Engine Performance Monitoring – TORXmeter® mkII shaft power meter

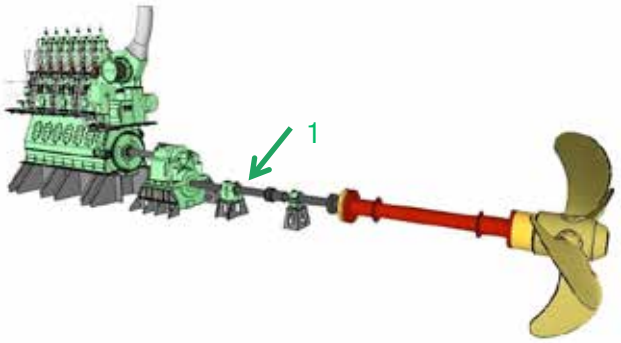
The determination of performances and efficiencies of the ship propulsion system is a crucial requirement for a complex process evaluation of ship engine operation.

The trend is also moving forward to a “Smart vessel” with several installed sensors to obtain and analyse a variety of data. An engine or ship performance improvement can only be done through better and more comprehensive data acquisition.

The recording and processing of the following engine measured variables help you to do this:

- Shaft Torque
- Shaft Speed
- Shaft Power

→ our solution for you the **TORXmeter® mkII shaft power meter (1)**



The shaft power measurement system TORXmeter® mkII measures the power transmitted through a shaft, enabling the measurement of actual engine power delivered to the propeller in real-time.

The cost of a maintenance free and accurate permanently installed torsion meter is very reasonable, in comparison with potential saving in operational costs and compliance with regulations or improvements in key indicators.

- → Fuel savings
- → Emission reduction
- → Improved maintenance scheduling
- → Equipment protection

Shaft power is an essential input (KPI) for ship performance monitoring systems and ship efficiency. Shaft power measurements levels provide an accurate reference point to assist with the assessment of:

- → Engine performance monitoring
- → Hull condition
- → Propeller condition
- → Specific fuel oil consumption
- → Operational efficiency planning
- → Ship condition changes

The TORXmeter® mkII is for permanent measurement of the torque and shaft rpm. As result the shaft power will be calculated. These data can be used for power measurement, fuel consumption management and engine management.

Principle of Operation

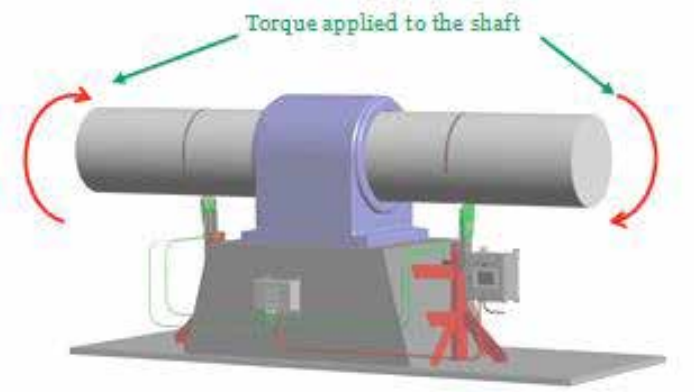
Flexible shaft will deform under the action of torque and a twist angle is generated. The angle of twist is measured by mounting two magnetic belts on the shaft.

The measurement principle is an extreme fast response (EXFR) magnetic scanning of the magnetic pattern of the belts. The EXFR sensors mkII uses the magnetic pole changing and the zero crossing (change of the magnetic fields) between the two sensor belts for angle measurement.

The signals are working with a resolution of 24 bit.

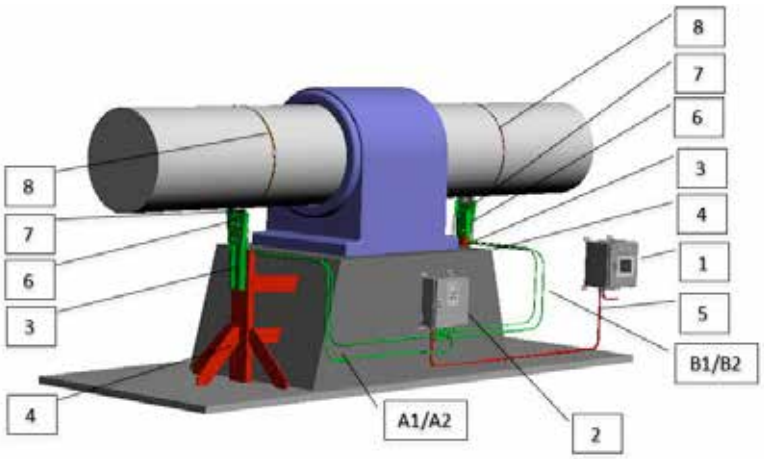
The measurements (raw data) will be sent to the MWE box mkII, which calculated the necessary angles. These values will be sent to the Terminal Box mkII. Here the values will be calculated to torque, RPM and shaft power.

The Terminal Box mkII is a touch screen operated system which provides the readings on the measurement display or via communication interfaces. Daily, - and single test reports can be created for the voyage automatically and will be stored, in addition to the measurements, on a SD card (history viewer).



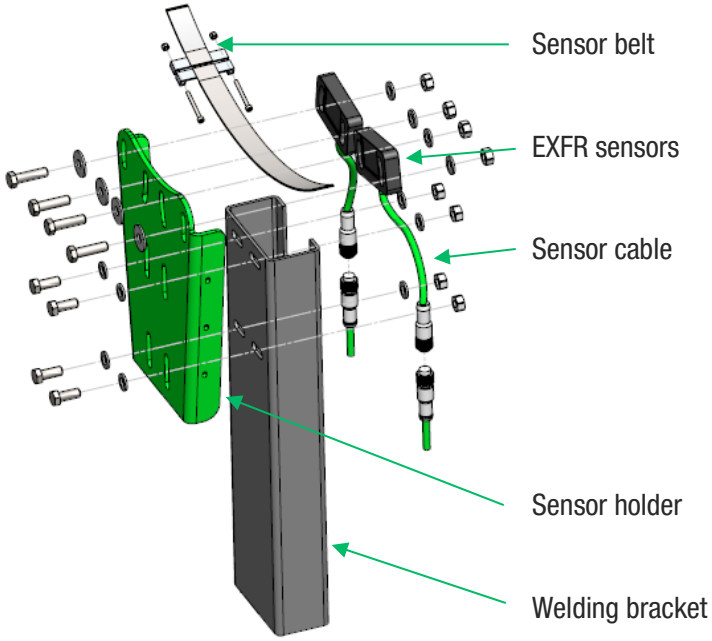
Scope of supply

No. 1	Terminal Box mkII
No. 2	MWE Box mkII
No. A1/A2	Pre-wired cable between MWE box mkII and EXFR sensors mkII (appr. 7,5 m)
No. B1/B2	Pre-wired cable between MWE box mkII and EXFR sensors mkII (appr. 7,5 m)
No. 3	2x Welding brackets (bracket must be welded to ships structure –No.4)
No. 4	2x Support for sensor holder
No. 5	Cable between Terminal box mkII and MWE box mkII (4x2x0,75mm²)
No. 6	2x Sensor holder (screwed on No.3)
No. 7	2 x Sensor holder with pre-mounted 2x2 EXFR sensors mkII (A1/A2) (B1/B2)
No. 8	2 x EXFR sensor belts mkII
Remark:	red items not in the scope off supply



The TORXmeter® mkII, is the further development of the TORXmeter® which offers new functions:

- New advanced EXFR sensor technology, now with 2 separate sensor heads per side. More flexibility for installation and smaller shaft diameter
- Extended LED status on the MWE mkII Box for simplified commissioning and error diagnosis
- Optional: repeater display for ECR or bridge



Benefits

The TORXmeter® mkII, has been developed to meet the requirements of the marine market.

The feedback from our customers are included in the revised system.

- ➔ Easy to install and operate
- ➔ No electronic parts on the rotating shaft
- ➔ Full contactless
- ➔ Maintenance free
- ➔ Can be Installed in 1 day
- ➔ All Components can be replaced individually
- ➔ Easy error diagnosos via email due to fault indicators on the components
- ➔ Zeroing (new calibration) can be done by ships crew

A major cost factor is always the installation and commissioning of shaft power systems.

The TORXmeter® mkII is designed for installation by crew and within a short time.

A set of training videos are included in the scope of supply to lead the crew step by step to the installation & commissioning process.

In addition, we will support with free of charge E-mail assistance and questionnaires to guide the crew remote.

As a matter of fact, we are offering installation and commissioning even by service technicians or training courses in our factory.

Terminal Box mkII

The Terminal Box mkII is a touchscreen operated system for the operation of the TORXmeter® mkII with following functions:

- Permanent display of shaft power, torque and shaft rpm
- Display of the load diagram
- Entry of the ship specific parameter
- Calibration (Zeroing) of the system
- Carry out single and daily reports
- Software update via USB stick
- Datalogging on SD card

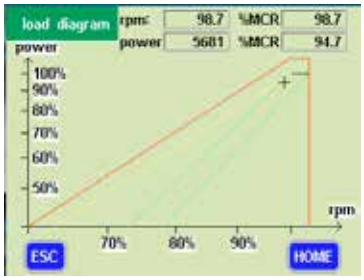
ShaPoLi compliance in progress

Also available for existing Systems with an easy software update.

Main screen

Parameter screen

Measurement screen



Load diagram

Daily report screen

Calibration angle screen

MWE Box mkII

- Pre-wired with 4 cables for connection of the EXFR sensors
- Only one cable needed between Terminal Box mkII and MWE Box mkII for power supply and communication interfaces
- Evaluation of the raw data and send to Terminal Box mkII
- Status LEDs on the front for health check of the MWE board and sensor board

Technical Specification:		
Sensor Accuracy	<0,1% (Shaft torque, Shaft RPM, Shaft power) <0,1%+Ke (Shaft torque) (Ke means total error in shaft modulus constant and shaft diameter)	
System Accuracy	<0,1% (Shaft power, Shaft RPM)	
Shaft diameter	150mm up to 3000mm	
Speed Range	Up to 1200 rpm	
Data Output	Performance output 4-20mA Outputs (4 PCS)	RS485 (NMEA183) protocol Other communication interfaces, e.g. Modbus optional available Torque, shaft power, shaft rpm, bipolar shaft rpm
Data storage	Mini SD card at the Terminal Box mkII control board	
Alarm output	Overload alarm, system failure via potential free contact	
Measurement principle	Extreme fast response magnetic scanning	
Environmental	Operating temperature	0°C up to 50°C
Environmental Sealing	Terminal Cabinets	IP 67
	Sensors	IP 67
Supply Voltage	Power consumption	100/240VAC, 5-60Hz, 16A; 24 Volts / <2A
Options	Repeater display for ECR or WH	

TORXmeter®mkII digi

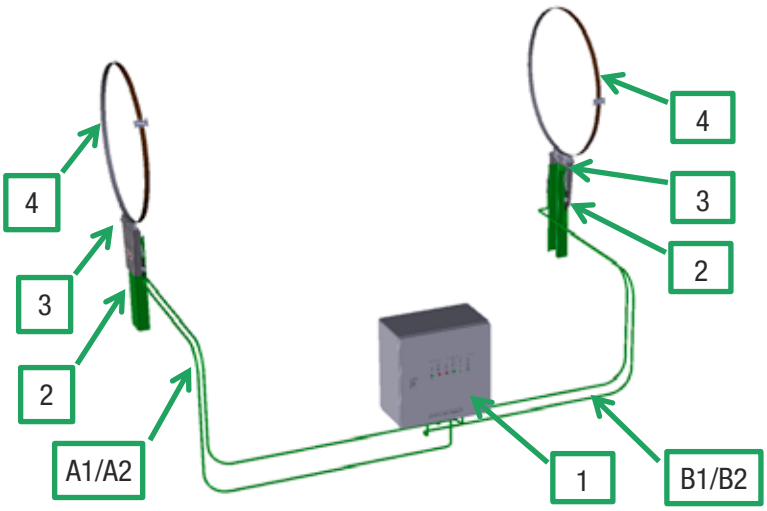
More Functionality - More Flexibility - ShaPoLi compliant – Class certificate in progress

The TORXmeter® mkII digi is the next generation in torque measurement and evaluation with following new functions:

- less number of components
- PC software for displaying measuring data
- Setup via Laptop of all parameters via software and USB connection
- Extended Performance outputs for more extensive evaluations of the measured values and raw data
- Output via RS485 (NMEA183) protocol 1/s; Baud rate 4800 up to 38400
- Output for °twist/°crankshaft; resolution <2°; binary 14 bytes
- Small coloured display for setup and displaying measurement data
- Super-fast raw data of twist angle and shaft position
- Failure and overload indication via LED or NMEA protocol
- Status indication via LED or NMEA protocol
- SD card storage
- Firmware update via USB connection
- Optional available repeater display for ECR or WH

Scope of supply

No. 1	Cabinet with display
No. A1/A2	Pre-wired cable between Cabinet and EXFR sensors mkII (appr. 7,5 m)
No. B1/B2	Pre-wired cable between Cabinet and EXFR sensors mkII (appr. 7,5 m)
No. 2	2x Welding brackets (bracket must be welded to ships structure –No.4)
No. 3	2 x Sensor holder with pre-mounted 2x2 EXFR sensors mkII (A1/A2) (B1/B2)
No. 4	2 x EXFR sensor belts mkII
No. 5	PC Software for setup parameter, display of measurement data and calibration
No. 6	“Torsional vibration” viewer of raw data and twist



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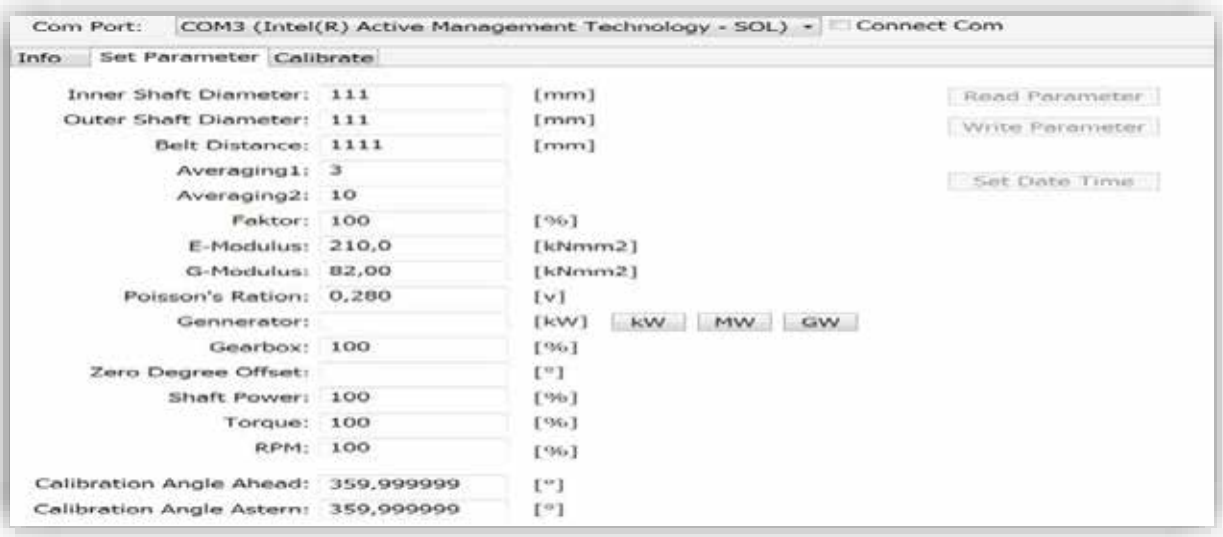
Com Port:
COM3 (Intel(R) Active Management Technology - SOL)
Connect Com
Info
Set Parameter
Calibrate
Inner Shaft Diameter: 111 [mm]
Outer Shaft Diameter: 111 [mm]
Belt Distance: 1111 [mm]
Averaging1: 3
Averaging2: 10
Faktor: 100 [%]
E-Modulus: 210,0 [kNmm2]
G-Modulus: 82,00 [kNmm2]
Poisson's Ration: 0,280 [v]
Gennerator: [kW] kW MW GW
Gearbox: 100 [%]
Zero Degree Offset: [°]
Shaft Power: 100 [%]
Torque: 100 [%]
RPM: 100 [%]
Calibration Angle Ahead: 359,999999 [°]
Calibration Angle Astern: 359,999999 [°]
Read Parameter
Write Parameter
Set Date Time

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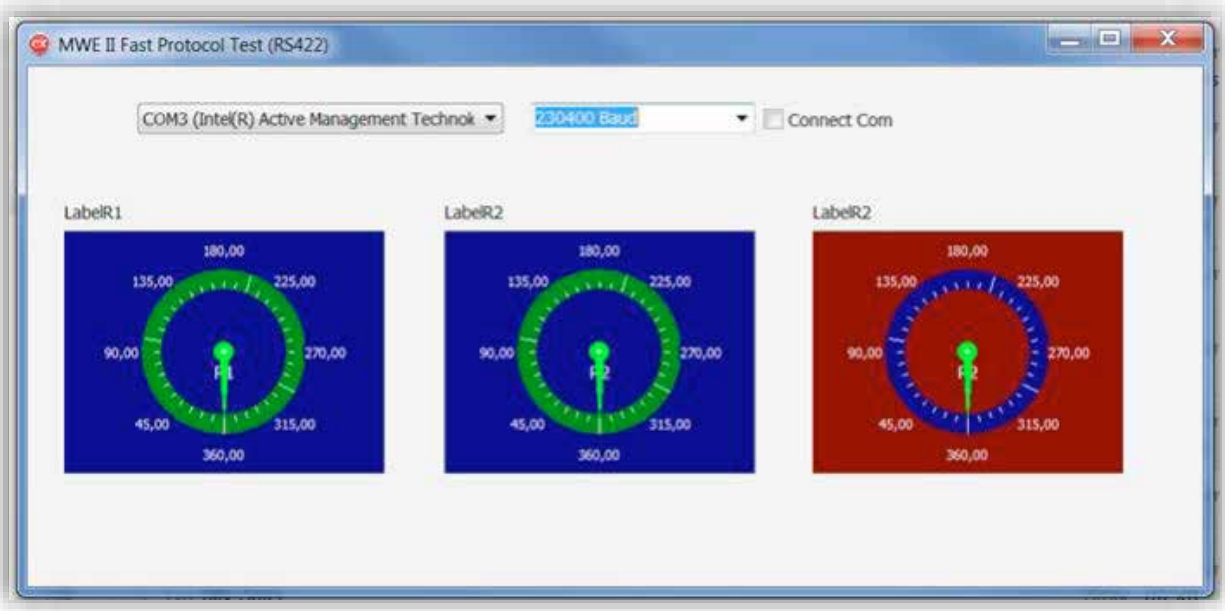
MWE II Fast Protocol Test (RS422)
COM3 (Intel(R) Active Management Technok
230400 Baud
Connect Com
LabelR1
LabelR2
LabelR2
180,00
135,00
225,00
90,00
270,00
45,00
315,00
360,00

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TORXmeter Mark II
TX Marine Messsysteme GmbH
Password:
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ESC


ESC

For a better shipping – a steadily growing global network

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