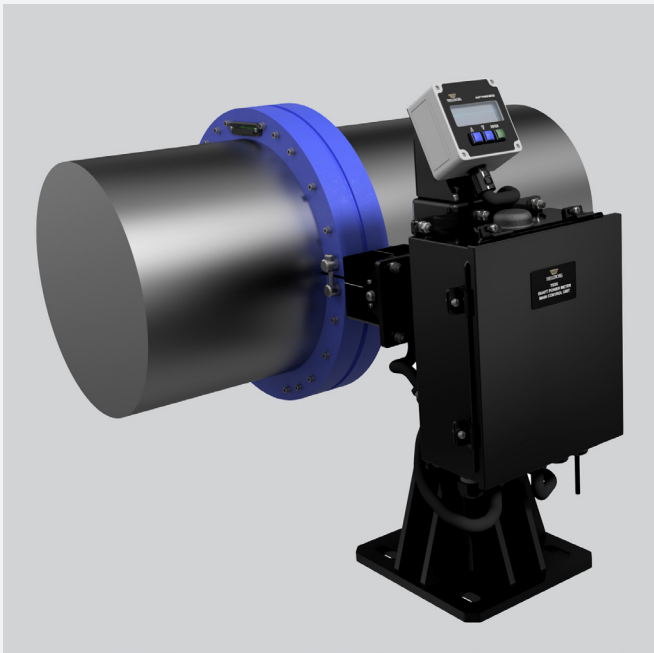
Shaft power meters offer ship owners and managers a well proven, low cost and quick way to achieve efficiency gains. Improving ship operational efficiency through the monitoring of power usage creates a more sustainable operating mode that will result in reduced fuel consumption and carbon emissions.

The measurement of shaft power necessitates the use of a power meter that accurately measures shaft torque. Through real time measurement of surface strain, shaft torque and power are calculated. The measurement of shaft power provides an early indication of increasing power requirements, that cannot be identified through theoretical calculations derived from base line efficiency curves. Increased power usage means **increased fuel consumption and therefore higher fuel bills.**

Trelleborg's **TSX5 Shaft Power Meter**, with strain gauge technology, offers the most accurate measurement of shaft power and can therefore deliver the greatest efficiency savings. Direct measurement of shaft power is more accurate than engine estimations alone and will help ship owners and managers to realize efficiency gains that otherwise would not be possible.

When comparing performance against base line data, **TSX5 Shaft Power Meters** can provide an early indication of any degradation in operating conditions by highlighting increasing power usage. Examples of this could include issues with the engine, shaft components or fouling of the hull and propeller. This information can then be used to adjust operating conditions and help schedule preventative maintenance.





Reducing fouling of the hull and propeller is most probably the No.1 challenge facing the shipping industry, as it can increase fuel consumption and engine emissions by over 50%. With a **TSX5 Shaft Power Meter** fitted the effects of fouling can be spotted early and preventative action taken to limit its impact. It will also allow for the before and after effects of any anti fouling technologies, applied to the hull or propeller, to be monitored.

The **TSX5** is also a critical hardware component for any ship performance monitoring system. When combined with fuel consumption and the ship's speed, the system can be used for reporting power, ship and fuel efficiencies, as well data for EEOI and ISO19030 reporting.

The positive effect of optimizing power usage by installing a **TSX5 Shaft Power Meter**, means that fuel consumption and engine emissions are reduced. This will result in cost savings for ship owners and managers by reducing fuel bills, which provide a quick return on investment for the **TSX5** system.

Why Fit a TSX5 Shaft Power Meter?

1



Saves users money, providing a quick return on investment.

2



The first step to making real efficiency gains.

3



Critical piece of equipment for a ship performance monitoring system.

4



Best way to identify propeller and hull fouling.

5



Reducing fuel consumption and ship emissions, offers a pathway for a more sustainable operating model.

EEXI Compliance

On 17 June 2021, the International Maritime Organisation (IMO) adopted amendments to MARPOL Annex VI at MEPC 76, introducing regulations 23 and 25 – the the Energy Efficiency Existing Ship Index (EEXI), which are the first steps for the shipping industry to move towards its target of a 50% reduction in carbon emissions by 2050.

The key aspect of the regulations is that all existing ships must achieve a required EEXI score, with the target score dependent on the type of ship. The initial work to be carried out by each ship is to calculate it's attained EEXI score, in accordance with MEPC.333(76), and to establish if it meets the required EEXI score. If it does not, then the ship must take action before compliance is demonstrated. Compliance has to be demonstrated in accordance with MEPC.334(76), on or after Jan 1st 2023 at the date of the IAPP survey and during the annual, intermediate or renewal survey, whichever comes first.

Two methods have been prescribed by the IMO that the ship can take to improve its EEXI score for the main engines in accordance with MEPC.335(76):

- 1) Engine Power Limitation (EPL)
- 2) Shaft Power Limitation (ShaPoLi)

The ShaPoLi method involves the measurement of shaft power, torque and speed that are fed back to the engine management system to then limit power in accordance with the regulations. The ShaPoLi method will be most commonly required for ships that have engines with multi consumers and controllable pitch propellers, where limiting engine power using the EPL method will result in power being reduced to all consumers, which would not be acceptable. By measuring shaft power to the propeller and limiting only this consumer, through the adjustment of the propeller fin angle, then the ship can comply with EEXI requirements, whilst the rest of the configuration keeps its original profile.

Trelleborg's TSX5 Shaft Power Meter can form part of an EEXI compliant ShaPoLi system in accordance with the requirements of MEPC.335(76). For more information regarding TSX5 Shaft Power Meters and EEXI compliance please contact TMSUKsales@trelleborg.com

TSX5 Operation

The TSX5 system utilizes strain gauge technology applied to the surface of the intermediate shaft. The engine and gearbox apply torque to the shaft, whilst resistance from the propeller applies drag. The combination of torque and resistance twists the shaft, causing the strain gauge to deform and change its electrical resistance, from which a measurement of strain is calculated.

The change in resistance from the strain gauge is measured by the rotor board unit, which is housed in the rotor ring clamped to the shaft. The rotor ring also protects the strain gauge from damage and contamination. The rotor board unit conditions and processes the information from the strain gauge and then wirelessly transmits the signal to the processing cabinet for calculating shaft torque and power.

The **TSX5** processing cabinet and power head are mounted on the stanchion unit and the height of both can be adjusted to match the center of the shaft and optimize performance. The stanchion unit is mounted on a pedestal which is securely welded to the deck.

An electromagnet housed in the power head induces an electrical current in a copper coil wrapped on the rotor ring, and this powers both the rotor board unit and acts as a magnetic source for rotor mounted inductors to measure shaft direction and speed.



The values for torque and power can be displayed on remote screens in the ECR and on the bridge. Shaft speed is also displayed and thrust measurement can be provided as an option. Cumulative totals are reported, and the configuration mode allows for set up, calibration and fault finding.

TSX5 Shaft Power Meters can be fitted to a wide range of shaft sizes from 150mm all the way up to 1000mm for the largest ships. 4-20mA and serial data outputs are available for connecting to the ship's IAS or DCS, and for connecting to a Ship Performance Monitoring system.

TSX5 Characteristics

Features

- Compact system fits majority of shaft spaces
- Suitable for any shaft diameter from 150mm to 1000mm
- Simple, easy-to-read displays
- Multiple output types provided
- Possible to integrate into control and monitoring systems, data networks & ship performance monitoring system
- Thrust option available
- Robust construction
- Proven installation method by skilled engineers
- Reliable and maintenance free operation
- Annual calibration ensures system accuracy
- Over 700 systems installed
- Type Approved – DNV-GL & CCS

Benefits

- Proven, accurate and real time measurement of shaft power
- Direct measurement of shaft power is the most accurate measure of power to water
- Having accurate power data allows for the most efficient operating mode to be adopted
- Base line power curves created from sea trials provides data for trending analysis
- Can be used as an early indicator of hull and propeller fouling
- Effective monitoring device for any antifouling measures taken
- Reducing power usage will lead to a reduction in fuel consumption
- Reduced fuel consumption leads to reductions in NOx, SOx, and CO2 emissions
- Saves money, quick return on investment



Ship Technology for a
Sustainable Future

Service, Support and After-sales



Trelleborg provides dedicated support throughout the full length of a product's lifetime and beyond. Our support combines commercial and technical knowledge, which are both put into practice through site services, installations and repair, helping you to reduce downtime, improve productivity and reduce costs.

Services include:

- Skilled and experienced technicians
- On site installation and commissioning
- Crew training in product operation
- Global service support
- Dedicated product support and After Sales Department at service.TMSK@trelleborg.com



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The responsibility or liability for errors and omissions cannot be accepted for any reason whatsoever. Customers are advised to request a detailed specification and certified drawing prior to construction and manufacture. In the interests of improving the quality and performance of our products and systems, we reserve the right to make specification changes without prior notice. All dimensions, material properties and performance values quoted are subject to normal production and testing tolerances. This brochure supersedes the information provided in all previous editions. If in doubt, please check with Trelleborg Marine and Infrastructure.

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BC_OGT_TSX5_v1_EN_2021



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