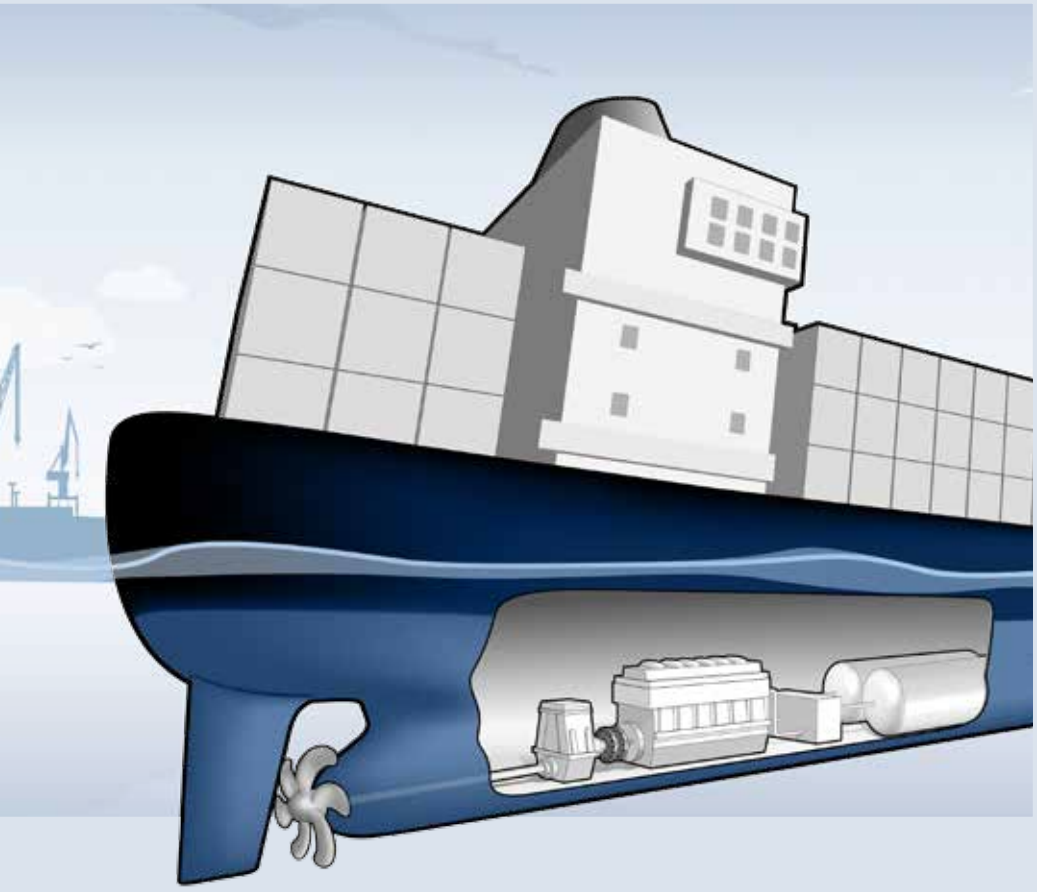
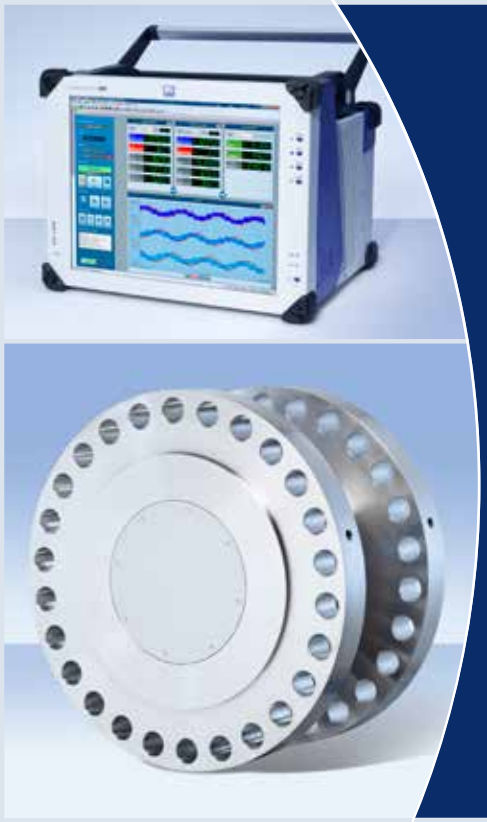
# Full Steam Ahead – With Highest Precision

## Test and measurement technology for the marine and shipbuilding industry







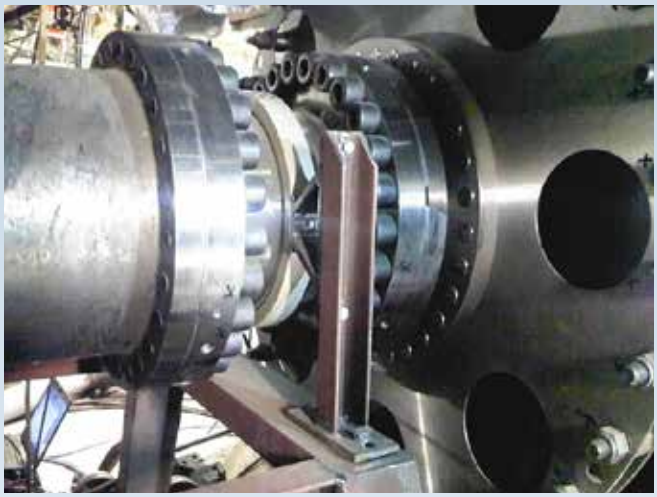
HBM

# On Course to Success With HBM

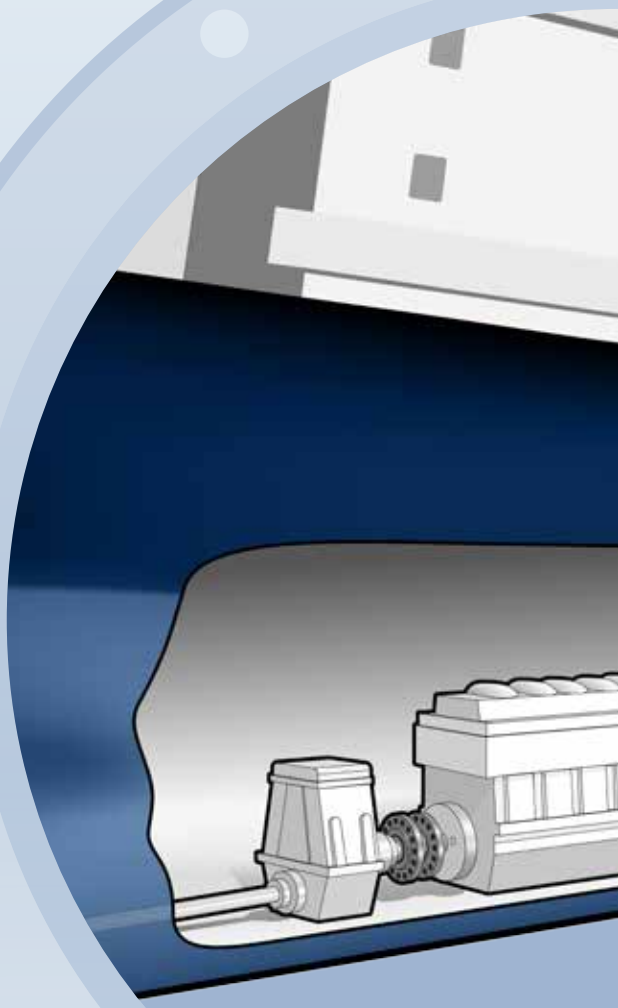
HBM test and measurement technology supports shipbuilders and their component suppliers in the development of increasingly efficient components and propulsion systems as well as through on-board monitoring during the operation of ships - providing complete solutions from high-precision sensors to powerful measuring amplifiers and analysis and visualization software.

## On-board Monitoring:

Reliable and highly efficient operation of dual-fuel and gas engines thanks to precise load measurement in the power train.

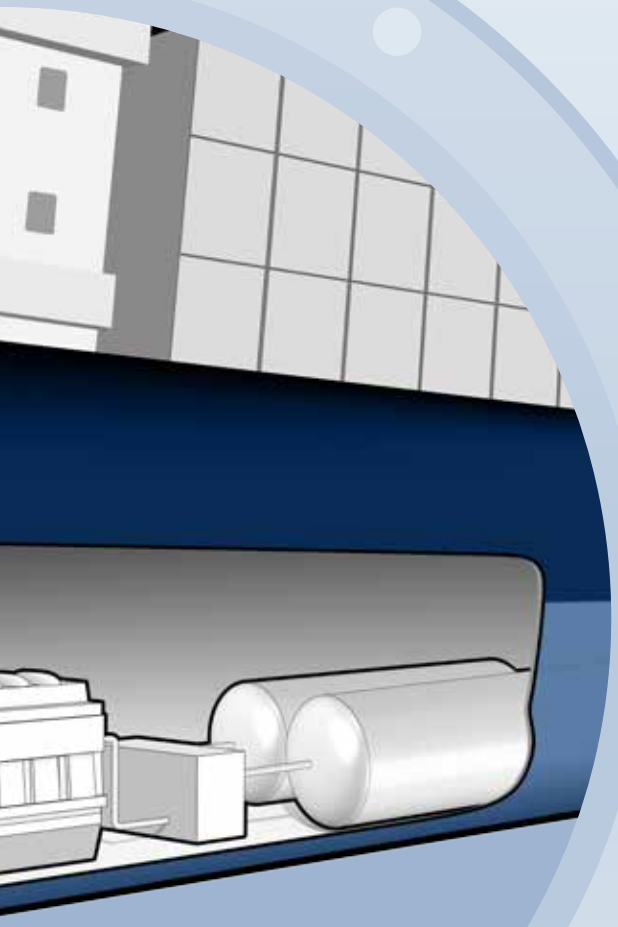


*T40MAR torque transducer installed in a ship propulsion system*



## HBM:
## Your Reliable Partner in the Marine Industry.

- Sensors for physical quantities:
  Torque, strain, force, pressure and more
- Measuring amplifiers for high-performance data processing
- Professional software for visualization and measurement data processing
- Services for the installation of test and measuring equipment on site
- Certification in compliance with international marine standard



*Certified torque sensor for marine use*

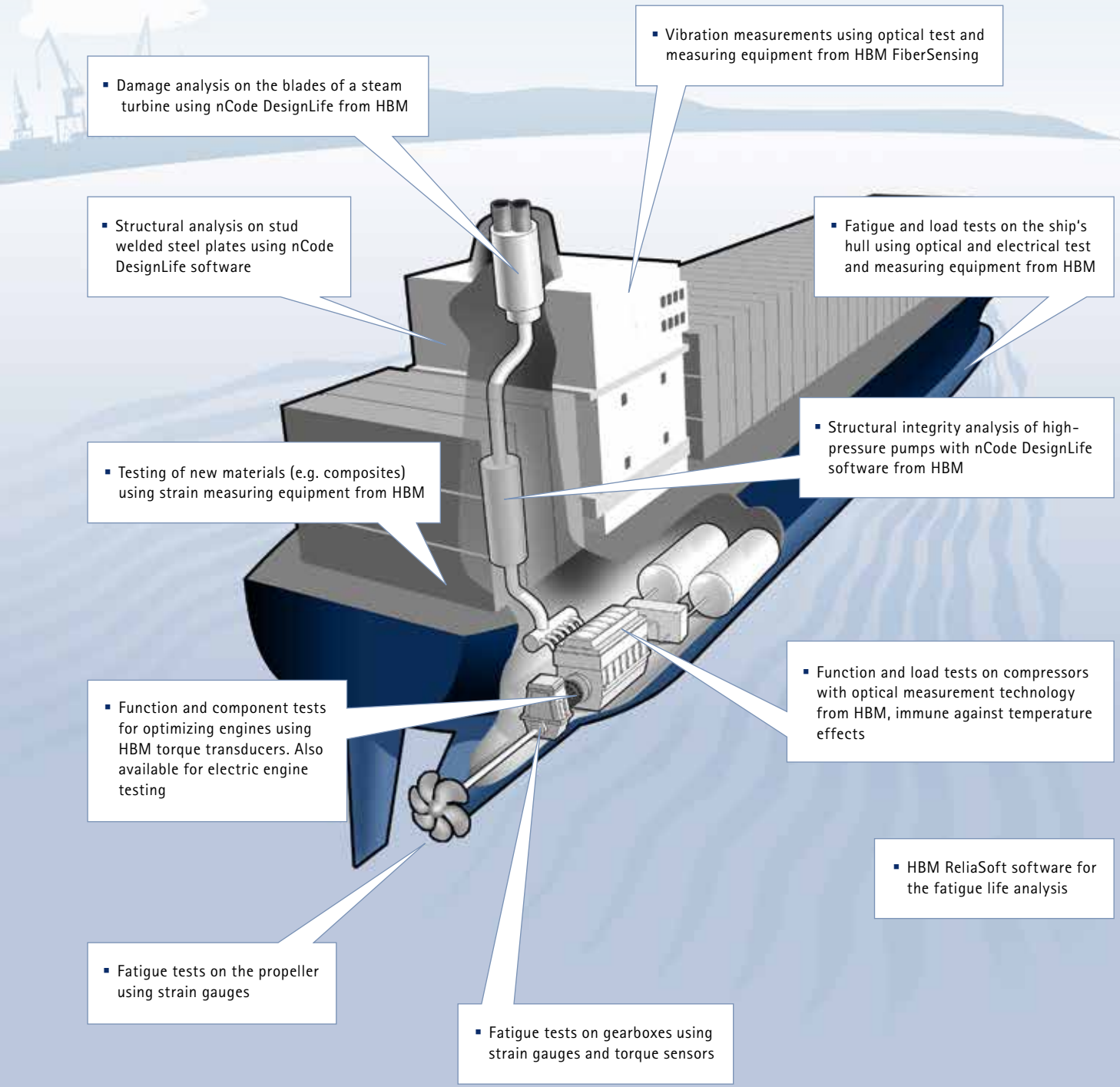
### Testing on the Test Stand:

Reliable development of components and propulsion systems thanks to sensors, measuring amplifiers and software from HBM.

*Torque transducer in a test stand for ship engines*

# Test and Measurement Equipment for Ship Component Testing

A good ship is more than the combination of its components. HBM provides you with sensors, amplifiers and software for conclusive fatigue and load testing of your components - such as measurement of strain, force, torque and many other measurement quantities.



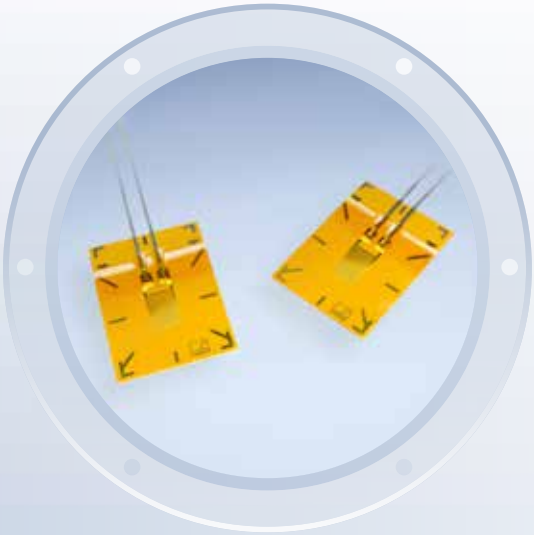
- Damage analysis on the blades of a steam turbine using nCode DesignLife from HBM
- Vibration measurements using optical test and measuring equipment from HBM FiberSensing
- Structural analysis on stud welded steel plates using nCode DesignLife software
- Fatigue and load tests on the ship's hull using optical and electrical test and measuring equipment from HBM
- Structural integrity analysis of high-pressure pumps with nCode DesignLife software from HBM
- Testing of new materials (e.g. composites) using strain measuring equipment from HBM
- Function and load tests on compressors with optical measurement technology from HBM, immune against temperature effects
- Function and component tests for optimizing engines using HBM torque transducers. Also available for electric engine testing
- HBM ReliaSoft software for the fatigue life analysis
- Fatigue tests on the propeller using strain gauges
- Fatigue tests on gearboxes using strain gauges and torque sensors

## Testing and Optimizing Electric or Hybrid Propulsion Systems

The HBM eDrive testing solution enables testing and optimizing your electrical system, a purely electric motor or entire cutting-edge hybrid drives.
eDrive testing acquires and analyzes all signals - from merely mechanical such as torque, rotational speed and temperature through to electrical such as currents and voltages - while at the same time providing real-time power analysis and efficiency calculation.
This allows a holistic approach to assessing, measuring and optimizing propulsion system strategies and fully utilizing hidden efficiency reserves.

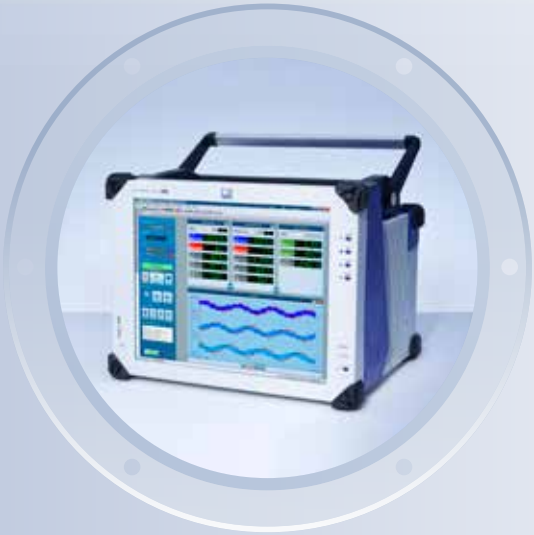
## Torque Measurement in the Test Stand

Reliably acquiring torque is the key task of engine and component testing in test stands. HBM's high-precision digital torque transducers provide you with measurement data you can trust - for example when developing new and highly precise ship propulsion systems.

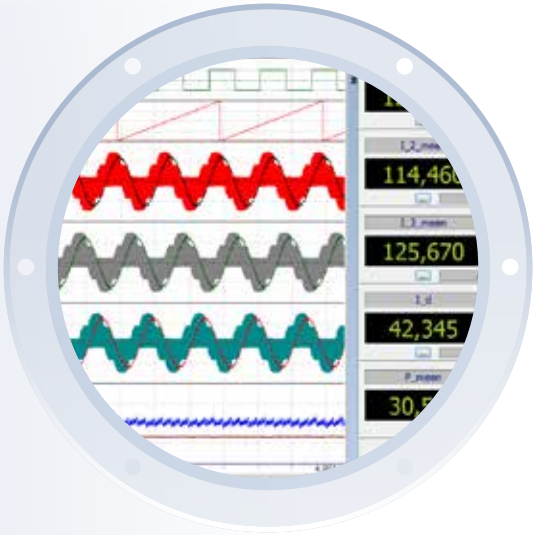


*Strain gauges*

*Torque Transducers*



*Genesis HighSpeed Data Acquisition System*



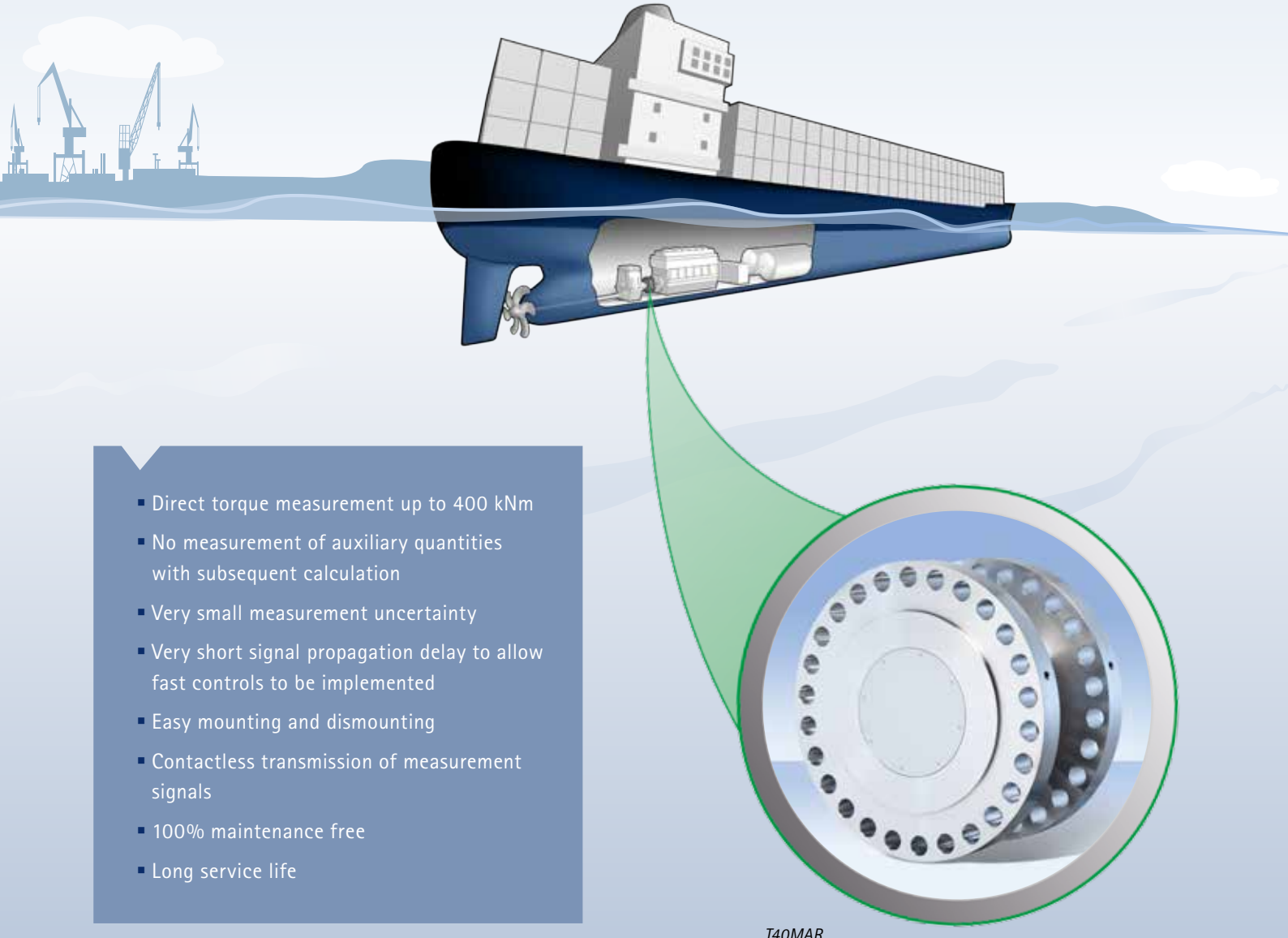

*HBM analysis software with real-time efficiency calculation in hybrid propulsion systems*

# The Professional On-board Monitoring Solution

Current MARPOL regulations call for the use of cleaner and more efficient ship propulsion systems. Dual-fuel and gas engines represent an attractive solution, however, they depend on the generation of a precise load signal during operation to avoid knocking and misfiring. Only torque flanges based on strain gauge technology can generate this load signal - and thus ensure reliable and efficient on-board monitoring. This solution is also suited for other applications such as thruster or crane winch monitoring.

## T40MAR: HBM's On-board Monitoring Solution

T40MAR is the certified torque transducer for use on ships. Benefit from direct torque measurement without additional calculations to reliably determine the load signal.



- Direct torque measurement up to 400 kNm
- No measurement of auxiliary quantities with subsequent calculation
- Very small measurement uncertainty
- Very short signal propagation delay to allow fast controls to be implemented
- Easy mounting and dismounting
- Contactless transmission of measurement signals
- 100% maintenance free
- Long service life

*T40MAR*

*the certified torque transducer for use on ships.*

On ships, the load signal has often been measured using a lever arm so far.
This has significant disadvantages compared to using a torque flange:

| | Torque flange | Measurement using a lever arm |
|---|---|---|
| Precision | Very high | Low |
| Calculation of the quantity Torque | Not necessary<br>▸ Very low measurement uncertainty | Torque is calculated on the basis of other quantities<br>▸ Very imprecise and high measurement uncertainty |
| Determination of the load signal to avoid knocking | Precise<br>▸ no risk of knocking | Uncertain<br>▸ risk of knocking |


*400 kNm calibration machine*

*HBM has calibration machines up to 400 kNm.*

*Thus we guarantee that you get optimal measurement results even with ship propulsion systems*





*Certified for marine use.*

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